



Questioned Documents Examination

Test No. 20-5211 Summary Report

Each sample set consisted of a questioned certificate of qualifications (Q1) and a known sample template for comparison (K1). Participants were requested to compare the questioned certificate and template to determine if the questioned document is authentic. Data were returned from 166 participants and are compiled into the following tables:

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This report contains the data received from the participants in this test. Since these participants are located in many countries around the world, and it is their option how the samples are to be used (e.g., training exercise, known or blind proficiency testing, research and development of new techniques, etc.), the results compiled in the Summary Report are not intended to be an overview of the quality of work performed in the profession and cannot be interpreted as such. The Summary Comments are included for the benefit of participants to assist with maintaining or enhancing the quality of their results. These comments are not intended to reflect the general state of the art within the profession.

Participant results are reported using a randomly assigned "WebCode". This code maintains participant's anonymity, provides linking of the various report sections, and will change with every report.

Manufacturer's Information

Each sample set contained one known, generic template for a job training certificate (K1) and one questioned certificate issued in the name of Alexandria Smith (Q1). Participants were asked to compare the known and questioned documents to determine if the certificate in question could be confirmed or refuted as authentic.

SAMPLE PREPARATION -

The known certificate template (K1) was produced on Neenah Exact Index Premium card stock (94 bright, 110 lb). The contents of the certificate were generated and assembled in Photoshop. The font used was Perpetua Regular. Two handwritten signatures were scanned and inserted onto the template. Printing margins were set at Top = -0.15, Left = -0.2. The certificate was printed using a commercial-grade, wide format Epson inkjet printer. This template was also used to generate a certificate in the name of Maria Jones, dated 21 March 2019. This certificate was not part of the provided sample set.

The questioned certificate (Q1) was produced on Neenah Bright White card stock (96 bright, 65 lb). The Maria Jones certificate was scanned into Photoshop using an Epson high resolution scanner. The scanned certificate was modified by removing the name and replacing it with "Alexandria Smith" in Sitka Banner font. Printing margins were set to auto-center. The modified certificate was printed using a general use, desktop Epson inkjet printer.

SAMPLE SET ASSEMBLY -

After visual quality reviews were complete, each item was packed with chipboard into a pre-labeled item envelope. Following predistribution testing, all item envelopes were sealed and initialed with "CTS". These item envelopes were then packed within sample set envelopes, which were also sealed and initialed.

VERIFICATION -

Predistribution examiners determined that the certificate issued in the name of Alexandria Smith (Q1) was not authentic when compared to the template (K1). This was supported by the following observations: differing optical properties of the papers and inks used in document production, variance between printing processes, and misalignment of borders and texts.

Summary Comments

Each sample set consisted of one questioned certificate of qualifications (Q1) and a known sample template for comparison (K1). The company who issues the certificates is questioning whether or not the certificate issued in the name of Alexandria Smith is authentic. The Q1 certificate is not an authentic document as compared to the K1 template (Refer to the Manufacturer's Information for preparation details).

For question 1, "Based on the findings of your examination, to what degree can it be confirmed or refuted that the certificate is authentic?" 157 of 166 (94.6%) responding participants reported the certificate was not authentic ("E", 147 participants) or was probably not authentic ("D", 10 participants). Four participants could not determine if the certificate was authentic ("C"), and five participants reported the certificate was authentic ("A").

A majority of participants provided the following observations to support their conclusion that the questioned certificate was not created using the known template: Commonly, it was observed that different reactions from the inks and paper occurred between K1 and Q1 when subjected to examinations of luminescence, reflectance, and fluorescence. Many participants stated that the documents could be distinguished under microscopic comparison of ink deposition and utilized colors. Some participants noted that the color of the paper differed slightly between the two documents. Additionally, observations of misalignment of the document features were reported when K1 and Q1 were overlaid. Finally, some noted that the font used for the name "Alexandria Smith" was incongruent with the other font used throughout the rest of Q1 and K1, indicating a cut-and-paste edit of an authentic certificate.

Across the 166 responding participants, 648 methods of analysis were reported in total. Some of these methods were reported more than once by a single participant, indicating the technique was possibly performed more than once to examine different features of the document or to use different equipment settings. The most commonly reported technique utilized was Video Spectral Comparator (VSC), reported 140 times; it was frequently used for determining optical properties of the documents. Other frequently reported methods include Visual Examination (103), Microscopic Examination (84), Ultraviolet Light (42), and Transmitted Light (40). The methods listed in the response summary are the preloaded options for selection via the CTS Portal and do not reflect all answers provided by participants.

Examination Results

Based on the findings of your examination, to what degree can it be confirmed or refuted that the certificate is authentic?

TABLE 1

WebCode	Q1	WebCode	Q1	WebCode	Q1
23LKHZ	E	7F8NNK	E	CCR6AJ	C
2DGXEP	E	7MBTHP	E	CJB9GL	E
2DJLV4	E	7PUP4U	E	CWDZKH	E
2X6CUZ	E	7UAWRU	E	DBUBPK	E
32HG3U	E	7WCV3M	E	DGF9CL	E
33YEUT	E	8HUMEN	E	DK3QWR	E
37ZHN2	E	8LUZZR	E	DM3YYG	E
3TAQYQ	E	8PCV4K	E	E7ANPK	E
42YTKY	D	92MNBQ	E	EF6N8J	E
48P4UX	E	94RFZJ	E	EQJLCM	E
4AR7FT	E	9DDKA4	E	EUMGVP	E
4DPMU8	E	9DVQAU	E	EYCY8F	E
4GQVWW	E	9QEDEL	E	EZ9A8P	E
4TK8BV	E	9RXYD3	E	FBK27H	E
63PEQV	E	9VXB93	E	FCWVQP	E
6A8PZP	E	AGDAUN	A	FE4BZG	E
6DQ2HR	E	AJZUVL	E	FNTYUJ	E
6LK8BT	E	AMY6QL	E	FQENEW	E
6N37PN	E	AUVZQ6	E	FQZYCJ	E
6YQZ6Q	E	AVQHUR	E	FXGUUY	E
6ZWMEP	E	AYN4GN	E	FYBJEF	E
74UJGN	D	B9TBWN	E	G42DPL	E
7AH7CU	D	BJG3L2	E	G4LT6N	E
7C6PDR	E	BRBB7R	E	GDLNYD	E

TABLE 1

WebCode	Q1	WebCode	Q1	WebCode	Q1
H74BZE	E	MXCQGA	E	RCH9JK	E
HAGF89	E	N6TLX4	E	RDQKYZ	E
HHWUEK	E	N6UEVB	E	RFXZ67	D
HM6EYB	E	N9TPQB	E	RFZQEA	E
HYJC4E	E	NDJZ2A	E	RNNLB6	D
J2J3PK	E	NK7WMC	E	RNPEAC	E
JDW3JT	E	NLHPHD	E	T2WJY6	E
JQKAE9	E	NN3GUG	E	T8ZPE8	E
JQL3CF	E	NQ9YRC	A	TVQRQ8	E
K9JLMA	E	P4CP64	E	TZYDHB	E
KBNA6K	E	P8QMB7	E	U3HPTZ	E
KP8WAC	E	PCM7GB	E	U8DJQ2	E
KU4J6K	C	PDHPhC	E	UBY2B8	E
KYXK6E	E	PHDFQ9	A	UC9BYY	C
KYYBDH	E	PQ7VB7	E	UEDYFA	E
L4NA6H	D	PTRDVC	E	UHWXT4	D
L88AHC	E	PWUEVA	E	UMQRQ6	E
LQYBEF	E	PZTPRA	E	UMRMF3	E
LW3GTH	E	Q49K6L	E	UWU6PK	E
LWL6BD	E	QDWF62	E	V4A3W6	E
LZLCWB	E	QVDG4A	E	VNJ34J	E
M2B63D	E	QVG74Z	E	VUKF23	E
M8E4FN	E	QZ9DMA	E	W3XN34	A
MFRZHA	E	R2EBBB	E	WACGEY	E
MLHAR9	E	R6ZZVM	D	WB8ZF2	E
MPLZ29	E	R9VQ2Y	D	WKDW44	E
MR7XMD	E	RA8LK7	A	WRYXHV	E

Revised: July 31, 2020. Data for participant 7MBTHP added.

TABLE 1

WebCode	Q1	WebCode	Q1	WebCode	Q1
WVX9DV	E				
X6HYDT	D				
XB3VH4	E				
XJ2KY8	E				
YMEP72	E				
Z4HJD2	E				
Z6P2CW	C				
ZBWJCB	E				
ZLGXDR	E				
ZQNK7V	E				
ZT2UJ3	E				
ZVHE4W	E				
ZZYLRW	E				

Response Summary - Q1		Total Participants: 166
<i>Based on the findings of your examination, to what degree can it be confirmed or refuted that the certificate is authentic?</i>		
<u>Response</u>	<u>Q1</u>	
A	5	Response Key: A. The questioned certificate IS AUTHENTIC as compared to the template. B. The questioned certificate IS PROBABLY AUTHENTIC as compared to the template. C. CANNOT DETERMINE whether or not the questioned certificate is authentic as compared to the template. D. The questioned certificate IS PROBABLY NOT AUTHENTIC as compared to the template. E. The questioned certificate IS NOT AUTHENTIC as compared to the template.
B	0	
C	4	
D	10	
E	147	

Methods and Observations

What methods/techniques did you utilize? What observations were made from each method/technique?

TABLE 2

WebCode	Methods/Techniques	Observations
23LKHZ	Visual Examination	Overall appearance of paper & ink-jet printing differs between K1 and Q1. Colour differences in paper and printing of K1 and Q1. Q1 name of recipient not in upper case and note differences in font style of 'Alexandria Smith' entry on Q1 compared with other entries on Q1 and all on K1.
	Ruler	Differences in size of K1 and Q1 paper.
	Thickness	Differences in thickness of K1 and Q1 paper (micrometer).
	Video Spectral Comparator (VSC)	Differences in appearance of K1 and Q1 paper under different lighting conditions including transmitted, UV and spot (fluorescence). Also differences noted in printing on K1 and Q1 under different lighting conditions (IR & spot), though results need to be treated with caution given differences in paper.
	Macroscopic/Microscopic Examination	Differences in font style of 'Alexandria Smith' and in microscopic appearance of printing of this entry compared with other entries on Q1. Differences noted in microscopic appearance of all printing on Q1 compared with K1. Repeating fault noted in printing on Q1 (lines through the text) and 'trash' marks.
	Indented Writing	Oblique light and ESDA examination of K1 and Q1 carried out but no discernible roller marks or other found.
	Overlays	Overlaying of K1 and Q1 shows a difference in size of comparable elements (Q1 larger). This, and the appearance of the printing on Q1, is what might be expected if; for example, a genuine certificate were scanned/copied and the name of the recipient was subsequently altered to produce Q1.
2DGXEP	Video Spectral Comparator (VSC)	Document K1 and Q1 were printed with use different devices (individual features, quality of outprints, different optical properties of inks).
	Video Spectral Comparator (VSC)	Document K1 and Q1 were printed on different papers.
	Video Spectral Comparator (VSC)	In K1 document, text "NAME OF RECIPIENT" was typed with use capital letters, probably "Perpetua" font. In Q1 document, text "Alexandria Smith" was typed with use uppercase and lowercase letters, probably in "Sitka Banner" font.
	Video Spectral Comparator (VSC)	Individual graphic elements of the K1 document (border, the same text on each copy, caption images of signatures) are compatible with the corresponding graphic elements of the Q1 document (in position, size and typeface). The entries in the date of issue of the document are analogous in type, font size and print characteristics, but differ in content.
2DJLV4	Microscopic Examination	
	Macroscopic Examination	
	Video Spectral Comparator (VSC)	
2X6CUZ	Macroscopic Examination	Questioned certificate Q1 showed differences in the colour of the frame pattern from K1.

TABLE 2

WebCode	Methods/Techniques	Observations
	Microscopic Examination	The printed entries of Q1 showed similar inkjet printing process as the printed entries of K1. However, the printing characteristics of Q1 showed high print density compared to K1.
	Video Spectral Comparator (VSC)	1) The printed entries of Q1 and K1 showed differences under infra red luminescence. Q1 showed fluorescent ink outlining the ink strokes and no outlining ink stroked observed on K1. 2) The printed entries of Q1 were blue in colour whereas the printed entries of K1 were black in colour under infra red of wavelength 645nm. 3) The printed entries of K1 remain visible under infra red of wavelength 1000nm while the printed entries of Q1 disappeared. 4) The printed entries used for general layout of the certificate of Q1 & K1 corresponded when superimposed.
32HG3U	Video Spectral Comparator (VSC)	780 nm filter: Q printing process optical reaction displayed reflectance, E did not. IR fluorescence: Q printing process displayed an outline of fluorescence, E did not. IR absorption (with 400nm filter) – Q paper appeared to contain less colored fibers than were present throughout E
	Microscopic Examination	Inkjet printing process: Q printing process visually appeared to have more yellow color present than E
	Macroscopic Examination	Size: Q measured slightly smaller (approximately 199mm) than E (approximately 200mm). Green border: darker green color on Q
	Overlays	Overlay of Q and E shows general agreement, excluding the uppercase/lowercase characters for the Q and all uppercase for the E
	Transmitted Light	Q paper displayed a different color than E
	Adobe Photoshop	Q paper appeared to contain less colored fibers than were present throughout E
33YEUT	Visual Examination	Organoleptic observation allows differentiating physical characteristics between the support of the Q1 certificate and the K1 certificate, finding a small difference between its dimensions, since Q1 presents 0.5 mm less in the contour of its support, compared to the dimension of K1, thus The same happens in the color of the support, where the Q1 certificate has a slight yellow hue compared to the white color that the K1 certificate support exhibits.
	Macroscopic/Microscopic Examination	The comparison by YUXTAPOSICIÓN and microscopy, allows to identify the existing differences regarding the printing system used, which although it is the same used in both cases "Ink Jet Printing", the K1 certificate (reference), presents less accumulation of colored particles (yellow, red and blue), while the Q1 certificate (investigated), multicolored dots abound in all the graphic elements, as well as in the support in general.
	Video Spectral Comparator (VSC)	The superposition of the Q1 and K1 certificates, observed against the light, shows the gap that exists between the topographic distribution of the graphic elements present (design of the frame, texts and signatures), in each of them, while the morphological characteristics and size of all printed graphic elements do not correspond.
37ZHN2	Photography	Photographed the evidence envelope prior to opening the envelope. Removed contents.
	Photography	Photographed the 2 evidence envelopes that were inside the large envelope prior to opening them. These envelopes contained Q-1 and K-1. Then I opened the envelopes.
	Ultraviolet Light	Examined each document under UV light.

TABLE 2

WebCode	Methods/Techniques	Observations
	Infrared Light	Examined each document under IR light.
	Oblique Light	Used oblique light to look for impressions or indentations in the paper on K-1 and Q-1.
	Visual Examination	Placed Q-1 and K-1 on a desk and did an overall visual side-by-side comparison between Q-1 and K-1 to note similarities or differences.
	Overlays	Overlaid Q-1 onto K-1 to look for any similarities and differences.
	Transmitted Light	Placed the overlaid documents, Q-1 and K-1 onto a light table and used transmitted light to note similarities and differences.
	Magnification	Used magnifying devices to examine any similarities or differences in the font usage between the name 'Alexandria Smith' to the rest of the printed text in the document, Q-1. Then compared the fonts Q-1 compared to the fonts used in document K-1.
	Microscopic Examination	Microscopic inspection allowed for a closer view of the serifs on the letters in 'Alexandria Smith' compared to the serifs on the remaining part of the document.
3TAQYQ	Visual Examination	Visible difference in general appearance between Q1 and K1
	Microscopic Examination	Both documents were produced by inkjet printers. Significant differences in the deposition characteristics. Alleged "dust particles" on document Q1 are also produced by inkjet printer (CMYK).
	Thickness	Different thickness of paper
	Infrared Light	Different reaction of the ink under infrared light.
	Weight	Difference in weight (Q1 10.9 grams / K1 11.7 grams)
42YTKY	Video Spectral Comparator (VSC)	The documents were examined using the VSC using alternative lighting sources. This examination disclosed optical differences in the substrate when using: 1) Incident white light – a slight colour difference was observed between the two substrates. 2) UV 254nm light - a slight reaction difference was observed between the two substrates 3) Transmitted white light - a significant color difference was observed between the two substrates. 4) Spot fluorescence @ 400-535 nm – a significant absorption/transmission of light difference was observed between the two substrates.
	Radiography	Nothing of note was observed in the radiographs of either document.
	Regula MagMouse	The document was found to contain ink with no traces of magnetic properties.
	Typography Examination	The formatting and layout, with respect to placement of the various elements and pieces of text is constant between the documents. The comparable elements of text, except the "name" field, share similar typefaces. The "name" field was observed to show a discrepancy in the type face, as shown during the comparison of the upper case "A". Differences were observed in the structural features of the glyph.

TABLE 2

WebCode	Methods/Techniques	Observations
	Macroscopic/Microscopic Examination	1) Print Process examination: the examination of the print process used to create the two documents disclosed a difference in the print process used to create the Q document as compared to the K document. This difference was observed in the printing of the text as well as in the printing of the border image. 2) Substrate a. the examination of the substrate used to print the two documents disclosed what appeared to be a difference in the stock or weight of the paper. This was a subjective and qualitative observation as not measurements were made but the paper felt different to the touch. b. Paper fibers were distinctively visible in multiple areas of the known and these fibers were not as visible in the questioned document.
	ESDA	The examination of the documents using the ESDA disclosed the presence of what appeared to be transport marks on the reverse of the Known document. These markings were not observed on the front of the document, and were not observed on the front or the reverse of the questioned document.
48P4UX	Visual Examination	general texture of the paper: no differences noted
	Magnification	examination of printing failures. For example, there were the same failures in the letter "w" in K1 and Q1
	Macroscopic Examination	examination of printing failures. For example, there were the same failures in the letter "w" in K1 and Q1
	Infrared Light	Ink comparison of pink dots "halo" on the letters of Q1 and of green dots "halo" on the letters of K1
	Ultraviolet Light	difference in background color of the paper substrate
4AR7FT	Visual Examination	The paper of K1 has a somewhat more yellow tone when compared to Q1.
	Microscopic Examination	Lower quality inkjet-printing on Q1, signs of copying/reproduction in all parts except the name. The paper of K1 contains a lot of yellow fibers, and some red ones, while Q1 barely contains any such fibers at all.
	Infrared Light	The paper of K1 has a small repeating square pattern visible in UV on the reverse side. This pattern is not present in the same way on Q1.
	Ultraviolet Light	The IR luminescence differs between the papers of K1 and Q1 and so does the IR reflection of the inkjet printing.
4DPMU8	Microscopic Examination	Q1: Stereomicroscopic examinations of Q1 revealed four color inkjet printing process. Four color spatter is located in the white areas of the paper. The black print appears to have four color inkjet, behind the black ink (K-fortification). The green border contains CYMK dots with additional black ink dots printed over the top. K1: Stereomicroscopic examinations of K1 revealed a black inkjet printing process; with lighter and darker black text with edges which consist of very few yellow, cyan and magenta ink dots. Microscopic examinations of the paper used to make K1 revealed long, tan paper fibers.

TABLE 2

WebCode	Methods/Techniques	Observations
Video Spectral Comparator (VSC)		Examinations of the Q1 paper using the VSC revealed the paper reacted less brightly and contained fewer fluorescent fibers when examined using the Spot Light Source and a 635 filter. This is different from the same examinations conducted with the same light sources and setting on the VSC with the paper appearing less bright and the fluorescent fibers being present in a much smaller amount. Examinations using the Spot light source and all combinations of filters revealed the black text on Q1, excluding the name "Alexandria Smith", reacted differently than all the black text present on K1. Examinations using the Spot light source and all combinations of filters revealed the green border pattern on Q1 reacted differently than the green border pattern present on K1. Additional examinations of the text and borders present on Q1 and K1 using the IR light source and the UV light source and all filter combinations, revealed the text and borders on Q1 and K1 both reacted differently.
ESDA		Electrostatic Detection Apparatus examinations failed to reveal any indented writing impressions, drawing impressions or mechanical text impressions. However, patterns were developed on the front side of Q1 and the backside of the K1 documents, which appear to be from feeder/roller mechanisms within the printers. Feeder/roller mechanism patterns were developed on the front side of the Q1 document which run vertically, top edge of Q1 certificate to bottom edge. The backside of the Q1 document failed to reveal any patterns from feeder/roller mechanisms. Feeder/roller mechanism patterns were developed on the backside of the K1 document which run across the certificate horizontally. The front side of the K1 document failed to reveal any patterns from feeder/roller mechanisms. The feeder/roller mechanisms pattern on the front side of the questioned Q1 certificate is different from the feeder/roller mechanisms pattern on the backside of the K1 certificate.
Visual Examination		The Q1 document has the same green border pattern as the K1 document; however the Q1 document's green border pattern is a richer, darker green color than the K1 document's green border pattern. The Q1 document also bears at least three trashmarks which are not present on the K1 document. There were not any trash marks present on the backsides of either the Q1 or K1 document. When the Q1 document and the K1 document are placed on top of each other, the Q1 document is approximately 1 cm short in length than the K1 document.
Oblique Light		Oblique light examinations of the Q1 document failed to reveal any indented writing, drawing, or mechanical impressions on the front side or backside of the document. Oblique light examinations of the K1 document failed to reveal any indented writing, drawing, or mechanical impressions on the front side or backside of the document. Additional oblique lighting examinations of the Q1 document revealed the paper used to create the Q1 document has a more textured surface than the paper used to create the K1 document.
Ruler		Measurements were taken Using a metric "Lightning Powder" forensic ruler, revealed the following: Q1: length: ~280cm / width: ~216.5cm. K1: length: ~281cm / width: ~217cm
Transmitted Light		Overlays of the Q1 document and the K1 document revealed the text and border were similar, excluding the text involved with the Name of the Recipient and the date information, is an exact layover when centered over a transmitted light table; however, to do this one cannot have alignment on either short end of the two documents but the long ends of the documents are in alignment.

TABLE 2

WebCode	Methods/Techniques	Observations
4GQVWW	Visual Examination	Slight color difference, a bit rougher appearance. Digital images were overlaid, and showed that the Q1 name field and dateline were slightly shifted down versus those fields on K1.
	Oblique Light	Slight embossing on the back of each corresponding to the border. No obvious other impressions.
	Microscopic Examination	Q1 is lower resolution CMYK inkjet than what is seen on K1. Q1 has a rough appearance whereas K1 appears smooth under magnification
	Video Spectral Comparator (VSC)	Both papers have fluorescent fibers. The Q1 paper is optically dull, whereas the K1 paper is optically bright. The black inks do not respond the same in IR exams. The magenta inks do not respond the same in IR Fluorescence exams.
4TK8BV	Visual Examination	Details observed: Differences the tonality of the writing surface; Differences in the ink's tonality.
	Microscopic Examination	Details observed: Differences in letter printing and shape printing, because letters and shapes appear sharp or detailed in the known specimen, but they appear irregular in the questioned document; Greater amount of color points in the background of the questioned document.
	Video Spectral Comparator (VSC)	Details observed with the following devices: UV Light source: Differences the tonality of the writing surface; Infrared light source: Differences in ink's tonality; Transmitted white light: Differences the tonality in the writing surface; Overlays: Slight mismatch.
63PEQV	Video Spectral Comparator (VSC)	Examined both certificates using IR/IRL. Q1 printing process is color laser. Overlay of Q1 onto K1 reveals print is not an exact overlay.
	Magnification	Microscopic examination at 40x to verify color laser printing process used to produce print text and signatures on Q1
6A8PZP	Microscope: Keyence Digital Microscope	Q1: Inkjet printed (CMYK) with high density of all four colors and severe fill-in in non-image areas (i.e. bowl of the smallest font "e" below the signatures). K1: Inkjet printed (CMYK) with subtle presence of CMY in black text; higher saturation of black. Q1 and K1 substrates: contain visible tan/brown fibers
	ESDA	Q1: Striations (horizontal) observed on the reverse side that appear patterned; no observed impressions on the front. K1: Striations (vertical and horizontal) observed on the front and reverse; banding present along the top front of K1. Q1 and K1 impressions do not correspond and are different.
	Video Spectral Comparator (VSC)	Q1: UV bright; not watermarked; ink fully reflects IR at 850nm, and is no longer visible. K1: UV bright; not watermarked; ink absorbs IR at 805 nm and remains visible. Q1 superimposed onto K1 and overlays to exclude the personalization (name and date)
	Tools: micrometer, ruler/measurements, overlays	Q1: Caliper measurements averaged to 0.21925mm; ruler measurements 279x215mm. K1: Caliper measurements averaged to 0.2335mm; ruler measurements 280x215mm. In Photoshop, Q1 was superimposed onto K1 and overlays to exclude the personalization
	Comparative Examinations	Inner-comparative examination of Q1 revealed internal inconsistencies between the fixed text (dense CMYK) and personalization (dense K). The font used in the personalization of Q1 differs from the font used for the fixed text. Inner-comparative examination of K1 revealed internal consistency between the personalization and fixed text.

TABLE 2

WebCode	Methods/Techniques	Observations
	Comparative Examinations	The font used in the personalization in Q1 does not conform to the font used in the personalization of K1. Print defect with voided print lines observed in Q1 are not present in K1.
6DQ2HR	Video Spectral Comparator (VSC)	1) Fibers of paper are different .Fine fibers in Q1 whereas rough texture is observed in K1. 2) Fluorescence is different. Q1 is dull whereas K1 is bright. 3) Yellow appearance of Q1 in transmitted light as compared to brownish appearance of K1. 4) Printing inks are different. Ink of Q1 disappear in IR longpass filter whereas ink of reference remains. 5) Inks proportion of Q1 printing is different. Yellow ink is more in Q1 printing. 6)Font style of Name "Alexendria Smith" is different as compared to font of K1 printing.
6LK8BT	Video Spectral Comparator (VSC)	No assurances found.
	Overlays	They do not correspond in their tonality and location.
	Visual Examination	Different print quality.
	LUPAS	No matches found in print quality.
6N37PN	[No Methods Reported.]	Documents K1 and Q1 show differences studied under the stereomicroscope.
	[No Methods Reported.]	Inks from documents K1 and Q1 show different characteristics under VSC.
6YQZ6Q	Visual Examination	K1 paper backing has a different tonality than Q1
	Video Spectral Comparator (VSC)	Use of light filters: the behavior of the inks is very different between K1 and Q1. Transmitted light: different behavior of the papers k1 and Q1
	Microscopic Examination	The dot plot of the K1 printing system differs from that of Q1
6ZWMEP	Video Spectral Comparator (VSC)	differences in printing methods between the name and the others observed.
74UJGN	Visual Examination	The Q1 document had the recipient's name in upper and lower case letters, the K1 had the name of recipient in all caps. The Q1 document had bolder coloring the page itself was more yellow in color.
	Microscopic Examination	The microscopic examination revealed a much heavier colored ink spray in the Q1 document than in the K1 document. This is an evidence that the Q1 was copied from a document like the K1 document. If these documents came from the same machine with the same template they would not vary in the level of color intensity.
	Overlays	When the Q1 was placed over the K1 document it had to be positioned to the left for the text to be aligned. If it both documents were taken directly from the template this would not be an issue. They would overlay exactly and the text and border would be in alignment.
7AH7CU	Macroscopic Examination	Stereomicroscope (up to 100X) showed CMYK inkjet printing throughout both K1 and Q1. Fluorescent fibers were visible under normal lighting, on K1 only. All text was printed in K ink, with a halo of CMY ink, barely noticeable on K1, very prominent on Q1. A periodic pattern of 4 misfiring printhead nozzles was found on Q1, repeating at a distance of about 25mm across the page. K1 did not show any significant nozzle misfiring.

TABLE 2

WebCode	Methods/Techniques	Observations
	Video Spectral Comparator (VSC)	K1 and Q1 had different UV responses. Fluorescent fibers on K1 were common, Q1 fibers were rare. The ink on Q1 showed a strong spot light fluorescent response at 585-720 nm with 2.8s of integration. K1 showed no such response.
	ESDA	K1 had a very weak response of the printed text and border. Q1 had a very strong response. No latent handwriting impressions were observed.
	Overlays	Photoshop CS6 was used to overlay K1 and Q1 to determine alignment. All aspects superimposed when scaling was taken into account, except that the baseline of "Alexandria Smith" was lower than the same line on the template, by the height of a serif. RGB channels were also configured to show the presence of yellow dots. No CPS codes were found, as expected, but clusters were observed in the regions of the signatures on K1.
	Thickness	Both K1 and Q1 were measured to be 0.009" thick.
7C6PDR	Microscopic Examination	printer ID - both documents colour ink-jet.
	Visual Examination	Dissimilar appearance of printing
	Transmitted Light	substrates dissimilar colours
	Video Spectral Comparator (VSC)	Dissimilar reactions of inks under IR absorption and IR luminescence.
	Micrometer	Thickness - Q1 lighter than K1. Weight - Q1 thinner than K1.
7F8NNK	Video Spectral Comparator (VSC)	Optical properties (IR absorption and IR luminescence) of inks used for preparation of the K1 are different than optical properties of inks on the Q1. Optical properties (UV luminescence and IR luminescence) of papers of compared documents (Q1 and K1) are different. As well as colour and structure of both papers observed in transmitted light.
	Macroscopic Examination	Structure of whole printed text on the K1 is the same. Structure of printed text "Alexandra Smith" is different than the rest of the text on the Q1. Significant more black ink was applied to print letters of "Alexandra Smith" than to other letters on the Q1 document. Colour and structure of ornamental frame on the Q1 and the K1 are different.
7MBTHP	Visual Examination	Differences are observed in the color tone regarding the frame, text and signatures, being more occurrences in the questioned certificate.
	Macroscopic Examination	Differences are observed in the margins between the s certificate of example and the questioned certificate.
	Microscopic Examination	Similar printing system is observed.
	Video Spectral Comparator (VSC)	When subjected to ultraviolet light in different nanometers, fibrils are abundantly observed in the example certificate, but not in the questioned certificate (Alexandria Smith). While in submitting both certificates in infrared light, differences are observed between them, being lighter shade, the certificate in question. Likewise, when exposing them in coaxial light with an infrared filter, it is observed that the certificate in question, the margin and texts disappear, not in the base document of collation. Likewise, when submitting the certificates in coaxial light, it is observed that the document questioned halos of white color predominantly in the texts, not in the example certificate.

TABLE 2

WebCode	Methods/Techniques	Observations
	DOCUMENT ANALYSIS METHOD (AUTHENTICITY)	<p>1.-Differences are observed in the color tone regarding the frame, text and signatures, being more occurrences in the questioned document.</p> <p>2.-differences are observed in the margins between the s certificate of example and the questioned document. 3.-similar printing system is observed. 4.- When subjected to ultraviolet light in different namometers, fibrils are abundantly observed in the example certificate, but not in the questioned certificate (Alexandria Smith). While in submitting both certificates in infrared light, differences are observed between them, being lighter shade, the certificate in question. Likewise, when exposing them in coaxial light with an infrared filter, it is observed that the certificate in question, the margin and texts disappear, not in the base document of collation. Likewise, when submitting the certificates in coaxial light, it is observed that the document questioned halos of white color predominantly in the texts, not in the example certificate.</p>
7PUP4U	Paper	<p>The paper in the questioned certificate in Item 001 was compared to the paper in the known certificate in Item 002 to determine whether or not the two certificates were from a common source in regards to paper type, physical dimensions, color, paper fiber distribution, and reactivity to fluorescent luminescence, using non-destructive test methods. The questioned and known certificates were consistent in class characteristics such as paper type, physical dimensions, and the lack of watermarks. The questioned certificate in Item 001 was inconsistent with the known certificate in Item 002 in color, paper fiber distribution, and reactivity to fluorescent luminescence.</p>
	Print Process	<p>The questioned certificate in Item 001 was compared to the known certificate in Item 002 to determine whether or not the border and machine printed text were similar in ink type and print process. The questioned and known certificates in Items 001 and 002 were examined macroscopically, microscopically, and with an alternate light sources, using non-destructive test methods. The questioned and known certificates in Items 001 and 002 were printed with multicolor inkjet technology, which included cyan, yellow, magenta, and black (CYMK), excluding the border of Item 002, which could not be determined as to whether or not black (K) ink was present. During the assessment of the questioned certificate in Item 001, the name "Alexandria Smith" was dissimilar in print quality from the other machine printed areas of the certificate. Also, a print defect which presented as vertical, voided lines was noted throughout the border and portions of the text in Item 001. When compared to the known certificate in Item 002, the questioned certificate in Item 001 was inconsistent in regards to ink droplet size, print quality, color concentration of the ink, and ink reactivity to luminescence. The known certificate in Item 002 did not contain the print process defect which was noted in Item 001.</p>
	Indented Writing	<p>The questioned and known certificates in Items 001 and 002 were examined for the presence of indented impressions. These, generally, are impressions left on a document which has been in contact with another document during the writing process. Indented impressions are subject to more than one interpretation when deciphered. Four (4) electrostatic detection device (EDD) lifts, uniquely identified as lifts 001A1, 001A2, 002A1, and 002A2 can be viewed in Items 001A and 002A, respectively. No sourced or unsourced indented impressions of writing developed on EDD lifts 001A1, 001A2, 002A1, or 002A2 from Items 001A and 002A, respectively. However, unknown impressions, which developed as short horizontal lines, appeared on lift 002A2 in Item 002A, which was from the reverse of the known certificate in Item 002.</p>

TABLE 2

WebCode	Methods/Techniques	Observations
	Typeface Classification	The machine printed text within the questioned and known documents in Items 001 and 002 were searched with the use of the reference materials available within the FDU to determine the typeface / font family of the text. The text in the questioned and known documents in Items 001 and 002 contained serif text. When overlaid, portions of the machine printed text were in alignment. Therefore, the serif text contained in the questioned and known certificates shared a common font, excluding the text "Alexandria Smith", "ON THIS 21ST DAY OF MARCH 2019" in Item 001, and "NAME OF RECIPIENT" and "ON THIS 1ST DAY OF JANUARY 2020" in Item 002. Using the reference materials available within the FDU, both the serif text in the questioned and known certificates in Items 001 and 002, excluding the name "Alexandria Smith" in the questioned certificate in Item 001, were of a common font, have class characteristics similar to fonts from the "Perpetua" family typeface or other similar fonts, which measured approximately eleven (11) to twenty-four (24) points in size. The font of the "Alexandria Smith" text was compared to the other serif font in the questioned certificate of Item 001 and well as the serif font in the text in the known certificate in item 002. The font of the "Alexandria Smith" text differed from both fonts in the questioned and known certificates of Items 001 and 002. When compared to the upper and lowercase letters in the known certificate in Item 002, the following differences were noted in the font of the "Alexandria Smith" text in the questioned certificate in Item 001: the apex of the capital "A", the shape of the arms in the lowercase letters "a" and "r", the angle of the head serif in the lowercase "i", "r" and "h", the head and foot serifs in the lowercase letter "d" and capital "S", and the beak of the lowercase "t". The characters "l", "x", "n", "m", and "9" in the questioned certificate were not compared, as the characters were not present within the known certificate in Item 002. The typeface / font classification was limited due to the lack of a complete representation of characters in the questioned and known certificates in Items 001 and 002, as well as the quality of the print process.
7UAWRU	Visual Examination	Papers are different color. Borders are different color. Person's Name on 1 is Upper Case, on # 2 its upper/lower case.
	Microscopic Examination	Different printing process.
	Ultraviolet Light	Papers are different.
	Video Spectral Comparator (VSC)	Border Inks are different. Machine Printed Data ink is different
	ESDA	No decipherable indented impressions were detected from Item 1. Several faint indented impressions were recovered from Item 2.
7WCV3M	Video Spectral Comparator (VSC)	Optical properties of ink and paper in Exhibits Q1 and K1 are dissimilar.
	Macroscopic/Microscopic Examination	Exhibits Q1 and K1 are printed with inkjet. Microscopic examination revealed dissimilarities in appearance of ink and paper.
	Font examination	Dissimilarities were observed in the font of Exhibit Q1 "Alexandria Smith" versus the font in Exhibit K1 "NAME OF RECIPIENT".

TABLE 2

WebCode	Methods/Techniques	Observations
8HUMEN	Macroscopic/Microscopic Examination	During the optical evaluation, inconsistencies are observed between the "READY-TO-WORK" PROGRAM certificate identified as K1 versus the questioned certificate Q1, the differences are: An alert creates the colored dots present at the edge of the signs and signatures of the Q1 certificate against the original gray border of the K1 certificate. White color dissimilar of the supports (paper). Uneven green color of the frame. Tint of the texts.
	Video Spectral Comparator (VSC)	The applications made on the device confirm the inconsistencies mentioned above in certificates K1 and Q1. Others of dissimilar gender are also discovered: The application with of infrared scales results in differences in the behavior of the inks, under the same application the texts of the K1 certificate prevail and those of the Q1 certificate disappear. The UV light application shows differences in the white color of the paper, exhibits a darher blue tone for the K1 certificate and lighter for the Q1 certificate. The measures made to the margins show differences in the Q1 certificate compared to those show in the K1 certificate.
	Thickness	The exercises carried out with this instrument show differences regarding the thickness of the support, being thicker in the K1 certificate and thinner in the Q1 certificate.
8LUZZR	Visual Examination	
	Microscopic Examination	
	Video Spectral Comparator (VSC)	
8PCV4K	Microscopic Examination	Both Q1 and K1 have been produced using an inkjet printing process although the visual appearance of the print is different on each document.
	Video Spectral Comparator (VSC)	Significantly differing responses in ink were observed between Q1 & K1. Significantly differing responses in paper were observed between Q1 & K1.
	Overlays	Where comparable, the recipient's name on Q1 (Alexandria Smith) is in a different font from the other entries on Q1 and the entries on K1. A direct comparison between the fonts in the recipient name field was limited as this field is in capitals on K1, but sentence case on Q1.
92MNBQ	Comparative Method of documents with Security Measures	Greater light passage was observed in the support of the Questioned Certificate (Q1) with the K1 template, using Comparison Spectral Video 8000, applying transmitted light.
	Comparative Method of documents with Security Measures	Using the 8000 Comparison Spectral Video and the EZ4D Stereo Microscope, applying incident light and different magnifications, and when comparing the Questioned Certificate (Q1) with the K1 template, it was observed that the questioned certificate (Q1), it presents greater tonality in the border box; the colored dots that make up the printing system are larger and more toned; In addition, the edges of the letters do not have a hatched fit saw.
94RFZJ	Visual Examination	Visual examination displays different colour, layout of margins, font and paper.
	Microscopic Examination	Microscopic examination displays different inks and appearance of printing.
	Video Spectral Comparator (VSC)	VSC examination displays different properties of the ink and paper.
9DDKA4	Visual Examination	Intensity of ink in Q1 is more intense than ink in K1

TABLE 2

WebCode	Methods/Techniques	Observations
	Video Spectral Comparator (VSC)	Spot (Fluorescence) : Q1 has fluorescent ink except " Alexandria Smith " while K1 does not have fluorescent ink at all. Transmitted : Paper color of Q1 and K1 is different.
9DVQAU	Video Spectral Comparator (VSC)	1.The fluorescence responses of Q1 is different from K1. 2.The opacity of Q1 is different from K1. 3.The fluorescence responses of Q1's Print texts and images is different from K1.
	Microscopic Examination	The distribution pattern of inkjet dots of Q1 is different from K1.
	Overlays	1.The overlap comparison of Q1 and K1 does not match. 2.The distribution positions of printing defeat dots of Q1 are different from K1.
	Visual Examination	The distribution positions of printing defeat dots of Q1 are different from K1.
9QEDEL	Visual Examination	Q1 conforms in overall design and formatting with K1, excluding the recipient name in which the questioned is in Title Case instead of all CAPITAL letters. The blue border on Q1 is a different color than that of K1 and, overall, the printing on Q1 is deeper and darker in color than K1. There is a different thickness and color of the paper used for Q1 and K1. The overall print quality of Q1 is lower than K1.
	Microscopic Examination	The blue border design and black printed information on Q1 was produced using ink jet and the different color components that make up the image areas are clearly visible under low magnification. Ink droplets are scattered across the void areas of the paper. Under magnification, the printed areas on K1 are more uniform in color and the component colors comprising the printed areas are harder to distinguish requiring a higher magnification to visualize. The individual droplet size of the ink used on Q1 is larger than in K1. Overall, the quality of the printing appears lower in Q1 than K1. The paper texture of Q1 and K1 appears different under magnification.
	Oblique Light	With side lighting, K1 appears more glossy.
	Indented Writing	Using the Crime-lite and ESDA 2 instruments, I examined the front and reverse sides of Q1 for the presence of indented writing. I verified the functionality of the ESDA 2 using a verification test strip each time the item of evidence was processed. No indented writing was observed.
	Ultraviolet Light	In a side by side comparison of Q1 and K1 under UV light on the VSC8000, a slight difference was observed in the brightness of the fluorescence. Q1 appears more optically bright. A weave pattern was observed on the back of K1. A weaker but still visible weave pattern was observed on the front side of Q1. A difference in the paper fibers of Q1 and K1 was readily visible.
	Transmitted Light	Under transmitted light, I observed a difference in the amount of light transmitted. K1 appears darker. K1 also has visible fibers in the paper substrate while Q1 does not. Additionally, Q1 appears a more cream/off white color and K1 is whiter.
	water solubility	Using a cotton swab, I moistened the upper left hand corner of the blue borders on Q1 and K1. The ink on Q1 bled and the ink on K1 did not demonstrating that the Q1 ink is water soluble and the K1 ink is more water resistant.
	Micrometer	Using a micrometer, I measured the thickness of Q1 and K1 at each of the four corners (unprinted areas). There is a slight difference in thickness. Q1 measures .22 mm at all 4 corners and K1 measures .23mm at 3 corners and .22mm at a 4th.

TABLE 2

WebCode	Methods/Techniques	Observations
	Ruler	Using a ruler, I measured Q1 and K1. Both are around 8.5 x 11 inches, however, K1 is slightly larger/wider than Q1 by about 1mm.
	Infrared Light	Using the VSC8000 and IR filters, I examined Q1 and K1. The Q1 and K1 inks reacted differently. At 925nm, the Q1 black ink dropped out entirely and the blue border faded to almost nothing. The K1 ink, both blue and black, remained visible. Using IR spot luminescence, the Q1 ink luminesced while the K1 ink did not.
9RXYD3	Visual Examination	Analysis of the documents under study (K1 and Q1) begins, ruling out interferences and identifying characteristics.
	Macroscopic/Microscopic Examination	Continuing with the analysis of the documents subject to study (K1 and Q1) it is observed when making the comparison differences in paper fibers, type of printing, quality of printing and definition in the printed edges.
	Video Spectral Comparator (VSC)	The documents (K1 and Q1) are analyzed by spectral equipment applying different types of light, such as: white light, transmitted light, oblique light, UV and IR light.
9VXB93	Macroscopic/Microscopic Examination	K doc: muted/dusty green border, blurry edges; Q doc richer green color border, cyan, magenta and yellow ink/toner dots around writing and border color;
	Ruler	border top edge to btm edge K 192 mm; Q 193 mm; outside edge to outside edge: K 255mm, Q 256mm; signature lines for president and VP 1/2mm longer on Q;
	Overlays	Q slightly to the right of center compared to K; Date line one space to right on Q even though more spaces used (Q 31 digits/spaces; K 30 digits/spaces)
	Visual Examination	Q name has lower case within; K name has all capital letters
	Oblique Light	No distinguishing features
	Transmitted Light	No distinguishing features
	scale	K: .5 oz; Q: .4 oz
	grid	border is 1 mm larger
AGDAUN	Visual Examination	An inspection is made of both the doubted and the undisputed document, in order to find some irregularities in the material of doubt against the employer.
	Magnification	Characteristics in terms of printing system, morphology and character size are observed.
	Video Spectral Comparator (VSC)	An overlay was carried out using transmitted light between the dubbed and the uninvited document, taking the texts of the uninvited template as a basis for comparison, in order to find similarities or differences in the location of the texts, size, distribution and morphology of the characters.
AJZUVL	Microscopic Examination	Item Q1 and item K1 both has been produced by inkjet printer.
	Video Spectral Comparator (VSC)	Significant differences are between properties (eg. structure, IR fluorescence) of paper sheet Q1 and paper sheet K1. Colour and optical properties of printing inks used for Q1 certificate are different from those that were used for K1 template.

TABLE 2

WebCode	Methods/Techniques	Observations
AMY6QL	Visual Examination	Macro and microscopy with diascopic and episcopic lighting, for the general and detailed exploration of each of the lines that makes up the diligence of the dubited document.
	Ultraviolet Light	Macro and microscopy with diascopic and episcopic lighting, for the general and detailed exploration of each of the lines that makes up the diligence of the dubited document.
	Macroscopic/Microscopic Examination	Macro and microscopy with diascopic and episcopic lighting, for the general and detailed exploration of each of the lines that makes up the diligence of the dubited document.
	Oblique Light	Observation with direct and oblique light to verify the integrity of the support and the homology of the inks; quality of inks and direct prints on the stand.
	Video Spectral Comparator (VSC)	Comparison of the unsubstantiated document K1 submitted for study against the dubited document Q2.
AUVZQ6	Video Spectral Comparator (VSC)	Templates were examined on the following Video Spectral Comparators: Foster and Freeman VSC 40, Foster and Freeman VSC 8000 and Regula 4307.
AVQHUR	Visual Examination	The visual examination showed a subtle loss of resolution quality of the questioned certificate when compared with the known sample.
	Microscopic Examination	The use of a microscope showed the printing process used for the text, on both documents, was from an inkjet printer. The microscope was also used to compare the fonts on Q-1 and K-1. The font for the questioned certificate, for the text, "Alexandria Smith", differed from the text on the same document as well as the known sample.
	Transmitted Light	Backlighting was used to determine if either certificate was watermarked. No watermarks were observed.
	Ultraviolet Light	There seemed to be a very slight difference in the paper optic response between the two sheets, but the difference was not adequate to state with authority the papers were difference.
AYN4GN	Macroscopic/Microscopic Examination	Both Q1 and K1 were produced using colour inkjet, however differences in quality were observed between the two. Trashmarks were observed on Q1 that were not present on the K1 template.
	Video Spectral Comparator (VSC)	Differences in the paper were observed (hue, presence of coloured fibres, luminescence of substrate and individual fibres, opacity, surface characteristics). Differences in the inks were observed (luminescence and reflectance properties)
	Overlays	Q1 and K1 were overlaid with the aid of transmitted light. The printed entries were well aligned (with the exception of the name and date which were entries with different content so this was to be expected). There were some slight alignment differences of the printing with respect to the edge of the page, however, this may be explained by the variation expected owing to the paper feeding process during printing.
B9TBWN	Visual Examination	There is an obvious difference in the color of the borders between the Q-1 and K-1.
	ESDA	Nothing of obvious evidentiary use observed.
	Video Spectral Comparator (VSC)	This examiner observed several spectral dissimilarities between the Q-1 and K-1 when observed under various settings.
	Overlays	The two overlays do not line up in all of the same spots.

TABLE 2

WebCode	Methods/Techniques	Observations
BJG3L2	Ultraviolet Light	Examined paper for differences/similarities.
	Visual Examination	Examine the Q and K in their entirety.
	Macroscopic/Microscopic Examination	Examined Q and K microscopically and macroscopically.
	Thickness	Paper measured and examined for thickness.
	Magnification	Utilized throughout examination of Q and K.
	Video Spectral Comparator (VSC)	Ink and paper examinations.
	Micrometer	Measured paper thickness.
	Overlays	Utilized light table to see if Q and K overlaid.
	Transmitted Light	Utilized light table to see if Q and K overlaid.
	Ruler	Eruler and regular ruler utilized for measure of fonts and size of paper.
	Infrared Light	VSC exams.
Font	Examination of fonts on Q and K.	
BRBB7R	Visual Examination	
	Video Spectral Comparator (VSC)	
	Macroscopic/Microscopic Examination	
	Infrared Light	
CCR6AJ	Video Spectral Comparator (VSC)	Scientific Method, applying the phases of: observation, signaling of the characteristics distinctives, comparison and identity judgments.
CJB9GL	Visual Examination	A visual examination was conducted between the questioned certificate and the know certificate. These observations included differences in the print quality. Observations also revealed that the 2 signatures are duplicates of each other.
	Microscopic Examination	Microscopic examinations revealed that the printing process used to produce the K1 document is different than the printing process used to produce the Q1 document.
	Printing Process	K1 = appears to be an offset process. Q1 = appears to be and inkjet process
CWDZKH	Microscopic Examination	Red, Blue and Green dots observed in the printed area of Q-1 and not on the known template.
	ESDA	Q-1 and K-1 exhibited different development properties using ESDA.
	Ultraviolet Light	No difference in color of the paper was observed between Q-1 and K-1
	Transmitted Light	Nothing of interest observed in Q-1 and K-1
DBUBPK	Video Spectral Comparator (VSC)	Under ultraviolet light in order to show if it has any type of alteration

TABLE 2

WebCode	Methods/Techniques	Observations
	Visual Examination	observed that the tone of the substrates is different
	Overlays	It was observed that as to the design, a disappoint is present in the date and in the name
DGF9CL	Visual Examination	Visually examined K1 and Q1 and noted slight visual differences in the printing of the border.
	Microscopic Examination	Noted differences in the printing between K1 and Q1.
	Video Spectral Comparator (VSC)	Noted differences in the reaction to IR between K1 and Q1. Q1 completely dropped out at 1000nm
DK3QWR	Ultraviolet Light	The reflection of the paper is different between questioned and templet certification
	Magnification	We found dots in the question certificate which is not existed in the printing for the templet
	Microscopic Examination	The method of printing is different between questioned and templet certificate
DM3YYG	Macroscopic/Microscopic Examination	Macro and microscopy with episcopic illumination for general and detailed examination of the dubbed document (Q1), to verify the integrity of the support and the individuality characteristics of the printed texts. Microscopy is a technique based on the detailed observation of the particularities of the document by applying lenses of different magnifications and by using episcopic illumination to analyze the class and individual characteristics of the printing and document creation systems.
	Video Spectral Comparator (VSC)	Macro and microscopy with episcopic illumination for general and detailed examination of the dubbed document (Q1), to verify the integrity of the support and the individuality characteristics of the printed texts. Microscopy is a technique based on the detailed observation of the particularities of the document by applying lenses of different magnifications and by using episcopic illumination to analyze the class and individual characteristics of the printing and document creation systems.
E7ANPK	Macroscopic Examination	Observed slight difference in color of paper between K1 and Q1. K1 is white while Q1 is off-white by comparison. Observed differences in the darkness of printing. Observed "Alexandria Smith" entry on Q1 was not in the same font as as the rest of Q1 or K1.
	Microscopic Examination	Observed differences in morphology of inkjet printing between Q1 and K1. Observed differences between the inkjet printing for the "Alexandria Smith" entry on Q1 and the rest of the printing on Q1.
	Video Spectral Comparator (VSC)	Using infrared reflectance, observed a significant difference in the inkjet printing between Q1 and K1. Using infrared luminescence, noted difference in the luminescence of the paper between Q1 and K1. Also noted less luminescence around the characters in the "Alexandria Smith" entry than in other places on Q1.
	Ultraviolet Light	Did not observe a significant difference in the UV fluorescence in the paper between Q1 and K1. Observed many more dark fibers in the paper of K1 than Q1.
	Thickness	Did not observe a difference in thickness between K1 and Q1.
	Oblique Light	Did not observe any handwriting indentations on Q1 or K1.
	ESDA	Did not develop indentations on Q1 or K1.

TABLE 2

WebCode	Methods/Techniques	Observations
	Transmitted Light	Observed significant difference in paper between Q1 and K1.
	Ruler	Did not observe any differences in the width/length of the paper between Q1 and K1.
	Font comparison	The fonts on K1 are consistent with a combination of Perpetua and Perpetua Titling MT fonts. This was also observed on Q1 except the "Alexandria Smith" entry is in a different font. It is consistent with one of the versions of the Sitka font family and at 24 points was consistent with Sitka Banner. A definitive determination of the fonts used was not made.
EF6N8J	Visual Examination	The green border ink on Q1 looks darker than the green border ink on K1. The paper used to produce in Q1 looks slightly darker than the paper used to produce K1.
	Microscopic Examination	The Q1 green border and text is made up of CMYK dots. The K1 border and text appears to be flat green and black, respectively.
	Ultraviolet Light	Both Q1 and K1 paper fluoresces under 254, 313, and 365 nm UV.
	Infrared Light	The border on Q1 reflects at 850nm. The border on K1 transmits at 850nm.
	Overlays	The Q1 certificate does not precisely overlay with the K1 certificate
	ESDA	Q1 and Q2 have different printer feed roller marks.
EQJLCM	Microscopic Examination	The ink jet print (droplets and shape)of the documents K1 and Q1 have differences when compared to each other with microscopic examination.
	Video Spectral Comparator (VSC)	When using 1000nm NIR filter the inks of K1 and Q1 reacts differently.
	Transmitted Light	The cloudness and structure of the paper in K1 and Q1 are different when compared in transmitted light
	Video Spectral Comparator (VSC)	The surface of the paper in K1 and Q1 reacts differently (fluorescence and non-fluorescence)when examined in luminescence with VSC6000.
	Micrometer	Average measurements of paper thickness with micrometer: K1=0,221 mm and Q1=0,215 mm
	Weight	Mesurements of weight. Q1 = 10,9g and K-1 = 11,67g
EUMGVP	Microscopy	Determined that both Exhibits Q1 and K1 were produced using inkjet technology. Observed a discrepancy in printing quality between Exhibits Q1 and K1.
	Video Spectral Comparator (VSC)	Examined the submitted items within the visible, ultraviolet, and infrared spectra. Observed a discrepancy in the optical characteristics of the inks present on Exhibit Q1 as compared to Exhibit K1 (specifically IRL properties). Observed a discrepancy in printing quality between Exhibits Q1 and K1. Observed a slight difference in the UV properties of the Exhibit Q1 and K1 substrates. Documented the direct overlay of the image areas on Exhibits Q1 and K1.
EYCY8F	Visual Examination	Q-font, print sharpness inconsistent within document. Ident-a-font revealed two different font styles used: Perpetual and Sitka (employee name only). K-consistent font and sharpness throughout, Perpetual font used. QvK-overlays revealed different size dimensions, paper color and texture different; signatures are consistent between documents
	Microscopic Examination	Q-printing process/clarity different within document. QvK- printing process/text clarity different

TABLE 2

WebCode	Methods/Techniques	Observations
	Video Spectral Comparator (VSC)	QvK- ink, papers different based on examination and reactions to IR, UV, and fluorescent spot light
EZ9A8P	Video Spectral Comparator (VSC)	A:Examine with VSC 6000/HS - (a)The paper of two certificates show different UV fluorescence and fiber disturbance. (b)The two certificates show significant difference in ink reaction when held to the infrared reflection and luminescence.
	Video Spectral Comparator (VSC)	B:Examine the document microscopically. In consistent printing characteristics presented on K1 and Q1 certificates, for example, reproducible marks, ink type and color capability.
FBK27H	Transmitted Light	Transmitted light using a light box demonstrates that the K1 paper stock was dissimilar in translucency to the Q1 paper stock.
	Infrared Light	Using visible light and an infra-red 1000nm filter, showed that the ink on the Q1 document was filtered out while the ink on the K1 document was passed.
FCWWQP	Visual Examination	Upon visual inspection, the K1 "Ready-To-Work" certificate appears to have more optical brighteners in the cardstock-weight paper when compared to the Q1 "Ready-To-Work" certificate.
	Visual Examination	Upon visual inspection, K1 has a teal colored border around the perimeter of the certificate which appears to be lighter than the teal colored border on Q1.
	Infrared Light	Utilizing a digital microscope with Near-Infrared Illumination I did a side by side examination of the K1 and Q1 teal colored borders. Near-Infrared Illumination showed that the teal borders were not printed with consistent printer ink.
FE4BZG	Stereoscopic Microscope	Printing process determinations
	F&F VSC8000	Visible, side, spot, ultraviolet lighting; printing processes, reactions to various conditions of substrates, inks
FNTYUJ	Analysis method for authenticity of documents	It is verified that the documents indicated as a basis for comparison and questioned do not exist interferences for their analysis such as: deterioration, mutilations, perforations or damage, once the above has been verified and not containing any of the aforementioned, the following is done: Analyze first the collation base document, then the questioned document, both on its front and back from top to bottom and from left to right; through the following three stages. Stage one: Analysis without instruments; At this stage some of the following characteristics are observed: Dimension, color, design, legends, etc. Stage two: It consists of an analysis through optical instruments that magnify the details. At this stage, the aforementioned is confirmed and some of the following characteristics are discovered: printing defects, printing systems, etc. Stage three: Through light sources with UV and infrared filters, and / or spectral analysis equipment; Here we analyze the reaction of ink, paper, holographic properties, etc. Finally, the comparative analysis of the collation base document against the questioned document is carried out, we carry out the assessment of the confrontation, in order to reach the conclusions.
	Visual Examination	ANALYSIS WITHOUT INSTRUMENTS: In the document indicated as a basis for comparison: Presents better print quality than the collation base document. There is a variation in the tonality of the paper with respect to the document indicated as questioned.

TABLE 2

WebCode	Methods/Techniques	Observations
	Microscopic Examination	The documents indicated as a basis for comparison and questioned are analyzed, observing the following: In the collation base document: Well defined edges of the margin in the form of a fret, as well as in all the printing of the document. In the document indicated as questioned: Irregularly shaped letter edges. Small drops of ink (cyan-magenta-yellow) of different sizes on the edges of the letters. Small drops on different parts of the paper where it does not contain printing. Some vertical lines can be observed as a result of a printing defect, which can be constantly observed in the printing of the entire questioned document, highlighting: In the left frame of the document going from the top to the bottom, In the letter: "J", In part of the signature located in the lower left at the level of the letter "J" mentioned above, In the lower and upper margin.
	luminescence	When the document indicated as a basis for comparison is submitted, the aforementioned in the previous stage is corroborated and the following is discovered: In the collation base document: Well-defined edges of the margin in the form of a greco, as well as in the entire document print. They highlight fibrils in all the paper which at first glance cannot be perceived. In the part where the second signature is located, at the bottom of the right side of the document, a series of disorganized points stand out (shine). In the document indicated as questioned: The printout contained in the document appears thicker than the collation base. Irregularly shaped letter edges. Small drops of ink (cyan-magenta-yellow) of different sizes on the edges of the letters. Small drops on different parts of the paper where it does not contain printing. You can see some lines formed with the ink on the Greek pattern located on the left margin of the document from the top to the bottom, as well as the letters: "j" and part of the signature located on the bottom left ; Furthermore, at this same level in the vertical direction, it can be seen in the lower and upper margin, which comes from a printing defect, which can be constantly observed in the printing of the entire questioned document. Regarding paper, at this stage there is no reaction.
	Infrared Light	When comparing with both documents, the collation base and the questioned, it can be specified that the printing: In the collation base document it is observed darker. Ink in the document fades.
	Ultraviolet Light	When carrying out the analysis with this light, the following is observed: In the document indicated as a basis for comparison: It has fibrils, which shine through this light. In the document indicated as questioned: The paper does not react.

TABLE 2

WebCode	Methods/Techniques	Observations
FQNEW	Macroscopic/Microscopic Examination	Paper Examination: the paper colour is different (K1 is whiter whereas Q1 has a more yellow tone) and the texture of the paper also revealed dissimilarities between K1 and Q1. Moreover, the left edges of the paper are also different: the edge in K1 presents a more irregular cut than Q1. Printing system: both documents were printed using inkjet printers. However, the microscopic examination revealed significant differences between the printing defects present in K1 and Q1. In K1 the printed characters exhibit a halo, which is absent in Q1. Furthermore, the printed characters in Q1 present vertical white lines which do not occur in K1. Finally, the number of black dots present in the paper surface are higher in Q1 than in K1. The analysis also revealed differences in pixelization between K1 and Q1. In K1, the signatures have less definition than the rest of the printed characters. In Q1, this difference in pixelization between the signatures and the rest of the printed characters does not occur. Moreover, the signatures in K1 are more pixelized than in Q1. Moreover, in Q1 the name "Alexandria Smith" has a higher definition than the rest of the printed characters, which does not occur in K1. Finally, the name of the certificate holder is in capital letters in the template K1, whereas in Q1 it is in cursive writing.
	Video Spectral Comparator (VSC)	Paper Examination: The paper fibres in K1 and Q1 exhibited significant differences when observed under spot light. Moreover, the paper analysis under UV light revealed illegible letter marks in Q1 that are absent in K1. Inks: The ink in both documents revealed significant differences when observed under spot light. Overlays: Overlay tests revealed misalignments between the common printed writing that occurs in K1 and Q1.
	Indented Writing	Q1 was analysed with the Electrostatic Vacuum Box (Kjell Carlsson Innovation). No significant observations occur.
FQZYCJ	Microscopic Examination	It has been determined that the submitted Exhibit Q-1 item was produced with the aid of an office machine system that utilizes ink jet technology. The ink is water soluble.
	Microscopic Examination	It appears that the Exhibit K1 item was prepared with the aid of an office machine system that utilizes ink jet technology. The quality is significantly better than what was used to prepare the Exhibit Q1 item. Additional information is requested about the make, model and technology used in this printer. The ink is not water soluble.
	Visual Examination	The style of font used to prepare the "Alexandria Smith" entry on the Exhibit Q1 item is different than the style of font used to prepare the remainder of the Q1 item and is also a different type style than the "NAME OF RECIPIENT" entry appearing on the Exhibit K1 item.
	Ruler	The printed border of the Exhibit Q1 item is slightly wider and taller than the printed border of Exhibit K1 item.
	Ultraviolet Light	The paper used to prepare the Exhibit Q1 fluoresces a little brighter than the paper used to prepare the Exhibit K1 item.
	Micrometer	The paper used to prepare the Exhibit Q1 is slightly thinner (.0085") than the paper used to prepare the Exhibit K1 (.009").
	Infrared Light	The "Alexandria Smith" entry appearing on the Exhibit Q1 item luminesces less than the remainder of the printed material on the document.
	Visual Examination	The image quality of the typewritten "Alexandria Smith" that appears on the Exhibit Q1 item is significantly better than the image quality of the remaining typewritten material appearing on that document.

TABLE 2

WebCode	Methods/Techniques	Observations
	Typewriter Grids	Typewriter grids were used to determine whether or not there were any issues with the horizontal or vertical spacing of the "Alexandria Smith" entry on the Exhibit Q1 item. No spacing irregularities were noted.
FXGUUY	Physical examination of the content of items K1 and Q1 and the super-imposing feature on VSC 8000 (Video Spectral Comparator)	Similar wording, same font type and size observed. The wording on K1 and Q1 (with exception of name of recipient and date) are identical and super-impose perfectly well including the two signatures on the documents.
	Examination under high magnification on the VSC 8000	Yellow randomly distributed dots. Uneven edges along the letters. Random yellow fibres embedded within the paper.
	Examination using infra-red oblique light and infra-red floodlight features on the VSC 8000. The IR floodlight was at 925nm filter	K1: The certificate boundary remains visible as a black image. Black wording on the certificate remains black. Q1: Almost disappearance of certificate boundary into a faint grey image. Black wording completely disappears.
FYBJEF	[No Methods Reported.]	
G42DPL	Video Spectral Comparator (VSC)	Q1 and K1 differs from the examination by using IR absorption, fluorescence emission etc.
	Microscopic Examination	Magnification shows Q1 is printed via a inkjet printer while K1 is printed via laser printer.
G4LT6N	Magnification	Method of printing is different
	Ultraviolet Light	The reflection of the paper is different between question and templet certification
	Ruler	The borders of the paper is different between question and templet certification
	Microscopic Examination	
GDLNYD	ESDA	Exhibits Q1(a), Q1(b), K1(a) and K1(b) were examined for the presence of indented handwriting and/or machine-created impressions using the Electrostatic Detection Apparatus (ESDA). Indented machine-created impressions were observed on Exhibits Q1(a), Q1(b), K1(a) and K1(b). The machine-created impressions observed on Exhibits Q1(a) and Q1(b) are of a different type and design than the machine-created impressions observed on Exhibits K1(a) and K1(b). No further indented impressions were observed on Exhibits Q1(a), Q1(b), K1(a) and K1(b). The result of the ESDA examination was preserved by lifting.
	Microscopic Examination	The questioned machine-generated entries on Exhibit Q1(a) and the known machine-generated entries on Exhibit K1(a) were both prepared using liquid ink jet printing technology.
	Video Spectral Comparator (VSC)	Ink differences were observed when the machine-generated entries on Exhibit Q1(a) were compared with the machine-generated entries on Exhibit K1(a). The questioned machine-generated entries on Exhibit Q1(a) were not prepared by the same printer as Exhibit K1(a). In addition, differences in color and optical properties were observed when the paper of Exhibits Q1(a) and Q1(b) were compared with the paper of Exhibits K1(a) and K1(b). Therefore, Exhibits Q1(a) and Q1(b) are not genuine.

TABLE 2

WebCode	Methods/Techniques	Observations
	Overlays	Differences in size were observed when the paper of Exhibits Q1(a) and Q1(b) were compared with the paper of Exhibits K1(a) and K1(b). Therefore, Exhibits Q1(a) and Q1(b) are not genuine.
	Digital preservation	Exhibits Q1(a), Q1(b), K1(a) and K1(b) were digitally preserved. The ESDA indentation lifts were digitally preserved and processed. The digital images will be retained.
H74BZE	Visual examination, Macroscopic/Microscopic examination, Video Spectral Comparator (VSC), Magnification	The same inkjet printer was used throughout the questioned ready-to-work certificate (Q1). Examination of the questioned document (Q1) has revealed the presence of genuine fibers as the template used to create Ready-To-Work certificates (K1). However printed fibers were found on Q1 and are not present on (K1). This result supports the hypothesis that the printed fibers on Q1 are the result of a reproduction of genuine fibers originating from ready-to-work certificate. The questioned ready-to-work certificate (Q1) and the template used to create Ready-To-Work certificates (K1) were printed using two different inkjet printers. Examination of the questioned document (Q1) has revealed irregular density printing (dot pattern) between the name of recipient "Alexandria Smiths" and the other information on the same document. However, in the template used to create Ready-To-Work certificates (K1), density printing (dot pattern) is the same for all edited information. This result supports the hypothesis that the name of recipient "Alexandria Smiths" was edited on scanned ready-to-work certificate.
	Side by side comparison/overlying comparison	The font type of the name "Alexandria Smiths" is different from the font type of the other information printed on the questioned document (Q1), whereas the font type used to create the template (K1) is the same for the entire document. The overlying comparison has revealed a perfect overlying of information between Q1 and K1, except on the name of recipient where horizontal misalignment was observed.
HAGF89	Visual Examination	graphical layout comparison: compatible with possible minor differences in font for name of recipient (uncertain)
	Ultraviolet Light	differences in UV light: higher density of fluorescent fibers for Q1
	Microscopic Examination	K1: inkjet with cyan, magenta, yellow, black, orange, green and light black inks. Q1: inkjet with CYMB inks
HHWUEK	Video Spectral Comparator (VSC)	Overlay-Template font, text, and signatures overlay whereas the variable information does not, as expected.
	Video Spectral Comparator (VSC)	Infrared-Q1 ink drops out while K1 does not. Q1 paper does not luminesce while K1 paper does.
	Video Spectral Comparator (VSC)	Ultraviolet-Q1 paper very uniform while K1 paper has optically dark fibers throughout.
	Oblique Light	No indentations noted via oblique light.
	ESDA	Minor machine indentations noted on K1, no indentations on Q1.
	Microscopic Examination	Keyence Microscope-Q1 Border and Text are multicolored print process whereas K1 has a uniform border and single colored text.
HM6EYB	Visual Examination	Utilizing a visual examination, it can be observed that the optical properties of the paper between the known exemplar and questioned document are different. It can also be observed that the print quality between the known exemplar and the questioned document is different.

TABLE 2

WebCode	Methods/Techniques	Observations
	Microscopic Examination	Utilizing a microscopic examination, it can be observed that the print processes between the known exemplar and the questioned document are different. It can also be observed that the known exemplar consists of one print process and the questioned document consists of multiple print processes.
	Video Spectral Comparator (VSC)	Utilizing the Video Spectral Comparator (VSC), it can be observed that the optical properties of the paper and inks between the known exemplar and questioned document are different. It can also be observed that the optical properties of the ink on the known exemplar are internally consistent and the optical properties of the inks on the questioned document are not consistent throughout the document.
	Ultraviolet Light	Utilizing the UV light box, it can be observed that the optical properties of the paper between the known exemplar and questioned document are different.
	Overlays	Utilizing overlays with transparency film, it can be observed that the alignment of the certificate borders and text between the known exemplar and questioned document are different.
	Micrometer	Utilizing the micrometer it was observed that the measured paper thickness of the known exemplar and the measured paper thickness of the questioned document is similar.
HYJC4E	Visual Examination	Noted that border on Q1 was significantly darker than that on K1.
	Infrared Light	Noted that printing on Q1 dropped out at 850nm while printing on K1 under the same lighting conditions did not.
	Transmitted Light	Noted that Q1 had a brighter appearance than K1 which was noticeably dull in comparison.
J2J3PK	Micrometer	Paper thickness for Q and K is similar at approximately .008" . Micrometer measurements four corners averaged.
	Macroscopic/Microscopic Examination	Color inkjet printed black text of Q1 has less sharply defined edges than does K1. CMYK for both Q and K printers. LCM examination of Q and K digital scans showed difference for Q text entry "Alexandria Smith" from corresponding "NAME OF RECIPIENT" text on K sample.
	Magnification	Printed texts on K are in a font similar to MS Office Peperua and Perpetua Titling MT. The printed texts on Q are similar to fonts on K, excluding the "Alexandria Smith" text entry printed in a font similar to MS Office Sitka Banner; this differs from the PERPETUA TITLING MT font for this entry on K.
JDW3JT	Visual Examination	Substrate comparison: K1 paper is brighter than Q1. Text comparison: Text in K1 is sharper than Q1 and text size in K1 (line 2, 4 and 6) is a little bit thinner than Q1 (line 2, 4 and 6). Other: The color of frame pattern in K1 is more faded than Q1
	Video Spectral Comparator (VSC)	1. flood lighting: The magnification reveals ink droplets penetrate into paper fiber of K1 and Q1, which is the character of inkjet printing and the other observation is ink droplets in K1 are less than Q1. Moreover, the 16X magnification shows mis-overlay of text printing in K1 but could not be seen in Q1. 2. Spot light (Fluorescence): The color of frame pattern in K1 is more fluoresce than Q1, furthermore, the 16X magnification shows fluorescence around text in Q1 (Except " Alexandria Smith") while there is no fluorescence around text in K1. 3.IR Paper fiber in K1 is denser than Q1 under IR exposure

TABLE 2

WebCode	Methods/Techniques	Observations
JQKAE9	Video Spectral Comparator (VSC)	Paper Examination showed differences in the amount of fluorescing paper fibers between the Q1 and K1 documents indicating possible different sources of paper. Infrared and Infrared Luminescence examinations between the Q1/K1 observed differences in the writing maxtix found on those documents.
	Microscopic Examination	Printing Process differences were observed between controlled K1 document and submitted Q1 document.
JQL3CF	Microscopic Examination	the print as viewed microscopically is different on the two certifications. The certification that was in question had more yellow and blue print to make up the outline of the certification than that of the comparison certification.
K9JLMA	Visual Examination	Basic screening tool.
	Microscopic Examination	Liquid ink print processes shows differences.
	Video Spectral Comparator (VSC)	Optical differences in ink used in print processes
	Transmitted Light	Light box indicates different paper color.
KBNA6K	Visual Examination	Different type of paper with a difference in thickness.
	ESDA	Latent tread marks are positive on the back of part K1 and correspond to marks left by a printer.
	Video Spectral Comparator (VSC)	Reaction difference of paper supporting Q1 and K1 printouts under fluorescent lighting. Observation under high magnification to determine that both documents are printed in colour inkjet. Presence of print defects on document Q1 caused by clogged print nozzles. Differentiation of inks under infrared radiation 1000, the ink is no longer visible on document Q1.
KP8WAC	Microscopic Examination	K1 is better print quality than Q1. The name on Q1 is better print quality than the remainder of Q1. Less ink spatter in white spaces was observed on K1. Many light brown fibres were observed in the K1 paper but only a few random yellow fibres were observed in the Q1 paper.
	Video Spectral Comparator (VSC)	A different infrared response was observed between Q1 and K1. A different response was also observed between the name on Q1 compared to the remainder of the text on Q1.
	Visual Examination	A different font style was used for the name on Q1 compared to the font style in the remainder of Q1 and in K1. The border on Q1 is slightly larger than K1.
KU4J6K	Visual Examination	This examiner initially examined and compared the documents visually to determine if the fonts style and size were the same on both the template and the questioned document. There were disparities.
	Ultraviolet Light	This examiner utilized UL to possibly find signs of adverse factors.
	Macroscopic/Microscopic Examination	This examiner utilized the MiScope and Celestron microscopes to examine the Q-doc for remnants of pixels from a possible mechanical cloning. No sign of cloning. There were obvious differences in both the know and questioned document as far as appearance.
	Overlays	This examiner used a Logan light box to over lay the two documents to determine whether or not the characters and signatures were in alignment. They were not.

TABLE 2

WebCode	Methods/Techniques	Observations
	Indented Writing	This examiner was not able to determined whether or not there was indented writing.
	Infrared Light	This examiner utilized IR to possibly discover adverse factors.
	Oblique Light	This examiner was not able to determine adverse factors from oblique lighting.
KYXK6E	Visual Examination	The text and border of K1 appeared lighter in color compared to the text and border of Q1
	Microscopic Examination	Under 40x observed black toner on K1 and four color inkjet in Q1
	Video Spectral Comparator (VSC)	Under Spot fluorescence the some of the ink appeared lighter or had halo while some text disappeared in Q1 while the ink on K1 remained dark. The paper for Q1 appeared darker than the paper for K1
KYYBDH	Visual Examination	The Q1 paper has different colour (more yellow).
	Transmitted Light	The Q1 paper has different cloudiness.
	Video Spectral Comparator (VSC)	The K1 paper contains fibres which are visible under IR-luminescence. The Q1 does not contain such visible fibres.
	Microscopic Examination	Both of the papers created by means of ink-jet printer but the printing characteristics are different.
	Magnification	The name of the holder is printed differently (no capitals) on Q1 document.
L4NA6H	Visual Examination	Paper is slightly different colour. Printed image on Q1 is not as sharp / defined as on K1 and the green border is a different colour.
	Microscopic Examination	Printed image on Q1 shows more colour around the characters compared to K1.
	Video Spectral Comparator (VSC)	Paper of Q1 differs from K1 under UV light. Inks of Q1 exhibit more luminescence than inks on K1.
	Type Comparison	Font of entry "Alexandria Smith" on Q1 differs from font on the rest of the document and is different to the font on K1. Entry "Alexandria Smith" is slightly out of alignment when compared to the position of the entry "NAME OF RECIPIENT" on the template document K1.
L88AHC	Visual Examination	Using standard room lighting the card stock of Q1 was creamier in colour than K1.
	Ultraviolet Light	Ultra violet light detected darker paper fibres scattered throughout K1. No fluorescence was observed. The paper stock used for Q1 was different to that used for K1; no darker paper fibres or fluorescence was observed in Q1.
	Transmitted Light	Using transmitted light differences in the colour/transmittance of the paper stock was observed.
	Overlays	No differences were observed in layout or font used, other than the font used in the participants name was in lowercase type on Q1, whereas in K1 was in uppercase type. When aligning the middle of the certificates a slight misalignment was observed at the edges.
	Microscopic Examination	Both certificates appeared to be created using the same print process. However, Q1 had presence of yellow ink dots scattered throughout, which was not observed in K1. There was also presence of evenly spaced vertical bands lacking ink in printed areas throughout Q1. No such banding was observed in K1.

TABLE 2

WebCode	Methods/Techniques	Observations
LQYBEF	Visual Examination	After examining K-1 and Q-1 visually, it was determined that both documents did not have watermarks. K-1 and Q-1 were overlaid on top of each other and the borders were out of alignment with one another. K-1 and Q-1 did not exhibit any evidence of misalignment when examined with a grid overlay.
	Microscopic Examination	After examining the document borders of K-1 and Q-1, it was determined that there was a difference in the printing process used to print each document. A microscopic examination and comparison of the document signatures suggests that the Q-1 signatures were created from the K-1 signatures. The areas within the K-1 signatures where eyelets are present become smaller or nonexistent in the Q-1 signatures.
	Video Spectral Comparator (VSC)	Q-1 and K-1 exhibited significant differences when examined under different wavelengths of IR lighting.
	ESDA	There were no significant impressions identified on K-1 and Q-1.
LW3GTH	Visual Examination	naked eye: Print: different quality. Paper: different colour.
	Microscopic Examination	Print: both jet, different drops (drop size, colour intensity, different black, different amount of drops on white surface, different ratio of black vs. coloured drops).
	Infrared luminescence	Print: magenta of Q print fluoresces, K not. Paper: different luminescence (some fibers in K paper show fluorescence that is not visible at Q).
	Infrared absorption	Print: different absorption of Q print compared to K print (850 nm).
	Transmitted Light	Paper: different colour, different fibers.
	Ultraviolet Light	Different fluorescence of paper.
	ESDA	K shows transport mechanism marks, not visible at Q.
LWL6BD	Visual Examination	Differences noted in color of certificates. Q1 appears to be buff colored versus the K1 color, which is more white. Q1 green border is richer in color and appears darker than K1. Both documents are approximately the same size and the borders appear similarly spaced from the edges of the papers. Q1 name entry font style different from remainder of entries, however, K1 font styles are similar.
	Microscopic Examination	Q1 printing is inkjet and with the exception of the "Alexandria Smith", which has a green tint from more green ink within the characters. The characters in the name appear more black. K1 printing appears uniformly black throughout the document. Q1 ink dot formation is more prominent and has a generally different morphology from K1. Q1 and K1 typesizes appear the same.
	ESDA	Examination for indentations revealed no decipherable marks, characters, or signs in indented form.
	Video Spectral Comparator (VSC)	Examination with IR, IRL, and UV revealed difference in ink and paper responses between Q1 and K1.
	Transmitted Light	Differences were noted in the formation of paper fibers and paper color when viewed with transmitted light.
	Micrometer	Paper thickness was the same for both Q1 and K1.
Font styles	The Q1 and K1 entries appear to be versions of the "Perpetua" font family, except for the "Alexandria Smith" entry on Q1 that appears to be from the "Sitka font family.	

TABLE 2

WebCode	Methods/Techniques	Observations
LZLCWB	Visual Examination	The template support has different shades from the questioned certificate. The ornate frame of the template has different tonalities of green than the certificate in question. The measurements of the ornate template frame are slightly different from the certificate in question. The general text and signatures of the template present different tonalities to the certificate in question.
	Macroscopic/Microscopic Examination	The template support has yellow fibrils compared to the questioned certificate. The template and the questioned certificate have a color inject printing system; the template with high definition and the certificate with low definition. Vertical lines are seen in the ornate frame of the template compared to the questioned certificate.
	Video Spectral Comparator (VSC)	The support of the template and the questioned certificate submitted to the white light, the color inkjet printing system is confirmed; the template with definition and the certificate with low definition. The ornate frame, the entire text and signatures of the template, when subjected to infrared light, maintain the tonality of ink and of the questioned certificate the tonality of inks disappear. The ornate frame, the text in general and the signatures of the template, when fluorescent light the ink tonalities appear opaque and from the questioned certificate the ink tonalities look bright. When overlapping the general text and signatures of the template and the questioned certificate, they do not coincide in the following text: "ON THE 1ST DAY OF".
M2B63D	Macroscopic/Microscopic Examination	Q1/K1 both measured ~8 ½ inches by 11 inches and did not contain watermarks; Q1 appeared more off-white in color and was slightly brighter under UV 254nm, whereas K1 was appeared whiter in color and not as bright under UV 254nm compared to Q1. K1 had tan fibers in the paper which were not observed in Q1.
	Print Process	Q1/K1 – both were printed with inkjet technology, however Q1 contained repeating print defects that were not observed on K1; the droplet size of Q1 also appeared larger than K1; Q1 reacted differently under IRR/IRL than K1; the name "Alexandria Smith" was of a different print quality than the remainder of the printing on Q1 as well as K1; the printed border on Q1 was also not in horizontal/vertical alignment on the paper as compared to K1.
	Font Comparison	The font on Q1 was consistent in content and overlaid with the font on K1 excluding the font used to produce "Alexandria Smith" and the date line; the font on the dateline was similar but was not the same content/letters; the serifs on "Alexandria Smith" were more slanted/angular whereas the serifs for the remainder of the font on Q1/K1 were flat. Limitation – print quality and limited quantity of characters for comparison.
	Handwriting Examination	Q1/K1 – The two signatures on Q1/K1 aligned when overlaid; shared a common source; appeared naturally written; and are suitable for comparison if requested.
	Indented Writing	Q1/K1 – No decipherable indented writing impressions developed on the lifts produced from Q1/K1; the printed material on Q1 attracted the EDD toner and the printed material on K1 repelled the EDD toner. A band of indented lines developed on the reverse of K1 that did not develop on Q1 – source unknown.

TABLE 2

WebCode	Methods/Techniques	Observations
M8E4FN	Macroscopic/Microscopic Examination	Visual examination – Q1: single sheet of cream colored unlined paper measuring approximately 280mm x 215mm, paper weight .008. No visible watermark. Green and white pattern border and printed information created by inkjet printer. Border begins 12.5mm from top edge, 11mm from left edge, 11mm from bottom edge, and 12mm from right edge. Border is 8mm in width. The border contains a printer defect of a linear pattern with 4 misses. These defects are visible at approx. 19mm, 43mm, 69mm, 94mm, 119mm, 143mm, 169mm, 194mm, 219mm, 243mm horizontally from left to right, top and bottom. This defect is visible in the interior printed material along the vertical points measured in the border. K1: single sheet of cream colored unlined paper measuring approximately 280mm x 215mm, paper weight .008. No visible watermark. Green and white pattern border and printed information created by inkjet printer. Border begins 8mm from top edge, 10.5mm from left edge, 12mm from bottom edge and 14mm from right edge. Border is 8mm in width. No printing defect is found. When overlaid the images are consistent with a slight offset. Conclusion: There is a common source document, however different printers were used in the creation of the Q1 and K1 documents.
	Video Spectral Comparator (VSC)	A VSC (Video Spectral Comparator) examination using various microscopic, infrared, ultraviolet, and alternate light source examination techniques revealed that: Q1: The printing on the Q1 certificate fades under IRR beginning at 665nm and disappears at 1000nm. Under IRL there is a luminescence that appears under the visible printing at 485-590nm LP 645nm. This luminescence reveals a possible second font under the visible font in the all but the "Alexandria Smith: printing. This luminescence is less visible under the "Alexandria Smith" than the remainder of the of the printing. Also visible are luminescent paper fibers. K1: The printing on the K1 certificate remains visible under the IRR spectrum. There are luminescent paper fibers visible under IRL. Under transmitted light and under IRL an upside down "T" shaped image was found located between the left side border and the printing beginning at approximately 50mm from the bottom of the border, extending to approximately 110mm. The bottom approximately 40mm in length. Conclusion: Different inks were used in the printing of the Q1 and K1 documents. Different papers were used in the creation of the Q1 and K1 documents.
	Visual Examination	Using the Identifont program the fonts used for the content of the Q1 and K1 documents were narrowed down to Lapidary 333 and Perpetua, however slight differences were noted. The font used for the "Alexandria Smith" was found to be Sitka Display, a preloaded font for Microsoft Office. The font sizes used were the same for both documents, first line 32pt, second line 16pt, third line 24pt, fourth line 16pt, fifth line 22pt. sixth line 13pt, signature line 11pt.
MFRZHA	Visual Examination	The text "Alexandria Smith" on Q1 was typed with a different font than the remainder of the text on Q1.
	Video Spectral Comparator (VSC)	Under IR the Q1 ink reflect and transmits. Under IR the K1 ink absorbs. The Q1 ink is brighter than the K1 ink. The Q1 and K1 UV fluorescence properties could not be differentiated. The text and signature images on Q1 and K1 do not overlay.
	ESDA	No indentations or physical impressions of evidentiary value were developed on Q1. Physical impressions from the printer hardware were developed on the front and back sides of K1.

TABLE 2

WebCode	Methods/Techniques	Observations
MLHAR9	ESDA	Machine-created impressions observed on Exhibits Q1a, Q1b, K1a, and K1b. No other impressions observed.
	Macroscopic/Microscopic Examination	Exhibits Q1 and K1 (ink, paper) and the ESDA lifts generated from Exhibits Q1a, Q1b, K1a, K1b are suitable for comparison.
	Video Spectral Comparator (VSC)	Differences in paper and ink (machine-generated entries) were observed between Exhibit Q1 and K1
	Microscopic Examination	The machine-generated entries on Exhibits Q1a and K1a were prepared using liquid inkjet printing technology. Printing defects were observed on Exhibit Q1a. No printing defects were observed on Exhibit K1a. Trashmarks were observed on Exhibit Q1a. These markings were not observed on Exhibit K1a.
	Macroscopic Examination	The machine-created impressions observed on Exhibits Q1a and Q1b ESDA Lifts are a different type and design to those observed on Exhibit K1a and K1b ESDA lifts. Q1 and K1 were not produced by the same printer or with the same paper.
	Digital Processing	Notations of machine-created impressions made on Exhibits Q1a, Q1b, K1a, and K1b ESDA Lifts via Photoshop
MPLZ29	Ultraviolet Light	luminescence of Q1 is different than K1
	Infrared Light	luminescence of Q1 is different than K1
	Microscopic Examination	there is more yellow drops on Q1 than K1, drops on Q1 have a different diameter (they are bigger) than drops on K1, misdirected or dead nozzles resulting in white lines on the printout of Q1
	Grammage	Grammage of Q1 is different than K1
	Video Spectral Comparator (VSC)	line spacing between name and sentence "WHO HAS SATISFIED ..." on Q1 is different than line spacing between same lines on K1
	Visual Examination	There are printed marks on Q1
MR7XMD	Visual Examination	The color of the green border is different between Exhibit 1 and Exhibit 2.
	Transmitted Light	The paper/card stock for Exhibit 1 has a yellow tint whereas the paper/card stock for Exhibit 2 is whiter.
	Micrometer	The paper thickness for Exhibits 1 and 2 was the same (0.009").
	Ultraviolet Light	The back of the paper/card stock on Exhibit 2 is darker than the paper/card stock on the back of Exhibit 1.
MXCQGA	Visual Examination	The Q1 paper color is subjectively different from the K1 paper.
	Infrared Light	IR reflection: The Q1 printing inks do reflect the IR radiation at 830 nm. as the paper background while the K1 printing inks do not. IR luminescence: The K1 paper show an infrared luminescence (exc. 485-590nm; obs. 665 nm) while the Q1 paper does not.
	Macroscopic Examination	The Q1 certificate has been printed using a color inkjet system using cyan (C), magenta (M), yellow (Y) and black inks (B), while the K1 certificate has been printed with a different printing technique using CMYB inks.
N6TLX4	Visual Examination	Q1: Off-white paper substrate, visually darker printed border. K1: white paper substrate, visually lighter printed border.

TABLE 2

WebCode	Methods/Techniques	Observations
	Microscopic Examination	Q1: Different font type observed within the document (3rd row). K1: Consistent font type observed within the document. Comparison: Different paper substrate, printing mechanism, printing quality and printing features observed between Q1 and K1.
	Video Spectral Comparator (VSC)	Q1: Different optical properties of the ink observed within the document (3rd row). Consistent optical properties of paper substrate. K1: Consistent optical properties of ink and paper substrate were observed within the document, respectively.
	Thickness	Q1: ~0.227 millimetre (mm). K1: ~0.233 mm
	Ruler	Q1: ~280.0 mm by 217.0 mm (length by width). K1: ~280.5 mm by 217.0 mm
	Transmitted Light	Comparison: Different paper substrate observed between Q1 and K1.
N6UEVB	Visual Examination	The questioned document has different color in the frame
	Magnification	The printing system of the questioned document is different from the printing system of the not questioned document
	Ultraviolet Light	The filter 365 was used and fibrils were not observed in both documents
	Video Spectral Comparator (VSC)	With the VSC the different printing system is confirmed the questioned document is laser printing and the not questioned is inkjet printing
	Method Used	The analysis method of authenticity or falsification of documents is also used
N9TPQB	Visual Examination	Step 1: was determine whether the known document (Item K1) is suitable for examination and comparison and their general characteristics were determined. Step 2: was examine both sides of the item Q1 to determine whether the questioned document is suitable for examination and comparison, was searched any forms of contamination on the document (such as well as stains from food, drink, dirt smudges of grease or chemicals); Was searched any differences in the substrate, such as the use of different paper. Also was searched variations in the document, such as a different dyes or colors of low printing, intersections with printed or typed material, etc.
	Microscopic Examination	Step 1: was compared class characteristics (for example, paper supply system, ink type, marks caused by mechanics, color capability). was found significant differences (as spatter or satellite droplets, print type CMYK). Step 2: was noted and recorded the presence of fading or discolorations of ink printed in signatures. Was observed samples of ink print have qualitatively different colorant compositions can be easily distinguished by used to microscopy.
	Video Spectral Comparator (VSC)	Was applied a range of different light sources, filters, filter combinations, etc. to determine characteristics of the ink print. Step 1: Ultraviolet (UV) Examination: was observed the print sample under both long-wave UV and short-wave UV sources. To Searched to the emission of any fluorescence of the substrate. (to searched indications that the document does not has been stained by chemicals or other material that may affect the print comparison, the for example: stains, aging, etc.). Step 2: infrared luminescence (IRL) Examination: Recorded the IRL characteristics of the ink printed in Item Q1, relative to the item K1 as darker, indicating different ink printing. (in Item K1 Ink printed that luminesces more brightly than the substrate unlike Item Q1 that the ink does not luminesce or does not luminesce as brightly as the substrate).

TABLE 2

WebCode	Methods/Techniques	Observations
NDJZ2A	Visual examination and Transmitted light	Printed text: Q1: colour of the printed name "Alexandria Smith" is of a darker tone of black than the other printed text on Q1. The letter 'A' in this name appears to be different in size and design from the letter 'A' in "NAME" of K1. K1: colour of the printed text was black. Printed green border: Q1 had a brighter shade of green than K1. Paper: Q1 has a yellow tinge compared to K1.
	Dimensions and weight	Green border: Q1 has a slightly bigger green border than K1. Printed text "CERTIFICATE OF COMPLETION": Q1 is slightly longer than K1. Paper: The paper used for printing Q1 is lighter in weight compared to that for K1.
	Microscopic Examination	Printing: Q1 and K1: characteristics of colour inkjet, with CMY dots observed at the printed green border and printed text and signatures. However, the colour of the CMY dots appeared more intense and brighter in Q1, such that K1 has an overall duller or matt-like appearance compared to Q1. Additionally, roller lines were observed at 2.5 cm intervals across Q1.
	470 blue light	More fluorescing fibres were observed on both sides of K1, compared to Q1.
NK7WMC	Macroscopic/Microscopic Examination	The Q1 and K1 were printed with color liquid ink jet technology. There are dissimilar visible characteristics between the ink jet printing on Q1 and K1. K1 has a better print quality compared to Q1. Q1 has more areas of undesirable ink droplets compared to K1. The "NAME OF RECIPIENT" text on K1 is solely in uppercase letter format, whereas the "Alexandria Smith" text on Q1 is in upper and lowercase letter format. The uppercase letter "A" of "Alexandria Smith" on Q1 is a different font design compared to the uppercase letter "A" of the "NAME OF RECIPIENT" on K1. Where comparable, other letters of the "Alexandria Smith" text are also a different font design compared with the other certificate text.
	Video Spectral Comparator (VSC)	There are differences between Q1 and K1 with respect to the printing ink and paper characteristics when examined with Reflected IR and IR Luminescence at this level of non-destructive analysis.
	ESDA	ESDA examination resulted in differences between the paper transport mechanism impressions on Q1 and K1.
	Overlays	Image overlay of Q1 and K1 revealed a misalignment between the "Alexandria Smith" and "NAME OF RECIPIENT" text. The Q1 "Alexandria Smith" text has a lower placement compared to the K1 "NAME OF RECIPIENT" text.
NLHPHD	Video Spectral Comparator (VSC)	differences in printing methods between the name and the others observed.
NN3GUG	Visual Examination	EXAMINATION OF THE PAPER: Q1: Size: approx. 280mm (H) x 216.5mm (W). Colour: Light cream white. K1: Size: approx. 281mm (H) x 217mm (W). Colour: White. EXAMINATION OF THE BLACK TEXT: Those in Q1 is darker than in K1. EXAMINATION OF THE PAGE BORDER: Page border in Q1 is dark green and those in K1 appears dusty green.

TABLE 2

WebCode	Methods/Techniques	Observations
	Video Spectral Comparator (VSC)	Ultra Violet Examination: Viewed with 254nm, 312nm, 365nm UV: The papers of Q1 and K1 fluoresce. Absorbance/ Reflectance Examination: Viewed with Flood Lighting + 695 nm filter: The text and page border of Q1 begin to fade or become transparent while those of K1 stay dark. Viewed with Flood Lighting + 925 nm filter: The text of Q1 fades or becomes transparent while those of K1 stay visible. The page border of Q1 appears very faint while that of K1 stays visible. Spot Filter Examination: Viewed with Spot 485nm – 610nm: The white areas of K1 luminesce while those of Q1 appears dark.
	Macroscopic Examination	Using Video Spectral Comparator (VSC): EXAMINATION OF THE PAGE LAYOUT: Overlapping Q1 with K1: The left margins of text lines 1, 2, 4 and 5 are significantly similar but those of line 6 (ON THIS..) are significantly different. EXAMINATION OF THE FONT TYPE AND SIZE: Q1 and K1 have significant similarities in font type and size used.
	Microscopic Examination	Using Stereomicroscope and VSC: Q1 and K1: Spatter consisting of multi-coloured irregularly shaped dots were observed around the image areas but not all over the page. Some paper fiber diffusions were also present. The dots in Q1 are bigger and their colours are sharper and clearer when compared to those in K1.
NQ9YRC	Visual Examination	A simple and direct inspection of the study document is carried out to establish first-hand any irregularities, as long as the printed texts
	Magnification	Design characteristics, morphology, preprinted information size are observed
	Video Spectral Comparator (VSC)	By transmitted illumination, the overposition of the compared documents (dubitted and unsubstantial), is carried out in order to show the size, interstructural separations, morphology, among other aspects
P4CP64	Microscopic Examination	different font of title/name. different screen, colour deposit and drop size of ink. reproduced charactersitics on Q1. dark paperfibres in K1
	Infrared Light	different properties of ink
	ESDA	negative
	Ultraviolet Light	different reaction of Q1 and K1. dark paperfibres in K1
	Transmitted Light	different paper structures
	spectrophotometer	different paper colour between K1 and Q1
	Ruler	nearly same paper size
	Micrometer	paper thickness nearly identical
	scales	paper weight different
	calculator	different paper grammage
P8QMB7	Macroscopic/Microscopic Examination	
	Video Spectral Comparator (VSC)	
PCM7GB	Visual Examination	A magnifying glass was used to examine the vertical alignment of date words such as "ON", "THIS", "DAY", "OF" and the first digit "2" of the year in order to verify correct alignment with respect of template prints.

TABLE 2

WebCode	Methods/Techniques	Observations
	Transmitted Light	It was used to verify matches of the certificate form and especially the vertical alignment of words of the date.
	Ultraviolet Light	It was used to verify the intensity of the optical bleach on the certificate paper.
PDHPHC	Visual Examination	They do not match.
	Transmitted Light	They do not match.
	Ultraviolet Light	They do not match.
	Overlays	They do not match.
	Microscopic Examination	They do not match.
	Macroscopic Examination	They do not match.
	Thickness	They do not match.
	Video Spectral Comparator (VSC)	VSC-8000. They do not match.
	Infrared Light	They do not match.
	Oblique Light	They do not match.
	Magnification	They do not match.
PHDFQ9	Visual Examination	The visual comparison of document Q1 and K1 was made, where shape, topographic distribution, interverbal, interliteral and interlinear spaces of the letters, numbers and figures on the edges of the certificates were observed.
	Video Spectral Comparator (VSC)	With the support of the video comparator, the comparison of document Q1 and K1 was made, where coincidences of shape, topographic distribution, interverbal, interliteral and interlinear spaces of the letters, numbers and figures on the edges of the certificates were observed.
	Ultraviolet Light	Documents Q1 and K1 were subjected to ultraviolet light and no alteration was found.
PQ7VB7	Visual Examination	The shade of paper color of the questioned certificate (Q1) was different from that of the control template (K1). The shade of color of the frame pattern on Q1 was different from that on K1.
	Overlaying the transparencies bearing the images of Q1 and K1	Apart from the name and date, similarities in the relative positions, size and alignment of the contents were found between Q1 and K1.
	Microscopic Examination (VSC)	Q1 and K1 were printed by inkjet printing method. The repeated defect marks found along the vertical axis of Q1 were not found in K1. The printing details of the words "Alexandria Smith" were different from those of the other words on Q1 whereas those of all words on K1 were similar.
	SPOT light (VSC)	The optical property of the printing ink on Q1 was different from that on K1. The optical appearance of the paper in Q1 was different from that in K1.
	IR filter (VSC)	The optical property of the printing ink on Q1 was different from that on K1.
PTRDVC	Microscopic Examination	Printing methods for Q1 and K1 differ. Not printed in the same manner.

TABLE 2

WebCode	Methods/Techniques	Observations
	Video Spectral Comparator (VSC)	Paper differs in appearance under ultra violet illumination.
PWUEVA	Visual Examination	By observation, a visual examination was carried out, the analysis of a questioned Certificate against a certificate provided as elements of comparison was carried out.
	Macroscopic/Microscopic Examination	Through observation, the printing system of the questioned and unintended samples is used.
	Video Spectral Comparator (VSC)	With the use of the VSC, direct light, magnification, IR filters, ultraviolet light were applied and the color overlap of the sample was used.
	Ultraviolet Light	The ultraviolet light is to observe the color tone in both samples.
	Overlays	This tool was used to observe if the certificates coincide or not in some of their parts
	Infrared Light	This application was used to observe the ink differences
	ESDA	The ESDA was used to verify the indented marks and it was observed that there are two vertical lines or grooves in the questioned certificate (Q-1) on both sides of the document. In relation to the certificate identified as K-1, I saw that it has a horizontal line on the back.
PZTPRA	Video Spectral Comparator (VSC)	White light: The item Q1 is 0.6mm longer than the item K1. Was detected a variation in the ink tonality used in printing for both items.
	Video Spectral Comparator (VSC)	IR light: There is a difference between the ink tonalities of item Q1 and K1; the ink of Q1 disappears under IR light; otherwise, the ink of the item K1 is completely visible.
	Video Spectral Comparator (VSC)	Optical amplification (Zoom): The Item K1 printing corresponds to grayscale inkjet while the other item Q1 has a color inkjet printing.
Q49K6L	Visual Examination	The color degree of the frames is different between the questioned certificate and the template. the brightness degree of the certificate's substrate is contrasted between the QD and the template. The text color of both QD and the template is slightly different.
	Video Spectral Comparator (VSC)	The reflection of UV reaction of both substrate of the certificates is slightly different. The printing text and the frame of the QD are disappeared over (800 nm) wavelengths of IR while the template is not. The fibers of both certificate's paper are different under transmitted light and IR reaction. Spot IR fluorescent of the printed text of both certificate are different. The thickness of the frames are slightly different.
	Magnification	The printing techniques of the text and frame are different between the both certificates.
	Ruler	The distances between the edges of the paper and the frame are different as we comparing between them >
	Microscopic Examination	- The printing techniques of the text and frame are different as we comparing the QD certificate and the template.
QDWF62	ESDA	Physical mark on the paper caused by rollers and the pick-up mechanism of the printer is revealed on K1 contrary to Q1.
	Transmitted Light	By transparency, the impressions of K1 and Q1 do not perfectly overlap. There has been a change of scale.
	Video Spectral Comparator (VSC)	The two documents K1 and Q1 are printed using an office process : the inkjet. The black inkjet of Q1 is based on dyes while that of K1 is based on pigments. The composition of black inks is therefore different.

TABLE 2

WebCode	Methods/Techniques	Observations
	FFT2D	The paper of Q1 is less white than K1 but can be explained by different storage conditions. Their wire marks (paper structure) are the same. The papers are therefore not significantly different.
QVDG4A	Magnification	Analyzing the substrate in its integrality Q1 is established that it is different to the certificate used by JFG industries.
	Ultraviolet Light	Is a full copy of the K1 document where the opacity in the light of the certificate is white unlike Q1 which is yellow
	Visual Examination	In the visual analysis we can observe that the bullets of K1 offer clear chromatic tonality, before dark chromatic tonality for Q1, and presents misalignment in their texts being superimposed K1 on Q1
QVG74Z	Visual Examination	Different color of paper and print of Q1 and K1. Different font type of the holder's name of Q1 and K1. Small letters for the holder's name in Q1, capital letters for the holder's name in K1.
	Microscopic Examination	As the signatures had been added to the digital template of K1 as scanned images, there are small artefacts printed just in the area of the signatures due to scanned dust or other pollution. More and major (up to 0,5 mm diameter) of these artefacts are printed all over the whole certificate Q1. Therefore Q1 is not printed from the original text template but from a scanned template (image). Just the name of the recipient Alexandria Smith is text print. The edge sharpness and the combination of coloured dots of the letters is different from the rest of the text. The size of the ink dots of Q1 and K1 are different. Different printer were used to print Q1 and K1.
	Transmitted Light	Slightly different position of the holder's name of Q1 and K1. Different paper structure (wire mesh, transparency) of Q1 and K1.
	VSC - Ultraviolet Light	No significant differences
	VSC - Infrared Light - Fluorescence	The fluorescence of the paper of Q1 and K1 are different. The magenta ink of Q1 and K1 fluoresces; Magenta occurs far less on K1
	VSC - Infrared Light - Remission	The ink of the printed text of Q1 is not visible anymore at 850 nm, the ink of the printed text of K1 is still visible. Different ink was used to print Q1 and K1.
	Basis weight/Grammage	The paper of K1 (approx. 200 g/m ²) is slightly heavier than the paper of Q1 (approx. 180 g/m ²).
	Overlays	Slightly different position of the holder's name of Q1 and K1. The scaling of Q1 and K1 are different. The Image of Q1 is slightly smaller.
QZ9DMA	Visual Examination	Differences in the appearance of the paper and printing between Q1 and K1.
	ESDA	differences between Q1 and K1 in indented impressions that are likely to originate from the paper handling mechanism of the printer.
	Microscopic Examination	Both documents Q1 and K1 made with inkjet printing technique. Differences in the appearance and the details of the printing between Q1 and K1.
	Video Spectral Comparator (VSC)	Differences in the optical properties (IR absorption, fluorescence) of the ink between Q1 and K1.
	Raman microscopy	Differences in the properties of the ink between Q1 and K1 were observed in examination by Raman microscopy.
	Grammage measurement	Differences in the grammage of the paper between Q1 and K1.

TABLE 2

WebCode	Methods/Techniques	Observations
R2EBBB	Macroscopic/Microscopic Examination	Paper colour (hue) difference: K1 is whiter than Q1 which has a yellow hue to it. Printing process difference – K1 is very high-quality liquid ink process (precise nature not determined), while Q1 appears to be CMYK with lower marking resolution. Better overall tonal resolution for printing on K1 vs Q1.
	Video Spectral Comparator (VSC)	IR reflectance: Form details respond differently for K1 (visible thru 1000nm) and Q1 (fades at 830nm, transparent at 1000nm). IR luminescence: K1 paper fibres luminesce (spot 400-485nm with LP 695nm) while Q1 has no similar fibres. This effect is also visible by viewing blue channel from scanned RGB images of each doc.
	ESDA	Visualized transport markings on reverse of K1 appear different from those observed on Q1
	Micrometer	Paper thickness approx. same for K1 and Q1.
	Overlays	Q1 form information (text included) does not overlay with K1 information being slightly larger in scale.
	Transmitted Light	No watermark observed on either K1 or Q1.
	Digital channel separation	In blue channel of scanned images, a rectangular area of yellow ink dots was observed around each signature on K1, but this was not visible on Q1.
R6ZZVM	Visual Examination	K1: forest green border with interlinking loops vs. Q1 darker and more vibrant forest green border. K1 and Q1 papers are thicker certificate type papers and when held at one edge, they are bendable. The section "NAME OF RECIPIENT" in K1 is all capitalized, but that section on Q1 contains uppercase and lowercase letters "Alexandria Smith" - this may be operator influenced. K1 and Q1 have the same signatures at the lower left and right. The reverse side is blank for both Q1 and K1. In Q1 and K1 the certificate is positioned in the landscape orientation with the longest side of the page along the horizontal axis. Q1 and K1 type appears to be centred on the page; different font sizes; the "CERTIFICATE OF COMPLETION" line is the largest font and the names below the signature line are the smallest font. No overt misalignments on Q1 were observed.
	Macroscopic Examination	Q1 paper has a yellow hue compared to K1, which is off white. Q1 is more translucent than K1. K1 reads "CERTIFICATE OF COMPLETION. This certificate is awarded to NAME OF RECIPIENT WHO HAS SATISFIED THE REQUIREMENTS OF THE "READY-TO-WORK" PROGRAM ON THIS 1ST DAY OF JANUARY 2020". Q1 reads: "CERTIFICATE OF COMPLETION. This certificate is awarded to Alexandria Smith WHO HAS SATISFIED THE REQUIREMENTS OF THE "READY-TO-WORK" PROGRAM ON THIS 1ST DAY OF JANUARY 2020".

TABLE 2

WebCode	Methods/Techniques	Observations
	Ruler	<p>K1 page size: 215.9 ± 0.05 mm (length) x 280.1 ± 0.05 mm (width). Q1 page size: 216.1 ± 0.05 mm (length) x 279.75 ± 0.05 mm (width). A standard letter size sheet of paper that is positioned in the landscape orientation would measure 11" x 8.5" or 279.4 mm x 215.9 mm. There is a slight difference in the size of paper. Q1 is 0.2 ± 0.05 mm larger in the length of the sheet and 0.35 ± 0.05 mm shorter in width compared to K1. The line spacing between printed lines in K1 and Q1 is the same: 13.5 ± 0.05 mm. K1 signature line of "President, JFG Industries": 82.95 ± 0.05 mm. Q1 signature line of "President, JFG Industries": 83.5 ± 0.05 mm. K1 Signature of "President, JFG Industries": 81.5 ± 0.05 mm. Q1 Signature of "President of Operations, JFG Industries": 82.15 ± 0.05 mm. The signature line and signature for the "President of Operations, JFG Industries" is larger in Q1 compared to K1. K1 signature line of "Vice President, JFG Industries": 83.5 ± 0.05 mm. Q1 signature line of "Vice President, JFG Industries": 83.5 ± 0.05 mm. K1 Signature of "Vice President, JFG Industries": 51.35 ± 0.05 mm. Q1 Signature of "Vice President of Operations, JFG Industries": 51.25 ± 0.05 mm. The signature line for the "Vice President of Operations, JFG Industries" is the same for Q1 and K1. The signature for the "Vice President of Operations, JFG Industries" is slightly larger in Q1 compared to K1. Border Measurements: K1 from the bottom edge of the page to the bottom edge of the border: 11.5 ± 0.05 mm. Q1 from the bottom edge of the page to the bottom edge of the border: 11.4 ± 0.05 mm. K1 from the top edge of the page to the top edge of the border: 12.5 ± 0.05 mm. Q1 from the top edge of the page to the top edge of the border: 13.55 ± 0.05 mm. K1 from the left edge of the page to the left edge of the border: 10.5 ± 0.05 mm. Q1 from the left edge of the page to the left edge of the border: 11.5 ± 0.05 mm. K1 from the right edge of the page to the right edge of the border: 14.5 ± 0.05 mm. Q1 from the right edge of the page to the right edge of the border: 12.4 ± 0.05 mm. The bleed of the page (the outer edge of the border to the edge of the page) was different between K1 and Q1. Thickness of Border: K1 Border width 8.5 ± 0.05 mm. Q1 border width 8.5 ± 0.05 mm. [Participant included a table that could not be reproduced in this report.]</p>
	Micrometer	<p>The Mitutoyo Combimicre Micrometer was used and 10 measurements were taken on the page and then averaged: K1: The paper thickness of K1 is 0.155 ± 0.005 mm. Q1: The paper thickness of Q1 is 0.143 ± 0.005 mm. There is a difference in paper thickness between K1 and Q1. K1 is 0.012 ± 0.005 mm thicker than Q1.</p>
	Thickness	<p>The visual and light table examinations, along with the micrometer measurements showed that K1 is a thicker paper stock than Q1. There is a difference in paper thickness between K1 and Q1.</p>
	Oblique Light	<p>No indentations were observed on K1 or Q1. Paper fibres were visible. K1 has a slightly more mottled surface than Q1.</p>
	Transmitted Light	<p>Q1 and K1 were examined on a Gagne Porta-Trace 5000K Light Table. K1 - off white; nearly opaque. Q1- yellow hue; more translucent than K1. There is a difference in opacity between K1 and Q1. Neither K1 or Q1 have a watermark.</p>

TABLE 2

WebCode	Methods/Techniques	Observations
	Microscopic Examination	<p>K1 – beige and red randomly dispersed security fibres; red fibres tend to be much smaller than the beige ones. Q1 - no security fibres are visible. K1 – inkjet printing process; refer to additional attachment for more info. Q1 – green border shows bleeding of inks into paper – consistent with inkjet; Cyan(C), Yellow(Y), Magenta(M) and Black(K) are visible. Q1 - all type, except the “Alexandria Smith” section has a fuzzy, diffuse appearance; the edges are not crisp and there is CYM dots surrounding the black characters. Q1 “Alexandria Smith” line has a crisper, more defined appearance with heavy black application and slight CYMK wicking at the edges. Q1: image formed by dots and dots are randomized; feathering of the ink in the dot edges; Cyan, Yellow, Magenta, possibly two other colours, including orange and red; satellites; ink is bleeding into fibres; coloured dots surrounding black text; consistent with being produced on a colour inkjet printer; the characters and images are less clear (e.g. it is difficult to make out some of the initial and terminal serifs) in all of the sections, except the “Alexandria Smith” section; the type is a lower resolution than K1 and the “Alexandria Smith” line; consistent with being produce on a colour inkjet printer; interlocking pattern in border is diffuse and less defined. No evidence of erasure or removal of text. Digital manipulation cannot be ruled out, e.g. a scan of a genuine certificate with a name added. K1: image formed by dots and dots are randomized; feathering of the ink in the dot edges; Cyan, Yellow, Magenta visible; ghosting effect observed around the black text; layering of cyan, magenta and yellow, which is consistent with a fortified or rich black effect; satellites; ink is bleeding into fibres; coloured dots surrounding black text; consistent with being produced on a colour inkjet printer; interlocking pattern in border is more crisp and defined.</p>
	Video Spectral Comparator (VSC)	Q1 and K1 were viewed under the VSC-4. They were both examined under UV and IR settings.
	Infrared Light	<p>When the camera filter (CF) was set for the following settings, the observations were made: K1 text and border not visible between 630nm and 645nm. K1 text and border was faint at 665nm. K1 text and border was visible between 695nm and 830nm. Q1 border and text visible at 630nm, 645nm, 665 nm. Q1 border absorbs all IR light and is black at 665nm, 695 nm and the text is visible. Q1 border section completely absorbs light (black) and text visible at 735 nm. There is a significant limitation as Q1 and K1 are on different papers.</p>
	Ultraviolet Light	<p>K1 - brightly fluoresces and a large quantity of sporadic security fibres are visible; some of these fibres are beige under white light and black under UV. Q1 - is more dull under the UV compared to K1; there are a few fibres that are visible with the UV, but not as large a quantity as K1. K1 has more security fibres and appears to have short and longer security fibres compared to a smaller quantity of security fibres in K1. Q1 and K1 have different paper characteristics and qualities.</p>

TABLE 2

WebCode	Methods/Techniques	Observations
	ESDA	Q1 and K1 top and reverse sides were examined with the Foster and Freeman ESDA. Two trials were completed one where the document was not humidified and one where the document was humidified for 10 minutes before undergoing the ESDA Examination. K1 (no humidity, top): there were smudged fingerprint impressions at the top left corner. The document was handled with gloves since it was received; no written indentations observed. K1 (no humidity, reverse): fingerprints at the bottom left corner; no written indentations observed. Q1 (no humidity, top): border, text and signatures show were revealed on the ESDA; a curvature with a lower curve was observed to the right of the line "WHO HAS SATISFIED THE REQUIREMENTS OF THE", this could be a "b" or "6". Q1 (no humidity, reverse): there was no handwritten indentations on the back. K1 (humidified for 10 mins., top): some of the border and text were observed; no indented writing observed. K1 (humidified for 10 mins., reverse): smudge fingerprints with no indented writing observed. Q1 (humidified for 10 mins., top): border, text and signatures show were revealed on the ESDA; a curvature with a lower curve was observed to the right of the line "WHO HAS SATISFIED THE REQUIREMENTS OF THE". Q1 (humidified for 10 mins., reverse): there was no handwritten indentations on the back.
	Indented writing	The only indentations observed was the a curvature with a lower curve was observed to the right of the line "WHO HAS SATISFIED THE REQUIREMENTS OF THE", this could be a "b" or "6" on Q1.
	Handwriting Examination	The signatures are identical, except they are slightly horizontally stretched on Q1. If Q1 and K1 were printed on the same printer, the stretching should not occur.
	Typography	The text on K1 is entirely in a Perpetua font family. The text on Q1 is also in a Perpetua font family, except for the name "Alexandria Smith", which is in the Sitka font family.
	Overlays	A transparency copy of K1 was placed over Q1 @ 100%. I also tried 98%, 99%, and 101%. Using the 100% transparency, the document does not align in all aspects. There appears to be some stretching along the horizontal axis in Q1 compared to K1. Starting at the "M" in "COMPLETION" the Q1, the characters are slightly shifted to the right. This horizontal stretching is observed in each line of Q1 versus K1. If I try to line up the "C" in "CERTIFICATE" the "NAME OF RECIPIENT" in K1 sits slightly higher compared to the same line in Q1 "Alexandria Smith". There is some horizontal stretching in Q1 versus K1.
R9VQ2Y	Visual Examination	Q-1, Certificate Awarded Font is Printed in Lower Case and Upper Case Lettering. The Template is all Upper Case Lettering.
	Visual Examination	The Body of the Certificate Font is not Consistent with the Template Font.
	Video Spectral Comparator (VSC)	The Color of Printing Technique (Entire Questioned Document) is not consistent with Template.
RA8LK7	Visual Examination	the forms and the distributions have the same relations
	Macroscopic/Microscopic Examination	confirm that the forms of the letters and the distributions of the text and frame are the same
	Video Spectral Comparator (VSC)	overlay the two samples and verify the same conditions in both
RCH9JK	Visual Examination	

TABLE 2

WebCode	Methods/Techniques	Observations
	Microscopic Examination	
	Video Spectral Comparator (VSC)	
RDQKYZ	Visual Examination	The paper of Q is more yellowish than K. The green color of the frame is more intense on Q than on K. The black printing on Q is thicker than on K. The same font was used on both documents.
	Ultraviolet Light	Both documents floresce.
	ESDA	No indented writing or printer pulling arms marks found.
	Microscopic Examination	Brown-yellow fibers in the K paper that don't exist in the Q paper. microscopic printed dots scattered on Q that don't exist on K. The printing of the name on Q looks different from the rest of the document. The same microscopic defects appear on the same letters on Q and on K. The printing of the Q contains the basic colors - YCMK. The printing of K contains two more colors - red and green.
	Oblique Light	No notable observation.
	Micrometer	No difference found.
	Video Spectral Comparator (VSC)	Spot IRL - The reaction of the ink on Q was different from the ink on K.
	Overlays	No major differences were found.
	Transmitted Light	Q is different from K.
RFXZ67	Video Spectral Comparator (VSC)	Microscopic images using VSC showed Q1 to have inkjet printing with very visible color dots surrounding the printed text of the certificate. The color dots are noticeably more scattered around the Q1 text than is seen in K1. The K1 document showed inkjet printing with color dots in closer proximity to the printed text and were visible at a far less magnitude than what is seen in Q1. In several areas of text on K1, the dots are barely visible or invisible. Case information indicates that these certificates are only printed on an access-controlled workstation including printer and materials. Thus, the differences observed in Q1 vs. K1 printing may be due to Q1 having been printed on another device. Sidelight and spot light VSC images of Q1 and K1 reveal differences as well. No watermarks noted.
	Visual Examination	Q1 document appears "darker" overall than K1. This may be due to different paper and/or inks or the printer settings. As above, may be suspicious considering access is controlled to the workstation producing genuine certificates. Transparency overlays revealed some alignment differences.
	ESDA	Nothing of evidentiary value discovered.
	Thickness	Paper micrometer did not reveal any paper thickness differences.
RFZQEA	Visual Examination	Slight colour difference noted between paper used for Q1 and K1. When overlaid, some alignment differences noted between Q1 and K1.
	Microscopic Examination	Inkjet colour printer coloured dots much more prominent around text on Q1 compared to K1.

TABLE 2

WebCode	Methods/Techniques	Observations
	Video Spectral Comparator (VSC)	When viewed under IR Absorbance (from 630nm – 1000nm) the printed text on Q1 showed different IR properties compared to that on K1. When viewed under IR Luminescence (440-640nm and 445-675nm) the printed text on Q1 showed different IR properties compared to that on K1. When viewed under UV @ 254nm, there was a visual difference between the paper used for Q1 and K1, including paper fibres on K1 being more prominent than on Q1.
RNNLB6	Adobe Photoshop	The printed areas of Q are darker than the printed areas of K. The letter "A" in "Alexandria" shows slight differences in appearance from the corresponding letter in "NAME" and "PROGRAM".
	Overlays	Overlaying images indicates that Q is slightly larger than K – approx. 0.2% along the long axis and 0.1% on the short axis (measured in Photoshop).
	Ruler	Matching print defects are noted between K and Q, but when the certificates are aligned, the defects are misaligned. Misalignment occurs in both horizontal and vertical axes and measures approx. 0.05" in the X axis and approx 0.02" in the Y axis (measured in Photoshop).
RNPEAC	[No Methods Reported.]	By examining Item K1 using VSC 8000, the printing methods used is laser printing.
	[No Methods Reported.]	By examining Item Q1 using VSC 8000, the printing methods used is inkjet printing.
T2WJY6	Macroscopic Examination	2.1 macroscopic observation - The Q1 documents are observed directly and with a magnifying glass, also the K1 pattern. They are visually compared by superimposing the doubt sheet against the standard prints facing the documents, to see if they have the same dimensions and distribution of texts, designs and format.
	Microscopic Examination	2.2 Review of the printing system used and the substrate fiber by microscopic observation, to find out if they exhibit the same behavior at the point of printing and in the type of paper fiber or not.
	Transmitted Light	2.3 Incidence of transmitted light of the document Q1, on the printed sheet K1, to find out if they present the same dimensions and distribution of texts, designs and format among themselves.
	Ultraviolet Light	2.4 Fluorescence reaction of the substrate with ultraviolet light, to find out if they exhibit the same behavior or not.
T8ZPE8	Visual Examination	The color of the green print on the certificate is different from the known certificate K1. The color of the paper Q1 is yellowish, the color of the paper K1 is white
	Ultraviolet Light	no special findings
	Macroscopic/Microscopic Examination	both certificates are printed with inkjet. While the print on K1 is clear, there are many "impurities" on Q1 which are printed. Like there was dust on the original which was copied.
	weight	there is a significant difference in weight between K1 and Q1
	Infrared Light	From 830nm, the ink on the certificate Q1 disappears and can be differentiated from K1
TVQRQ8	Visual Examination	
	Video Spectral Comparator (VSC)	IR ink comparison

TABLE 2

WebCode	Methods/Techniques	Observations
	Oblique Light	No indentations observed
TZYDHB	Visual Examination	
	Microscopic Examination	Different printer process and printer
	Video Spectral Comparator (VSC)	
U3HPTZ	Macroscopic/Microscopic Examination	There are color differences within the inkjet border and the paper between Exhibits Q1a and K1a. There are printing defects which are different between Exhibits Q1a and K1a. Exhibits Q1a and K1a were produced by liquid inkjet technology; however, the questioned machine-generated entries on Exhibits Q1a were not prepared by the same printer as Exhibit K1a. The font is similar between Exhibits Q1a and K1a; however, alignment differences within the name and date and the use of upper and lower-case letters in the name are different between Exhibits Q1a and K1a.
	Video Spectral Comparator (VSC)	There are differences in the inkjet printing between Exhibits Q1a and K1a. Paper differences were observed between Exhibits Q1a and K1a.
	ESDA	Different machine-created impressions were observed between Exhibits Q1b and K1(a and b). No further indented impressions were observed on Exhibits Q1b and K1(a and b). No indented impressions were observed on Exhibit Q1a.
	Magneto-Optical Visualizer (MOV)	The inkjet printing on Exhibits Q1a and K1a did not contain magnetic properties.
	Digital Processing	Images of the four ESDA lifts were cropped.
U8DJQ2	Visual Examination	Q1 print appears darker than that on K1. Q1 paper (non-print areas) has a slightly yellowish appearance compared with the slightly off-white but slightly darker appearance of K1.
	Microscopic Examination	The recipient name on Q1 is in a different font to the "NAME" part of K1 and to the rest of the text on Q1 and K1. Q1 has more prominent dots of CYMK ink than K1. Yellow dots detected in the non-print areas of Q1 but not on K1.
	Micrometer	Paper thickness measured at 7 locations on each of Q1 and K1. No significant difference in thickness (0.224 mm, $s \sim 0.002$) between Q1 and K1.
	Ruler	Paper dimensions are different in the x direction - Q1: 279.5mm (smaller); K1 280.4mm. (Both are ~ 216.2 in the y direction.)
	Transmitted Light	Transmitted light very different shade/colour comparing Q1 with K1.
	Overlays	Signature image slightly larger on Q1 compared with that on K1.
	Ultraviolet Light	Blue fluorescence in response to long wave (254nm) UV: Q1 slightly more fluorescent than K1.
	Infrared Light	IR Q1 print "fades" i.e. transmits more, as wavelength increases, almost completely fades/transmits at 900nm. Red/infrared luminescence (e.g. excitation 445-570 + long pass 645+nm): paper luminesces much more on K1 compared with Q1; fragmentary luminescence of print seen on Q1 not K1.
UBY2B8	Ultraviolet Light	1) Different paper luminescence and surface structure.

TABLE 2

WebCode	Methods/Techniques	Observations
	Microscopic Examination	1) Q1 and K - Different number of colors (eq. green and grey ink dots in K1). 2) Print-head defects in QA (nozzles produce white lines)
	Video Spectral Comparator (VSC)	1) Different IR luminiscence of the inks. 2) Different IR luminiscence of the paper. 3) Different IR reflection of the inks. 4) Different structure of the paper.
	FFT and transmitted light	Different structure of the paper.
	HPLC (UV-VIS and MS)	Different type of inks (different ink composition)
	Raman spectrometry	Different type of inks and different ink composition
	Visual Examination	1) Different color of the paper and printed green frame. 2) Different location of content (text, signatures and frame) in the certificates.
	Thickness	Different paper thickness
	Oblique Light	Different structure of the paper surface
UC9BYY	Macroscopic/Microscopic Examination	Printing Process: Difference Noted - K1 - 3 or more color ink jet printing - very weak coloration on paper (all entries including border); Q1 - 3 or more color ink jet printing (all entries including border)
	Visual Examination	Visual examination: With exception of "Alexandria Smith" and "NAME OF RECIPIENT" - same size, same font style, same placement (superimposable) between Q1 and K1. Non-variable Data is directly superimposable. Signatures: Visual examination - same size and same placement (superimposable) between Q1 and K1. (The signatures are each produced by 3 or more color ink jet printing (all entries including border))
	Thickness	Paper: Difference Noted - Both the Q1 and K1 paper stock are consistent in paper thickness.
	Ultraviolet Light	Paper: Difference Noted - Different optical brightener response between Q1 and K1 at 365 nm, conclusion different paper stock
	Typeface	Typeface: Visual examination: With exception of "Alexandria Smith" and "NAME OF RECIPIENT" - same size, same font style, same placement (superimposable) between Q1 and K1. Difference Noted - Q1 displays upper and lower case font for name "Alexandria Smith", K1 standard displays all upper case lettering for the name of recipient
	Video Spectral Comparator (VSC)	Printing Process: Difference Noted - K1 - 3 or more color ink jet printing - very weak coloration on paper (all entries including border). All inkjet inks do NOT display IR luminescence. Q1 - 3 or more color ink jet printing (all entries including border). All inkjet inks DO display IR luminescence. All IR Lum exam at Excite @ 400-640nm, barrier pass @ 725nm
	Video Spectral Comparator (VSC)	overlay comparison utilized
	Video Spectral Comparator (VSC)	B&W IR reflective exam - inconclusive at 715 nm possible due to weak coloration of K1 inkjet ink.
UEDYFA	Video Spectral Comparator (VSC)	The questioned document was reproduced through ink that reacts transparently to the infrared filter (TIR), and the model document was reproduced through ink that does not react transparently to the infrared filter (not TIR).
	Ultraviolet Light	To verify if they had security measures.

TABLE 2

WebCode	Methods/Techniques	Observations
UHWXT4	Visual Examination	Visual/transmitted and microscopic examination: Under transmitted Light - Difference in colour/opaqueness observed between K1 and Q1 with K1 more grey/darker and Q1 more yellow/lighter under same conditions, with side by side examination. Microscopic - printing on K1 and Q1 both appear to be produced using a printing process of colour ink dots (including for black text) but with different morphology (Q1 appears darker in overall colour with significantly more yellow ink dots visible than observed on K1 which has minimal yellow dots visible). Overlay exam - Size of pages similar. Printing of border, text and signatures individually aligned between Q1 and K1 (excluding name and date). K1 'NAME OF RECIPIENT' in uppercase, Q1 'Alexandria Smith' upper and lowercase. Edges of page to placement of printing on page different between Q1 and K1. Document as a whole not fully superimposable.
	Video Spectral Comparator (VSC)	Spectral examination - VSC8000: IR luminescence - higher number of luminescent paper fibres present in paper on K1 in comparison to Q1 paper. IR absorption - observed difference between ink appearing on K1 and Q1, with Q1 becoming less visible with higher longpass filters. UV fluorescence - at 254nm, K1 slightly darker than Q1. Overall examination for security features - no overt or covert features observed on Q1 or K1.
	ESDA	Possible roller marks developed on K1, not developed on Q1. Dissimilar reaction of ink to ESDA process observed between K1 and Q1, with development of printed text on Q1 and not on K1.
UMQRQ6	Macroscopic/Microscopic Examination	Physical examination of the questioned and known documents (Q1 and K1). Documents appear to have been created on white paper with a thicker paper weight. The text portion of Q1 appears to have been printed using an ink jet printing process and a colored dot pattern is present on the letter forms. The text portion of K1 appears to have also been printed using an ink jet print process. Moreover, you can visualize the colored dot pattern in the border design of the questioned document, Q1 and that is not present in the known document, K1.
	Video Spectral Comparator (VSC)	Use of various light sources, filters and magnification on the VSC6000 to determine authenticity. With magnification you are able to visualize the colored dots that appear around the letter forms and in the decorative border of the document on Q1. There are also stray colored dot patterns in the non-printed areas of the document. With the use of filters you are able to visualize that the text portion of the questioned document, Q1 begins to fade at around 830nm wavelength. The known document, K1, does not appear to have stray colored dot patterns in the non-printed areas. There are fibers that are visible in the paper under spot lighting (400-485). At the same wavelength (830nm) the text of the known document is still visible. Some of the text on K1 appears to have a shadow or halo appearance on the letter forms. Specifically, you can observe where the ink has bled into the paper fibers and a gray area where the ink is not as dark (e.g. the staff of the P in "recipient").
UMRMF3	[No Methods Reported.]	Expertise of security documents, application of luminescence to the examination of documents NIR Absorption and Reflection examination of document.
	Microscopic Examination	
	Video Spectral Comparator (VSC)	

TABLE 2

WebCode	Methods/Techniques	Observations
UWU6PK	Visual Examination	There is a difference in the printing tone in the documents analysed (Q1 and K1).
	Video Spectral Comparator (VSC)	By using the infrared light spectrum and its filters, a difference was found in the characteristics of the printing inks of both documents (Q1 and K1). When using ultraviolet light, a different whiteness was found in the documents analyzed (Q1 and K1).
	DC-O-m-03 Analysis for Document Authenticity	The method allows a comparison between the characteristics observed in the known document (K1) against the questioned document (Q1), obtaining in this case differences.
V4A3W6	Visual Examination	Chromatic differences in the shades of the substrate and the frame of the document are evident, with Q1 being of greater intensity.
	Overlays	There were no gaps in the fixed design data (only the name of the beneficiary and date vary)
	Video Spectral Comparator (VSC)	Variation is evident in the printing pattern of the digital system used (inkjet), being the K1 stamped in monochrome ink (black) and the multitone Q1 (CMYK).
VNJ34J	Video Spectral Comparator (VSC)	The Spectral Video Comparator (VSC) was used, with its different types of filters and lights, such as: Ultraviolet Light, Transmitted Light, Grazing or oblique light, on position, comparative and different approaches.
	Macroscopic/Microscopic Examination	The DVM Stereoscopic Microscope at different magnifications was used to analyze in detail the elements of the documents such as printing system, legends, and borders.
	Analysis Method for Document Authenticity	The Analysis Method was used for authenticity of documents. A visual examination was made to continue the analysis with the mentioned equipment (VSC and DVM), applying their different tools.
VUKF23	Video Spectral Comparator (VSC)	
	Microscopic Examination	
	Infrared Light	
	Ultraviolet Light	
W3XN34	Visual Examination	Examination of the two samples to verify distribution of the components
	Overlays	with overlays it is verified that all the elements match
	Transmitted Light	it is verified that all the elements match
WACGEY	Visual Examination	Color ink on Q1 and K1
	Ultraviolet Light	Ink components of Q1 and K1
	Microscopic Examination	Print Systems of Q1 and K1
	Oblique Light	Print Systems of Q1 and K1
	Magnification	Paper Fibers of Q1 and K1
	Video Spectral Comparator (VSC)	IR and UV analysis for ink and paper differences on Q1 and K1
	Micrometer	Thickness of Q1 and K1

TABLE 2

WebCode	Methods/Techniques	Observations
	Transmitted Light	Needle marks on Q1 and K1
	Infrared Light	Ink components of Q1 and K1
WB8ZF2	Macroscopic/Microscopic Examination	Border inks appear to be different colors. Margins on Q1 appear to be smaller than those on K1.
	Video Spectral Comparator (VSC)	Printing inks on Q1 and K1 are different. Using the measuring tool in the VSC6000 H/S the printed area on Q1 is larger than that on K1.
	Transmitted Light	No watermarks were noted on either Q1 or K1.
WKDW44	Video Spectral Comparator (VSC)	Q1 is different from K1 in printing ink and paper.
	Microscopic Examination	Q1 is different from K1 in the ink distribution of printed words, and Q1 has more scattered ink dots on the blank paper than K1. Moreover, the name "Alexandria Smith" was of higher quality than the other words on Q1.
	Overlays	The overlapped image of Q1 and K1 only has a little misplacement.
	Raman Spectroscopy	The Raman spectrum of Q1's printing ink is different from that of K1.
WRYXHV	Visual Examination	The questioned document has a more yellow tone when compared to the known document, the green border and black colored font appear to be darker on the questioned when compared to the known, and the printed material on the questioned appears to be skewed downward.
	Microscopic Examination	The font used for the line "Alexandria Smith" on the questioned document is different than the font used on the rest of the document. The font used for this area is also different than the font used for the corresponding area on the known document. Although the printing on both documents is consistent with inkjet process technology, the printing on the questioned contains vertical banding, and the colored ink dots are significantly more visible on the edges of the printed border and text of the questioned document. The paper surface of the questioned document is less smooth than the known.
	Transmitted Light	The printed material on the questioned document is skewed downward and stretched in the horizontal direction as it moves toward the side containing the Vice President's signature when compared to the known.
	ESDA	The indented impression marks on the back of the questioned document are different than those on the known document. On the questioned document, the ESDA developed a rectangular impression on the lower left corner. On the known document, the ESDA developed two parallel bands that run the length of the document.
	Video Spectral Comparator (VSC)	There are dissimilarities in the optical properties of the paper and ink used on the questioned and known documents. For example, on the questioned document, the ink around the black text luminesced when examined for infrared luminescence, and the ink on the known document did not. Also, the paper used for the questioned document darkened, while the paper used for the known document did not.
	Oblique Light	The indented impressions revealed using oblique light on the back of the questioned document are different than those on the known document. On the questioned document, oblique lighting revealed no visible impressions. On the known document, oblique lighting revealed a short linear impression running parallel to the document's length.
	Ruler	The relative sizes of both documents were the same.

TABLE 2

WebCode	Methods/Techniques	Observations
	Micrometer	Used to compare the relative thickness of the documents. The paper used to produce the questioned document is slightly thicker than that used for the known.
WVX9DV	Visual Examination	The overall tone of the text and border on Item Q1 is darker than the text and border on Item K1.
	Microscopic Examination	The text and border on Item Q1 had substantially more stray cyan, magenta, and blue dots than found on Item K1. Item Q1 has vertical banding, running the entire length of the document, slightly less than one inch apart. The far right side of the border is much more banded. Item K1 contains no such banding.
	Video Spectral Comparator (VSC)	Text and border on Item Q1 reacted differently than the text and border on Item K1 under IR and IRL examinations. The Item K1 document contains a plethora of luminescent paper fibers while the Q1 document contains much less luminescent paper fibers.
	ESDA	The front of Item Q1 revealed a very visible negative image of the text and border while Item K1 revealed a very light negative image. The front of Item K1 contains horizontal lines that run the length of the document. These lines could possibly be from the copier/printer. These lines are not present on Item Q1.
	Font Styles	Font style of lower case characters in the name "Alexandria Smith" on Item Q1 different than the other lower case characters on Item Q1 and different than the lower case characters on Item K1.
X6HYDT	Visual Examination	Paper of Q-1 appeared to be less bright than that of K-1. Documents Q-1 and K-1 do not exactly overlay when held together. Document Q-1 needs to be shifted up and to the left to overlay exactly with K-1. The printed border on Q-1 appears darker than that present on K-1 and appears less clear (more blurry) than K-1.
	Video Spectral Comparator (VSC)	Infrared Luminescence - Using longpass filters and spot lamp filters, the printed material on Q-1 was found to luminesce. Using longpass filters and spot lamp filters, the printed material on K-1 did not fluoresce. Upon observing the colored borders using Infrared Reflectance (longpass filters of 645-1000 nm), the border on Q-1 dropped out around 1000 nm, while the border on K-1 did not drop out. Transmitted light was used to observe the misalignment between documents Q-1 and K-1 when aligning the signature of the President of JFG Industries and the line of text "READY-TO-WORK PROGRAM". Under high magnification, the border of Q-1 appears to contain small cyan, magenta, and yellow dots, whereas the border of K-1 does not bear these dots.
XB3VH4	Video Spectral Comparator (VSC)	K1 paper has different optical properties in VIS, UV, IR than Q1 paper. K1 paper has a different fiber structure than Q1 paper (K1 more long fibers). There is much more yellow ink on Q1 than on K1. On Q1 there are printed marks and image of the paper fibers from the original document. There are no such prints on K1. On Q1, on the longer edges of the border, repetitive (evenly spaced) groups of "white lines" were revealed. These lines are not on K1.
	Microscopic Examination	There are definitely more drops of yellow ink on Q1 than on K1. Ink drops on K1 are smaller than ink drops on Q1. On Q1, "white lines" are revealed (a faulty part of the printhead nozzles). No such lines were disclosed on K1.
	ESDA	No individual traces left by the printing device on Q1 and K1 were revealed.

TABLE 2

WebCode	Methods/Techniques	Observations
XJ2KY8	Microscopic Examination Video Spectral Comparator (VSC)	To carry out this study and to observe possible manipulations and reactions of the inks, it has been used a stereoscopic microscope of the brand "Leica", model "S6D" and a video spectral comparator of the brand "Projectina", model "Docucenter-Nirvis". We have taken the parameters of the authentic document, K1: Type of support, Type of impression, Inks used, and: They have been studied with the video spectral comparator of the brand "Projectina", model "Docucenter-Nirvis", to observe the reaction of inks to exposure to UV and IR light waves. It has been studied and observed using the "Leica" brand stereoscopic microscope, model "S6D", to appreciate the details of the printing system and the inks used. After carrying out the work described above, significant differences have been observed between documents K1 and Q1, in terms of: 1. Different reaction to exposure to IR light at 715 nm 2. Different printing system of the whole document and not only for the personalization data, as the company itself explains.
YMEP72	Visual Examination ESDA Microscopic Examination Video Spectral Comparator (VSC) Overlays Transmitted Light Oblique Light Ultraviolet Light	<p>The font used in the "Alexandria Smith" printed text of Q1 differs from the font used for the remaining text on Q1 and the text on K1. The color of the Q1 paper differs from the color of the K1 paper.</p> <p>Vertical lines and a series of short horizontal bars that may be paper transport impressions were developed through ESDA processing of K1. Additionally, an extraneous mark, irregular curved line, was developed on K1. No significant impressions were developed on Q1 through ESDA processing.</p> <p>Both Q1 and K1 appear to be printed with inkjet processes. However, there are differences in the appearance of the print. The Q1 printing generally has more cyan, magenta, and yellow ink outlining the black printed text in comparison to the K1 printing. The "Alexandria Smith" printed text of Q1 has less cyan, magenta, and yellow ink outlining the printed black text in comparison to the remaining printed text of Q1.</p> <p>Portions of the ink on the Q1 document exhibit infrared fluorescence while the ink on the K1 document does not. The ink on the Q1 document begins to "drop out" in the infrared red range with a camera long pass filter of 780nm and becomes transparent with a camera long pass filter of 1000nm. The ink on K1 does not exhibit any "drop out" in the infrared range.</p> <p>"Alexandria Smith" printed text of Q1 is not in the same position relative to the other text in comparison with the K1 document.</p> <p>Paper texture/ pattern differences between Q1 and K1 were observed with transmitted light.</p> <p>Paper fiber surface differences between Q1 and K1 were observed with magnification and oblique light.</p> <p>No significant differences between Q1 and K1 when observed under ultraviolet light.</p>
Z4HJD2	Visual Examination	Examined Item Q1 and K1 for any obvious differences and any similarities. The green border printing appears more muted in Item K1 than in Q1. Font style similar in both.

TABLE 2

WebCode	Methods/Techniques	Observations
	Microscopic Examination	Examined Items Q1 and K1 microscopically. The green border print in Item K1 appears to be one color. The black printed text in Item K1 contains a gray shadow line and appears to be produced with ink jet technology. The green border in Item Q1 appears to be color ink jet and contains color half tones. The black text in Item Q1 appears to be a color ink jet technology as it contains color half tones. The black text portion of the name "Alexandria Smith" appearing in Item Q1 is a blacker ink than the remaining black printed text in Item Q1. Yellow fibers were also observed in the paper of both Item K1 and Q1.
	Ultraviolet Light	Items K1 and Q1 were examined with UV light - no differences observed in optical brightness.
	Video Spectral Comparator (VSC)	Items K1 and Q1 were examined under infrared lighting on the VSC6000. Infrared examination of Item Q1 revealed the "Alexandria Smith" portion reacts differently than remaining text portion. The "Alexandria Smith" signature is black whereas the remaining portions of Item Q1 have a fluorescence around the letters and black in the middle. Item K1 examined under the same infrared filters showed a black text and border throughout with no fluorescence.
	Overlays	Made overlays of Items K1 and Q1. With a little adjustment, the areas lined up with the exception of the name area.
	Oblique Light	Examined Item Q1 with side lighting for indented writing impressions. Non observed.
	Transmitted Light	No watermarks were observed.
	Micrometer	Paper thickness of each certificate was measured with a Starrett micrometer. K1 and Q1 were each tested on the right side, three separate areas each that measured .0085 inches.
Z6P2CW	Transmitted Light	Forensic analysis of the Questioned and Known certificates Transmitted light, Longpass=VIS, Magnification=22.14, White balance=385(R) 651(B), Auto Exposure (Integration=41ms, Iris=50) Brightnes=50, Gamma=Off, Imaged width=211mm detected dissimilar shades of color.
	Overlays	Similarities included overlays with exception of use of all upper case lettering on K-1.
	Video Spectral Comparator (VSC)	Forensic analysis of the Questioned and Known certificates Spot light 485-590 (0), Longpass=645, Magnification=2.14,Auto Exposure (Integration=304ms, Iris=70) Brightnes=50, Gamma=Off, Imaged width=211mm detected dissimilar imaging with respect to inked lettering.
	Microscopic Examination	Microscopic examination of K-1 and Q-1 revealed tracking fibers in K-1 and tracking dots in Q-1
ZBWJCB	Magnification with hand held light magnifiers	Scan of document at 1200 dpi and viewed on a computer screen to note any differentiations in type/font quality. It appears that the type fonts remained consistent between the Known and Questioned certificates, although the saturation of the line color was deeper in the Questioned documents.
	Light sources	When viewed under transmitted light and oblique light, no particular differences between the known and questioned documents surfaced. When viewed under ultraviolet light, an obvious difference in paper was visible. When viewed under infrared light
	Measurements were taken of the placement of elements	Borders, signature line length and placement, position of typography etc. and there appeared to be a consistency between the Known and Questioned document.

TABLE 2

WebCode	Methods/Techniques	Observations
ZLGXDR	ESDA	The front and back of the Q1 document contains what appears to be the impression of a paper transport mark that does not appear on K1.
	Ultraviolet Light	Q1 and K1 have a different response to UV light at 254nm and 312nm.
	Overlays	The machine printing (border/text/signatures) on the documents does not precisely overlay showing a difference in alignment. There is a difference in baseline position with K1 sitting slightly above Q1, when the other areas of machine printing are overlaid.
	Thickness	Dissimilar paper thickness. Paper thickness = Q1 .22mm and K1 .23mm.
	Visual Examination	K1 paper (white) visually appears brighter than Q1. The hue of the Q1 printed border has a darker color green appearance than the appearance of the K1 printed border.
	Transmitted Light	K1 has a different response to transmitted light as K1 appears darker than Q1. No watermarks present on Q1 or K1.
	Microscopic Examination	Printing Process: Q1 = color inkjet K1 = color inkjet. The Q1 inkjet printing has a brighter appearance of colors (CYM) than the K1 document. A printing defect (banding) was observed in the Q1 printing, not observed in the K1 printing. A font comparison between Q1 and K1 found a difference in the font used in the machine printed "Alexandria Smith" on Q1 and the font used on the machine printing on K1. Differences were found in the letter's "A", "a", "d", "r", "i", "S", "t" and "h". Q1 was found to have multiple printed trash marks that were not present on the K1 document.
	Ruler	Q1 printed border: Top (header) = 36pts, Bottom (footer) = 31pts, Left = 32pts, Right = 36pts. Measurements made with a GalaxyGauge ruler. K1 printed border: Top (header) = 36pts, Bottom (footer) = 33pts, Left = 30pts, Right = 42pts. Measurements made with a GalaxyGauge ruler.
ZQNK7V	Visual Examination	A preliminary observation was made in order to identify any interference that prevents the analysis from being performed, detecting no impediment. Subsequently, direct observation in order to detect characteristics with or without documentary affinity, establishing discordant characteristics.
	Macroscopic/Microscopic Examination	With the application of the magnifying equipment and the stereoscopic microscope, it was detected discordance of print quality and type of impression of the base document of comparison with the questioned document. Support tonality and discordant fibrils between the template and the questioned document.
	Video Spectral Comparator (VSC)	Transmitted light was applied, detecting dissonance in the tonality of the support to the passage of light between the questioned document and the template. When applying ultraviolet light, it was shaded in the fibers of the support of the template contrary to the questioned document.
ZT2UJ3	Video Spectral Comparator (VSC)	differences in printing methods between the name and the others observed.
ZVHE4W	Microscopic Examination	ACCORDING TO THE EXAMINATION RESULTS OF MACROSCOPIC EXAM THE QUESTIONED CERTIFICATE HAS A DIFFERENT COLOUR IN THE PRINT OF THE FRAMEWORK OF THE QUESTIONATE DOCUMENT.
	Visual Examination	THE QUALITY OF THE PRINT IS DEFICIENT USING VISUAL EXAM.
	Microscopic Examination	THE PATTERN OF THE PRINT OF INK DIFFERENT EACH OTHER USING MICROSCOPIC EXAM.

TABLE 2

WebCode	Methods/Techniques	Observations
	Magnification	PRELIMINARY WE USED MAGNIFYING GLASSES, WITH THE PURPOSE OF OBSERVING SOME TYPE OF DIFFERENCE BETWEEN THE COMPETENT AUTHORITIES SIGNATURES, AND FINALLY WE FOUND THEM PRINTED.
	Oblique Light	THE ANALYSIS OF THE TEXTURE OF THE PAPER IS ROUGH.
	Video Spectral Comparator (VSC)	WITH THE USE OF SPECTRAL COMPARATOR UNDER THE INFLUENCE OF INFRARED LIGHT. IT IS ESTABLISHED THAT TEXT DISAPPEARS WITHIN THE SPECTRUM OF 1000 NANOMETERS WHICH INDICATES THE USE OF ANOTHER TYPE OF INK.
ZZYLRW	Visual Examination	Similarities: the general appearance (border, the name of the documents, the signatures, print text); Differences: the color tone of the border dye and the inscriptions
	Macroscopic/Microscopic Examination	Distribution of the dye in paths as chaotic, multicolored point-like micro-deposits. Differences: in the Ready To-Work certificates in the name of Alexandria Smith (Q1) - there are four colors in the example template; (K1) - there are six colors
	Video Spectral Comparator (VSC)	Differences: different fluorescence of the path (routes) in IR light (for both objects, Q1 and K1); diagrams of the absorption and reflection spectrum of the path dye (position and height of the peaks)

Response Summary

Participants: 166

Methods Utilized

ESDA	33	Magnification	19	Thickness	13
Handwriting Examination	2	Micrometer	18	Transmitted Light	40
Indented Writing	7	Microscopic Exam	84	UV Light	42
Infrared Light	26	Oblique Light	20	Visual Exam	103
Macroscopic Exam	14	Overlays	37	VSC	140
Macroscopic/Microscopic Exam	33	Ruler	17		

****Note:** Methods listed are the preloaded options for selection via the CTS Portal and do not reflect all answers provided by participants.

Conclusions

TABLE 3

WebCode	Conclusions
23LKHZ	Given that K1 is an example of a genuine certificate, the differences I found between this and Q1 are such that, in my opinion, Q1 is not a genuine certificate.
2DGXEP	Document Q1 was printed on different workstation (including computer, printer, printing materials) than document K1. Probably another original certificate, dated on 21st of March 2019, was scanned, then the name of the recipient was removed, text "Alexandria Smith" was added and document was printed on another device.
2DJLV4	[No Conclusions Reported.]
2X6CUZ	On further examination, I found that the Q1 showed differences in print characteristics from the K1. Hence, I am of the opinion that the Q1 is not authentic as compared to the template.
32HG3U	The questioned and exemplar certificates were examined and compared to determine the authenticity of the questioned certificate. There were substantial differences between the questioned and exemplar certificates with the optical reactions/physical properties of the paper and printing processes. Therefore, the evidence indicates that the questioned certificate is not authentic as compared to the exemplar certificate.
33YEUT	According to the analyzes carried out, the material doubted for the present study and the technical reasoning previously exposed, it is established that the CERTIFIED document "READY-TO-WORK" Q1 investigated, does not present the characteristics of the CERTIFIED document "READY -TO-WORK "K1, that is, it is not an authentic document.
37ZHN2	It is the opinion of this examiner that the font utilized in the name: 'Alexandria Smith' on the document identified as Q-1 is a different font than the font used on the remaining text on the document Q-1. Additionally, the font utilized in the name 'Alexandria Smith' is not the same font that is utilized in the entire body of text on the document identified as K-1. The questioned certificate IS NOT AUTHENTIC as compared to the template due to the use of a different font in the name Alexandria Smith.
3TAQYQ	The fact that there is a difference between the two documents in the used paper and the reaction of the printing under infrared light can be explained by a possible change in the used brand of paper (likely) and/or ink cartridges (highly unlikely). Furthermore there is a discrepancy in the way the name of the recipient is printed. (K1: all capital letters, Q1: only first letter of first and family name in capital letters. The above mentioned findings are surcomstantial evidence at best. Further investigations would be required to confirm/dismiss this. The fact that alleged "dust particles" on document Q1 are printed with CMYK-colors proves that document Q1 is a digital copy of an original certificate and was not printed on the access-controlled workstation normally used for the certificate of completion. Dust particles on a digital template are impossible.
42YTKY	There is a strong probability that the questioned document is not authentic as compared to the template.
48P4UX	Item Q1 and K1 differ significantly in the nature of the paper, the composition and the characteristic deposition of the ink. Item K1 shows slight printing failures in the "w" of the word "awarded" and in the signature at the bottom left. Similar print failures at the same place can also be found in item Q1. Assuming that there has been no change in either the access and entry authorisation or the equipment and materials used up to 1 January 2020, we conclude that item Q1 (Alexandria Smith) is a counterfeit certificate. We assume that if the certificate would have been issued by the delegate authority the paper and ink shows no differences between K1 and Q1
4AR7FT	The results of the examination extremely strongly support that the document Q1 is not authentic as compared to the template (Level -4).
4DPMU8	Comparisons between the questioned Q1 "Ready-To-Work" certificate and the known K1 "Ready-To-Work" certificate revealed multiple differences between the two certificates. These differences

TABLE 3

WebCode	Conclusions
	include, but are not limited to: printing processes used to produce the design and print on the front sides of the certificates; differences in the papers used to make the certificates (dimensions, paper compositions, paper surface finishes); and, differences between feeder/roller mechanism patterns present on the front side of Q1 certificate and the backside of the K1 certificate. Based on the significant differences revealed during the comparisons between the questioned Q1 "Ready-To-Work" certificate and the known K1 "Ready-To-Work" certificate, the Q1 "Ready-To-Work" certificate is not a genuine "Ready-To-Work" certificate.
4GQVWW	Visual, microscopic, and instrumental examinations were conducted to characterize and compare the K1 and Q1 documents. A stereomicroscope, various light sources, computer imaging to create overlays, and controlled light apparatus were all used in these examinations and comparisons. The controlled light apparatus was the Foster and Freeman VSC 6000. Each document was a single sheet of heavy paper, each bearing an image of a certificate of completion. Information was provided that the company certificates are created on an access controlled work station, including the computer, printer, and printing materials. The question asked was whether or not the Q1 document was genuine. It is the conclusion of this examiner that the Q1 document did not originate from the same source as the K1 document. Differences include: 1. The K1 paper is optically bright while the Q1 paper is optically dull. 2. The K1 document is crisp in appearance, and high resolution, while the Q1 document is lower resolution and appears rough in both visual and microscopic examinations. 3. The Q1 recipient name field and date line are shifted slightly lower than those in the K1 document, and this shift is too slight to be an extra line space. 4. Both documents are printed on inkjet printers, and both have CMYK ink images. Differences were found in the VSC 6000 examinations. The black inks do not respond the same in infrared examinations, and the magenta inks do not respond the same in infrared fluorescence examinations.
4TK8BV	Based on the document authenticity method, Questioned Document Q1 is not authentic as compared to Known Sample K1.
63PEQV	The questioned document is not an authentic certificate. Printing process differences observed between the questioned certificate and the known certificate.
6A8PZP	A physical, microscopic, instrumental, and comparative examination resulted in the following: Given the set parameters for the production of the K1 template/standard, it was determined that the Q1 questioned certificate is not authentic as compared to the K1 template. This finding is supported by the fact that the Q1 questioned certificate does not conform to the K1 template based on the following observations: While both Q1 and K1 are produced utilizing inkjet, the inks differ from one another as evidenced by their reaction when exposed to infrared light. The density of the ink used in the production of the border and fixed text in Q1 is greater than that of K1 as observed by the fill-in of the non-imaged areas of specific text/characters. This indicates that the fixed portions of the Q1 document is multi-generational with the personalization being added in separately. This does not conform to the K1 template, which is internally consistent. An examination of the personalization and date revealed differences between Q1 and K1. An inner-comparative examination of Q1 revealed internal inconsistencies between the fixed text (dense CMYK) and personalization (dense K). The font used in the personalization of Q1 differs from the font used in the fixed text. This differs from K1 where internal consistency was observed between the personalization and the fixed text. Therefore, the font used in the personalization in Q1 does not conform to the font used in the personalization of K1. Impression evidence was derived from both Q1 and K1. The impressions on Q1 are horizontal striations observed on the reverse of the document and appear patterned. These impressions are different from those observed on the K1 template which contains both vertical and horizontal striations on the front and reverse, in addition to banding that is present along the top front of the K1 template. An overlay of Q1 with K1 revealed that the fixed text and border appeared similar with differences observed in the personalization of the name and date. Measurements of paper thickness resulted in a difference of 0.01425mm; K1 measuring to be thicker than Q1. Measurements of the length and width of the paper resulted in a difference of 1mm in length; K1 measuring longer than Q1 at 280mm versus 279mm. Lastly, a print defect of voided print lines was observed in Q1 that were not present in K1.

TABLE 3

WebCode	Conclusions
6DQ2HR	Item No./Description 1. Original Questioned 'ready to work certificate' marked as Q-1 in the name of Alexandria Smith, dated 21st March 2019 for forensic examination (01 page). 2. Original Reference template used to create 'ready to work certificate' marked as K-1, dated 1st January 2020 (01 page). The case consists of total 02 evidence items. Dates of Examination(s) Performed: Start Date: 02-03-2020, End Date: 23-04-2020. Result(s) & Conclusion(s): After careful examination and comparison of item no. 01 with item no. 02 using Video Spectral Comparator (VSC-8000, software version 7.2), following observations were noted: a) Paper fluorescence of item no. 01 is different from item no. 02. b) Color shade and sharpness of printed matter of item no. 01 is different from item no. 02. c) Printing ink of item no. 01 shows different behavior from item no. 02 in Infrared optical filters. It is therefore concluded that questioned item no. 01 is not authentic.
6LK8BT	A comparison is made between the certificate of doubt (Q1) versus the unintended one (K1) by means of optical instruments with a wide visual field, magnifying glasses, negatoscope and ultraviolet light cabinet. Initially, a general comparison is made between one and the other, not finding any correspondence in their tonality, being darker that of doubt in its frame or rim, the reference, on the contrary, said area is clearer. When submitting the documents to the negatoscope, it appeared initially that the substrate of the questioned certificate is darker or more opaque, compared to the greater clarity or whiteness of the unintended substrate. After the superposition (one on the other) and the use of diasopic white light or from the bottom up, it was found that the preprinted texts do not fit perfectly in their entirety, and there is a gap in their location. Through the use of magnifying glasses, it is established that despite using the same inkjet printing system, the reference certificate is monotonal with low concentration compared to multi-tonality and higher concentration than its forms exhibit.
6N37PN	Document Q1 is a falsification.
6YQZ6Q	The technical findings support the proposal that the Alexandria Smith certificate has not been made by JFG Industries
6ZWMEP	The questioned certificate is not authentic as compared to the template.
74UJGN	Based on the documents submitted, my opinion is that it is probable that the Q1 document is not authentic.
7AH7CU	There is some evidence to suggest that Items K1 and Q1 do not share a common origin. A stronger conclusion may be possible with the submission of additional samples contemporaneous to Q1 as well as a maintenance history of the known printer.
7C6PDR	Q1 is not an authentic document when compared to K1.
7F8NNK	In course of examination evidences were found supporting the questioned certificate (Q1) is not authentic. Based on authentic template the Q1 was forged.
7MBTHP	The questioned certificate IS NOT AUTHENTIC as compared to the template.
7PUP4U	Based on the inconsistencies noted during the comparison of the questioned certificate in Item 001 to the known certificate in Item 002, which included paper color, paper fiber distribution, reactivity to fluorescent luminescence, print quality, print defects, and the font of the "Alexandria Smith" machine printed text, the questioned certificate in Item 001 was a non-genuine document.
7UAWRU	Item 2 has been eliminated from being generated from the same source as Item 1. No decipherable indented impressions were detected from Item 1. One ESDA lift sheet was created from Item 1 and was made sub-item 1.1. The transparent plastic-like lift used to recover the indentations is being returned to you in evidence container # A. The lift should be retained as evidence. Several faint indented impressions were recovered from Item 2. One ESDA lift sheet was created from Item 2 and was made sub-item 2.1. The transparent plastic-like lift used to recover the indentations is being returned to you in evidence container # A. The lift should be retained as evidence. Three image enhanced images of the

TABLE 3

WebCode	Conclusions
	indentations are also returned in container # A.
7WCV3M	Based on visual and instrumental examinations and inter-comparison of the questioned form Exhibit Q1 with the known form Exhibit K1, it was determined Exhibit Q1 is a non-genuine "Certificate of Completion" form. This finding is based upon the following: The questioned machine printed entries on Exhibits Q1 and K1 were produced using inkjet technology (e.g., inkjet printer, all-in-one machine). The inkjet inks in Exhibits Q1 and K1 do not share similar class characteristics (e.g., optical properties). Printing defects and banding voids observed in Exhibit Q1 were not observed in Exhibit K1. The paper in Exhibit Q1 does not share similar class characteristics (e.g., optical properties, surface texture) with the paper in Exhibit K1. The font used to produce the text "Alexandria Smith" in Exhibit Q1 is a different font design than the text "NAME OF RECIPIENT" in Exhibit K1. In addition, the text "Alexandria Smith" in Exhibit Q1 displays misalignment with the text "NAME OF RECIPIENT" in Exhibit K1.
8HUMEN	The "READY-TO-WORK" PROGRAM certificate, issued in the name of "Alexandria Smith", with the issue date "ON THIS 21ST DAY OF MARCH 2019", indicate as Q1, IS NOT AUTHENTIC, probably corresponds to a computerized reproduction mechanism using printer laser or injection printer.
8LUZZR	[No Conclusions Reported.]
8PCV4K	Significant differences were observed between both the ink and paper of Q1 and K1. Additionally, differences in font were noted between the recipient's name on Q1 and other text on the documents. Based on these differences, it is my opinion that Q1 has a different source than the comparison certificate K1. Accordingly Q1 should not be accepted as a genuine certificate based on the known sample provided.
92MNBQ	The "Certificate of Completion" Q1, questioned, is not Authentic.
94RFZJ	In my opinion, the certificate Q1 is not authentic as it has been printed with different inks and on different paper when compared to a template certificate K1.
9DDKA4	The Q1 certificate is not authentic compared to the K1 certificate.
9DVQAU	The questioned certificate IS NOT AUTHENTIC as compared to the template.
9QEDEL	Forensic, comparative examinations using magnification and specialized lighting revealed that Q1 is not authentic as compared to the K1 template. The print quality of Q1 did not conform to that of K1 and a different ink was used to produce Q1 than that used to produce K1. Additionally, differences in the paper used to produce Q1 were observed as compared to the paper used to produce K1.
9RXYD3	The ready to work certificate dated March 21, 2019 (Q1) is FALSE.
9VXB93	Based on my scientific examination of the document and lack of agreement of the unique, identifiable characteristics and the measurable distinctions in the questioned document, including different printer or ink type used, misplacement of image, misplacement of specific line of type, different border size, different color of border, different lengths of signature lines per document, different case of lettering used, and differing paper weight, it is my professional expert opinion that the questioned document was manufactured by a different method than the known document. Therefore, it is my professional expert opinion that the questioned document is a falsified or fraudulent document deeming it an invalid document.
AGDAUN	An overlap was made between the dubious and the undoubted document, taking the texts of the template as a basis for comparison, and by means of the transmitted light, a complete coincidence was found in the location of the box, texts and signatures on both certificates. Likewise, the morphology of the texts and signatures that endorse the document retain the same shape and size. Only the name and date of issue of the certificate vary, as they are data added to the certificate.

TABLE 3

WebCode	Conclusions
AJZUVL	The questioned certificate is not authentic as compared to the template.
AMY6QL	Macro and microscopy with diascopic and episcopic lighting, for the general and detailed exploration of each of the lines that makes up the diligence of the doubted document.
AUVZQ6	The questioned certificate of Alexandria Smith submitted for examination is not authentic as compared to the template and is printed on the different printer.
AVQHUR	The font in the name of "Alexandria Smith", had subtle differences from the lower-case font in the same documents as well as in the known specimen. Assuming there was no reason for the font to be changed in the printing of the name for certificates issued for the same purpose, the differences provide conclusive evidence the questioned certificate was not genuine.
AYN4GN	Based on the K1 template provided, in my opinion, Q1 is a counterfeit certificate.
B9TBWN	After completion of an examination of the submitted Q-1 and K-1 materials, this examiner opines that the Q-1 is not a genuine document and was not produced on the same machine/instrument as the K-1 exhibit.
BJG3L2	<p>PERSON ORIGINATING REQUEST: Collaborative Testing Services; Date: 5-25-20; Case #CTS 20-5211/20U00291; Lab #CTS; QUESTIONED DOCUMENT EXAMINATION REPORT: DESCRIPTION OF ITEMS EXAMINED: Q-QUESTIONED: Received in person from the Evidence Unit for Case #20-5211 CTS. Q1: Ready-to-Work Certificate containing the name Alexandria Smith dated March 21, 2019. K-KNOWN: K1: Ready-to-Work Certificate known template sample dated January 1, 2020. OBJECT OF EXAMINATION: Determine if exhibit Q1 is authentic when compared to the known sample and conduct additional forensic examinations. RESULT OF EXAMINATION: The examinations and comparisons are based solely on the materials submitted and are opinions based upon my experience, education and training and are as follows: 1. The questioned Certificate of Completion in exhibit Q1 containing the name Alexandria Smith dated March 21, 2019 is not authentic. 2. Exhibit Q1 appears to have been produced via an inkjet printer and the name "Alexandria Smith" is a different font than the remainder of the text on the questioned or known documents. a. The "Alexandria Smith" text visually appears to be of a higher quality than the remainder of the printed text and is a different font than the remainder of the questioned text. However, the "Alexandria Smith" text does contain defects that are consistent with the text being created on the same printer as the remainder of the questioned text. b. The questioned inks react similarly under infra-red luminescence wherein luminescence appears as a halo around the letters. The halo is created by cyan, magenta and yellow inkjet dots that are printed below the true black ink. There appears to be a second font below the original text which may also be causing the halo effect. 3. The remaining text on the questioned and known documents contain the same font configuration and were produced by two separate inkjet printers. This can be demonstrated by the questioned text luminescence under IRL; wherein the known text remains dark (absorbs) under the IRL. 4. The questioned and known documents contain an individual defect in the inkjet printing on the second line of text. The horizontal spacing between the letter "r" and "t" in the word certificate are consistent and demonstrate that the questioned and known documents have a common source origin. However, the source document was not submitted. 5. The questioned document contains additional vertical defects in the inkjet printing in the form of vertical lines through multiple areas of the top and bottom border, through several letter forms and in the signatures. These defects are not repeated in the known sample. 6. Exhibits Q1 and K1 were examined with ultraviolet light and exhibit Q1 differs from K1 in that the paper is brighter. This suggests that the paper utilized to create Q1 is inconsistent with the known certificate paper submitted. a. The paper was measured and exhibit Q1 is 8 1/2" X 11: (215mm X 280mm) and is .009 millimeters thick and exhibit K1 is 8 1/2" X 11 1/16" (216mm X 280mm) and is .009 millimeters thick. 7. The font utilized on exhibit Q1 and K1 is Perpetua or Lapidary 333 (excluding the Alexandria Smith text); due to limitations in the amount of questioned text available for examination, the font could not be narrowed down further. The point size varies on the questioned and known documents. The questioned and known point sizes are consistent except for line three. Point sizes as follows: line one 32 point; line two 16 point; line four 15 point; line five 22 point, line six 12 point and line seven 11 point. Line three on the questioned document is 24 point and line three on the known</p>

TABLE 3

WebCode	Conclusions
	document is 22 point. 8. Exhibit Q1 contains the text of "Alexandria Smith" and this text most closely matches a Sitka family font. Due to limitations in the small amount of questioned text available for examination, the font could not be narrowed down further. This font is inconsistent with the font located on the remainder of exhibit Q1 and K1. 9. Exhibits Q1 and K1 were scanned for preservation by Specialist XXX. 10. The altered document may have been produced by the following means but are not limited to these methods: scanning the document and manipulating the writing in a computer environment or image editing photocopiers. DISPOSITION OF EVIDENCE: The original questioned and known evidence examined per this request will be returned to the CTS envelope. Copies and scans of this evidence will be retained in the Lab.
BRBB7R	[No Conclusions Reported.]
CCR6AJ	It is not possible to determine whether the certificate in question is authentic in comparison with the template, given that the certificate (provided by Mrs Smith) is a copy, which prevents the analysis of questioned documents from being carried out objectively.
CJB9GL	The questioned certificate identified as Q1 is not authentic as compared to the known template identified as K1.
CWDZKH	There were differences in physical properties observed between the Certificate Of Completion, Q-1, and the Certificate Of Completion, K-1.
DBUBPK	A detailed analysis was carried out on the material close to the study (K1 and Q1), observing initially directly and later using optical and light aid instruments, taking into account substrate or paper, content in general, topographic distribution in space. graph, morphology and size of the digits, internumeral spacings, color tones, as well as the possible suppressive and / or additive alterations found in the documents being studied. Documents K1 and Q1 (front and back) were subjected to the ultraviolet light of the document comparator, as well as their filling in different types of transmitted light: diascopic (bottom up), episcopic (top down) and ground (angled) incidence); as well as at different wavelengths, specifically of the infrared and ultraviolet spectra, in order to identify possible alterations in the spelling (digits) in the substrate; Obtaining as a result the following: The Q1 format presents differences compared to the K1 format in terms of the substrate being this more opaque, the hue in the frame design is lighter in color compared to the K1, also the printing system is inkjet but in Q1 it has a multitone hue (CMYK), while in K1 the substrate is white, its hue is monochromatic.
DGF9CL	Based on an examination of the evidence submitted, it can be determined that Exhibit 2(Q1) is not an authentic Ready-To-Work certificate.
DK3QWR	The questioned certificate is not authentic
DM3YYG	There is NO IDENTITY between the Ready-To-Work certificate in the name of Alexandria Smith dated March 21, 2019 (Q1) and the form used to create Ready-to work certificates dated January 1, 2020 (K1).
E7ANPK	Based on a comparison of Item Q1 to Item K1, Item Q1 is not a genuine "Ready-To Work" Program Certificate of Completion. This opinion relies upon Item K1 being fully representative of genuine "Ready-To Work" Program Certificates of Completion. Items Q1 and K1 were examined microscopically and macroscopically. These documents were also examined using a Video Spectral Comparator (VSC6000) using infrared reflectance, infrared luminescence, ultraviolet fluorescence, and transmitted light. Observations supporting the above opinion include, but are not limited to: a. Differences in the paper used for Items Q1 and K1. b. Differences in the inkjet printer ink used to print Items Q1 and K1. c. Differences in the font used for the recipient's name entries. Items Q1 and K1 were examined for the presence of indented writing images. None were found.
EF6N8J	Differences in alignment, ink, and printer marks indicate Exhibit Q1 and Exhibit K1 were not prepared in the same manner.

TABLE 3

WebCode	Conclusions
EQJLCM	The print in the documents K1 and Q1 are most probably produced with two different ink jet printers. The paper of the documents in K1 and Q1 are most probably of different origin/types.
EUMGVP	[No Conclusions Reported.]
EYCY8F	Methods: Visual and instrumental examination and comparison of the questioned certificate and the known certificate revealed the following: Findings: Source exclusion: The questioned certificate and known certificate originated from different sources. This is based on differences noted in the printing process, dimensions, font, ink, and paper between the questioned and known certificates.
EZ9A8P	TO sum up, Q1 certificate is not authentic and is not printed from the digital template on and access-controlled workstation.
FBK27H	It is my opinion that questioned certificate Q1, is not authentic as compared to the template document K1.
FCWVQP	It is my opinion that the Q1 "Ready-To-Work" certificate is eliminated as being authentic when compared to the K1 "Ready-To-Work" certificate.
FE4BZG	A combination of inconsistencies with respect to the substrates, border printing, and printed text were observed between Exhibit Q1 and Exhibit K1. The green colored certificate borders were printed by ink jet printing on Exhibits Q1 and K1. Differences in color and print quality were noted between the green colored border printing on Exhibits Q1 and K1. The printed text in the body of both Exhibits Q1 and K1 was produced by ink jet printing, however, when exposed to the same instrumental conditions the Exhibit Q1 text luminesced while the Exhibit K1 text did not luminesce, indicating optical inconsistencies between the Exhibit Q1 and Exhibit K1 inks. When exposed to the same instrumental conditions the Exhibit Q1 substrate produced a dull optical reaction while the Exhibit K1 substrate produced a bright optical reaction. Accordingly, in consideration of the foregoing observations, the Exhibit Q1 certificate was determined not to be authentic when compared to the Exhibit K1 certificate.
FNTYUJ	The Questioned Document is a false Document, because it lacks the characteristics and properties of the authentic document presented as a Matching Base.
FQENEW	a) The examination revealed significant differences between the template K1 and the questioned certificate Q1, regarding the paper and printing systems used to produce both documents. b) Based on the differences found in the examination of the template K1 and the questioned certificate Q1, the questioned certificate Q1 is not authentic when compared to the genuine template K1.
FQZYCJ	It has been determined that the submitted Exhibit Q-1 item was produced with the aid of an office machine system that utilizes ink jet technology and is a different office machine system than the one that was used to prepare the Exhibit K1 item. Therefore, the submitted Exhibit Q-1 item is not a genuine Certificate of Completion.
FXGUUY	I am of the opinion that there is conclusive evidence to show that certificate Q1 is not authentic.
FYBJEF	[No Conclusions Reported.]
G42DPL	The questioned certificate IS NOT AUTHENTIC as compared to the template.
G4LT6N	The question certification is not authentic
GDLNYD	Exhibits Q1(a), Q1(b), K1(a) and K1(b) were examined visually and with alternate light sources. Exhibits Q1(a) and K1(a) were examined microscopically. Exhibits Q1(a), Q1(b), K1(a) and K1(b) were examined for the presence of indented impressions using the Electrostatic Detection Apparatus (ESDA). Indented machine-created impressions were observed on Exhibits Q1(a), Q1(b), K1(a) and K1(b). The machine-created impressions observed on Exhibits Q1(a) and Q1(b) are of a different type and design

TABLE 3

WebCode	Conclusions
	<p>than the machine-created impressions observed on Exhibits K1 (a) and K1 (b). No further indented impressions were observed on Exhibits Q1 (a), Q1 (b), K1 (a) and K1 (b). The result of the ESDA examination was preserved by lifting. Please see the attached images for details. The questioned machine-generated entries on Exhibit Q1 (a) and the known machine-generated entries on Exhibit K1 (a) were both prepared using liquid ink jet printing technology; however, ink differences were observed when the machine-generated entries on Exhibit Q1 (a) were compared with the machine-generated entries on Exhibit K1 (a). The questioned machine-generated entries on Exhibit Q1 (a) were not prepared by the same printer as Exhibit K1 (a). Please see the attached images for details. Furthermore, differences in size, color and optical properties were observed when the paper of Exhibits Q1 (a) and Q1 (b) were compared with the paper of Exhibits K1 (a) and K1 (b). Therefore, Exhibits Q1 (a) and Q1 (b) are not genuine. Exhibits Q1 (a), Q1 (b), K1 (a) and K1 (b) were digitally preserved. The ESDA indentation lifts were digitally preserved and processed. The digital images will be retained. [Attachment not provided by participant.]</p>
H74BZE	<p>The questioned certificate (Q1) is a reproduction made from a ready-to-work certificate and an alteration was observed on the name of recipient "Alexandria Smiths", as a result, the questioned certificate (Q1) is not authentic as compared to the template used to create Ready-To-Work certificates (K1).</p>
HAGF89	<p>The performed examinations have permitted to conclude that, on the basis of the characteristics exhibited by Certificate K1, Certificate Q1 is a counterfeit document.</p>
HHWUEK	<p>Based on the examination and comparison of the submitted standards, the following conclusion was reached: The questioned certificate (Item Q1) has been determined to be not authentic as compared to the submitted known certificate (Item K1). This conclusion is dependent upon the assertion that all materials utilized to create genuine certificates are strictly controlled without deviation (i.e. no substitutions of printer or printing materials ever occur).</p>
HM6EYB	<p>Utilizing visual examinations, microscopic examinations, digital imaging, and the Video Spectral Comparator (VSC) revealed that the document, Laboratory item #2 (Q1), Invoice #Q200050 is non-genuine as compared to known reference standard Laboratory item #1 (K1), Invoice #Q200050.</p>
HYJC4E	<p>Q1 was not an authentic Ready-To-Work document.</p>
J2J3PK	<p>The Q1 certificate was not printed with the same computer/software/printer system that printed K1. Printing quality differences between Q and K, and the different type font used to print the "Alexandria Smith" entry on Q, formed the basis for the opinion that Q1 and K1 were printed on different computer/software/printer systems.</p>
JDW3JT	<p>Base on the comparison, K1 paper is not the same as Q1 paper and the K1 certificate is not print from the same printer of Q1 certificate, therefore it is determined that the question certificate is not authentic as compared to the template.</p>
JQKAE9	<p>Based on the side by side comparisons of Item K1- Ready-To- Work Certificate to Item Q1- Ready-To- Work Certificate (Questioned Document) it is this examiners opinion that: The Q1-Ready-To- Work certificate is a counterfeit/non-genuine version of Item K1-Ready-To-Work Certificate.</p>
JQL3CF	<p>The certification in question was not printed on the same printer as the certificate obtained from the company as being the certificate given to employees.</p>
K9JLMA	<p>Video Spectral Comparator revealed that the document Laboratory item #2 (Q1) is non-genuine. The following is a list of differences observed between the questioned and known documents: a. Optical differences in the ink used in the print processes. See Page 2 for interpretation [Table 2 - Methods and Observations]. b. Differences in paper color.</p>
KBNA6K	<p>The sheets supporting Q1 and K1 printouts are not made of the same paper (presence of visible fibers on the K1 document). This can also be observed by the reaction of the paper under fluorescent lighting. Both documents are printed in colour inkjet. However, their print rendering is different. In addition, print</p>

TABLE 3

WebCode	Conclusions
	defects due to clogged print nozzles are visible on document Q1. The inks used to print the 2 documents are different. Indeed, under infrared radiation with a 1000 stop filter, the text is no longer readable on document Q1. In conclusion, the Q1 paper is different from K1. The printing ink of Q1 is different from K1. The traces of embossing left by the printer on document K1 are not present on document Q1. The certificate provided by Ms SMITH could therefore not be printed on the workstation (including computer, printer and printing equipment) dedicated within the company.
KP8WAC	The questioned certificate Q1 is not authentic as compared to the known template K1.
KU4J6K	First and foremost, the scenario is unclear. There was not enough information provided in the scenario to make a determination. The clarification of whether or not the subject provided "her copy" as the original would be the determining factor. Just "her copy" as provided in the scenario is inadequate. The subject may have received "her copy" and made a photo copy for her files. Without the capacity to ask additional questions I would reserve my opinion until I had all the facts. If, in fact "her copy" is being purported to be the original, provided as a hard copy directly from the employer, then the document is not authentic. It is a photo copy of the original template. Both the questioned document and the known template were visually examined unaided, and then compared under 150X magnification using the MiScope and Celestron microscopes. The subject's name is printed in upper and lower case on the questioned document. On the template, "NAME OF RECIPIENT" is in upper case. I would question the employer about the change in upper case to upper and lower case, since the scenario claims all the files were lost on their computer systems. The most incriminating factor is that the questioned document is a color copy. The template is a color print. Again, I would question the employer and the subject to see if the subject had an "original" or if "her copy" was being alleged as the original. I would also ask the employer if slight changes were inadvertently made to the template since the files were all lost due to a virus.
KYXK6E	It was determined the certificate, Q1, was not authentic.
KYYBDH	The questioned document is counterfeit. It was made with a different printer on a different paper surface. The base (source) was a genuine certificate which was scanned, modified and printed on a different IT environment.
L4NA6H	Findings support the view that the document Q1 is not an authentic Certificate based on the information provided in the scenario.
L88AHC	In my opinion, the differences observed in the distribution of ink and properties of the paper stock used for Q1 and K1 provide very strong support for the proposition that Q1 is not an authentic document, over the proposition that Q1 is an authentic document.
LQYBEF	My opinion is based on the observations I made during my examinations and my ability to evaluate these observations, based on the training and experience I have in the area of document examination. It is my opinion that Q-1 was made by altering K-1 (or a similar genuine certificate to K-1 and/or a copy of a certificate) as the model. It is further my opinion that Q-1 is not an authentic document. These opinions are drawn to a reasonable degree of scientific certainty and based on recognized scientific principles.
LW3GTH	The results of the investigation show that Q and K certificate were printed with different printers and on different paper. There were no limitations to the investigation. Our expert opinion is, that Q and K certificate were printed with different printers and on different paper. According to the information that we got from the submitter, that the certificates are always printed on the same printer and on the same type of paper, that means that the Q certificate is counterfeit.
LWL6BD	The item Q1 printing was not generated by the same machine as that which produced the printing on K1 nor are the papers the same. This opinion is based on the notation of visibly different colors of paper stock and border shades and a different reaction of the inks (borders and printed characters) when examined under infrared reflectance and infrared luminescence. This indicates different inkjet ink. Examination under UV fluorescence revealed slight differences in papers. Further, the Q1 paper stock has a different appearance when examined under transmitted lighting. The font style used on the entries

TABLE 3

WebCode	Conclusions
	<p>on Q1 appears to be the same as K1 except for the name entry on Q1, which is in a different font. This opinion is also predicated on K1 being a true representative of the certificates that would have been issued during the period of time as Q1. Examination for indentations did not reveal any decipherable marks, characters, signs, or symbols in indented form.</p>
LZLCWB	<p>The questioned certificate is NOT AUTHENTIC compared to the template.</p>
M2B63D	<p>The items listed in this Certificate of Analysis were assessed and examined based on methodology described in the Forensic Document Unit (FDU) Test Methods (unless otherwise noted). The methodology used included macroscopic, microscopic, paper, print process, indented impression, and handwriting examinations. Paper Comparison: The paper in Items Q1 and K1 were compared to one another to determine whether or not these two pieces of paper were from a common source. The paper in Items Q1 and K1 were examined macroscopically, microscopically, and with an alternate light source. The paper in Items Q1 and K1 were consistent in class characteristics, such as physical dimensions; the lack of a watermark; and similar paper fiber distribution. However, the paper in Items Q1 and K1 were inconsistent in color and reaction to ultra violet light at 254 nanometers (nm). The paper in Item Q1 appeared more off-white in color and was slightly brighter under ultra violet light at 254 nm, whereas the paper in Item K1 was visibly whiter in color and not as bright under ultra violet light at 254 nm compared to the paper in Item Q1. Additionally, the paper in K1 contained tan fibers whereas those fibers were not observed in the paper in Item Q1. Print Process and Font Comparison: The printing on the documents in Items Q1 and K1 were compared to one another to determine whether or not the printing was from a common source. The printing in Items Q1 and K1 were examined macroscopically, microscopically, and with an alternate light source. The printing on the documents in Items Q1 and K1 were printed with inkjet technology. However, the printing on the document in Item Q1 contained repeating print defects that were not observed on the document in Item K1. The printing on the document in Item Q1 reacted differently under alternate lift sources as compared to the printing on the document in Item K1. The droplet size of the printing on the document in Item Q1 also appeared larger than the droplet size on the document in Item K1. The name "Alexandria Smith" was of a different print quality than the remainder of the printing on the document in Item Q1 as well as the document in Item K1. The printed border on the document in Item Q1 was also not in horizontal or vertical alignment on the paper as compared to the printed border on the document in Item K1. The font on the document in Item Q1 was similar and overlaid with the font on the document in Item K1, excluding the font used to produce "Alexandria Smith" and the date line on the document in Item Q1. The font on the dateline on the document in Item Q1 was similar to the dateline on the document in Item K1 but was not produced with the same characters. The font use to produce "Alexandria Smith" on the document in Item Q1 was different from the font used to produce the printed text on the remainder of the document in Item Q1 as well as the printed text on the document in Item K1. The serifs on "Alexandria Smith" on the document in Item Q1 were more angular whereas the serifs for the remainder of the font on the documents in Items Q1 and K1 were straight. Indented Impression Examination: The documents in Items Q1 and K1 were examined for the presence of indented impressions. These, generally, are impressions left on a document which has been in contact with another document during the writing process. Indented impressions are subject to more than one interpretation when deciphered. The four EDD lifts, uniquely identified as Q1A1, Q1A2, K1A1, and K1A2, that were produced during the indented impression examination of the documents in Items Q1 and K1 may be viewed in Items Q1A and K1A, respectively. No decipherable indented impressions developed on the four lifts in Items Q1A and K1A, which were from the front and reverse of the documents in Items Q1 and K1. Indented impressions of a band of lines developed on lift K1A2 in Item K1A, which was from the reverse of the document in Item K1. This band did not develop on lifts Q1A1 or Q1A2 in Item Q1A, which were from the front and reverse of the document in Item Q1. The source of the indented impressions of the band of lines that developed on lift K1A2 in Item K1A was unknown. Handwriting Examination: The four signatures depicted on the documents in Items Q1 and K1 were non-original, appeared naturally written, and deemed suitable for comparison to known writing. The document(s) containing the original signatures that were depicted on the documents in Items Q1 and K1 were not submitted to the laboratory for comparison. The partially stylized signature depicted on the "President" line and the partially stylized signature depicted on the "Vice President" line on the document in Item Q1 were compared to the partially stylized signatures</p>

TABLE 3

WebCode	Conclusions
	<p>depicted on the corresponding lines on the document in Item K1. Partially stylized means some of the characters were not decipherable. The slight deviations and variations between repetitions of writing that exist in natural writing were not present in these signatures. Furthermore, the signature depicted on the "President" line on the document in Item Q1 and the signature depicted on the "President" line on the document in Item K1 aligned when overlaid onto one another. The signature depicted on the "Vice President" line on the document in Item Q1 and the signature depicted on the "Vice President" line on the document in Item K1 also aligned when overlaid onto one another. Therefore, the two signature on the "President" lines on the documents in Items Q1 and K1 share a common source and the two signatures depicted on the "Vice President" lines on the documents in Items Q1 and K1 also share a common source. Overall Opinion Regarding the Document in Item Q1: Based on the non-destructive macroscopic and microscopic examinations performed at this level of analysis, significant differences were observed when the document in Item Q1 was compared to the document in Item K1. Therefore, the document in Item Q1 is not authentic as compared to the document in Item K1.</p>
M8E4FN	<p>It is my opinion that the questioned certificate is Not Authentic as compared to the template based on the above observations.</p>
MFRZHA	<p>The Q1 certificate has been identified as non-genuine as compared to the K1 template. This is a definitive result with the highest degree of certainty. No indentations or physical impressions of evidentiary value were developed on Q1. Physical impressions from the printer hardware were developed on K1.</p>
MLHAR9	<p>Exhibits Q1a, Q1b, K1a, and K1b were examined visually. Exhibits Q1a and K1a were examined microscopically. Exhibits Q1a and K1a were also examined with alternate light sources. The questioned machine-generated entries on Exhibit Q1a and the known machine-generated entries on Exhibit K1a were produced using liquid inkjet printing technology. However, ink differences between the questioned machine-generated entries on Exhibit Q1a and the known machine-generated entries on Exhibit K1a were observed. Paper differences were also observed between Exhibit Q1 and Exhibit K1. Printing defects were observed on Exhibit Q1a. These variable defects may occur during the manufacture or printing process and may give additional information about the production of the document; however, these printing defects were not observed on Exhibit K1a. Exhibits Q1a, Q1b, K1a, and K1b were examined for the presence of indented impressions using the Electrostatic Detection Apparatus (ESDA). Machine-created impressions were observed on Exhibits Q1a, Q1b, K1a, and K1b. No further impressions were observed on Exhibits Q1a, Q1b, K1a, and K1b. The results of the ESDA examination was preserved by lifting. Please see the attached images for details. The ESDA lifts created from Exhibits Q1a and Q1b were compared to the ESDA lifts created from Exhibits K1a and K1b. The machine-created impressions observed on the ESDA Lifts of Exhibits Q1a and Q1b were not of a similar type or design to those observed on the ESDA lifts of Exhibits K1a and K1b. Therefore, Exhibits Q1 and K1 were not produced by the same printer and Exhibit Q1 is not genuine. [Attachment not provided by participant.]</p>
MPLZ29	<p>Certificate copy provided by Ms. Smith is not authentic. It was printed on different printer and different paper than example template and probably was scanned and altered from another issued certificate.</p>
MR7XMD	<p>The questioned certificate (CTS Item Q1; Exhibit 1) is not authentic as compared to the template (CTS Item K1; Exhibit 2)).</p>
MXCQGA	<p>The findings show that the Q1 certificate is different from the K1 comparison certificate. According to the printing scenario information's, the findings extremely strong support the proposition that the Q1 certificate is not authentic as compared to the K1 template.</p>
N6TLX4	<p>In view of the differences observed between Q1 and K1, and the inconsistency observed within Q1, the questioned certificate Q1 is not genuine.</p>
N6UEVB	<p>The certificate of Alexandria Smith is False</p>
N9TPQB	<p>The analytical procedures outlined here are sufficiently discriminating that was evaluated characteristics</p>

TABLE 3

WebCode	Conclusions
	differences and determine: Elimination (are founded significant differences between items K1 and Q1 at Microscopic and Video Spectral Comparator (VSC) Examination level). This two documents are not from the same device printing, based by a) the Ink print samples being compared between K1 and Q1 items are from different instruments of impression. b) significant differences printing between K1 and Q1 items are found at this analysis.
NDJZ2A	In view of the significant differences in printing characteristics, dimensions and colour of the green border, well as the colour and weight of the paper, the questioned certificate marked Q1 is not authentic as compared to the template marked K1.
NK7WMC	The questioned certificate (Q1) is not authentic as compared to the template (K1).
NLHPHD	The questioned certificate is not authentic as compared to the template.
NN3GUG	a) Comparisons between Q1 and K1 showed the following, i) The paper of Q1 is different to that of K1. ii) A similar type of printing process (inkjet) was used to produce Q1 and K1 but based on the differences in the size of the dots and the sharpness of their colours, in my opinion, Q1 and K1 were not printed using a same printer. b) Based on the above findings, in my professional opinion, the questioned certificate Q1 is NOT AUTHENTIC.
NQ9YRC	A detailed documentological analysis of the study reason document against the reference standard document was advanced, by overlaying the documents with the help of the spectral comparator video laboratory team, where total matching of the preprinted information (template) is evident, including signatures, which correspond in their morphology, size, distribution, location, inter-literal separations; so it is concluded that the document presented by Alexandria Smith is authentic
P4CP64	The result of the forensic examination of the specimen K1 and the questioned certificate Q1 proves that the questioned certificate Q1 is not identical to the specimen K1.
P8QMB7	According to the analysis performed, to the questioned sample, to the reference standard and the above reasoning, it is determined that the "READY-TO-WORK" certificate, in the name of Alexandria Smith, dated March 21, 2019, item (Q1), IS NOT AUTHENTIC compared to the template.
PCM7GB	The Q1 Certificate in Question is NOT AUTHENTIC compared to the K1 Certificate template
PDHPHC	The questioned certificate (Q1) is not authentic as compared to the template (K1).
PHDFQ9	The Q1 proficiency certificate corresponds to the K1 proficiency certificate.
PQ7VB7	The questioned certificate in Q1 was examined and compared with the control template in K1. Visual examination revealed that the shade of paper color of the questioned certificate in Q1 was different from that of the control template in K1. Moreover, under special lighting conditions, the optical appearance of the paper of the questioned certificate in Q1 was found to be different from that of the control template in K1. These results indicated that the paper substrates for the questioned certificate in Q1 and the control template in K1 were different. Visual examination also revealed that the shade of color of the frame pattern on the questioned certificate in Q1 was different from that on the control template in K1. In addition, under special lighting conditions, the optical properties of the printing ink used on the questioned certificate in Q1 were found to be different from those used on the control template in K1. These results indicated that the questioned certificate in Q1 and the control template in K1 were printed with different printing ink. Apart from the name and date, similarities in the relative positions, size and alignment of the contents were found between the questioned certificate in Q1 and the control template in K1. However, microscopic examination revealed that the printing details of the words "Alexandria Smith" were different from those of the other words on the questioned certificate in Q1 whereas those of all words on the control template in K1 were similar. These results indicated that the template for the questioned certificate in Q1 was a modified copy of an authentic template. In view of the above observations, while taking into consideration that the digital template, computer, printer and printing

TABLE 3

WebCode	Conclusions
	materials including paper and printing ink are access controlled, I am of the opinion that the questioned certificate in Q1 is not authentic as compared to the control template in K1.
PTRDVC	I have found a number of differences between Q1 and K1. In my opinion, these differences provide strong evidence that Q1 is not a genuine certificate.
PWUEVA	In my opinion, the questioned certificate (Q-1) has been identified as inauthentic compared to sample K-1.
PZTPRA	The item Q1, a Ready-To-Work Certificate in the name of Alexandria Smith, dated 21 March 2019, IS NOT AUTHENTIC as compared to the template K1, that is, item Q1 IS A FALSE DOCUMENT.
Q49K6L	Based on the observed differences that are found by using several examination methods we can conclude that the questioned certificate IS NOT AUTHENTIC as compared to the template.
QDWF62	The impressions of K1 and Q1 do not perfectly overlap. The composition of black inks is different and physical marks from rollers and pick-up mechanism of the printer are observed on K1 and not on Q1. Thereby if Q1 is the original certificate received by Alexandria Smith and not a copy, Q1 is not authentic.
QVDG4A	Q1 is not authentic
QVG74Z	The genuine certificates are printed from a digital template on an access-controlled workstation. It is proven that the paper, the printer and the digital template – only the name and date are changed for each individual – is the same for each certificate that is handed out to the employees. One example template of such a certificate was submitted for examination K1. It is therefore possible to compare the questioned certificate of Alexandria Smith Q1 to the sample K1 without any restrictions. During the examination it was carried out that the paper and the printing of Q1 and K1 are different and come from different sources. Both the paper and the printing (ink) react different when examined with different light sources and viewed under the microscope. In a digital template it is not possible to vary the font and the position of the text. Both is not the same on Q1 as on K1. As the sample K1 differs in all applied examinations from the questioned certificate Q1, it is confirmed that the questioned certificate Q1 is not authentic.
QZ9DMA	Differences between the questioned document Q1 and authentic reference material K1 were observed. Differences were observed in the properties of the paper and ink. Moreover, differences were observed in the indented impressions on Q1 and K1 that likely originate from the paper handling mechanism of the printer. It is described in the scenario that all authentic certificates are made with an access-controlled workstation using the same printer and similar printing materials. Based on the differences observed between Q1 and K1 it is concluded that the questioned document Q1 is not authentic.
R2EBBB	In propositional terms: Under H1 (ie, Q1 is authentic), the probability of these findings is effectively zero. Under H2 (ie, Q1 is non-authentic), the probability of these findings is effectively one. Overall, the resulting likelihood ratio (LR) is extremely in favour of H2 over H1. In other words, these findings provide extremely strong support for the belief that Q1 is not authentic, rather than Q1 being an authentic certificate as exemplified by K1. Please see the Caveat in 'Additional Comments'.
R6ZZVM	It is highly probable that Q1 is not authentic when compared to the template (K1).
R9VQ2Y	Questioned Certificate Q-1 is Probably Not Authentic as compared to the Template.
RA8LK7	the certificate of completion of Alexandria Smith of the "ready-to-work" program date 2019-03-21 corresponds to the standard sample
RCH9JK	EI DOCUMENTO CUESTIONADO IDENTIFICADO COMO Q1, CON RESPECTO AL DOCUMENTO ESTÁNDAR DE COMPARACIÓN K1, NO ES AUTENTICO. [Translation was not received prior to

TABLE 3

WebCode	Conclusions
	publication.]
RDQKYZ	I found significant differences between the questioned document and the sample sent for comparison. based on the given information that all such certificates are printed in the exact same conditions - the same printer, the same paper and the same inks, it is my opinion the questioned document is counterfeit. Both document did not come from the same source.
RFXZ67	Upon completion of an examination and comparison of the exhibits submitted in this case, it is the opinion of this examiner that the Q1 document is probably not authentic as compared to the K1 document. This is not a conclusive opinion due to no information submitted relative to any possible changes or variation in the access-controlled workstation and/or materials that produced the K1 document. A more conclusive opinion will require information to be submitted indicating if any changes to computer and printer settings occurred or differences in print materials (i.e. ink and/or paper) were used during the time the Q1 and K1 were generated.
RFZQEA	Differences were noted between Q1 and K1. These included differences in UV properties of the paper, differences in IR properties of the inks, visual differences in the inkjet colour printer coloured dots and some alignment differences when overlaid. Given these differences, in our opinion, Q1 is not authentic as compared to the template K1.
RNNLB6	The Q1 document is probably not authentic. A more conclusive opinion may be possible if additional known documents are submitted. Ideally, these would be filled-out and printed certificates from both before and aer the questioned document, as well as a copy of the digital template used to create the documents.
RNPEAC	Item Q1 is not authentic as compared to the Item K1.
T2WJY6	Alignment differences against the standard document in date and name of the certificate. Color intensity difference of the outline of the certificate, the questioned being more intense than the pattern. Differences in the substrate fibers as well as in their shade under ultraviolet light. Differences in the resolution or size of the printing point, being more defined in the tenplate document than in the questioned document. In conclusion, it can be established that The questioned certificate IS NOT AUTHENTIC as compared to the template.
T8ZPE8	The certificate Q1 has not been printed on the same paper. The printing ink on the certificates could have been differentiated. The two prints could not have printed with the same digital templates. The questioned certificate Q1 is not authentic as compared to the template K1.
TVQRQ8	1. The questioned document is not authentic.
TZYDHB	Q1 and K1 originated from two different printers/printing processes.
U3HPTZ	Exhibits Q1a and K1a were examined visually, microscopically, under alternate light sources, and with the Magneto-Optical Visualizer (MOV). Exhibits Q1(a and b) and K1(a and b) were examined for the presence of indented impressions using the Electrostatic Detection Apparatus (ESDA). The following was determined: Indented machine-created impressions were observed on Exhibits Q1b and K1(a and b); however, the indented machine-created impressions on Exhibit Q1b are different from the indented machine-created impressions on Exhibits K1(a and b). No further indented impressions were observed on Exhibits Q1b or K1(a and b). No indented impressions were observed on Exhibit Q1a. The result of the ESDA examination was preserved by lifting. Please see the attached images for details. Exhibits Q1a and K1a were prepared using liquid inkjet printing technology; however, the questioned machine-generated entries on Exhibit Q1a were not prepared by the same printer as Exhibit K1a. The inkjet printing, on Exhibits Q1a and K1a, did not contain magnetic properties. The font used to create the Certificate of Completion on Exhibits Q1a and K1a are similar; however, alignment differences within the recipient name and date and the use of uppercase and lowercase letters within the recipient name were observed between Exhibits Q1a and K1a. In addition, paper differences were observed

TABLE 3

WebCode	Conclusions
	between Exhibits Q1a and K1a. Therefore, Exhibit Q1 is not a genuine Certificate of Completion document. [Attachment not provided by participant.]
U8DJQ2	There is extremely strong support for the proposition that Q1 was produced on a printer and paper type that differ from those used for K1 rather than for the alternative proposition that they came from the same printer and paper type. This is the strongest conclusion (point 1) on a 9 point scale which compares the degree of qualitative support for a particular proposition with that for the alternative proposition. The conclusion could also be described as follows. There is extremely strong support for the proposition that Q1 is not an authentic document by reference to the example authentic document K1 rather than for the alternative proposition that Q1 is an authentic document.
UBY2B8	The questioned certificate and the template, which were used to create ready to work certificates, are made by different printers with different ink and on different paper.
UC9BYY	Explanation of "C" response - While significant differences were noted between the Q1 and K1 items, no conclusion could be reached concerning the authenticity of item Q1 due to the lack of contemporaneous known standards for comparison purposes. 1) The K1 standard is purportedly printed on 1/1/2020 and the Q1 item is purportedly printed on 3/21/2019, almost 9 months prior to the K1 standard. The different paper stock between K1 and Q1 could easily be explained by a new purchase of paper stock (same item number, but manufactured with a different optical brightener formulation) to replenish an exhausted paper supply or from an unauthorized purchase. The submission of additional contemporaneous known standards should address this discrepancy. 2) The difference in upper case vs. lower case font in the name of the recipient can easily be explained by input error, as this is a variable data portion area of the Q1 item. The submission of additional contemporaneous known standards should address this discrepancy. 3a) The Q1 item is printed by 3 or more color inkjet printing with strong coloration. 3b) The K1 item (dated approximately 9 months after the Q1 sample) is printed by 3 or more color inkjet printing with very weak coloration. Q1 and K1 display differences in IR Luminescence of the inkjet inks. This may indicate a different ink, or a product of ink/solvent leaching due to the 9 month time difference. The purportedly older Q1 ink (3/2019) is luminescing while the "fresher" K1 ink (1/2020) is not luminescing. The submission of additional contemporaneous known standards should address this discrepancy. The submission of contemporaneous known standards for comparison will be necessary for any definite conclusion concerning authenticity of the Q1 item. The submission of approximately 20 known standards dated between 3/20/2019 and 3/22/2019, including standards from 3/21/2019, in addition to the paper stock purchase order history, will be necessary for a more definitive conclusion concerning the authenticity of the Q1 item. The submission of the requested contemporaneous known standards will prevent any bias (guessing) in the determination of the authenticity of the Q1 item considering such a long time period of 9 months between the Q1 item and the K1 known item. Range of Testing Activities: 2/25/2020 to 5/1/20. Evidence Disposition: All submitted items are being retained at the Suffolk County Crime Laboratory.
UEDYFA	The questioned certificate is not authentic as compared to the template.
UHWXT4	I have considered the following propositions in the examination: P1 The questioned certificate in Item Q1 is authentic, and P2 The questioned certificate in Item Q1 is not authentic. I have contemporaneously examined the K1 and Q1 documents visually, at magnification, spectrally and using the Electro-static detection apparatus and have compared the results between both documents. As a result, I have observed similarities and dissimilarities in the overall appearance and alignment of layout, font and text where comparable, and differences in features such as paper properties, ink properties and printing properties between Q1 and K1. I have also assessed the quality and quantity of the specimen material provided, being only one specimen sample not contemporaneous to the questioned item. Based on the combination of these differences, and the information and exhibits provided, in my opinion the evidence provides strong support for the proposition that the questioned certificate in Q1 is not authentic, over the alternative. NB: This opinion is based on the information and exhibits provided to the examiner, as well as the specific propositions outlined above. Should this information, exhibit material or the propositions change, the opinion may also change.

TABLE 3

WebCode	Conclusions
UMQRQ6	The questioned document, Q1, was viewed microscopically, macroscopically and with the aid of various light sources, filters and magnification. The questioned document, Q1, does not appear to be an authentic document as compared to the known document, K1.
UMRMF3	Based on expertise results I conclude that on document of exhibit Q1 have different paper florescence, UV reaction compared to the template of exhibit K1.
UWU6PK	The questioned document (Q1) is false.
V4A3W6	Alexandria Smith's "CERTIFICATE OF COMPLETION" compared to the template is not authentic.
VNJ34J	The questioned document Q1, Certificate ready to work on behalf of Alexandria Smith dated March 21, 2019, is not authentic compared to the K1 document consisting of the template.
VUKF23	The comparative examination on the certificate issues by the name "Alexandria Smith" has been carried out using "Leica M205C" microscope and "VSC6000 / HS" equipment in ultraviolet, infrared luminescence and infrared reflective rays.
W3XN34	The physical and / or security characteristics of the document of doubt (Certificate of Completion of Alexandria Smith "Ready-to-work" Program, date 2019/03/21) CORRESPONDED against the standard sample and / or data sheet.
WACGEY	The certificate Q1, IS NOT AUTHENTIC as compared to the template use by JFG Industries.
WB8ZF2	The item #Q1 certificate is NOT authentic as compared to known item #K1.
WKDW44	Q1 is difference from K1 in printing material. Besides, the name "Alexandria Smith" was of higher quality than the other words on Q1, while the ink distribution of the words on K1 appears consistent (apart from the signatures). The production process of Q1 and K1 was different. Therefore, Q1 is not authentic as compared to K1.
WRYXHV	Conclusion(s): The questioned certificate is not authentic as compared to the known template. Numerous dissimilarities exist between the questioned and known documents. Note that information was received prior to the exam: genuine certificates are printed from a digital template on an access-controlled workstation (including computer, printer, and printing materials), and only the name and date are changed for each individual. Based on this information, it is assumed that the paper, ink, printer, computer, and template used would be the same for both questioned and known documents. This opinion may change if any of these assumptions change. Methods: Overall images of the documents were obtained at a scanning resolution of 300 pixels per inch (ppi). The documents were visually examined with the unaided eye and using a microscope capable of achieving a magnification of 160x. The documents were physically placed on top of one another and examined using transmitted light from a light table, to check for consistency of machine-generated text alignment, font differences, superimposition of printed material, and deviations in document format and size. The documents were examined for indented impressions using the Electrostatic Detection Apparatus (ESDA) and oblique lighting from the Video Spectral Comparator (VSC) and the Crime-lite 80L. The impression on the back of the questioned document was visualized using the ESDA, and the impressions on the back of the known were visualized using the ESDA and oblique light. Alternate light source examinations were conducted using the VSC. A micrometer was used to compare the relative thickness of the documents. Observations: The questioned document lacks internal consistency, while the known does not. The font used for the name "Alexandria Smith" on the questioned document is different than the font used on the rest of the document. Furthermore, this font is different than the font used in the corresponding area of the known document. For example, on the questioned document, the "r," "i," "a," and "d" in the name "Alexandria Smith" are different than the lowercase font used on the rest of the document. When this same name on the questioned document was compared to the font used for the "NAME OF RECIPIENT" text on the known document, differences were observed in the "A," and "S." The indented impression marks on the back of the questioned document are different than those on the known document. On the

TABLE 3

WebCode	Conclusions
	<p>questioned document, oblique lighting revealed no visible impressions, and the ESDA developed a rectangular impression on the lower left corner. On the known document, oblique lighting revealed a short linear impression running parallel to the document's length, and the ESDA developed two parallel bands that run the length of the document. The printed material on the questioned document is skewed downward and stretched in the horizontal direction as it moves toward the side containing the Vice President's signature when compared to that on the known. Although the printing on both the questioned and known documents is consistent with inkjet process technology, there are notable dissimilarities: 1. Microscopic examination shows that colored ink dots are significantly more visible on the edges of the printed border and text on the questioned document than on the known. Additionally, the black printing appears to be darker on the questioned document than on the known document. Compare images 1 and 2 below. 2. There is vertical banding present in the questioned printing that isn't present in the known. See image 3 below. 3. The printed border is a brighter green, and the text "Alexandria Smith" is a darker black on the questioned document than on the known. There are dissimilarities in the optical properties of the paper and ink used on the questioned and known documents when the documents are examined using alternate light sources. For example, on the questioned document, the ink around the black text luminesced when examined for infrared luminescence, and the ink on the known document did not. Also, the paper used for the questioned document darkened, while the paper used for the known document did not. There are visual differences in the paper used for the questioned and known documents. The questioned document has a more yellow tone when compared to the known document, and the paper surface of the questioned document is less smooth than the known, when viewed under magnification. The paper used to produce the questioned document is slightly thicker than that used for the known. Interpretation and Results: If the questioned certificate was printed using the same digital template as the known document, from "an access-controlled workstation (including computer, printer, and printing materials), and only the name and date" changed, as the case information received states, I would not expect to see the following: differences in paper color, roughness of the paper surface, relative paper thickness, and the optical properties observed under alternate light sources. horizontal stretch of the printing resulting in a slightly wider image on the questioned document than the known document. differences in indented impressions on the back of the questioned and known documents, which may be attributable to the paper transport mechanism from the printer used to print them. differences in the dispersion of ink, the banding pattern, and the optical properties of the ink observed between the known and questioned documents. (However, the difference in optical properties may be the result of the different substrate on which the documents were printed.). inconsistency in the font used within the questioned document, as well as between the questioned and known document. (However, it is unknown whether the user is able to change the font when creating a genuine document.). Although there may be alternate explanations for some of the above, when the evidence is considered together it is not likely that the questioned certificate is genuine. [Attachment not provided by participant.]</p>
WVX9DV	<p>After analyzing the evidence in this case, the following opinions have been formed: It has been determined that the questioned certificate is not authentic as compared to the known template. Comparison charts for all examinations have been included in this report. Microscopic examination of the text and border revealed substantially more cyan, blue, and magenta dots on the Q1 certificate than the K1 template. Also, the text and border on Q1 has a darker tone than that found on Item K1. The font styles on both documents were compared for consistency. The lower case letters in the name "Alexandria Smith" on Item Q1 are a different font style than the rest of the lower case letters on Item Q1 and are a different font style than all of the lower case letters on Item K1. Both documents were examined with the Video Spectral Comparator (VSC). The text and border on Item Q1 reacted differently than the text and border on Item K1. Under infrared illumination, with a 1000nm filter applied, the information on Item Q1 completely disappeared (transmitted) while the information on Item K1 remained visible (reflected). Also, under infrared luminescence, portions of the text and border on Item Q1 luminesced while the text and border on Item K1 had no luminescence. Item K1 contains a plethora of luminescent paper fibers embedded in the document, the Q1 document contains much less luminescent paper fibers. Items Q1 and K1 were examined visually, with sidelighting, and with the electrostatic detection apparatus (ESDA) for the presence of indentations from indented writings. Indentations of this sort are often caused on one document when writing is done on another document that is physically on top of it. ESDA processing revealed a very clear negative of the text and border on</p>

TABLE 3

WebCode	Conclusions
	<p>the front side of Item Q1. A very faint negative of the text and border was revealed on the front side of Item K1. Also, Item K1 contains horizontal indentation lines than run the length of the document. These lines may be roller marks from the copy machine. These indentation lines are not present on Item Q1. As per [Laboratory] standard operating procedures the ESDA lifts were given a Submission number and have been returned with the evidence. All requested examinations have been completed on this evidence. Items Q1 and K1 will be forwarded to the [Laboratory] in [City] and will be returned to the submitting agency upon completion of the analysis. If further examinations are required, these submissions should be resubmitted along with any additional materials.</p>
X6HYDT	<p>Based on the submitted reference sample, it was determined that questioned document Q-1 may not have been printed using the same materials and/or inks as those used for known document K-1, due to dissimilarities in the visible and infrared properties of the inks in Q-1 and in K-1.</p>
XB3VH4	<p>Q1 was printed on a different: type of paper and printer than K1.</p>
XJ2KY8	<p>The document submitted for study and referenced as Q1 is a complete forgery carried out by means of the printing technique known as ink jet.</p>
YMEP72	<p>The Q1 certificate is not authentic as compared to the K1 template. Significant differences were observed in paper, ink, and font between the Q1 certificate and K1 template.</p>
Z4HJD2	<p>The questioned certificate, Item Q1, is not authentic as compared to the template submitted in Item K1. Evidence of differences observed are as follows: Item Q1 and K1 were produced on different printers. The green border pattern, printed text, and signatures appearing on Item Q1 appear to have been produced with a color ink jet technology. The black portion of the text in the name "Alexandria Smith" appearing in Item Q1 is a blacker text than the remaining text portions on Item Q1 when examined under magnification. Infrared examination revealed the text appearing in the name "Alexandria Smith" on Item Q1 remained black whereas the remaining text portions had a fluorescence around the edges with a black center. This could be an indication that the name "Alexandria Smith" was produced on a different printer than the remaining text portions of Item Q1. The green border pattern appearing in Item K1 consists of one color. The printed text and signatures appearing in Item K1 contains a grayish shadow along the black portions of the text. This text does appear to have been produced by a color ink jet technology however, the halftone colors are much fewer and not as obvious as the halftones appearing in Item Q1. Infrared examination revealed the text, signatures and border all turned dark.</p>
Z6P2CW	<p>Forensic examination of the "READY TO WORK" certificates appearing in Q-1 and K-1 detected dissimilarities when subjected to Transmitted and Spot Fluorescence light sources from VSC-8000 analysis. There were also dissimilar results when Q-1 and K-1 were subjected to the ESDA analysis. Dissimilar tracking marks were detected between K-1 and Q-1 under microscopic examination. Similarities included overlays with exception of use of all upper case lettering on K-1. However, this examiner notes a substantial variation in the dates between the two certificate templates and requests information concerning the possibility of an adjustment in the paper stock used to create said certificates. This examiner also requests information pertaining to the printer(s) involved in the creation of these certificates and dates in which ink cartridges were replaced.</p>
ZBWJCB	<p>In my opinion, I have concluded that the questioned Ready-To-Work Certificate of Completion is not authentic. There are discrepancies in both the printing and the paper used to support this conclusion. (I am following the SWGDOC Standard Terminology for Expressing Conclusions 4.1). Border - 1) The printing of the Celtic knot border in the Known Certificate is monochromatic and forest green in color. The printing of the Celtic knot border in the Questioned Certificate exhibits two colors: a. a blue green outline of the knots, b. a forest green background. 2) The interior of the Celtic knots on the Known Certificate is clear. The interior of the Celtic knots on the Questioned Certificate contains a peppering of ink in random locations. 3) The color of the border on the Questioned Certificate is a deeper color saturation than the color saturation of the Known Certificate. Typography - 4) The overall line quality of the typography on the Known Certificate is clean and sharp. Under magnification there is a lighter color shadow effect that can be seen to the right side of some of the letters. The overall line quality of the</p>

TABLE 3

WebCode	Conclusions
	<p>typography on the Questioned Certificate, although relatively sharp appears to be darker or heavier. The type viewed on the Known Certificate appeared "thinner" in line quality or less "dense" than the type on the Questioned Certificate. The overall line quality of the typography on the Questioned certificate appears thicker and perhaps a bit more soft edged. Paper - 5) When viewed under an ultraviolet light source, the paper of the Questioned Certificate luminesces a much brighter white, indicating a different composition than the paper used to print the Known Certificate which exhibits a faint pinkish grey hue when viewed under the same ultraviolet light source. Papers for both certificates appear to be the same weight. Ink - 6) The white lines that form the Celtic knot border in the Questioned Certificate have a visible outline of peacock blue, which rests again the deep forest green background color. The dark green background border of the Known Certificate is not quite as saturated and deep in hue as the green in the questioned document. 7) There are regions in the signatures which also show blue where the writing line itself is thin. The blue is more visible in the writing on the Questioned Certificate, possible because all the writing/typography on the Questioned Certificate appears a bit thicker or more robust. 8) There are traces of yellow and magenta dots in and around the typography found on the Questioned Certificate. This strong yellow dot pattern does not appear on the typography of the Known Certificate. 9) When viewed under Infrared Luminescence, visible differences appear around 850 nanometers. The border on the Questioned Certificate becomes much lighter and less visible in contract in comparison to the border on the Known Certificate. The same phenomenon happens in the area designated for the Name of Recipient.</p>
ZLGXDR	<p>Request: Examine the questioned Alexandria Smith's certificate (Q1) to determine its authenticity compared to the known template certificate (K1) printed on an access-controlled workstation (including computer, printer, and printing materials). Results of Examinations: Paper Examination: The questioned sheet of paper (Q1) along with the known sheet of paper (K1) were examined with no visible watermarks observed. The two sheets of paper share a similar size, but are dissimilar in other class characteristics, such as hue, thickness, colored paper fibers and response to ultraviolet light, revealing the documents were printed on different paper. Indented Writing Examination: Q1 and K1 were examined for the presence of any indented writing, typing or other identifying impressions. These are impressions sometimes left on paper from writing, typing, or other markings done on another page while it was superimposed over the questioned material. The front and back of the Q1 document both contain the impression of what appears to be a paper transport mark that is not found on the K1 document. While Q1 contained an impression of a paper transport mark that K1 did not, the known sample was not contemporaneous with the questioned document. Furthermore, Q1 and K1 were printed on different substrates that may not reproduce paper transport markings similarly. There were no other meaningful impressions located. Printing Process Examination: The questioned document (Q1) and known document (K1) were examined visually, microscopically and instrumentally. These examinations revealed that both documents were printed with a color inkjet process. Further examinations on the documents revealed a difference in the font used in the machine printed text "Alexandria Smith" on the Q1 document compared to the font used in the machine printed text on the K1 document. Q1 and K1 were examined for evidence of authenticity by digitally overlaying the documents. These examinations revealed a difference in alignment as the documents do not precisely overlay one another. A baseline difference was also observed between the machine printed "Alexandria Smith" text on Q1 and the machine printed "NAME OF RECIPIENT" text on K1. Microscopic examinations of the documents revealed printing anomalies/imperfections known as "trash marks" located on the Q1 document that were not present on the K1 document. Trash marks are printing imperfections printed onto a document as a result of marks, scratches, dust or dirt on the glass platen, cuts on the delivery belt, dirt on the lens, scratches on the drum, and/or problems with the fusion system. These circumstances can arise as a result of normal wear and tear, abuse, or poor care and maintenance of the office machine. The presence of trash marks on Q1, indicates that the Q1 was document was produced, to some extent, by photocopying/scanning an authentic certificate or one that shares a common source with one. Certificate Authentication: On the basis of all examinations listed above, it is my opinion that the Q1 certificate is not authentic compared to the K1 template certificate.</p>
ZQNK7V	<p>The questioned document does not present concordant characteristics of support, tonality of support and printing, with respect to the document provided as a template to create certificates (base comparison document). From which it is concluded that the questioned document is not authentic compared to the</p>

TABLE 3

WebCode	Conclusions
	template.
ZT2UJ3	The questioned certificate is not authentic as compared to the template.
ZVHE4W	THE DOCUMENT IDENTIFIED WITH THE CODE "Q1" IS NOT AUTHENTIC, REFERED TO AS "CERTIFICATE OF COMPLETION" AN BEHALFOF ALEXANDRIA SMITH CONSISTENT WITHIN THE APPOINTED MODEL DOCUMENT REFERENCE WITH THE CODE "K1" AND THE TECHNICAL ARGUMENTS PRESENTED HEREIN.
ZZYLRW	Ready-To-Work certificate in the name of Alexandria Smith, dated 21 March 2019 (Q1) is made using computer techniques multiplier with color Inkjet printer (the border, document name, the name of the document, the signatures, text printing). The color Ink Jet printer used to print the certificate in the name of Ms. Smith (Q1), differs from the color Ink Jet printer used to print the example template (K1). Ready-to-work certificate in the name of Alexandria Smith, dated 21 March 2019 (Q1) is not authentic.

Additional Comments

TABLE 4

WebCode	Additional Comments
23LKHZ	The repeating fault found in the printing on Q1 and the trash marks may help to provide evidence of the machine(s) used in the production of this certificate.
2DGXEP	On Q1 the individual features of the print head (characteristic white lines) were disclosed. After delivery of the comparable material in the form of the selected device or comparative outprints, it will be possible to identify the print head or printing device.
2X6CUZ	The differences observed under different lighting conditions indicating that Q1 and K1 were printed using different ink.
33YEUT	The inks used in the printing of the certifications were analyzed by ABSORPTION (725 nm) and FLUORESCENCE (focus light 380 nm and long pass 830 nm), through the VSC6000HS Expectral Video Comparator, without finding spectral differences between them.
37ZHN2	Under UV light Q-1 had a slightly more yellow tint than K-1. This could be an explainable difference in that the stock that was used for printing was different. However, the difference is noted here. It appears that the text used in all of K-1 is a form of a Times font such as Times New Roman and the font used in the name Alexandria Smith in Q-1 is a Palatino font.
42YTKY	Limitations: Only a single sample of the known document was provided. This however does not give an understanding of the range of variation possible from the known printer and if the features observed in the known document can be expected from every document of this type generated by the known printer. For the purpose of this exercise the assumption was made that the known sample of the Certificate was representative of the other genuine Certificates produced.
74UJGN	In order to come to a more conclusivse opinion in this case I would need to examine more known (comparison) documents that have already been issued, preferably around the same time period (the day before, day of, or day after) of the questioned document.
7AH7CU	If this was a real case, the investigator would be contacted for more information regarding the maintenance of the printer and the use of consumables. Given the time difference between K1 and Q1, it might be possible that the printhead was changed affecting the nozzle output, and/or a different ink (OEM vs aftermarket) was used with different properties. Therefore, an inconclusive opinion would be rendered in a real case given the information provided, until more information and/or samples could be obtained.
7PUP4U	The FDU only conducts non-destructive examinations. If chemical analysis or destructive testing is requested to compare the inkjet technology between the questioned and known certificates in Items 001 and 002, the evidence may be sent to a laboratory which conducts these examinations. The EDD lifts in Items 001A and 002A will be returned to the agency. Images of the EDD lifts and submitted items will be retained by the FDU.
7WCV3M	In the event a subject office machine, office machine ink, office machine paper, and/or digital file is developed during this investigation, standards from the machine, ink, paper, and/or digital file should be taken and submitted to the laboratory for a comparison examination. For further details on procuring sufficient exemplars, please call the undersigned examiner before procuring the exemplars.
8PCV4K	For Investigative Purposes: The questioned certificate Q1 contains extraneous reproduced marks in its background. If it has been produced by scanning and editing a genuinely issued certificate, it may be possible to link Q1 to either this source document or the scanner. Accordingly, any genuine certificates the suspect has access to (particularly those issued on 21st March 2019) and samples from any suspect scanning devices could be submitted for an examination to identify the source of Q1.
9QEDEL	The case scenario explicitly states that the authenticity of Q1 should be determined based on its conformity or non-conformity to the K1 template. The background information provided by CTS regarding controlled access to the printer and materials was interpreted to mean the K1 template represents what the certificates should always look like and that nothing regarding the materials used to produce the documents had changed during the time-period that elapsed between their production. In other words, the background information was interpreted to mean that additional contemporaneous specimens were not necessary and that production settings and materials were consistent. It is within

TABLE 4

WebCode	Additional Comments
	these parameters, that Q1 was determined to not be authentic.
9RXYD3	It can be confirmed that the certificate in the name of Alexandria Smith was not issued by the company JFG industries (which issue these documents from their workstation with controlled access), because the same printer was not used, it was not used the same impression material, therefore, present discrepancies both in the substrate and in the printing system, compared to the template.
9VXB93	The quality of the questioned and known documents was sufficient for examination. A meticulous examination and comparison of the questioned document to the known document was conducted to determine similarities and differences using the following: unaided eye, microscope, handheld magnifying loupes, grids, lightbox, metric ruler, scale and oblique lighting. I have applied the generally accepted Questioned Document Examiner principles and methods reliable to the facts in this case.
AMY6QL	In photospectrometric scanning, the differences are checked, during the displacement of the indicator on the spectrum frame, applying the different wavelengths between 400nm and 925nm, which are visible on the computer screen as identifying color spectral. While it is true the standard document is 2020 it is necessary if for the year 2019 the template for the preparation of these documents was the same. It should be noted that in the place where the name is placed the participant appears in sustained capital letters (k1), while in the question document (Q1) it presents a shift and minuscular style.
AYN4GN	It is possible that the observed differences in the optical properties of the ink and paper may be due to any time difference between the printing of the questioned document and the template. However, given the specific information provided about the controlled workstation, template and supplies, my conclusion is that the certificate is not authentic.
B9TBWN	While conducting this examination, it was assumed that even though the word "copy" was used to describe the Q-1 exhibit, it was intended to be used as an additional print of the certificate that was printed at the same time (or at least the same workstation) and given to Ms. SMITH rather than a copy that was made from the original.
CCR6AJ	However, because it is a copy, there are differences in the printing system, as well as differences presented in the capital letter present in the sample template provided by the company.
EUMGVP	Physical, optical and/or chemical examinations were performed on the submitted exhibit(s) and resulted in the following opinion(s): It was determined that Exhibit Q1 is not authentic. Both Exhibits Q1 and K1 were produced using inkjet technology; however, discrepancies were noted in the optical characteristics of the printing ink and in the printing quality of Exhibits Q1 and K1. Discrepancies were also noted in the optical properties of the Exhibit Q1 and Exhibit K1 substrates. This indicates that Exhibit Q1 and Exhibit K1 were not produced from a common source (i.e. printer, and printing materials). The above stated opinion is predicated on information provided by the requestor in the Testing Scenario and Item Description(s) document, suggesting that there is a single source utilized for printing all genuine certificates, comprised of a computer, printer, and printing materials.
FQENEW	In real casework, the laboratory would previously confirm that the certificate template was the one used in 21/03/2019 (date in the questioned certificate Q1). We would also ask for additional genuine certificates contemporary of the questioned one.
FQZYCJ	It appears that the Exhibit Q1 item was produced by adding the "Alexandria Smith" name to an image or copy of an original "CERTIFICATE OF COMPLETION" dated 3/21/19 through an electronic method of cut and paste.
FXGUUY	Many aspects about the item Q1 were similar to item K1 including the paper, the print quality (a similar type of printer must have been used) and the overall content and layout of the certificate. However distinct differences were observed in the behaviour of the printing inks used on item Q1 in comparison with K1 particularly under infra-red (IR) oblique and IR floodlight on the VSC 8000.
GDLNYD	Exhibits Q1(a), Q1(b), K1(a), K1(b), along with the original ESDA indentations lifts, will be returned to the submitting agency.
JQKAE9	Not in report: Significant differences were observed in the substrate matrix, printing processes and paper between Item K1 Ready-to-Work Certificate (accessed-controlled digital template which includes computer, printer and printing materials) and the Item Q1 Ready-to-Work Certificate (Questioned Item). This opinion is based on the assumption that the K1 document statement of being a controlled

TABLE 4

WebCode	Additional Comments
	document is accurate.
JQL3CF	If the company changed printers between the time the questioned certificate was printed and the comparison certificate was printed, then the original printer would need a copy from it to be reviewed.
KU4J6K	As an experienced examiner, I would not opine without asking additional questions. An accusation of perpetrating a fraud upon her employer would have devastating consequences. Therefore, without knowing whether or not the employee was providing a photo copy of her certificate and whether or not the employer after having lost all their computer files may have created a new template would be essential. The printing on the template and the printing on the questioned certificate do not align with one another. The questioned certificate is darker in color. Again, if the employee is purporting this as her original certificate, then this examiner would opine the document is not authentic. It is a color copy.
KYYBDH	Further examination on printer identification is available based on detected printing features (number of used colors, head defects, etc.)
L4NA6H	In a normal case it would be ideal to examine some certificates issued by the company that are contemporaneous with Q1.
L88AHC	I have assumed that there has been no changes to the computer, printer (including service/s) and printing materials during the time period in which the two certificates have been printed.
LW3GTH	Comparison results interpretation: different printer, different paper.
LZLCWB	The method for document analysis was applied. (Authenticity)
M2B63D	Images of Items Q1 and K1 are being retained by the FDU. The EDD lifts in Items Q1A and K1A are considered secondary evidence and will be retained by the FDU for future reference.
MLHAR9	Exhibits Q1a, Q1b, K1a, K1b, and the original ESDA indentation lifts were digitally scanned. The original ESDA indentation lifts were digitally processed.
N6UEVB	The documents were analyzed with white light and magnifications and no security elements were observed
N9TPQB	we know that some ink supply units are interchangeable between different brands or models of machines. too that some ink units are refillable and ink from suppliers other than the original manufacturer may be used. However, these (K1 and Q1) documents have many significant differences among them.
PCM7GB	The location of the date in Q1 does not match the location of the date in K1. The Q1 Certificate paper has less opacity than the K1 Certificate paper
PHDFQ9	Despite the fact that the document in question is a photostatic reproduction, it was determined that there is correspondence with the master document in terms of shape, spaces and topographical distribution, it is noteworthy that the analysis of the printing system, color shade was not carried out since it is a photocopy which is noticeable the difference.
PQ7VB7	The repeated defect marks found along the vertical axis of the questioned certificate in Q1 were not found in the control template in K1. Whether or not the discrepancy was attributed to different printers or ink cartridges could not be determined.
PZTPRA	There are differences in the sheet size, inks and printings, which allows determining the falsity of the document Q1 as compared to the template K1.
QVDG4A	The signatures contained in Q1 fit perfectly with K1's signatures, noting that it is an integral copy
R2EBBB	Key framework: "The certificates are printed from a digital template on an access-controlled workstation (including computer, printer, and printing materials), and only the name and date are changed for each individual. The signatures are part of the template and are not signed on each certificate." Caveat: The conclusion is based upon the framework information and materials provided to the examiner, as well as the outlined propositions H1 and H2. In general, if any of the information changes, additional/different samples become available, or should different propositions be considered, then the opinion(s) may also change.
R6ZZVM	It may be possible to reach a more definitive opinion in the event that several genuine,

TABLE 4

WebCode	Additional Comments
	contemporaneous certificates produced around the time of March, 2019 become available. This would help to rule out the use of a different paper stock, printer, or digital template. It would also be helpful to attend at the location and try the system and see what components can be changed by the operator (e.g. font family, uppercase versus mixed uppercase and lowercase with initial caps). It would be also helpful to examine blank paper stock that is used to print and know the make and model of the printer. Examining the actual printer that is used to print the certificates may have some defects which are individualizing. The particulars of the paper stock such as the manufacturer and type of paper stock would be helpful. I would also like to see the computer that the templates are produced on as the Sitka font was introduced for Windows 10 and is not natively on Apple Macintosh computers.
RNNLB6	In addition to the presentation of more known documents to determine variations in print defects, it would be helpful to know if Ms. Smith had access to the equipment used to create the documents.
U3HPTZ	Exhibits Q1 and K1 were digitally preserved. The ESDA lifts were digitally preserved and processed. The digital images will be retained. Exhibits Q1, with original ESDA lifts, and K1, with original ESDA lifts, will be returned to the submitting agency. The images referenced above under the Results section, will be provided in hard copy form with the report my mail.
U8DJQ2	The conclusion is based on a large number of differences observed in the paper, print and font of Q1 compared with that of K1. We would normally recommend an ESDA examination of any questioned document to determine whether there are any writing impressions or marks on it that may assist in the investigation. This has not been undertaken in this case as so many findings of difference between Q1 and K1 were made. Ideally further K documents should be submitted for examination including a genuine certificate produced on or around 21 March 2019 so that variation among the genuine certificates could be assessed as well as the appearance of the genuine certificates at the time that Q1 was purportedly produced.
UBY2B8	Questioned document, probably, could be printed with Epson or Brother printer, or another printer with similar ink composition, but additional research is needed to prove this.
UEDYFA	The document did not have any security measures. The result was based on the special properties.
UHWXT4	Additional specimen certificates would be beneficial, particularly closer to the date on the questioned certificate, to demonstrate any variation between authentic certificates.
UMQRQ6	Any paper or printing devices found in the possession of any suspect can be submitted for further comparisons.
VNJ34J	After analyzing in detail the questioned document and the base comparison document (template) by microscope and specialized equipment, it was observed that the documents present different types of printing, as well as the name legend, from document Q1, is made with letters Uppercase and lowercase (Alexandria Smith), since the document template (K1) is only capitalized. Therefore, it can be determined that the document in question is not authentic.
X6HYDT	This examination process may have been aided with the submission of a second genuine certificate, preferably one created for another employee from around the time the questioned document was purportedly created.
XJ2KY8	The work has been demanding within the simplicity of its approach, as it has required the technician who has carried it out to examine the document in each and every one of its aspects. It has been illustrative and has served to make him aware of the need to examine in depth all the documents submitted to a forensic examination.
Z6P2CW	The Examination produced many questions that would have been helpful to be included in the test envelope such as samples of paper stock within the dates imprinted on Q and K as well as information concerning the ink jet cartages and printers. I would not be comfortable in court with any other conclusion until I had a chance for additional examination of the requested standards.

-End of Report-
(Appendix may follow)

Test No. 20-5211: Questioned Documents Examination

DATA MUST BE SUBMITTED BY **May 25, 2020, 11:59 p.m.** TO BE INCLUDED IN THE REPORT

Participant Code: U1234A

WebCode: 2U4CRH

The Accreditation Release section can be accessed by using the "Continue to Final Submission" button above. This information can be entered at any time prior to submitting to CTS.

Scenario:

JFG Industries performs contract work for a government agency. The agency requires project leaders at JFG Industries to have earned an internal "Ready-To-Work" certificate to demonstrate their proficiency and qualifications. Alexandria Smith recently led such a project where a significant error incurred substantial additional costs and delayed project completion. There are suspicions that Ms. Smith lacked the proper qualifications to lead the project, however, a recent computer virus has destroyed many of the company's records of who has earned "Ready-To-Work" certificates. Ms. Smith has provided her copy of the certificate as proof of her qualifications, but the company and agency are still suspicious. The certificates are printed from a digital template on an access-controlled workstation (including computer, printer, and printing materials), and only the name and date are changed for each individual. The signatures are part of the template and are not signed on each certificate. The company has provided you with an example template of what certificate holders are given and the certificate Ms. Smith purports is real. Please examine Alexandria Smith's certificate to determine its authenticity.

Items Submitted (Sample Pack QD):

Item K1: Template used to create Ready-To-Work certificates, dated 1 January 2020.

Item Q1: Ready-To-Work certificate in the name of Alexandria Smith, dated 21 March 2019.

1.) Based on the findings of your examination, to what degree can it be confirmed or refuted that the certificate is authentic?

(Select from the following list. If the wording below differs from the normal wording of your conclusions adapt these conclusions as best you can and use your preferred wording for question 3.)

- A. The questioned certificate IS AUTHENTIC as compared to the template.
- B. The questioned certificate IS PROBABLY AUTHENTIC as compared to the template.
- C. CANNOT DETERMINE whether or not the questioned certificate is authentic as compared to the template.
- D. The questioned certificate IS PROBABLY NOT AUTHENTIC as compared to the template.
- E. The questioned certificate IS NOT AUTHENTIC as compared to the template.

Q1

2.) Methods and techniques utilized.

Please briefly indicate the observations made from each method/technique utilized.

Please note: The list of methods/techniques provided in the dropdown list is not an all inclusive list and should not be used to determine what methods/techniques should be performed. Methods/techniques not on this list may be utilized.

***Please note:** Any additional formatting applied in the free form space below will not transfer to the Summary Report and may cause your information to be illegible. This includes additional spacing and returns that present your responses in lists and tabular formats.*

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3.) What would be the wording of the Conclusions in your report?

4.) Additional Comments

RELEASE OF DATA TO ACCREDITATION BODIES

The Accreditation Release is accessed by pressing the "Continue to Final Submission" button online and can be completed at any time prior to submission to CTS.

CTS submits external proficiency test data directly to ASCLD/LAB, ANAB, and/or A2LA. Please select one of the following statements to ensure your data is handled appropriately.

- This participant's data is intended for submission to ASCLD/LAB, ANAB, and/or A2LA. (Accreditation Release section below must be completed.)
- This participant's data is **not** intended for submission to ASCLD/LAB, ANAB, and/or A2LA.

Have the laboratory's designated individual complete the following steps **only if your laboratory is accredited in this testing/calibration discipline** by one or more of the following Accreditation Bodies.

Step 1: Provide the applicable Accreditation Certificate Number(s) for your laboratory.

ANAB Certificate No.
(Include ASCLD/LAB Certificate here)

A2LA Certificate No.

Step 2: Complete the Laboratory Identifying Information in its entirety.

Authorized Contact Person and Title

Laboratory Name

Location (City/State)