

FOR OFFICIAL USE



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Qualifications  
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Mark

**X835/77/01**

**Graphic Communication**

Date — Not applicable

Duration — 2 hours 30 minutes



Fill in these boxes and read what is printed below.

Full name of centre

Town

Forename(s)

Surname

Number of seat

Date of birth

Day

Month

Year

Scottish candidate number

**Total marks — 90**

Attempt ALL questions.

All dimensions are in mm.

All technical sketches and drawings use third angle projection.

You may use rulers, compasses or trammels for measuring.

In all questions you may use sketches and annotations to support your answer if you wish.

Write your answers clearly in the spaces provided in this booklet. Additional space for answers is provided at the end of this booklet. If you use this space you must clearly identify the question number you are attempting.

Use **blue** or **black** ink.

Before leaving the examination room you must give this booklet to the Invigilator; if you do not, you may lose all the marks for this paper.



1. A cafe chain called Taco Health is opening new premises. Taco Health has asked a marketing company to produce a promotional video with animated characters. The video is for a promotional event taking place before the opening.

The video will communicate the following information.

- The main features of the interior design
- How customers use the cafe
- How employees prepare orders and serve the customers

- (a) Describe two advantages of using each of these techniques in creating the promotional video.

Please note that you must give a different advantage in each case across the techniques.

(i) Motion-capture

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(ii) Motion-tweening

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(iii) Transitions

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1. (continued)

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Samples of printed items used in the cafe will be available to view at the promotional event. The printed items feature the company logo which contains graphics and text. The items include

- menus printed on biodegradable plastic
- window graphics with a height of 2500 mm
- promotional posters that incorporate a copper spot colour.

- (b) Describe three issues the print technician must address to ensure quality and brand consistency across these different printed items.

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The promotional event will also highlight the importance of environmental considerations in the cafe's business model.

- (c) Describe how to produce the cafe's menu to minimise the impact on the environment, other than by using a biodegradable substrate.

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\* S 8 3 5 7 7 0 1 0 3 \*

1. (continued)

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The cafe will also launch a phone app at the event. The app will include the location of the new cafe, an online booking facility that incorporates a floor plan and a menu tool.

Refer to the **supplementary sheet** for images of the phone app for use with **question 1 (e)**.

The design of the location mapping tool shown in **Image 1** uses design elements and principles.

- (d) The design principle of dynamic effect has been utilised in the ‘flashing’ blue dot in **Image 1**.

Explain, giving three reasons, how the dynamic effect has been achieved here.

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\* S 8 3 5 7 7 0 1 0 4 \*

1. (continued)

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A .dxf file format is used to display the floor plan of the new cafe in **Image 2**.

(e) Explain, giving two reasons, why this file format was chosen.

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Raster file types were used for both the mapping tool in **Image 1** and the menu tool in **Image 3**.

(f) (i) Describe one advantage of using this file type for the mapping tool.

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(ii) Describe one advantage of using this file type in the menu tool.  
You must give a different advantage to the one you have described above.

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\* S 8 3 5 7 7 0 1 0 5 \*

2. A chemical engineering company called CENCHEM ENGINEERING INTERNATIONAL has several smaller companies within its corporate group, each with their own logo. Three examples of these are shown below.

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Logo 1



Logo 2



Logo 3



- (a) Explain, giving two reasons, why it is desirable for these companies to have logos with simple clear shapes and solid colour fills.

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There are similarities in the design of each of these logos.

- (b) Describe how the similarities have been achieved. You should refer to specific design elements or principles, other than those relating to shape or colour.

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2. (continued)

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Each logo includes the registered trade mark symbol shown. ®

- (c) Explain why it is necessary for companies to protect their logo designs in this way.

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CENCHEM ENGINEERING INTERNATIONAL has developed many forms of graphic communications, including digital and printed media. The main company logo, shown below, appears in all communications.



- (d) Describe four issues associated with replicating this logo across digital and printed media.

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2. (continued)

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There are two examples of CENCHEM ENGINEERING INTERNATIONAL company graphics on the supplementary sheet.

Refer to the **supplementary sheet for use with question 2 (e), Image 1 and Image 2.**

**Image 1** An interactive advertisement from the company website aimed at recruiting new graduates.

**Image 2** A printed leaflet aimed at communicating statistical information to the general public.

- (e) (i) Describe, with reference to **Image 1**, how the following design elements and principles help to create a clear focal point in this design.

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Depth of field \_\_\_\_\_

\_\_\_\_\_

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Shape \_\_\_\_\_

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Radial balance \_\_\_\_\_

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- (ii) Explain, giving two reasons, why a focal point helps the advertisement communicate effectively with its target audience.

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2. (e) (continued)

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- (iii) Describe, with reference to **Image 2**, how the designer has used white space, grid structure and unity in the leaflet to communicate effectively with the target audience.

White space \_\_\_\_\_

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Grid structure \_\_\_\_\_

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Unity \_\_\_\_\_

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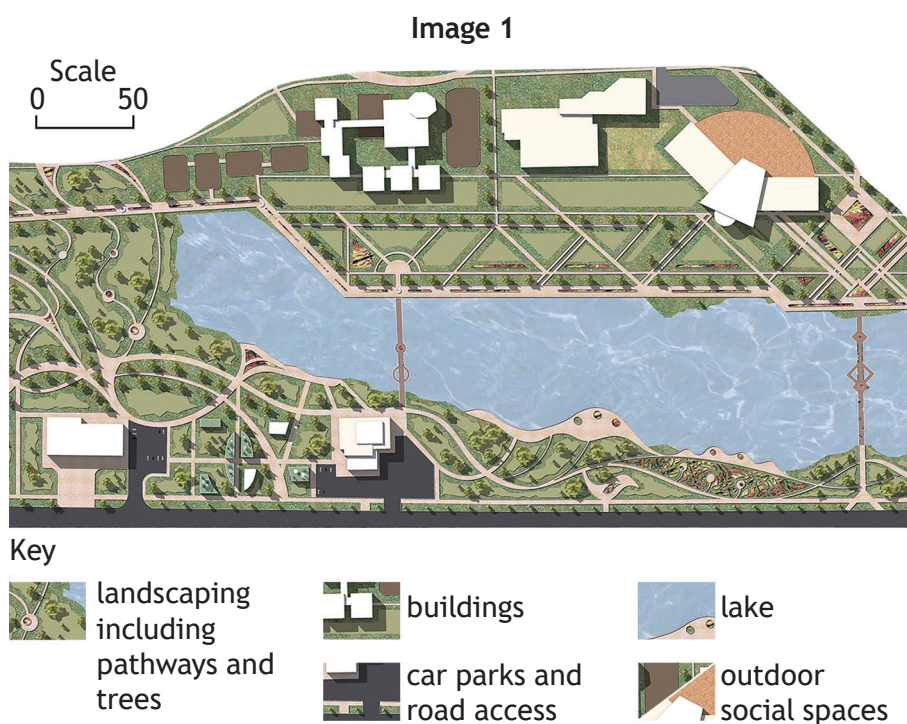
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[Turn over



\* S 8 3 5 7 7 0 1 0 9 \*

3. An architectural company has produced plans for a new office and leisure complex. The leisure complex will be available to office staff and local residents. An artist's impression of the site plan, shown in **Image 1**, has been produced to communicate effectively with this target audience.



- (a) Explain, giving two reasons, why the artist's impression has been used to communicate the proposal to this target audience.

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A British Standards site plan of the same area is also required to help professionals working on the project.

- (b) (i) State two features that would be included in a British Standards site plan that do not appear in the artist's impression.

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Feature 1 

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Feature 2 

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\* S 8 3 5 7 7 0 1 1 0 \*

3. (b) (continued)

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- (ii) Describe how a landscape architect would use the British Standards site plan during the project.

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An underground survey was carried out on the land before construction started.

- (c) (i) State two purposes of an underground survey.

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- (ii) Describe how a structural engineer would use an underground survey.

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- (iii) Describe how a conservation body would use an underground survey.

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\* S 8 3 5 7 7 0 1 1 1 \*

## 3. (continued)

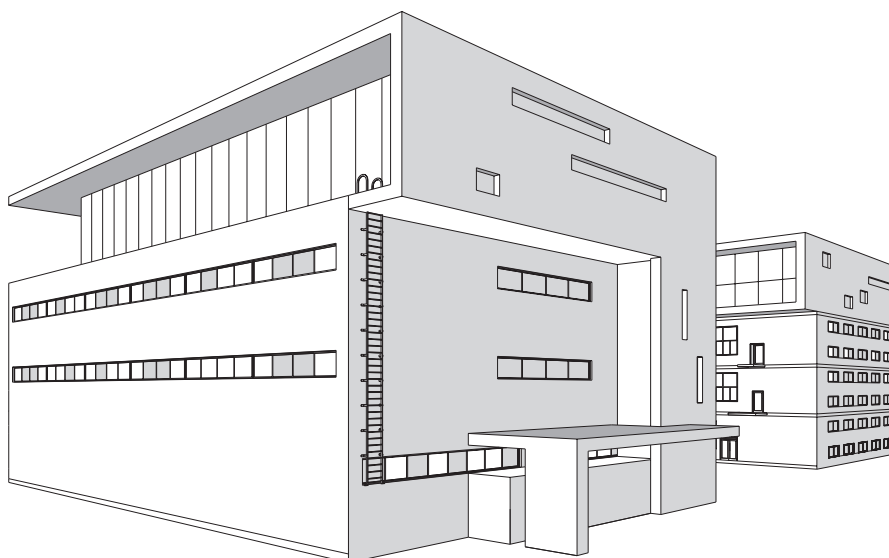
The phases in the development of the site are listed on a planning chart, such as a Gantt chart.

One phase is the excavation of the site, scheduled for completion before the foundations are laid. However a significant quantity of hazardous material was uncovered during this phase of the project. This was not picked up by the underground survey.

- 3

[illegible]

4. A 3D computer model of a proposed office unit is shown below. The model will be used in a promotional document where it will be placed in a suitable environment.



- (a) Name four different computer-aided illustration techniques and describe how they would enhance the model of the office unit after it has been placed in a suitable environment.

8

Technique 1 \_\_\_\_\_

Description \_\_\_\_\_

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Technique 2 \_\_\_\_\_

Description \_\_\_\_\_

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Technique 3 \_\_\_\_\_

Description \_\_\_\_\_

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\* S 8 3 5 7 7 0 1 1 3 \*

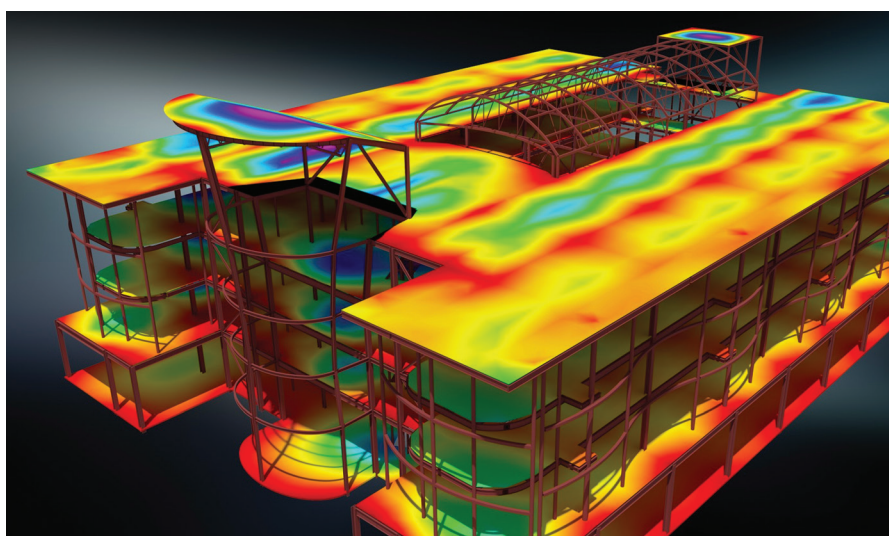
4. (a) (continued)

Technique 4 \_\_\_\_\_

Description \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_

A structural engineer has been asked to test aspects of the design.  
A screen shot taken during the digital test is shown below.



(b) (i) State the digital testing method shown.

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(ii) Describe how the design and construction company could use the test results.

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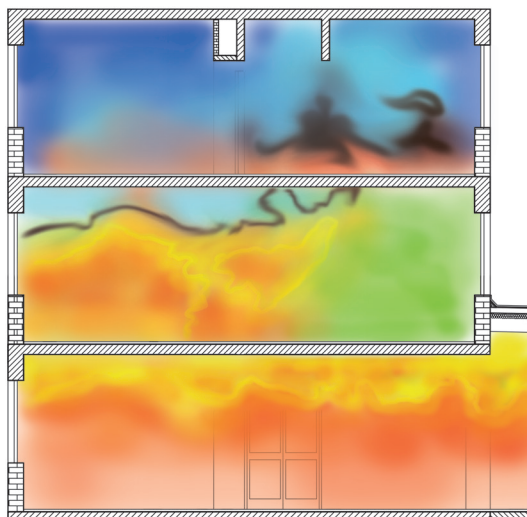
4. (continued)

Digital testing was also requested to simulate the spread of fire through the building.

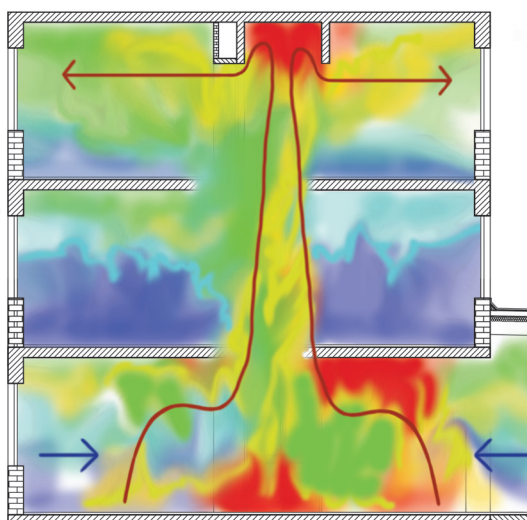
Two screenshots, showing a sectional end elevation of the building, were taken during the testing and simulation. These are shown in **Image 1** and **Image 2** below.

The building has not been drawn to British Standards.

**Image 1**  
**Building 15**  
**minutes after**  
**ignition**



**Image 2**  
**Building 45**  
**minutes after**  
**ignition**



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\* S 8 3 5 7 7 0 1 1 5 \*

4. (continued)

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- (c) (i) Explain, giving two reasons, why CFD is the most appropriate simulation method used for testing to show the spread of fire.

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- (ii) Describe how the data generated by the CFD test could be used, other than in planning an evacuation.

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A fire evacuation route was determined after the company analysed the data from the digital test. A digital simulation was created of the evacuation taking place.

- (d) Explain why the VRML file format was used to save the simulation of the evacuation.

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\* S 8 3 5 7 7 0 1 1 6 \*



5. A coffee company is introducing a cafetiere service within its shops. The proposed design of the cafetiere is shown below in **Image 1**.

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**Image 1**



The frame of the cafetiere, shown below in **Image 2**, consists of four vertical arms joined together at the base and by a ring at the top. Orthographic views of the frame are shown on the **supplementary sheet** for use with question 5 (a).

**Image 2**



## 5. (continued)

Refer to the **supplementary sheet** for use with question 5 (a).

- (a) Describe the 3D CAD modelling techniques that would be used to create the frame. You may use sketches to support your answer. You do not need to include dimensions in your response. **Ignore the metal ring and connection to the handle** (these are greyed out on the supplementary sheet).

6



\* S 8 3 5 7 7 0 1 1 8 \*

5. (a) (continued)

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\* S 8 3 5 7 7 0 1 1 9 \*

5. (continued)

A model-maker has produced a 3D printed prototype of the handle. This prototype will be used to test the comfort of the handle and how it is assembled to the cafetiere's frame.



- (b) (i) State the name of the file type used to produce a 3D print of the handle.

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- (ii) Explain, giving two reasons, why dimensional tolerances must be considered before 3D printing the handle.

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5. (continued)

Part of the cafetiere known as the filter spring is shown below.  
Refer to the **supplementary sheet** for use with question 5 (c).



- (c) Describe the 3D CAD modelling techniques that would be used to create the filter spring. You may use sketches to support your answer.

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[illegible]

## 6. (continued)

The online hub has proved to be hugely successful since its launch.

The company now wants to develop the website to include online CAD learning tutorials for school pupils.

The online learning space will include a range of downloadable graphic media to support pupils through the tutorials, including 3D CAD, video and PDF files.

- (b) Explain the issues the web team would have to consider to ensure ease of access to 3D CAD, video and PDF files across a variety of platforms.

Where relevant, consider file types, file sizes, resolution, accessibility and digital rights management.

8

This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins or other markings visible.

**[END OF SPECIMEN QUESTION PAPER]**



\* S 8 3 5 7 7 0 1 2 3 \*

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ADDITIONAL SPACE FOR ANSWERS



\* S 8 3 5 7 7 0 1 2 4 \*



# ADDITIONAL SPACE FOR ANSWERS

## *Acknowledgement of copyright*

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Question 4      [Yurii Andreichyn/Shutterstock.com](https://www.shutterstock.com/user/yurii-andreichyn)

Question 4 (b)      Image is taken from <https://dam.autodesk.com/c/gzmjrrdz>. Image courtesy of Autodesk, Inc. © 2019

Question 4      [Al-xVadinska/Shutterstock.com](https://www.shutterstock.com/user/al-xvadinska)





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## **Graphic Communication Supplementary sheets**

Date — Not applicable

Duration — 2 hours 30 minutes

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Supplementary sheets for use with questions 1, 2 and 5.



\* S 8 3 5 7 7 1 1 \*

Image 1

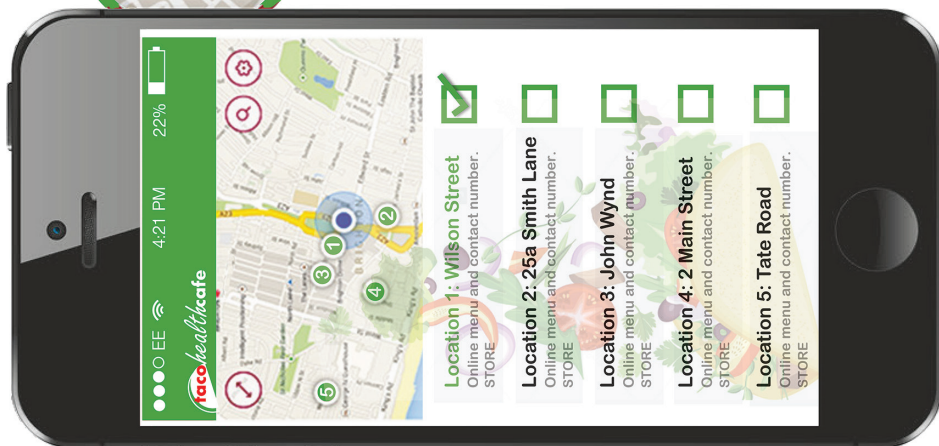


Image 2



Image 3





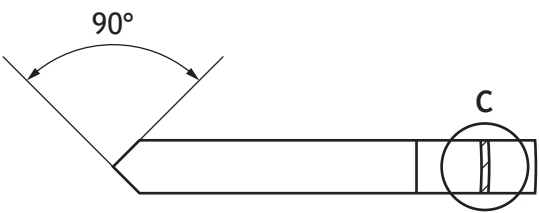
Image 1 An interactive advertisement from the company website aimed at recruiting new graduates



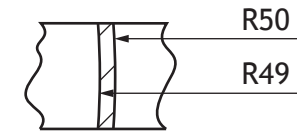
Image 2 A printed leaflet aimed at communicating statistical information to the general public

[Turn over

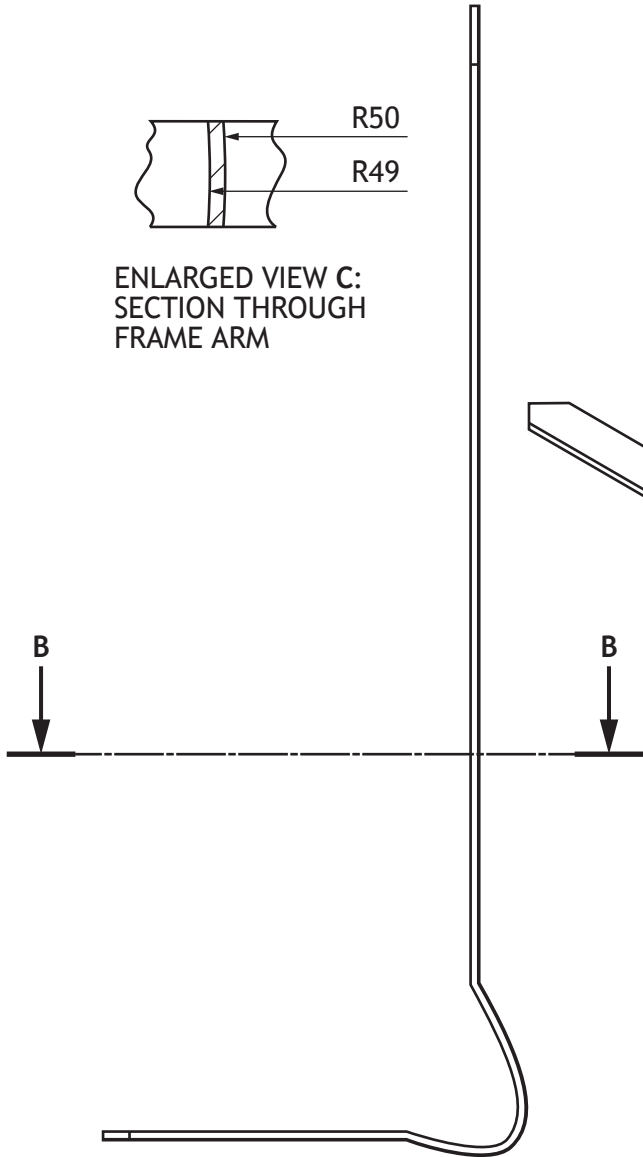




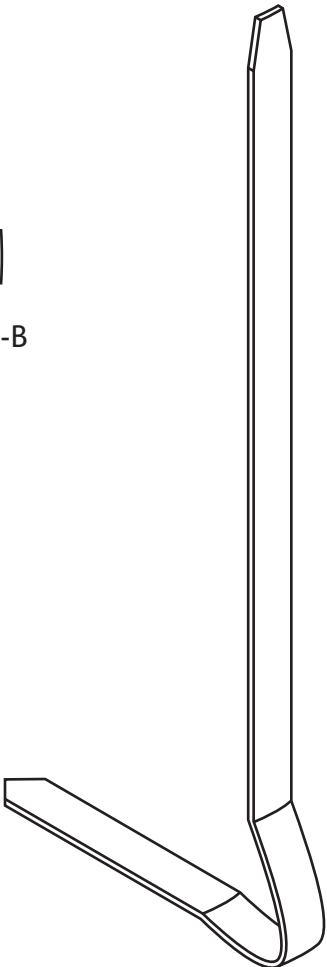
SECTIONAL PLAN OF FRAME ARM B-B



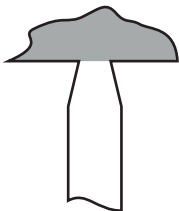
ENLARGED VIEW C:  
SECTION THROUGH  
FRAME ARM



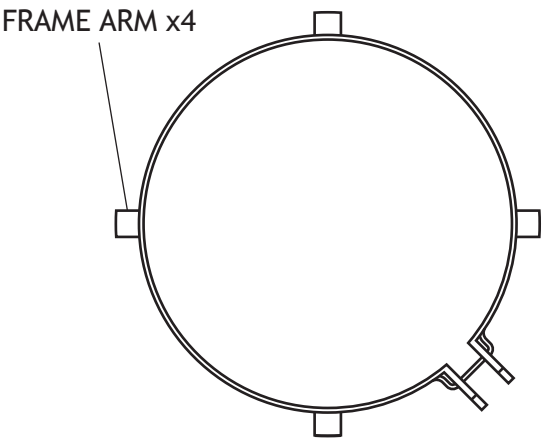
ELEVATION OF FRAME ARM



ISOMETRIC  
VIEW OF  
FRAME ARM



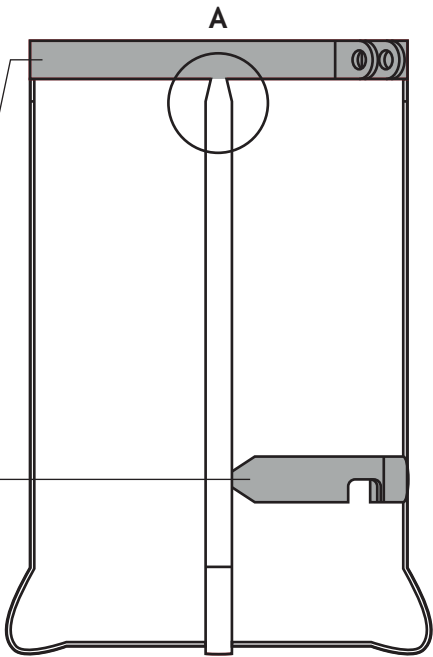
ENLARGED VIEW A:  
TOP DETAIL OF  
FRAME ARM



PLAN OF COMPLETE FRAME

METAL RING

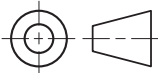
CONNECTION TO  
THE HANDLE



ELEVATION OF COMPLETE FRAME

Author:	ANON
Tolerance:	N/A
Scale:	Not to Scale
Sheet No:	1
Title:	Cafetiere Project
Drawing Title:	Cafetiere Frame
Dimensions:	Millimetres (mm)

Centre lines and hidden detail  
removed for clarity

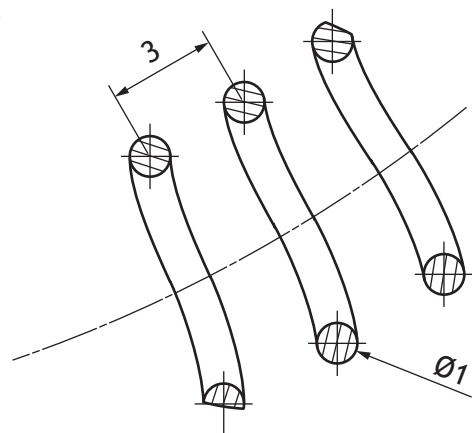
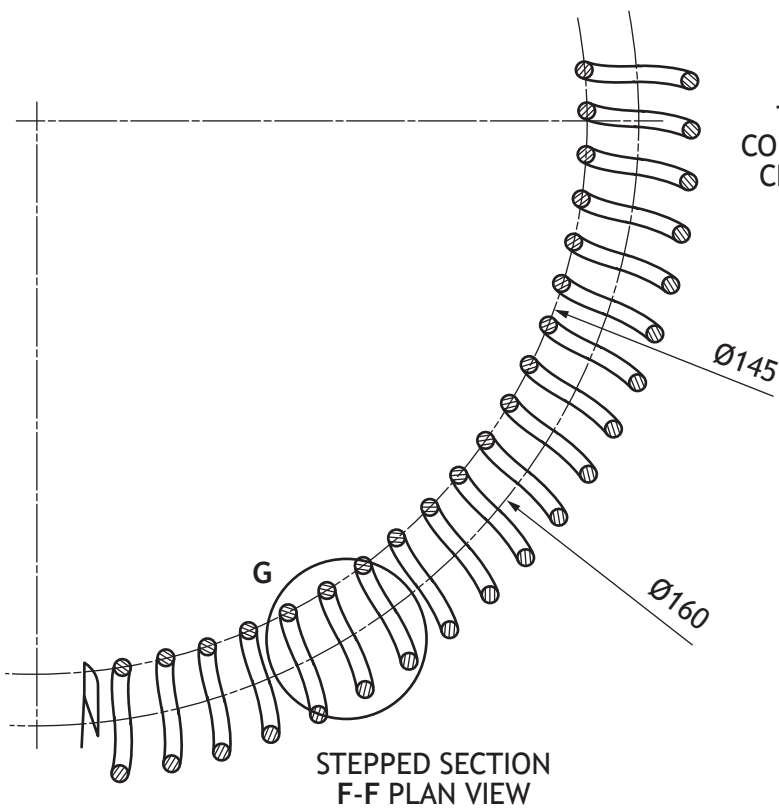


# CAFETIERE FRAME

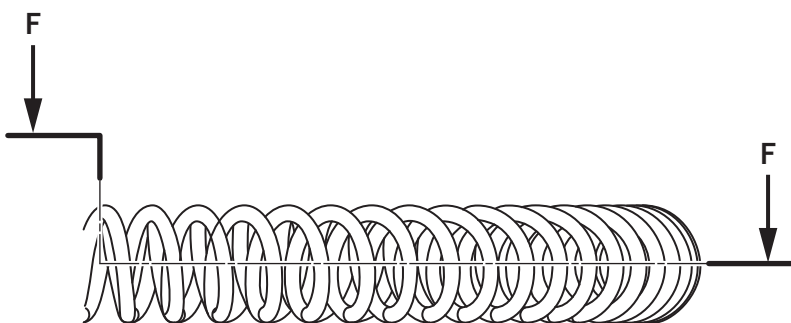
# CAFETIERE FILTER SPRING



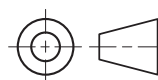
2 POINT PERSPECTIVE VIEW



ENLARGED  
VIEW G  
FILTER SPRING



ELEVATION



Author:	ANON
Tolerance:	N/A
Scale:	Not to Scale
Sheet No:	1
Title:	Cafetiere Project
Drawing Title:	Filter Spring
Dimensions:	Millimetres (mm)

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- Question 1      MPFphotography/Shutterstock.com  
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- Question 2 (e)   Pressmaster/Shutterstock.com  
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**Graphic Communication**

## Marking Instructions

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## General marking principles for Advanced Higher Graphic Communication

*Always apply these general principles. Use them in conjunction with the specific marking instructions, which identify the key features required in candidates' responses.*

- (a) Always use positive marking. This means candidates accumulate marks for the demonstration of relevant skills, knowledge and understanding; marks are not deducted for errors or omissions.
- (b) If a candidate response does not seem to be covered by either the principles or detailed marking instructions, and you are uncertain how to assess it, you must seek guidance from your team leader.
- (c) For 'Describe' questions  
Candidates must provide a statement or structure of characteristics and/or features, not just an outline or a list. For example they can refer to a concept, experiment, situation or facts in the context of and appropriate to the question. The number of marks available for a question indicates the number of factual/appropriate points required.
- (d) For 'Explain' questions  
Candidates must relate cause and effect and/or define relationships. This must be in the context of the question, or a specific area within the question.
- (e) For 'Compare' questions  
Candidates must demonstrate knowledge and understanding of the similarities and/or differences between things, methods, or choices. This must be in the context of the question, or a specific area within the question.
- (f) Candidates can respond to any question using text, sketching, annotations or combinations of these. Award marks for the information conveyed. Do not award marks for the quality of sketching.

## Marking instructions for each question

Question			Expected response	Max mark	Additional guidance
1.	(a)	(i)	<p>Motion-capture</p> <ul style="list-style-type: none"> <li>• Captures a range of customer/employee movement: how they use the café – entering, finding a seat, leaving.</li> <li>• To create the animation.</li> <li>• Creates a realistic animation, making the video more lifelike/believable.</li> <li>• Allows multiple characters to be animated at the same time.</li> <li>• Provides data on how the customers and staff relate to the environment, for example how they interact with products, open doors, lift trays of food or move furniture.</li> <li>• Provides real-time data over a specific time period, giving a realistic idea of how long activities take.</li> <li>• Allows animated characters to be placed in a realistic virtual cafe environment.</li> </ul> <p><b>Accept any two</b></p>	2	<p>Descriptions should refer to the question context and each of the techniques.</p> <p>If candidates mention blend/fade/transitions in motion capture or motion tweening responses, they cannot repeat the same advantage in the transitions response.</p>
		(ii)	<p>Motion-tweening</p> <ul style="list-style-type: none"> <li>• Animation shows the smooth changes of position when characters move to different places in the cafe; it also shows smooth changes of parts of characters, for example hands.</li> <li>• Makes it easier to add multiple characters to the animation, each with their own movement, adding realism.</li> <li>• Can generate frames in the animation quickly, speeding up the process.</li> <li>• Can edit more easily, for example edits to the path, adding transitions.</li> </ul> <p><b>Accept any two</b></p>	2	<p>Accept</p> <ul style="list-style-type: none"> <li>• reduced cost compared to other forms of animation with <b>justification</b></li> <li>• accept ‘only required start and end points’ provided it is <b>justified</b>, for example reduces time or expense</li> <li>• creating points and paths for camera positions, for example in a fly-through.</li> </ul>

Question			Expected response	Max mark	Additional guidance
1.	(a)	(iii)	<p>Transitions</p> <ul style="list-style-type: none"> <li>• Effective transitions can make the video appear more professional, dramatic or engaging.</li> <li>• Allows the designer to include features of the interior without breaking up the flow of the animation.</li> <li>• Consistent use of the same style of transition unifies the video.</li> <li>• Provides a way of including start and end points to different chapters/sequences in the animation.</li> <li>• Relatively easy to edit the transitions to suit the client.</li> <li>• Time taken, style (for example fade).</li> </ul> <p>Accept any two</p>	2	<p>Accept</p> <ul style="list-style-type: none"> <li>• responses that give appropriate examples of transitions – for example fade, blend – in relation to the context of the question.</li> </ul>

Question			Expected response	Max mark	Additional guidance
1.	(b)		<ul style="list-style-type: none"> <li>• Print quality of 300 dpi for all printed media so quality of brand maintained.</li> <li>• Use of pantone colour matching system to ensure consistency of colour between different printing methods.</li> <li>• Use of vector files so graphic and text can be scaled up without loss of quality, for example the logo for the menu scaled up for the window graphic.</li> <li>• Use of CMYK colour space.</li> <li>• Appropriate printing method for size of image.</li> <li>• Appropriate printing method so logo is the same quality on different substrates.</li> <li>• Appropriate printing method for spot colour maintains the other colours in the logo/brand (see additional guidance).</li> <li>• Text converted to vector to maintain the quality of text within the logo, or original text file made available to printer.</li> </ul> <p><b>Accept any three</b></p>	3	<p>Accept</p> <ul style="list-style-type: none"> <li>• the overprint of a spot colour will not affect the quality of the print/brand or logo</li> <li>• instead of text converted to vector, original text file sent to printer.</li> </ul>
	(c)		<ul style="list-style-type: none"> <li>• Use solvent-free inks in the printing process.</li> <li>• Use the most efficient printing process.</li> <li>• Use low-energy/low-waste printing method.</li> <li>• Use the substrate in the most efficient way in terms of number of menus per sheet.</li> <li>• No chemical residue in the biodegrading process.</li> <li>• Select the most durable/wear-resistant biodegradable plastic so it has a long life.</li> <li>• Use recycled material to create the menu.</li> </ul> <p><b>Accept any two</b></p>	2	<p>Accept</p> <ul style="list-style-type: none"> <li>• printing on both sides of menu, or using effective layout techniques to make the most effective use of the menu surface</li> <li>• laminating or sealing the menu surface to extend its life, using an environmentally safe method</li> <li>• using recycled material for the initial substrate</li> <li>• sourcing menu material from a renewable source.</li> </ul>

Question			Expected response	Max mark	Additional guidance
1.	(d)		<p>Responses such as</p> <ul style="list-style-type: none"> <li>• provides a clear indication of position due to shape of the dot</li> <li>• flashing dot creates contrast with other dots that don't have the dynamic effect</li> <li>• grabs attention by its pulse and fade dynamic effect</li> <li>• blue colour contrasts with plain background colour, making it easier to identify.</li> </ul> <p><b>Accept any three</b></p>	3	
	(e)		<p>Advantages of .dxf file in this context.</p> <ul style="list-style-type: none"> <li>• Allows users to zoom in and out of the floor-plan image without loss of image quality because .dxf is a vector file format.</li> <li>• .dxf is easily opened or stored on mobile devices due to its compatibility with different software.</li> <li>• Smaller file size makes it easier to download or store on mobile devices.</li> <li>• Vector graphics give the most accurate representation of the features in the room.</li> <li>• Can use layers to make different features distinctive.</li> </ul> <p><b>Accept any two</b></p>	2	<p><b>Accept</b></p> <ul style="list-style-type: none"> <li>• a .dxf file does not need to be created using AutoCAD software, making it easier for the app designer to produce.</li> </ul> <p><b>Do not accept</b></p> <ul style="list-style-type: none"> <li>• it is a 2D file type.</li> </ul>

Question			Expected response	Max mark	Additional guidance
1.	(f)	(i)	<ul style="list-style-type: none"> <li>• Simple block colours in the map tool reduce the file size, making it quick to download and to refresh.</li> <li>• Can compress .jpg files to reduce file size.</li> <li>• Can easily open commonly used file types such as .jpg or .png in the app (no file conversion needed).</li> <li>• Transparent background capability supported by .PNG raster file type, which is important for some icons on the map.</li> </ul> <p><b>Accept any one</b></p>	1	<p>Note ‘The .jpg files can be compressed to reduce its file size’ and ‘.jpg can be easily opened on most mobile devices’ are acceptable for both (i) and (ii) but the answer cannot be repeated.</p> <p>Also accept for (i)</p> <ul style="list-style-type: none"> <li>• mobile devices can cache maps.</li> </ul> <p>Also accept for (i) and (ii)</p> <ul style="list-style-type: none"> <li>• .jpg less grainy than a GIF file, but see note above. <p>Accept</p> <ul style="list-style-type: none"> <li>• .jpgs have smaller file sizes than the vector equivalent.</li> </ul> </li></ul>
		(ii)	<ul style="list-style-type: none"> <li>• .jpg allows vibrant colours of the food to be accurately reproduced on the menu page.</li> <li>• .jpgs are a commonly used file type and can be stored in/most mobile phones will open these.</li> <li>• .jpgs can be easily replaced so information on the menu is up to date.</li> </ul> <p><b>Accept any one</b></p>	1	<p>Do not accept</p> <ul style="list-style-type: none"> <li>• ‘high quality images’ (without justification) .</li> </ul>

Question			Expected response	Max mark	Additional guidance
2.	(a)		<ul style="list-style-type: none"> <li>• Small range of colours reduces expense of reproduction.</li> <li>• Simple shapes are easy to recognise/or memorable, helping small companies to be distinct from competitors and may contribute to customer loyalty.</li> <li>• Simple shapes/text are easier to reproduce on both printed and digital media.</li> <li>• Simple logos with block colours are more easily saved as vector files which are more useful for scaling, modifying or sending electronically.</li> <li>• The house style (in this case the circle/flame shape) can be easily applied to any new companies that join the corporate group.</li> <li>• Block colours are easy to save in both raster and vector file formats, making the logos versatile in terms of reproduction.</li> </ul> <p><b>Accept any two</b></p>	2	
	(b)		<ul style="list-style-type: none"> <li>• Left justified text in each logo creates alignment of company name and leads the eye to the slogan or sub-text.</li> <li>• Close proximity of text to graphic in each logo makes the association between logo and company name as clear as possible.</li> <li>• Using bold large text for the company title and smaller regular text for the slogan creates unity.</li> <li>• Through the position of the graphic on the left and bold/large text on the right creates asymmetrical balance.</li> <li>• Emphasis/dominance on the company name is achieved by using large, bold text.</li> </ul> <p><b>Accept any three</b></p>	3	<p>Accept</p> <ul style="list-style-type: none"> <li>• contrast between the bold company heading and the standard type subheading</li> <li>• contrast between the larger and smaller font sizes for the heading and subheading.</li> </ul>

Question			Expected response	Max mark	Additional guidance
2.	(c)		<ul style="list-style-type: none"> <li>To provide legal protection in copyright law if it is copied, or appears to be copied, by another company.</li> <li>To ensure the reputation of the company's products or services is not compromised by association with an inferior brand.</li> <li>To avoid confusion between different companies which would affect issues such as customer loyalty, public perception of the company, and purchasing.</li> <li>To prevent another company using your logo and taking your business.</li> <li>To maintain the company's brand identity.</li> </ul> <p><b>Accept any two</b></p>	2	
	(d)		<ul style="list-style-type: none"> <li>Some RGB colours do not reproduce accurately using CMYK process colour inks.</li> <li>Pantone colour matching may be needed to maintain colour space.</li> <li>Differences in screen resolution (72 dpi) and print resolution (300 dpi) must not affect the clarity of the branding.</li> <li>Digital rights management issues may be different between online and printed media.</li> <li>Ensure that converting images or fonts from raster to vector format does not affect appearance.</li> <li>Use compatible or exchange file formats as file types for printed and digital media are different.</li> <li>Select an appropriate printing method to ensure quality is maintained.</li> <li>Select an appropriate substrate for printed media to ensure quality is maintained.</li> </ul> <p><b>Accept any four</b></p>	4	<p>Award a maximum of 1 mark for each issue.</p> <p><b>Note</b> Responses must relate to the transition between printed and digital media.</p> <p><b>Accept</b></p> <ul style="list-style-type: none"> <li>if there are changes on the website or in a digital advertisement it may take time for the change to be made to printed media. The logo design should be simple for this reason: so it is easy to update, reproduce or reformat.</li> </ul>



Question			Expected response	Max mark	Additional guidance
2.	(e)	(i)	<p><b>Depth of field</b></p> <ul style="list-style-type: none"> <li>• The blurred or out-of-focus parts of the background image concentrate the reader's eye on the woman's face.</li> <li>• The blurred or out-of-focus parts of the background image also increases the contrast between this and the woman's face.</li> </ul> <p><b>Shape</b></p> <ul style="list-style-type: none"> <li>• The series of overlapping circles in the logo lead the eyes to the woman's face.</li> <li>• The dots and overlapping circles in the logo emphasises the woman's face, in particular her eyes.</li> </ul> <p><b>Radial balance</b></p> <ul style="list-style-type: none"> <li>• The words, for example 'TRAINING', are arranged to lead the eye to and from the focal point, emphasising both.</li> <li>• Other content – including the logo, slogan and text boxes – is arranged in a radial pattern around the focal point, giving it more emphasis.</li> </ul> <p><b>Accept any one from each feature</b></p>	3	Note Response must relate to image 1, the webpage.
		(ii)	<ul style="list-style-type: none"> <li>• Making the woman's face the focal point helps to grab the attention of new graduates and/or young adults as she is likely to be of a similar age.</li> <li>• The determination in the woman's face communicates a message the site wants to convey – it reflects the attitude that graduates need to be successful.</li> <li>• It could be seen as an unusual image for engineering recruitment as it shows a leisure activity.</li> </ul> <p><b>Accept any two</b></p>	2	Note Response must relate to image 1, the webpage.

Question			Expected response	Max mark	Additional guidance
2.	(e)	(iii)	<p><b>White space</b></p> <ul style="list-style-type: none"> <li>White space divides the report into sections, making it easier to understand the content.</li> <li>The information in the report may be demanding; white space makes it more accessible as it is more restful on the eye and gives the publication a relaxed feel.</li> </ul> <p><b>Grid structure</b></p> <ul style="list-style-type: none"> <li>The grid structure organises the information into narrow columns (two on each panel) making the text easier to read.</li> <li>The short paragraphs, wide margins and gutters make potentially complex information more accessible.</li> </ul> <p><b>Unity</b></p> <ul style="list-style-type: none"> <li>Unity in colour: links colours in the background image to colours in the logo and the text, tying different parts of the publication together.</li> <li>Unity in shape: the circle links the information graphics to the logo and the background image graphics.</li> <li>Unity in typeface: the same typeface is used in different sizes throughout the publication, connecting logo, headings and statistics.</li> </ul> <p><b>Accept any one from each feature</b></p>	3	<p>Response must refer to the leaflet.</p> <p>Also accept</p> <ul style="list-style-type: none"> <li>unity in shape: the sloping edges and/or parallelogram shapes connect the top and bottom of the leaflet</li> <li>unity in shape: the sloping edges and/or parallelogram shapes lead the eye through the leaflet and creates a sense of movement.</li> </ul>

Question			Expected response	Max mark	Additional guidance
3.	(a)		<b>Artist's impression</b> <ul style="list-style-type: none"> <li>Easier to understand for a non-technical audience.</li> <li>Gives a clear idea of proposed land use (through use of shape and colour).</li> <li>Indicates the heights of buildings from the shadows.</li> <li>Gives a more realistic impression of what areas of the site will look like.</li> <li>Use of a key to explain the key features.</li> </ul> <b>Accept any two</b>	2	Also accept <ul style="list-style-type: none"> <li>the colours clearly show how different areas of the site will be used</li> <li>it gives audience an idea of the scale/size of the development.</li> </ul>
	(b)	(i)	<b>British Standards site plan</b> <ul style="list-style-type: none"> <li>Access roads</li> <li>Scale</li> <li>Drainage</li> <li>Trees*</li> <li>North sign</li> <li>Contours</li> <li>Boundaries</li> <li>Dimensions</li> </ul> <b>Accept any two</b>	2	Note *'Tree' is acceptable as is 'proposed tree', 'existing tree to be removed' and 'existing tree' but no other variations.
		(ii)	The landscape architect would use <ul style="list-style-type: none"> <li>the contours to work out the amount of earthmoving required to make his design</li> <li>the north sign to determine prevailing wind and/or the aspect of each slope, or sun position, or shadows cast at different times of day</li> <li>the position of the drainage system so it is not damaged during landscaping</li> <li>the scale so the project can be costed</li> <li>the position of 'existing trees' or 'proposed trees' which may affect the type of planting or position of 'trees to be removed' which affect costing</li> <li>the dimensions and/or scale and/or boundary which helps determine the project costs.</li> </ul> <b>Accept any two</b>	2	Accept <ul style="list-style-type: none"> <li>existing contour lines to understand the lie of the land and/or the best position for plants or landscaping features</li> <li>position of the drainage system so planting is appropriate.</li> </ul>

Question			Expected response	Max mark	Additional guidance
3.	(c)	(i)	<p>The purpose of the underground survey is to show</p> <ul style="list-style-type: none"> <li>• geology</li> <li>• soil composition</li> <li>• depth of bedrock</li> <li>• water table</li> <li>• mine workings</li> <li>• previous land use</li> <li>• any harmful material.</li> </ul> <p><b>Accept any two</b></p>	2	<p>Accept</p> <ul style="list-style-type: none"> <li>• composition of the layers in the ground.</li> </ul>
		(ii)	<p>Structural engineer</p> <ul style="list-style-type: none"> <li>• Materials and/or construction method used for the foundations.</li> <li>• Structure effectively supported by the ground.</li> <li>• Depth of the foundations.</li> <li>• Time required to prepare the ground for construction.</li> <li>• Whether the ground is prone to flooding which would affect the nature of the foundation and/or necessitate flood defences.</li> </ul>	2	<p>Some answers may be relevant to both (ii) and (iii).</p> <p>Award a mark for a repeat response only if the candidate explains it in relation to the user.</p>
		(iii)	<p>Conservation body</p> <ul style="list-style-type: none"> <li>• Whether the site is destroying natural habitat; an underground survey may reveal the soil composition or some other aspect is important in supporting specific plants and/or animals.</li> <li>• Whether the site is of historical and/or social significance.</li> <li>• Whether the soil and/or rock is particularly valuable for another purpose.</li> </ul>	2	<p>Accept</p> <ul style="list-style-type: none"> <li>• safe disposal of any hazardous material.</li> </ul>

Question			Expected response	Max mark	Additional guidance
3.	(d)		<ul style="list-style-type: none"> <li>• Increased time on this phase to get rid of the hazardous material.</li> <li>• Delaying completion date of the project.</li> <li>• Increased expenditure of employing the excavation team for a longer period.</li> <li>• Increased amount of resources.</li> <li>• Rescheduling when construction materials and equipment might be required on site.</li> <li>• Rescheduling when construction workers would be required on site.</li> <li>• Reviewing and updating the planning chart to see when lost time could be made up (particularly if excavation period went beyond critical target dates).</li> <li>• Implementing contingency planning.</li> <li>• Revising intermediate targets.</li> </ul> <p><b>Accept any three</b></p>	3	

Question			Expected response	Max mark	Additional guidance
4.	(a)		<p><b>Technique: IBL</b> Description</p> <ul style="list-style-type: none"> <li>To reflect the surroundings and/or sky in the office windows and/or glass surfaces.</li> </ul> <p><b>Technique: texture mapping</b> Description</p> <ul style="list-style-type: none"> <li>To add suitable materials to items in different parts of the building.</li> </ul> <p><b>Technique: bump mapping/bump map</b> Description</p> <ul style="list-style-type: none"> <li>To add suitable surface finish to add realism in the apparent depth of roughness and/or smoothness of the surface.</li> </ul> <p><b>Technique: applied lighting (accept ambient lighting)</b> Description</p> <ul style="list-style-type: none"> <li>Realistic shadows on the building and in the environment; lighting that suggests a particular time of day or the building's global position.</li> </ul> <p><b>Technique: depth of field</b> Description</p> <ul style="list-style-type: none"> <li>To create a realistic foreground and background by blurring out certain features of the environment.</li> </ul> <p><b>Technique: secularity or reflection</b> Description</p> <ul style="list-style-type: none"> <li>To indicate the amount of light that bounces back off a particular material or feature of the building.</li> </ul>	8	<p>Award 1 mark for each technique.</p> <p>Award 1 mark for each description.</p> <p>Responses must relate to the model in the environment.</p> <p>Also accept</p> <p><b>Technique: volumetrics</b> Description</p> <ul style="list-style-type: none"> <li>To create more atmosphere through adding, for example, mist or cloud or visible beams of light.</li> </ul> <p><b>Technique: displacement mapping</b> Description</p> <ul style="list-style-type: none"> <li>To show surface geometry of the building to create realistic views.</li> </ul> <p>Do not accept</p> <ul style="list-style-type: none"> <li>HDRI</li> </ul>

Question			Expected response	Max mark	Additional guidance
4.	(b)	(i)	FEA or Finite Element Analysis	1	
		(ii)	<ul style="list-style-type: none"> <li>To identify flaws or weakness in the building.</li> <li>To change the material used.</li> <li>To change the number of supports.</li> <li>To change the dimensions of the material.</li> <li>Can view the FEA output as a video or series of high-res images to show others in the construction design team.</li> <li>Can use FEA in output in promotional material to show the quality of the images and/or data the company produces.</li> </ul>	2	<p>Accept</p> <ul style="list-style-type: none"> <li>FEA allows the CAD technician and/or structural engineer to change the design.</li> </ul> <p>Candidate responses must consider FEA in relation to the context of the construction.</p> <p>Do not accept generic FEA responses.</p>
	(c)	(i)	<ul style="list-style-type: none"> <li>CFD shows how air moves so it could be used to show how the smoke and flames are moved by the air around the building.</li> <li>CFD allows fluid properties, such as velocity, pressure and temperature to be evaluated.</li> <li>The use of properly calibrated CFD models can reduce or eliminate the need for extensive or large scale testing.</li> <li>CFD can be used where configurations pose a significant safety risk.</li> </ul> <p><b>Accept any two</b></p>	2	
		(ii)	<ul style="list-style-type: none"> <li>Helps fire service to target areas of greatest heat.</li> <li>Shows places where modifications to the building design may be required, such as installing fire-resistant materials, sprinklers, additional walls, windows or staircases.</li> <li>Provides evidence to customers and clients that the necessary safety checks have been carried out.</li> </ul> <p><b>Accept any one</b></p>	1	

Question			Expected response	Max mark	Additional guidance
4.	(d)		<b>VRML (Virtual Reality Modelling Language)</b> <ul style="list-style-type: none"> <li>• Supports animation data and could show a simulated evacuation of the building.</li> <li>• Supports a rendered model of the building with interior and exterior aspects that can be viewed from different positions.</li> <li>• Allows the use of accurately scaled, animated and rendered human figures.</li> <li>• The software accurately represents how people would move throughout the building.</li> <li>• Can support the rendered image of the building and the animation of the people in a single file that can be viewed on various platforms.</li> <li>• Can be easily transferred online for ease of viewing.</li> </ul> <p><b>Accept any two</b></p>	2	Accept <ul style="list-style-type: none"> <li>• user can interact with the model.</li> </ul>



Question			Expected response	Max mark	Additional guidance
5.	(a)		<ul style="list-style-type: none"> <li>Create section sketch from enlarged view C (dimensions not required).</li> <li>Create path sketch on a perpendicular work plane (perpendicular work plane must be stated or clear from the sketch).</li> <li>Use sweep and/or extrude along a path to create the frame.</li> <li>Use extrude subtract to create the top profile (accept irregular chamfer).</li> <li>Use extrude subtract to create bottom profile (this profile can be created using chamfer).</li> <li>Use radial array (though 360 degrees) to create the 4 frame arm.</li> </ul>	6	<p>Note</p> <p>Award marks if orientation or number of features are clear from the sketches.</p> <p>Accept</p> <ul style="list-style-type: none"> <li>assembling the 4 arms, provided all appropriate constraints are applied.</li> </ul> <p>Accept this alternative method</p> <ul style="list-style-type: none"> <li>creating the profile of the frame arm (2 marks)</li> <li>revolving 360 degrees (1 mark)</li> <li>using extrude subtract to leave only the 4 frame arms (2 marks)</li> <li>use extrude subtract or irregular chamfer to create the top profile (1 mark).</li> </ul>
	(b)	(i)	<ul style="list-style-type: none"> <li>STL. stereolithography</li> </ul>	1	
		(ii)	<ul style="list-style-type: none"> <li>Correct dimensional tolerance will ensure there is an acceptable range of sizes for parts.</li> <li>Correct dimensional tolerance will allow for interchangeability of parts.</li> <li>Correct dimensional tolerance will affect ease of assembly and functionality of the cafetiere.</li> </ul> <p><b>Accept any two</b></p>	2	
	(c)		<ul style="list-style-type: none"> <li>Profile circle and axis (diameter of circle 1 mm and create axis 14 mm away) (1 mark).</li> <li>Use helix to create a single spring revolution (1 mark).</li> <li>Create axis and use radial array to create 80 spring revolutions (axis at the correct orientation relative to the helix axis 73 mm away) (1 mark).</li> </ul>	3	<p>Note</p> <p>Award marks if orientation or number of features are clear from the sketches.</p> <p>Alternative method</p> <ul style="list-style-type: none"> <li>profile circle</li> <li>circular axis</li> <li>helix created with correct number of 'coils' or the pitch size.</li> </ul> <p>Note</p> <p>Dimensions are not necessary to achieve full marks.</p>

Question			Expected response	Max mark	Additional guidance
6.	(a)		<p>Explanations of potential file-sharing issues could include</p> <ul style="list-style-type: none"> <li>• compatibility, for example software file formats might differ, device compatibility</li> <li>• copyright infringements – open to piracy, ignorance of copyright law</li> <li>• file size – download speeds/time/limits</li> <li>• model type (surface/solid)</li> <li>• scale – accuracy, precision</li> <li>• negative impact on original product</li> <li>• defamation of brand/company</li> <li>• access to a wide range of models (library)</li> <li>• establish an online presence</li> <li>• promoting</li> <li>• professional networking.</li> </ul>	2	Award 1 mark for each explanation of a relevant issue, up to a maximum of 2 marks.
	(b)		<p>Explanations could refer to aspects such as</p> <p><b>3D CAD</b></p> <ul style="list-style-type: none"> <li>• ensure all files are available in cross-platform file types (for example STP, IG ES) that can be accessed using many CAD software packages</li> <li>• efficient CAD models result in smaller file sizes, especially useful in complex assemblies.</li> </ul> <p><b>Video</b></p> <ul style="list-style-type: none"> <li>• video can be available in a variety of resolutions that can be streamed and/or downloaded</li> <li>• can ‘chunk’ videos into manageable portions that allow easy access to the most relevant chapter or topic (easy and time-saving to download)</li> <li>• appropriate file types for use on PC/MAC/tablet/smartphone/smart TV.</li> </ul>	8	<p>Award 1 mark for each explanation, up to a maximum of 8 marks.</p> <p>Candidates may have included correct file type for use with appropriate device, for example smartphone uses .mpg format.</p>

Question			Expected response	Max mark	Additional guidance
6.	(b)		<b>PDF</b> <ul style="list-style-type: none"> <li>small overall file size of PDF to allow a bank of resources to be available offline, with minimal storage implications</li> </ul>		<p>Candidates may refer to file size of 72dpi for web optimisation and minimal storage implications.</p> <p>Candidates can also refer to high-resolution images of 300dpi for optimal print quality.</p>

[END OF SPECIMEN MARKING INSTRUCTIONS]