GCSE
DESIGN AND TECHNOLOGY
8552/W

Unit 1 Written Paper

Mark scheme

June 2024

Version: 1.0 Final

2 4 6 G 8 5 5 2 / W / M S

Mark schemes are prepared by the Lead Assessment Writer and considered, together with the relevant questions, by a panel of subject teachers. This mark scheme includes any amendments made at the standardisation events which all associates participate in and is the scheme which was used by them in this examination. The standardisation process ensures that the mark scheme covers the students' responses to questions and that every associate understands and applies it in the same correct way. As preparation for standardisation each associate analyses a number of students' scripts. Alternative answers not already covered by the mark scheme are discussed and legislated for. If, after the standardisation process, associates encounter unusual answers which have not been raised they are required to refer these to the Lead Examiner.

It must be stressed that a mark scheme is a working document, in many cases further developed and expanded on the basis of students' reactions to a particular paper. Assumptions about future mark schemes on the basis of one year's document should be avoided; whilst the guiding principles of assessment remain constant, details will change, depending on the content of a particular examination paper.

No student should be disadvantaged on the basis of their gender identity and/or how they refer to the gender identity of others in their exam responses.

A consistent use of 'they/them' as a singular and pronouns beyond 'she/her' or 'he/him' will be credited in exam responses in line with existing mark scheme criteria.

Further copies of this mark scheme are available from aqa.org.uk

Level of response marking instructions

Level of response mark schemes are broken down into levels, each of which has a descriptor. The descriptor for the level shows the average performance for the level. There are marks in each level.

Before you apply the mark scheme to a student's answer read through the answer and annotate it (as instructed) to show the qualities that are being looked for. You can then apply the mark scheme.

Step 1 Determine a level

Start at the lowest level of the mark scheme and use it as a ladder to see whether the answer meets the descriptor for that level. The descriptor for the level indicates the different qualities that might be seen in the student's answer for that level. If it meets the lowest level then go to the next one and decide if it meets this level, and so on, until you have a match between the level descriptor and the answer. With practice and familiarity you will find that for better answers you will be able to quickly skip through the lower levels of the mark scheme.

When assigning a level you should look at the overall quality of the answer and not look to pick holes in small and specific parts of the answer where the student has not performed quite as well as the rest. If the answer covers different aspects of different levels of the mark scheme you should use a best fit approach for defining the level and then use the variability of the response to help decide the mark within the level, ie if the response is predominantly level 3 with a small amount of level 4 material it would be placed in level 3 but be awarded a mark near the top of the level because of the level 4 content.

Step 2 Determine a mark

Once you have assigned a level you need to decide on the mark. The descriptors on how to allocate marks can help with this. The exemplar materials used during standardisation will help. There will be an answer in the standardising materials which will correspond with each level of the mark scheme. This answer will have been awarded a mark by the Lead Examiner. You can compare the student's answer with the example to determine if it is the same standard, better or worse than the example. You can then use this to allocate a mark for the answer based on the Lead Examiner's mark on the example.

You may well need to read back through the answer as you apply the mark scheme to clarify points and assure yourself that the level and the mark are appropriate.

Indicative content in the mark scheme is provided as a guide for examiners. It is not intended to be exhaustive and you must credit other valid points. Students do not have to cover all of the points mentioned in the Indicative content to reach the highest level of the mark scheme.

An answer which contains nothing of relevance to the question must be awarded no marks.

Glossary for maths

If a student uses a method which is not explicitly covered by the mark scheme the same principles of marking should be applied. Credit should be given to any valid methods. Examiners should seek advice from their senior examiner if in any doubt.

[a, b]	Accept values between a and b inclusive.
For π	Accept values in the range [3.14, 3.142]
Their	Accept an answer from the candidate if it has been inaccurately calculated but is subsequently used in a further stage of the question.

Questions which do not ask students to show working

As a general principle, a correct response is awarded full marks.

Qu	Part	Marking Guidance	Total marks	AO
01		**B** Brass	1 mark	AO4 1a

Qu	Part	Marking Guidance	Total marks	AO
02		**D** Tools and equipment	1 mark	AO4 1a

Qu	Part	Marking Guidance	Total marks	AO
03		**B** it has a compact molecular structure	1 mark	AO4 1b

Qu	Part	Marking Guidance	Total marks	AO
04		**A** 10mm	1 mark	AO4 1c

Qu	Part	Marking Guidance	Total marks	AO
05		**A** Carbon fibre reinforced plastic	1 mark	AO4 1a

Qu	Part	Marking Guidance	Total marks	AO
06		**C** 3 060 000 mm^3	1 mark	AO4 1c

Qu	Part	Marking Guidance	Total marks	AO
07		**D** A material that softens when heated to a specific temperature	1 mark	AO4 1b

Qu	Part	Marking Guidance	Total marks	AO
08		**A** First order	1 mark	AO4 1a

Qu	Part	Marking Guidance	Total marks	AO
09		**D** Silk	1 mark	AO4 1a

Qu	Part	Marking Guidance	Total marks	AO
10		**C** Solar	1 mark	AO4 1a

Qu	Part	Marking Guidance	Total marks	AO
11		One mark for each correct property given up to a maximum of two marks. **Single word answers are acceptable, but some words need to be qualified. Some responses may be in full sentence form and very detailed.**	2 marks	AO4 1a

Accept	**Don't accept**
Tough	Strong (unless correctly qualified)
Durable	Thick (unless correctly qualified)
Renewable	Cheap (unless correctly qualified)
Biodegradable	Lightweight (unless correctly qualified)
Flammable	Hard (unless correctly qualified)
Material is stronger with the direction of the wood grain.	Density (unless correctly qualified)
Wood grain has a good aesthetic/pattern.	Uses the waste bits of the tree (they are describing manufactured boards)
Different types of timber are available with different durability, elasticity etc for different applications.	Available in large flat sheets (they are describing manufactured boards)
Timbers have a high moisture content when felled and need to be seasoned to lower moisture content and become stable to use.	
Natural timbers are tough and durable and can resist knocks.	
Natural timbers have knots in them. which can have a	

		decorative property or create an inconsistency in the uniformity of the material and have to be avoided.		
		Natural timbers can warp, twist, split, cup if not dried and stored correctly.		

Qu	Part	Marking Guidance	Total marks	AO
12		One mark for a simple reason, with a second mark available for a well explained/clarified reason. **N.B. Mark across both reason blocks e.g., there could be 3 or 4 credit worthy points for reason 1 and nothing/incorrect information for reason 2.** **Indicative content** **Reasons why foil lined cardboard is used in the packaging of the takeaway food packaging are:** • Insulation – the foil lined cardboard reflects the heat back into the container. **Any reference to insulation of the packaging is acceptable** • Moisture resistance – the foil protects the card and stops it from going soggy and leaking too much • Stiffening/durability – the card bonded to the foil (composite) means the foil is kept flat and seals the food in to the aluminium tray • Minimise leaks – the composite foil bonded to card keeps it in a flat sheet without creasing and wrinkling up which means the lid can create a good seal and stop food juices/oil/sauce from leaking out • Recyclable – even though laminated foil lined board is used, it is becoming increasing accepted for recycling making it a more sustainable choice • Sterile barrier – the foil can provide additional protection from bacteria as well as light and air to keep the contents in good condition. It is food safe. • Easy to recycle. Accept all other valid responses	4 marks	AO4 1b

<table>
<tr><th>Qu</th><th>Part</th><th>Marking Guidance</th><th>Total marks</th><th>AO</th></tr>
<tr><td>13</td><td></td><td>One mark for each correct response up to a max of 4 marks.

N.B. Response must be an identifiable component NOT what the component does.

Do not accept:
RAM/ROM
Chip
Motherboard
Sensor
<table>
<tr><th>Correct inputs blocks</th><th>Correct process blocks</th><th>Correct output blocks</th></tr>
<tr><td>Mouse</td><td>Microcontroller
Microprocessor
Flash/ Intel 5 etc</td><td>Screen/Monitor</td></tr>
<tr><td>Keypad</td><td>Integrated circuit</td><td>Indicator lights</td></tr>
<tr><td>Stylus</td><td>Timer</td><td>Headphones</td></tr>
<tr><td>Switch or Button</td><td>Clock</td><td>Speaker</td></tr>
<tr><td>Microphone</td><td>Graphics card</td><td>LEDs</td></tr>
<tr><td>Camera</td><td>Video chip
CPU
GPU</td><td></td></tr>
<tr><td>Named specific sensor e.g., touch pad</td><td>Hard drive</td><td></td></tr>
</table></td><td>4 marks</td><td>AO4 1b</td></tr>
</table>

<table>
<tr><th>Qu</th><th>Part</th><th>Marking Guidance</th><th>Total marks</th><th>AO</th></tr>
</table>

<table>
<tr>
<td>14</td>
<td></td>
<td>Number of paving stones needed:

N.B. If the answer is correct, YOU MUST award full marks.
<table>
<tr><td>1 mark</td><td>1 paving stone covers area of 0.6 x 0.6 = 0.36m^2 (their 0.36)</td></tr>
<tr><td>1 mark</td><td>28/0.36 (28/their 0.36)</td></tr>
<tr><td>1 mark</td><td>77.7 (their 77.7)</td></tr>
<tr><td>1 mark</td><td>78 full paving stones</td></tr>
</table>
</td>
<td>4 marks</td>
<td>AO4 1c</td>
</tr>
</table>

<table>
<tr><th>Qu</th><th>Part</th><th>Marking Guidance</th><th>Total marks</th><th>AO</th></tr>
<tr><td>15</td><td>1</td><td>Award one mark for a correct specific named property for the chosen material.

N.B. If a specific material is not identified before 15.1 scan the whole question to see if a specific material is named and then mark accordingly.

Indicative content
<table>
<tr><th>Aluminium</th><th>Cartridge Paper</th><th>High Impact Polystyrene (HIPs)</th><th>Oak</th><th>Silk</th></tr>
<tr><td>Lightweight</td><td>High absorbency</td><td>Plasticity</td><td>Durability</td><td>Absorbent</td></tr>
<tr><td>Good conductor of heat or cold & electricity
Do not accept insulator here</td><td>Textured surface</td><td>Toughness – impact resistance</td><td>Hardness/ Hard</td><td>Tensile strength</td></tr>
<tr><td>Does not rust</td><td>Opaque</td><td>Durability</td><td>Appearance – grain</td><td>Dries quickly</td></tr>
<tr><td>Soft</td><td></td><td>Hard surface</td><td>Acidic (tannic acid)</td><td>Lightweight</td></tr>
<tr><td>Ductile</td><td></td><td>Lightweight</td><td>Tough</td><td>Soft</td></tr>
<tr><td>Malleable</td><td></td><td>Water resistant</td><td>High density</td><td>Smooth</td></tr>
<tr><td></td><td></td><td></td><td></td><td>Lustrous or shiny</td></tr>
</table>
Accept all other valid responses</td><td>1 mark</td><td>AO4 1a</td></tr>
</table>

<table>
<tr><th>Qu</th><th>Part</th><th>Marking Guidance</th><th>Total marks</th><th>AO</th></tr>
<tr><td>15</td><td>2</td><td>
<table>
<tr><td>1 mark</td><td>An appropriate named product using the specific material chosen.</td></tr>
<tr><td>0 marks</td><td>No named product or nothing worthy of credit.</td></tr>
</table>
Indicative content

N.B. Where a product uses a material e.g. printer can use cartridge paper award a mark.

Products:
<table>
<tr><th>Aluminium</th><th>Cartridge Paper</th><th>High Impact Polystyrene (HIPs)</th><th>Oak</th><th>Silk</th></tr>
<tr><td>• Drinking bottle
• Drink cans
• Cooking equipment eg pans</td><td>• Drawing pads
• Watercolour painting or picture
• Cards</td><td>• Storage trays and containers
• Signs
• models and model-making e.g. Airfix</td><td>• Furniture
• architecture e.g., floors, beams</td><td>• Clothing e.g. blouse, lingerie
• Parachute
• bedding
• Tie
• Scarf</td></tr>
</table>
The guidance provided is illustrative and not exhaustive.
</td><td>1 mark</td><td>AO4 1c</td></tr>
</table>

<table>
<tr><th>Qu</th><th>Part</th><th>Marking Guidance</th><th>Total marks</th><th>AO</th></tr>
<tr><td>15</td><td>3</td><td>
<table>
<tr><td>2 marks</td><td>A detailed description (or several relevant points) of why the named material is used in the named product</td></tr>
<tr><td>1 mark</td><td>A brief description of why the named material is used in the named product.</td></tr>
<tr><td>0 marks</td><td>No description or nothing worthy of credit.</td></tr>
</table>
N.B. Do not give credit in 15.3 for a simple repeat of 15.1.

N.B. award marks for a different correct property to 15.1 if it is correct for the product given in 15.2

Indicative content:
</td><td>2 marks</td><td>AO4 1b</td></tr>
</table>

		Aluminium Expect reference to aluminium being lightweight in a product application or non-ferrous so not rusting like iron or steel. It is a good conductor of heat, cold and electriciy. **Do not credit the word insulate but you can credit clarification e.g., keeps a drink's can cold when put in a fridge.** **Cartridge Paper** Expect reference to use in a drawing pad with use of pencils, charcoal. Pastels or ink. Rough surface and texture accepting colour well. Thick and heavy nature of paper absorbs ink well. **High Impact Polystyrene (HIPS)** Expect reference to self-coloured, thermopolymer /plastic so it can be vacuum formed into tubs and container in one piece. **Oak** Expect reference to hardwearing, tough and durable e.g., furniture. Good aesthetics from decorative grain pattern on furniture e.g., silver figure. **Silk** Expect references of how it feels on the skin, to touch, the senses. Smooth to the touch. Lustrous, soft or smooth. Good resistance to skin irritation and dermatitis. Silk repels dust mites, resists bacteria and mould.		

<table>
<tr><th>Qu</th><th>Part</th><th>Marking Guidance</th><th>Total marks</th><th>AO</th></tr>
<tr><td>16</td><td>1</td><td>One mark for a correct specific material stock form.

Indicative content
<table>
<tr><th>Metals</th><th>Papers and boards</th><th>Polymers</th><th>Textiles</th><th>Timber</th></tr>
<tr><td>• tube
• rod
• sheet
• ingot
• strip
• angle
• gauge</td><td>• A1, A2, A3, A4, A5 etc
• roll
• sheet
• ply
• thickness
• weight
• colour</td><td>• granules
• powder
• rod
• sheet
• film
• foam
• pellets</td><td>• balls
• roll
• hanks
• bolt
• reels
• yarns
• fabric</td><td>• board
• plank
• PAR
• PSE
• mouldings eg dowel
• veneer</td></tr>
</table></td><td>1 mark</td><td>AO4 1a</td></tr>
</table>

<table>
<tr><th>Qu</th><th>Part</th><th>Marking Guidance</th><th>Total marks</th><th>AO</th></tr>
<tr><td>16</td><td>2</td><td>
<table>
<tr><td>3–4 marks</td><td>Detailed outline demonstrating a in depth understanding of benefits stock forms bring to the designer and /or the manufacturer.</td></tr>
<tr><td>1–2 marks</td><td>Simple outline given demonstrating a limited understanding of benefits stock forms bring to the designer and/or manufacturer.</td></tr>
<tr><td>0 marks</td><td>No response or nothing worthy of credit.</td></tr>
</table>
Indicative content

• Buying materials in stock forms helps in waste management by buying only the material needed.
• Stock forms allow designers and manufacturers to compare product prices from different suppliers to purchase.
• Stock forms are prepared materials that reduce the amount of preparation that has to be undertaken before using the material eg timber comes debarked and planed. Fabrics come woven and ready to use.
• The purchase of stock forms allows a designer or manufacturer to bulk buy in materials to use across a range of possibly different products.
• Universal size
• Efficient storage of materials
</td><td>4 marks</td><td>AO4 1b</td></tr>
</table>

<table>
<tr><th>Qu</th><th>Part</th><th>Marking Guidance</th><th>Total marks</th><th>AO</th></tr>
<tr><td>17</td><td></td><td>
<table>
<tr><th></th><th>Method 1</th><th>Method 2</th></tr>
<tr><td>1 mark</td><td>Total cost of 1000 motors without discount applied:
£6.95 × 100 = £695.00
or
£6.95 / 10 = £0.695 per unit
£0.695 × 1000 = £695.00
or
£695</td><td>Same as method 1</td></tr>
<tr><td>1 mark</td><td>Discount is:
£695 (their £695) / 100= £6.95 for 1 %
£6.95(their £6.95) x 15
or
£104.25</td><td>Discount is:
£695 (their £695) x 0.85 = £595 (their £595) for 85% of original price</td></tr>
</table>
</td><td>3 marks</td><td>AO4 1c</td></tr>
</table>

		1 mark £590.75 £590.75 **N.B. If the answer is correct, YOU MUST award full marks.**		

<table>
<tr><th>Qu</th><th>Part</th><th>Marking Guidance</th><th>Total marks</th><th>AO</th></tr>
<tr><td>18</td><td></td><td>
<table>
<tr><td>5–6 marks</td><td>A detailed description making several correct points how to apply a quality surface treatment or finish using notes and/or sketches. Specific and clear stages evidenced in a sequenced order.</td></tr>
<tr><td>3–4 marks</td><td>A good description with points showing some understanding of how to apply a quality surface treatment or finish using notes and/or sketches. Some reference(s) to some of the different stages in the correct order.</td></tr>
<tr><td>1–2 marks</td><td>Basic notes or sketch showing limited understanding of the surface treatment or finish.</td></tr>
<tr><td>0 marks</td><td>No response or nothing worthy of credit.</td></tr>
</table>
N.B. Accept correct production detail of making a finish if given e.g. making paint.

Indicative content

The guidance provided is illustrative and not exhaustive. Credit any worthy points made in support of the band descriptors above.

Dip coating

• Metal to be dip coated has to be clean and fee from surface defects as they will be encapsulated when dip coating takes place.
• Heat metal to be dip coated to between 250 – 400 °C. This can be done on a brazing hearth with care or in a convection oven.
• Metal work piece is then immersed fully in a fluidising tank (box/vessel when air is blown through polyethene powder).
• The polymer powder then sticks to the hot metal surface.
• Too hot and you may get a fire, melting and dripping polymer of the workpiece and a very poor finish.
• Too cold and the finish has an ‘orange peel’ look to it.
• Work piece is removed and left to cool, hung up ideally until the polymer powder applied solidifies and cools.
• Credit for paint dipping or bluing.

Painting

Expect answers for different materials including woods, metals and polymers.

• All surfaces should be dust, dirt and grease free.
• Fill and sand back any surface imperfections that will reduce the quality of finish.
</td><td>6 marks</td><td>AO4 1b</td></tr>
</table>

		• Ensure a dust and dirt-free environment for painting as dust and dirt particle with be attracted to wet paint and lower the quality of finish. • Between coats lightly sand back (flat back) to remove and imperfections that may have been caught. • **For a full response, there should be reference to priming and/or undercoating and then applying a topcoat of paint.** • Time needs to be allowed before reapplication of new layer application. • Paint (and primer/undercoat) can be applied using rollers, brushes and sprayed on. • Stretch silk/fabric on frame, sketch design onto fabric, apply resist to outline, brush on silk paints, iron to fix dye **Printing** Expect answers for different materials including papers and boards, polymers and textiles: • dye sublimation printing • laser printing • block printing • screen printing • offset litho printing. **Lubrication** • Lubricants can be applied as an oil, grease of sprayed film. • Grease can be applied with a grease gun, brush, rag or finger. • Oils can be applied with an oil can. • Silicone films and light oils e.g. WD40 can be sprayed onto a surface. • Care must be taken not to overspray, or a surface could be accidentally lubricated e.g., clutch or brake surface. • Application needs to be carried out with due care of naked flames/ignition sources as oils many lubricants are flammable. • Care must be taken not to puncture a pressurised spray can. • Use spay lubricants in a well-ventilated room or drowsiness may occur leading to unsafe working. **Vinyl stickers** • Surface to which they are applied needs to be dirt, dust and grease free to ensure good adhesion. • Sticker is designed in Cad package and then transferred to a plotter cutter (Cam) where a blade cuts the design out. • The blade needs to be set so that it cuts the vinyl and not the backing paper. If the backing paper is cut, then it becomes difficult to remove the sticker from the backing paper. • Layout tape/film (frisk film) is then applied over the sticker to remove it from the backing paper. • The layout tape/film aids accurate placement and alignment of the sticker or multiple stickers.		

		• Air bubbles are then carefully removed by a soft edge rubbing strip or squeegee.		

<table>
<tr><th>Qu</th><th>Part</th><th>Marking Guidance</th><th>Total marks</th><th>AO</th></tr>
<tr><td>19</td><td></td><td>
<table>
<tr><td>7–8 marks</td><td>Detailed analysis and evaluation of several appropriate ecological issues created in the sourcing and extraction of materials during the design and manufacture of products. In depth judgement to offer personal opinion in evaluative points evidenced. Several relevant examples of linked to ecological issues used to support and clarify response.</td></tr>
<tr><td>5–6 marks</td><td>Good analysis and evaluation with appropriate consideration of several ecological issues created in the sourcing and extraction of materials during the design and manufacture of products. Attempt to offer personal opinion in evaluative points evidenced. Some relevant examples of linked to ecological issues used to support and clarify response.</td></tr>
<tr><td>3–4 marks</td><td>Basic analysis of some ecological points. Limited linking with material sourcing and/or origins of materials. No attempt to evaluate or offer a personal judgement. Limited or irrelevant examples to support and clarify response.</td></tr>
<tr><td>1-2 marks</td><td>One or two limited ecological points identified.</td></tr>
<tr><td>0 marks</td><td>No response or nothing worthy of credit.</td></tr>
</table>
Indicative content

The guidance provided is illustrative and not exhaustive.

Deforestation

• The removal of trees to provide materials for any timber-based products removes the planets ability to remove CO2 from the atmosphere.
• This leads to global warming and extreme weather events eg fires, extreme cold/heatwaves.
• Destruction of wildlife and habitats.

Mining

Ecological impact of mining to extract oil for polymers and metal ores are:

• pollution including noise pollution e.g. mining at sea impact on marine life
• sink holes
• water course pollution e.g. rivers can become so polluted fish die.
</td><td>8 marks</td><td>AO3 2b</td></tr>
</table>

		Drilling Similar issues to mining: • noise • water pollution • visual pollution where pipelines need to be laid to transport oil and gas etc. **Farming** • Farming of sheep requires food and water to feed the animals, putting additional strain on resources. • Whilst sheep do not usually cause deforestation like cattle farming. • Intensive crop growing to create biofuels and for use in creating non-oil-based polymer substitutes. • Cotton- excessive water use, toxic chemicals and fertilizers and herbicides used. **Product miles** • Transportation of raw materials from a point of extraction or where they are grown, still creates a lot of pollution burning fossil fuels. • Similar issues in the distribution of materials and products to and from factories. **CO2 production** • Produced in all stages of designing and making products. Many manufacturers are trying to improve their 'green credentials' by reducing their reliance on fossil fuels and improving energy efficiency and carbon offset initiatives.		

<table>
<tr><th>Qu</th><th>Part</th><th>Marking Guidance</th><th>Total marks</th><th>AO</th></tr>
<tr><td>20</td><td>1</td><td>
<table>
<tr><td>3–4 marks</td><td>A detailed analysis and evaluation of user needs and/or wants. Clear linking to bus stop(s) feature(s) are given.</td></tr>
<tr><td>1–2 marks</td><td>A basic analysis and evaluation of user needs and/or wants. Simple points linked to bus stop(s).</td></tr>
<tr><td>0 marks</td><td>No response or nothing worthy of credit.</td></tr>
</table>
Indicative content

The guidance provided is illustrative and not exhaustive. Credit any worthy points made in support of the band descriptors above.’

• clearly indicate where bus will stop/ show bus driver where to stop (all images)
• clearly indicate the times the bus stops so they can plan journeys and get where they want to go on time (all images)
• somewhere to keep dry in poor weather (all images potentially – unclear with bottom left image)
• well-lit for safety and security of the user (bottom right image)
• positioning in safe visible location for personal safety (all images)
• bollards to protect potential passengers from being hit by other vehicles while waiting for the bus (top left image)
• enough space for several persons to stand or sit without invading personal space (bottom left)
• somewhere to sit down if waiting a long time (all stops less bottom left)
• audible notifications about bus arrival times/travel updates (all stops less top right)
• positioned away from road so not to be splashed by passing vehicles (not top right or bottom left image).
</td><td>4 marks</td><td>AO3 1a
AO3 1b</td></tr>
</table>

<table>
<tr><th>Qu</th><th>Part</th><th>Marking Guidance</th><th>Total marks</th><th>AO</th></tr>
<tr><td>20</td><td>2</td><td>
<table>
<tr><td>3-4 marks</td><td>A detailed analysis and evaluation (and understanding) of innovation in the bus stop designs. Clear linking to bus stop(s) features are given.</td></tr>
<tr><td>1-2 marks</td><td>A basic analysis and/or evaluation (and some understanding) of innovation in the bus stop designs. Simple points linked to bus stop(s).</td></tr>
<tr><td>0 marks</td><td>No response or nothing worthy of credit.</td></tr>
</table>
Indicative content

The guidance provided is illustrative and not exhaustive. Credit any worthy points made in support of the band descriptors above.

• Provide audible bus/travel notifications about arrival time
• Visual ‘Live’ updates of bus arrival times
• Modern material used so that signs and materials do not degrade over time with exposure to UV light, rain, ice etc
• Vandal proof material and surface finishes used to prevent damage and graffiti making the bus stop unsightly and an eye sore
• Improved ergonomics of seat i.e., for comfort/ backrests
• Illuminated signage and use of phosphorescent pigments so information can be seen in the dark
• Anti-slip materials and textures around the bus stop to prevent users slipping in poor weather
• solar panels on the roof for power
• CCTV
• GPS tracking of bus
• Ticket terminals
• Braille information services
• Texture edges to warn of edge to platform
• Interactive targeted advertising
• Free phone charging facilities.
• Wi-Fi hotspot
• Panic alarm
</td><td>4 marks</td><td>AO3 1a
AO3 1b</td></tr>
</table>

<table>
<tr><th>Qu</th><th>Part</th><th>Marking Guidance</th><th>Total marks</th><th>AO</th></tr>
<tr><td>20</td><td>3</td><td>
<table>
<tr><td>3–4 marks</td><td>A detailed analysis and evaluation of both anthropometrics and ergonomics in the bus stop designs. Clear linking to bus stop(s) features are given.</td></tr>
<tr><td>1–2 marks</td><td>A basic analysis and evaluation of anthropometrics and /or ergonomics in the bus stop designs. Simple points linked to bus stop(s).</td></tr>
<tr><td>0 marks</td><td>No response or nothing worthy of credit.</td></tr>
</table>
Indicative content

The guidance provided is illustrative and not exhaustive. Credit any worthy points made in support of the band descriptors above.

Anthropometrics (use of measurements of the human body).

• Average sizes of user to ensure seats are big enough to sit on.
• Height of any signage that needs to be read e.g. timetables is positioned correctly.
• Hand sizes used to ensure bench handrails and grab rails of bus shelter can be used to get up from seat. Very important if elderly or infirm.

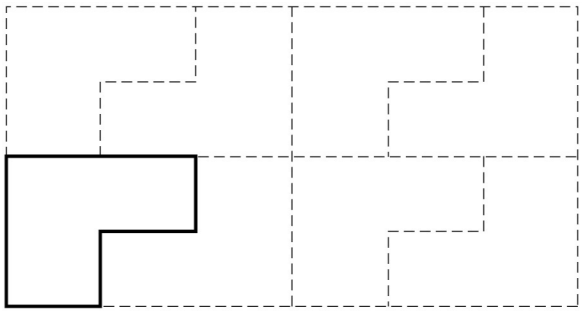
Ergonomics (how the user ‘fits’ safely and comfortably with features of the bus stop).

• High visibility finishes e.g. signpost, so it is easy for user to spot a bus stop.
• Ergonomic designed seats so they are comfortable to sit on over a period of time waiting for a bus.
• Shopping bags can be placed under the seat and bench, so they are out of the way and wont trip other people up.
• Seat that dries rapidly if wet so that they can be used e.g. drain holes.
• Stainless steel seats can be either hot or cold to sit on at times.
• Well-ventilated covered bus stops is good in hot weather and if people are vaping or smoking.
</td><td>4 marks</td><td>AO3 1a
AO3 1b</td></tr>
</table>

<table>
<tr><th>Qu</th><th>Part</th><th>Marking Guidance</th><th>Total marks</th><th>AO</th></tr>
<tr><td>21</td><td>1</td><td>
<table>
<tr><td>2 marks</td><td>Detailed explanation i.e., two points in brief or one point considered in detail.</td></tr>
<tr><td>1 mark</td><td>Basic explanation i.e., one brief correct point.</td></tr>
<tr><td>0 marks</td><td>No response or nothing worthy of credit.</td></tr>
</table>
Indicative content

Candidates refer to tessellation which can be marked correct.

• Shapes to be marked or cut out are placed as close as possible together = 1
• To minimise waste = 1
• Nesting allows more of the material it be used = 1
• Parts or components are positioned close to each other to use material more efficiently = 2
• Parts to be marked out and cut out are positioned in an interlocking pattern (tessellation) to maximise material usage= 2
• Tessellation is a bit like nesting, but the shapes to be marked of cut out fit perfectly together maximising material usage= 2.
</td><td>2 marks</td><td>AO4 2b</td></tr>
</table>

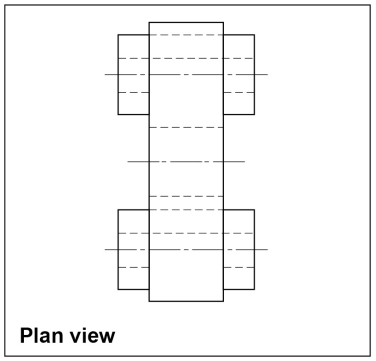
<table>
<tr><th>Qu</th><th>Part</th><th>Marking Guidance</th><th>Total marks</th><th>AO</th></tr>
<tr><td>21</td><td>2</td><td>
<table>
<tr><td>2 marks</td><td>Eight nested parts drawn accurately e.g., no gaps</td></tr>
<tr><td>1 mark</td><td>Evidence of understanding nesting i.e. interlocking parts. Can include inaccurate (not to scale/drawn with a ruler) graphic representation.</td></tr>
<tr><td>0 marks</td><td>No attempt or nothing worthy of credit.</td></tr>
</table>
Indicative content
 
</td><td>2 marks</td><td>AO4 2c</td></tr>
</table>

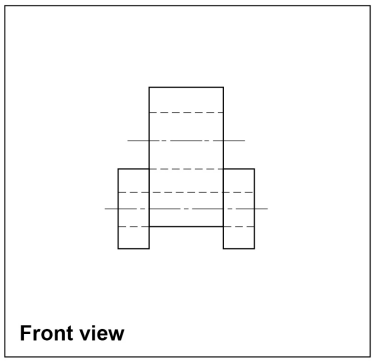
Qu	Part	Marking Guidance	Total marks	AO
22		One mark for each clear safety precaution taken using tools and equipment that use heat. **DO NOT award marks for just naming equipment or clothing or unexplained words e.g. safety goggles, goggles or visor alone.** **Look for supporting words (measure taken) explaining how tool or equipment is used** • Wear goggles when welding to prevent damage to eyes (from bright light). • Wear goggles to prevent hot splashes of material from getting into eyes e.g. hot wax. • Wear heat proof gloves to protect your hands from burns e.g. when casting or handling hot plastic. • Do not touch the heated part of the tool or equipment e.g. soldering iron tip, iron, flame, heating elements. • Do not direct a heat source at another person e.g. brazing torch. • Return equipment to a safe location until it cools down e.g. soldering iron stand. • Position equipment safely if hot e.g. an iron. • Fire extinguisher near by	5 marks	AO4 2b

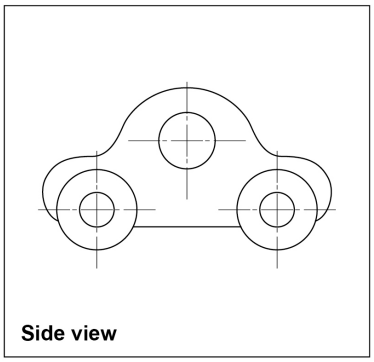
		• Do not work alone in case you have an accident and need urgent help. • Correct or sufficient training • Work where possible in a well-ventilated room so you don't get too hot. • Make sure any extraction is on when heating materials that may give off fumes when hot e.g. casting, wax.		

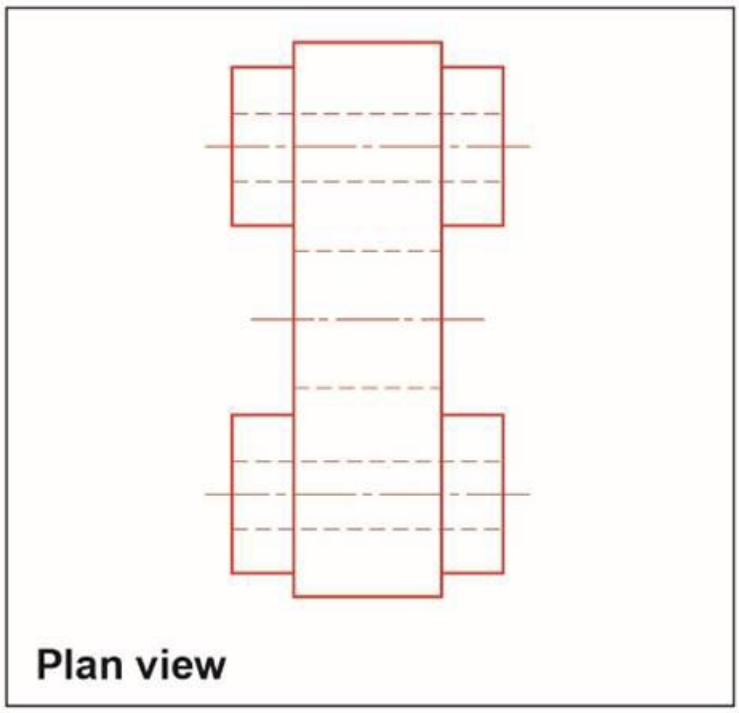
<table>
<tr><th>Qu</th><th>Part</th><th>Marking Guidance</th><th>Total marks</th><th>AO</th></tr>
<tr><td>23</td><td></td><td>Plan View

NB Ignore extra lines, only mark the content of the table below.
<table>
<tr><td>1 mark</td><td>Correct basic shape of a plan view drawn either vertically or horizontally</td></tr>
<tr><td>1 mark</td><td>Plan view is correctly projected/aligned above front view.</td></tr>
<tr><td>1 mark</td><td>Correct addition of centre lines for both pairs of wheels which extend outside the body of the car</td></tr>
<tr><td>1 mark</td><td>Correct addition of hidden detail lines for both axles.</td></tr>
<tr><td>1 mark</td><td>Correct addition of centre line for window which extends outside the body of the car</td></tr>
<tr><td>1 mark</td><td>Correct addition of hidden detail lines of window.</td></tr>
</table></td><td>6 marks</td><td>AO4 2c</td></tr>
</table>


Plan view


Front view


Side view


Plan view

<table>
<tr><th>Qu</th><th>Part</th><th>Marking Guidance</th><th>Total marks</th><th>AO</th></tr>
<tr><td>24</td><td>1</td><td>
N.B. If the answer is correct, YOU MUST award full marks.

N.B. Award method 1 - mark 1(320 stitches) and method 2 - mark 1 (3150 stitch length) if both are used together. They are two correct calculations in the mark scheme.
<table>
<tr><th></th><th>Method 1</th><th>Method 2</th></tr>
<tr><td>1 mark</td><td>The stitched join needs:
960/3 = 320 stitches</td><td>Total stitch length:
1050 x 3 = 3150</td></tr>
<tr><td>1 mark</td><td>Stitches completed per second:
1050/60 = 17.5</td><td>Stitch length per second:
3150/60 = 52.5</td></tr>
<tr><td>1 mark</td><td>Sewing time:
320(their 320) /17.5 (their 17.5) = 18.2857 seconds
Accept range 18.2 to 18.3</td><td>Sewing time:
960(their 960)/52.5(their 52.5) = 18.2857 seconds
Accept range 18.2 to 18.3</td></tr>
<tr><td>1 mark</td><td>Sewing time to the nearest second = 18</td><td>Sewing time to nearest second = 18</td></tr>
</table>
</td><td>4 marks</td><td>AO4 2c</td></tr>
</table>

<table>
<tr><th>Qu</th><th>Part</th><th>Marking Guidance</th><th>Total marks</th><th>AO</th></tr>
<tr><td>24</td><td>2</td><td>
<table>
<tr><td>1 mark</td><td>How long to make 30 joins:
30 x 18 = 540 seconds
or
30 × 18.29 = 548.7 seconds
or
30 x (their 18.29) = 548.7 (their 548.7) seconds</td></tr>
<tr><td>1 mark</td><td>Time in minutes:
548.7 (their 548.7)/60 = 9.145 minutes
Accept answers in the range 9 and 9.2 for disparities in calculators and if rounded answer in 24.1 used.</td></tr>
</table>
N.B. If the answer is correct, YOU MUST award full marks.
</td><td>2 marks</td><td>AO4 2c</td></tr>
</table>

<table>
<tr><th>Qu</th><th>Part</th><th>Marking Guidance</th><th>Total marks</th><th>AO</th></tr>
<tr><td>25</td><td></td><td>
<table>
<tr><td>3-4 marks</td><td>A detailed explanation of avoiding design fixation. Relevant example(s) given to support answer.</td></tr>
<tr><td>1-2 marks</td><td>A basic explanation of avoiding design fixation and/or relevant example.</td></tr>
<tr><td>0 marks</td><td>No response or nothing worthy of credit.</td></tr>
</table>
Indicative content

This question is not about defining design fixation, it’s about avoiding it.

Example of basic explanation

• Avoiding fixation is where a designer is will look at more than 1 design.

Example of detailed explanation

• Avoiding design fixation is where a designer will look at more than 1 design. A greater range of ideas should lead to better products meeting client needs and wants. This can be avoided by considering other potential concepts e.g. smart phone technology e.g. folding phones.

Example of avoiding design fixation

Examples can be products or techniques of avoiding design fixation:

• mobile phones having to have keys rather than a touch screen eg break from tradition with original smartphone/iPhone
• a bagged vacuum cleaner rather than a collecting drum as pioneered by Dyson
• creative and imaginative use of geometry in fashion in the 1960s pioneered by Mary Quant
• collaboration–designers working together with different skill sets
• focus groups–specific input of client needs and wants.
</td><td>4 marks</td><td>AO4 2b</td></tr>
</table>

<table>
<tr><th>Qu</th><th>Part</th><th>Marking Guidance</th><th>Total marks</th><th>AO</th></tr>
<tr><td>26</td><td>1</td><td>
<table>
<tr><td>2 marks</td><td>Detailed explanation showing a good understanding of what a tolerance is, or one point clarified in detail.</td></tr>
<tr><td>1 mark</td><td>Basic explanation as to what a tolerance is.</td></tr>
<tr><td>0 marks</td><td>No response or nothing worthy of credit.</td></tr>
</table>
Indicative content

• A tolerance is concerned with accuracy.
• It is a variation that can be accepted as ok above or below a specified length or weight etc.
• A tolerance can be shown as a percentage e.g. +/- 5% in working out resistor values.
• A tolerance cam be shown as a number e.g. +/- 2 mm in deciding hole much longer or shorter a material can be but still be acceptable to use.
</td><td>2 marks</td><td>AO4 2a</td></tr>
</table>

<table>
<tr><th>Qu</th><th>Part</th><th>Marking Guidance</th><th>Total marks</th><th>AO</th></tr>
<tr><td>26</td><td>2</td><td>
<table>
<tr><td>3-4 marks</td><td>A detailed description with example(s) of how tolerances are used to ensure quality and accuracy during Quality Control.</td></tr>
<tr><td>1-2 marks</td><td>A basic description of how tolerances are used to ensure quality and accuracy during Quality Control and/or an example.</td></tr>
<tr><td>0 marks</td><td>No response or nothing worthy of credit.</td></tr>
</table>
Responses need to say how tolerances are used (anticipate example). We are not looking for a definition of what a tolerance is.

Candidates may discuss tolerance parameters like temperature ranges and physical testing e.g. how much something can flex or bend within a range.

Indicative content

• Use of go/no go gauges and templates with preset tolerances allowing parts and components to be rapidly checked for compliance.
• Expect many responses discussing how maximum and minimum measurements are used to ensure many components/parts are not discarded for not being precisely the right size.
• Tolerances are used in Quality control to ensure that parts/components will work and be fit for purpose.
• Sampling e.g., every 10th product to check for quality
</td><td>4 marks</td><td>AO4 2b</td></tr>
</table>

		• Resistors have a tolerance as their resistance varies at different temperatures. If a resistor has a gold band, then it has a tolerance of +/- 5% meaning the actual ohms value can fluctuate between an upper and lower value limit. • When casting and forming with molten materials, the mould is usually a bit bigger to allow for material contraction when cooling. • Modern Cad Cam equipment has now allowed for much smaller tolerances to become acceptable. This has improved material efficiency e.g. track size on PCB boards • Seam allowance in textile garments. For example, a small tolerance of +/- 2mm would be expected on areas such as collars and pocket flaps but a larger tolerance +/-10mm on chest width or trouser leg length.		

Qu	Part	Marking Guidance	Total marks	AO
27		**3-4 marks** – Detailed description of how researching the designs of others can help with design work. **1-2 marks** – Basic descriptive point(s) of how researching the work of others can help with design work. **0 marks** – No response or nothing worthy of credit. **Indicative content** • Can already see what is commercially on the market. • Can see what products are popular and seem to work well. • Can see if the work of others will help designers with design work. • Looking at the work of other designers and companies can inspire designers to think of designs and look at a problem in a way they might not have first thought of. • The work of others can allow analogous products to be looked at i.e. ones not exactly solving the problem the designer has but may have features that could be adapted and applied to a different product e.g. a folding mechanism, electronic display, fashion or theme.	4 marks	AO4 2b

<table>
<tr><th>Qu</th><th>Part</th><th>Marking Guidance</th><th>Total marks</th><th>AO</th></tr>
<tr><td>28</td><td></td><td>
<table>
<tr><td>3 marks</td><td>Detailed explanation/ multiple relevant points which shows understanding of the purpose of using a focus group when developing a product.</td></tr>
<tr><td>2 marks</td><td>Basic explanation which shows understanding of the purpose of using a focus group when developing a product.</td></tr>
<tr><td>1 mark</td><td>A simple correct statement which shows understanding of what a focus group is but lacks understanding of purpose.</td></tr>
<tr><td>0 marks</td><td>No response or nothing worthy of credit.</td></tr>
</table>
Indicative content

• A group of people/users/customers who are gathered together to give feedback on a product.
• Getting people’s opinions on a product/prototype before it is launched.
• Watching or observing a group of people and how they interact with a product (often by recording them).
• To gain insight into the experiences and perspectives of various users.
</td><td>3 marks</td><td>AO4 2b</td></tr>
</table>