A-level

DESIGN AND TECHNOLOGY: PRODUCT DESIGN 7552/2

Paper 2 Designing and Making Principles

Mark scheme

June 2022

Version: 1.0 Final

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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.

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.

<table>
<tr><th>Qu</th><th>Part</th><th>Marking Guidance</th><th>Total marks</th><th>AO</th></tr>
<tr><td>01</td><td></td><td>
Figures 1 and 2 show two screwdrivers.
<table>
<tr><th></th><th>Figure 1</th><th>Figure 2</th></tr>
<tr><td>Handle material(s)</td><td>Aluminium</td><td>Thermoplastic and elastomer</td></tr>
<tr><td>Handle formed by</td><td>Casting</td><td>Injection moulding</td></tr>
<tr><td>Screwdriver tip</td><td>Fixed tip</td><td>Interchangeable magnetic attachment</td></tr>
</table>
Compare the two screwdrivers shown.

In your answer you should refer to:

• ergonomics
• material suitability
• product function.

<table>
<tr><th>Marks</th><th>Description</th></tr>
<tr><td>9–12 marks</td><td>The response provides detailed analysis and comparison of both screwdrivers, referring with technical details to ergonomics, material suitability and product function. The response makes judgements regarding the design of both products using the majority of the information provided.</td></tr>
<tr><td>5–8 marks</td><td>The response provides a good comparison of both screwdrivers referring to all reference points. The response makes analytical judgements regarding the design of both products referring to some aspects of the information provided.</td></tr>
<tr><td>1–4 marks</td><td>The screwdrivers are compared in basic terms with limited use of the information provided.
Responses may refer to elements such as material properties without linking these to the bullet points.</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.

Material suitability
• Figure 2 has a thermal and electrical insulator for the handle.
• Aluminium can be textured using the die casting process.
• Texture can be applied within the injection moulding process.
• Figure 1 requires fine adjustment and has flutes suitable for this.
</td><td>12 marks</td><td>AO3 1a
AO3 1b</td></tr>
</table>

		• Use of aluminium for the handle gives rigidity not possible from polymer of the same thickness. • Aluminium is a non-ferrous metal and will not corrode/rust. • The rotating top of the jeweller's screwdriver has been attached by bolt which may be possible using polymer but would not last as long. • Material recyclability: aluminium kept pure, TPE and Thermoplastic require separation **Ergonomics** • TPE gives a degree of elasticity required for increased grip when using **Figure 2**. • **Figure 1** is for precision and doesn't generally require a lot of force to be applied, leading to the slender pencil like grip. • **Figure 2** may require significant force and therefore has a wide handle allowing pressure to be applied without harming the palm of the hand. **Function** • The interchangeable ends for **Figure 2** means fewer tools are required. • If a tip was damaged then the whole product does not need to be replaced. • The use of standardised hexagonal tips allows for a wide range of functions to be achieved with one tool. • **Figure 1** the long narrow body means recessed screws can be reached easily. • **Figure 2** the magnetic tip means that removed screws are less likely to be lost when removed as they may remain attached to the tip upon removal. **Accept any other valid responses.**		

<table>
<tr><th>Qu</th><th>Part</th><th>Marking Guidance</th><th>Total marks</th><th>AO</th></tr>
<tr><td>02</td><td></td><td>Explain how different prototyping methods may be used in the development of a screwdriver handle.

<table>
<tr><td>Marks</td><td>Description</td></tr>
<tr><td>3–4 marks</td><td>The response gives a detailed explanation of appropriate prototyping methods that are directly related to a screwdriver handle.</td></tr>
<tr><td>1–2 marks</td><td>The response gives a basic explanation of prototyping used in product development.</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.

Methods:
• Physical/visual prototype to check handle ergonomics with a focus group
• 3D CAD prototype to check aesthetics and colour schemes for branding
• Sketch prototypes for client feedback before CAD modelling
• 3D CAD prototype to check costings with different materials
• FEA prototype to check forces, such as torsion and impact
• mould flow analysis to check forming processes
• Working prototypes to assess movement of components within the handle.

Accept any other valid responses.</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>03</td><td></td><td>
A screwdriver handle has a volume of 55 000 mm^3

The handle is formed from two materials:

<table>
<tr><th>Material</th><th>Density</th><th>Percentage of handle</th></tr>
<tr><td>A</td><td>1.4 g/cm^3</td><td>85%</td></tr>
<tr><td>B</td><td>1.1 g/cm^3</td><td>15%</td></tr>
</table>

Calculate the mass of the handle in grams.

<table>
<tr><td>Calculate volume in mm^3 of material A and/or B</td><td>A = 55 000 × 0.85
= 46 750 mm^3

B = 55 000 × 0.15
= 8250 mm^3</td><td>1 mark</td></tr>
<tr><td>Convert volumes of A and B into cm^3

or

Convert densities of materials A and B into g/mm^3</td><td>Volume of A = $\frac{\text{their 46 750}}{1000}$ = 46.75 cm^3

Volume of B = $\frac{\text{their 8250}}{1000}$ = 8.25 cm^3

Density of A = 0.0014 g/mm^3

Density of B = 0.0011 g/mm^3</td><td>1 mark</td></tr>
<tr><td>Calculate mass of material A and mass of material B (use of correct formula)</td><td>Use of: Mass = Density × Volume

Mass A:
their 46.75 × 1.4 = 65.45 g

Mass B:
their 8.25 × 1.1 = 9.075 g

or

Mass A = their 46 750 × 0.0014
= 65.45 g</td><td>1 mark</td></tr>
</table>
</td><td>4 marks</td><td>AO4 2c</td></tr>
</table>

			Mass B = their 8250 × 0.0011 = 9.075 g		
		Accurate calculation of mass of handle	Total = 65.45 + 9.075 = [74, 75]	1 mark	
		Calculate mass of handle Where no working has been shown but final answer is accurate	[74, 75] g	4 marks	
		Special case	Award 3 marks for a final answer which begins with the digits 74 or contains only the digits 75 e.g. 7.42 or 750	3 marks	
		or			
		Calculate volume of 1% of handle	$\frac{55\,000}{100}$ = 550 mm^3	1 mark	
		Calculate volume of material A and/or material B	Volume of Material A = 85 × their 550 = 46 750 mm^3 Volume of Material B = 15 × their 550 = 8250 mm^3	1 mark	
		Calculate mass of material A and mass of material B (use of correct formula)	Use of: Mass = Density × Volume Mass A = $\frac{1.4}{1000}$ × their 46 750 = 65.45 g	1 mark	

			Mass B $= \frac{1.1}{1000} \times$ their 8250 = 9.075 g		
		Calculate mass of handle	Total = 65.45 + 9.075 = 74.525 g	1 mark	
		Calculate mass of handle Where no working has been shown but final answer is accurate	[74, 75] g	4 marks	
		Special case	Award 3 marks for a final answer which begins with the digits 74 or contains only the digits 75 e.g. 7.42 or 750	3 marks	
		Note to markers: The order of the calculations may not follow those in the mark scheme.			

<table>
<tr><th>Qu</th><th>Part</th><th>Marking Guidance</th><th>Total marks</th><th>AO</th></tr>
<tr><td>04</td><td></td><td>
Explain how the Art Deco design style was influenced by:

• historical design styles
• socio-economic factors.

<table>
<tr><td>Marks</td><td>Description</td></tr>
<tr><td>5–6 marks</td><td>The response gives a detailed explanation of socio-economic factors and historical design styles that impacted on Art Deco design and how these influences were seen within the style.</td></tr>
<tr><td>3–4 marks</td><td>The response gives a good explanation of socio-economic factors or historical design styles on Art Deco design.</td></tr>
<tr><td>1–2 marks</td><td>The response gives a basic explanation of the Art Deco design style.</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.

Socio-economic factors
• The end of World War One (WW1) signalled a new beginning for a modern world with a need to rebuild, this is reflected in the use of sunburst motifs used to show a ‘new dawn’/start.
• The zoning regulation of 1916 was concerned with the building of skyscrapers that blocked light to streets below. The regulation ensured that buildings were stepped back from the streets like ziggurats to increase light.
• Building on the need for simple and affordable style suitable for those returning from WW1, the class system was changing and a modern style was needed to embrace this.
• Modern mass manufacturing techniques used during WW1 lent themselves to the production of simple geometric forms.

Historical Design Styles
• The discovery of Tutankhamun’s tomb in Egypt was a huge international story that caused a desire to replicate the Egyptian style of simplistic imagery and costume.
• African art influences with patterns.
• Rectilinear forms to emphasise height and power.

Accept any other valid responses.
</td><td>6 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>05</td><td></td><td>Outline the concept of eco-labelling and the impact on customer buying preferences.

<table>
<tr><td>Marks</td><td>Description</td></tr>
<tr><td>3–4 marks</td><td>The response shows detailed knowledge and understanding of eco-labelling, using specific technical vocabulary to outline the key issues and impact on consumer buying preferences.</td></tr>
<tr><td>1–2 marks</td><td>The response shows basic knowledge of eco-labelling beyond the information provided in the question.</td></tr>
<tr><td>0 marks</td><td>No response or nothing worthy of credit.</td></tr>
</table>

Indicative content

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• Eco-labels can raise awareness of environmental issues
• Consumers feel a sense that they are doing the right thing (ethically and morally).
• The use of a recognised eco-label can increase the chance of a customer purchasing the product.
• The wide range of eco-labels can lead to confusion due to lack of clarity on their meaning.
• As eco-labels are voluntary they may not always give a true representation of a company’s green credentials.
• ‘Green washing’, where fake eco-labels are created to confuse consumers, due to the vast number of different labels available, can occur.
• Reference to specific eco-labels and their impact.

Note: It is not necessary to mention specific eco-labels to receive full marks.

Accept any other valid responses.</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>06</td><td></td><td>
Table 1 shows sales of new vehicles from 2016–2019

Plot the data shown in the table to compare % sales of each fuel type from 2016–2019

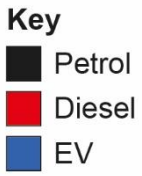
<table>
<tr><th>Year</th><th>Petrol</th><th>Diesel</th><th>Electric Vehicles (all types)</th><th>Total Sales</th></tr>
<tr><td>2016</td><td>1 319 423</td><td>1 292 496</td><td>80 781</td><td>2 692 700</td></tr>
<tr><td>2017</td><td>1 371 924</td><td>1 067 052</td><td>101 624</td><td>2 540 600</td></tr>
<tr><td>2018</td><td>1 491 273</td><td>733 801</td><td>142 026</td><td>2 367 100</td></tr>
<tr><td>2019</td><td>1 502 215</td><td>623 997</td><td>184 888</td><td>2 311 100</td></tr>
</table>
<table>
<tr><td>Calculate percentage of total sales for one fuel type for all four years

(seen on table, written or plotted on chart)</td><td>Petrol sales:
2016 = 49%
2017 = 54%
2018 = 63%
2019 = 65%
or
Diesel sales
2016 = 48%
2017 = 42%
2018 = 31%
2019 = 27%
or
EV Sales:
2016 = 3%
2017 = 4%
2018 = 6%
2019 = 8%</td><td>1 mark</td></tr>
<tr><td>Calculate percentage of total sales for all fuel types for all four years

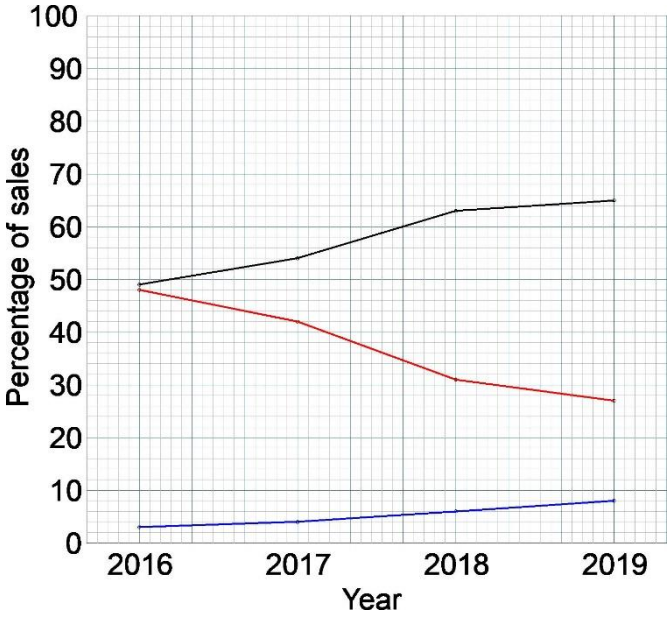
(seen on table, written or plotted on chart)</td><td>Petrol sales:
2016 = 49%
2017 = 54%
2018 = 63%
2019 = 65%
and
Diesel sales
2016 = 48%
2017 = 42%
2018 = 31%
2019 = 27%
and
EV Sales:
2016 = 3%
2017 = 4%</td><td>2 marks</td></tr>
</table>
</td><td>4 marks</td><td>AO4 2c</td></tr>
</table>

	2018 = 6% 2019 = 8%	
Accurate plotting of all three fuel types	Either as 3 lines on single set of axes **or** Triple bar chart representing fuel types per year. **or** as a percentage composite bar chart	1 mark
Accurate labelling of axes and inclusion of a key	Year / Percentage sales	1 mark

Expected plotted responses:

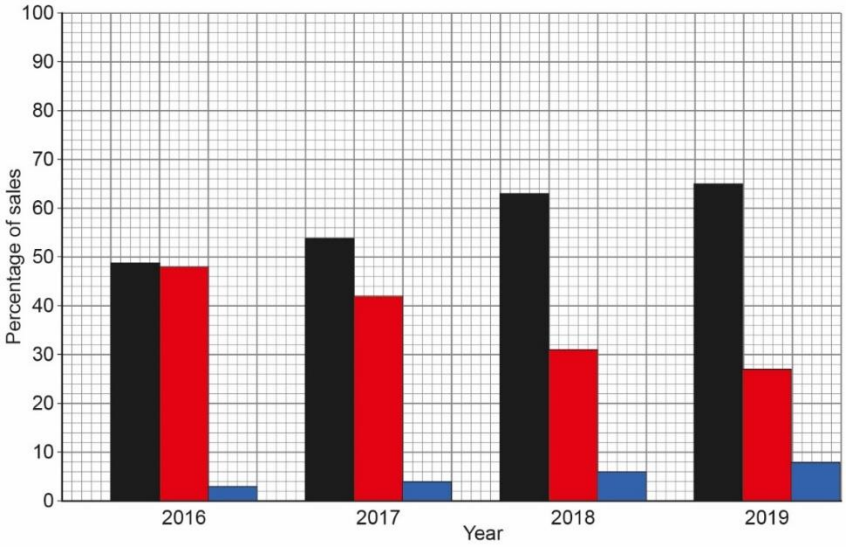


Three lines on a single set of axes



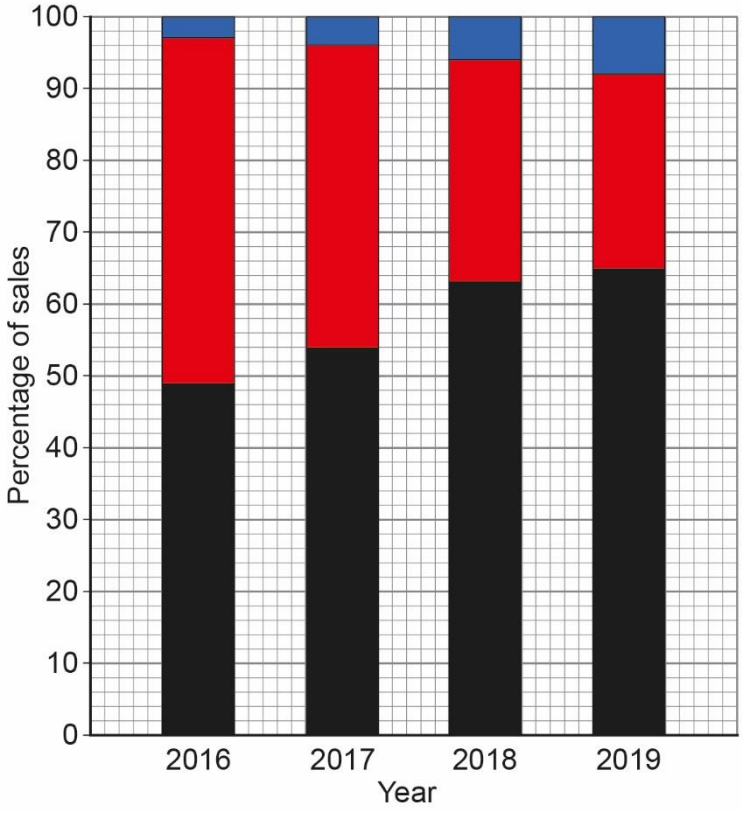
or

Triple bar chart representing fuel types per year.



or

A percentage composite bar chart



<table>
<tr><th>Qu</th><th>Part</th><th>Marking Guidance</th><th>Total marks</th><th>AO</th></tr>
<tr><td>07</td><td></td><td>Discuss the issues associated with the development of electric vehicles.

<table>
<tr><td>Marks</td><td>Description</td></tr>
<tr><td>5–6 marks</td><td>The response shows a detailed analysis of issues surrounding the development of electric vehicles such as fuel, infrastructure, cost.</td></tr>
<tr><td>3–4 marks</td><td>The response shows a good analysis of some issues with the development of electric vehicles. Answers may include misconceptions.</td></tr>
<tr><td>1–2 marks</td><td>The response shows some basic understanding of general issues surrounding electric vehicles.</td></tr>
<tr><td>0 marks</td><td>No response or nothing worthy of credit.</td></tr>
</table>

Indicative content

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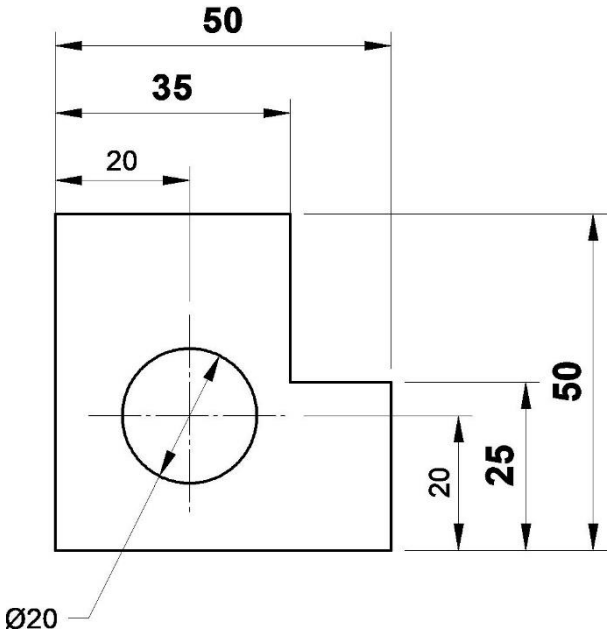
• Hazardous substances used in battery development
• Environmental concerns with extraction of materials for battery development (rare earth elements)
• Reference to the use of fossil fuels in the production of electric vehicles.
• Electric cars are prohibitively expensive in comparison to petrol and diesel alternatives
• Diminishing oil supplies and raising costs are encouraging some consumers to convert to electric vehicles.
• Increasing costs of diesel and petrol may encourage consumers to consider electric alternatives
• Range of a single charge can be a concern.
• Current charging infrastructure is not sufficient
• High temperatures (in the sun) can degrade the battery.
• Customer concerns re: ongoing maintenance costs such as replacement batteries/disposal of batteries
• Development of electric vehicles is a huge cost for car companies.
• Emissions from electric vehicles during use and environmental factors are a huge benefit for electric vehicles.
• Government targets for no new petrol or diesel car sales after 2030 are driving developments and investment in infrastructure.

Accept any other valid responses.</td><td>6 marks</td><td>AO3 2a
AO3 2b</td></tr>
</table>

Qu	Part	Marking Guidance	Total marks	AO
08		Fully dimension the drawing shown in **Figure 3** to minimise dimensional inaccuracies. Use the 5 mm grid and the datum labelled in red for your task. Evidence of 2 horizontal and 2 vertical dimensions for external shape with dimensioning lines used to indicate extremes of the dimension. — 1 mark Diameter of circle shown in recognised format (**ø20** or **R10** or **r10**) — 1 mark Centre of circle correctly dimensioned vertically and horizontally. — 1 mark All major external dimensions (emboldened on diagram below) taken from the datum point provided. — 1 mark If the drawing is over dimensioned then ignore unnecessary additions. 	**4 marks**	AO4 2c

<table>
<tr><th>Qu</th><th>Part</th><th>Marking Guidance</th><th>Total marks</th><th>AO</th></tr>
<tr><td>09</td><td></td><td>Outline the ways a design team can reduce the time from idea conception to product release.

<table>
<tr><td>Marks</td><td>Description</td></tr>
<tr><td>5–6 marks</td><td>The response gives a detailed description of specific, relevant methods used to reduce time from idea conception to product release.</td></tr>
<tr><td>3–4 marks</td><td>The response gives a good description of suitable methods to reduce time from idea conception to product release.</td></tr>
<tr><td>1–2 marks</td><td>The response gives a basic description of generic methods, which are largely appropriate to reduce time from idea conception to product release</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.

• Constant reference to a detailed specification ensures concepts are appropriate.
• Focus groups and effective primary research ensures that concepts meet consumer demands.
• Rapid prototyping using 3D printing techniques allows clients and consumers to visualise concepts and make adjustments early on in the development process.
• Use of online shared documents to enable collaboration between workers.
• The use of concurrent engineering to ensure all members of the team are involved throughout the development will reduce lead time as errors can be found earlier.
• The use of critical path analysis allows the team to predict log jams and allocate staffing accordingly to prevent delays, this also ensures that all processes are started as promptly and early as possible.
• The use of a project management system to check the progress of all elements at regular intervals and redistribute staffing accordingly increases efficiency, (SCRUM).
• The use of a project management system to analyse all processes and reduce errors, (Six sigma).
• The use of virtual modelling of concepts prior to production reduces monetary investment and time in production processes that may be incorrect.

Accept any other valid responses.</td><td>6 marks</td><td>AO4 2b</td></tr>
</table>

Qu	Part	Marking Guidance	Total marks	AO
10		State **four** of Dieter Rams' principles of good design. **One** mark for **each** correct answer up to a maximum of **four** marks. **Indicative content** • Good design is innovative. • Good design makes a product useful. (function as intended) • Good design is aesthetic. • Good design is understandable. • Good design is unobtrusive. • Good design is honest. • Good design is long lasting. • Good design is thorough down to the last detail. • Good design is environmentally friendly. • Good design is as little design as possible.	**4 marks**	AO4 2a

Qu	Part	Marking Guidance	Total marks	AO
11		Explain why utility furniture was introduced after the Second World War. Marks / Description 3–4 marks: The response gives a detailed explanation of utility furniture and reasons for its introduction. 1–2 marks: The response gives a basic explanation of utility furniture. 0 marks: No response or nothing worthy of credit. **Indicative content** The guidance provided is illustrative and not exhaustive. Credit any worthy points made in support of the band descriptors above. • Utility products were designed to make use of locally sourced materials due to limited resources after the war. • There was a need for simple good quality furniture due to vast bomb damage within many cities and towns. • The production of standardised plans allowed a wide range of manufacturers from around the country to produce the products efficiently. • The production at local manufacturer level was also aimed at a reduction in consumption. **Accept any other valid responses.**	**4 marks**	AO4 2b

Qu	Part	Marking Guidance	Total marks	AO
12		State **two** stages found on a product life cycle graph. **One** mark for **each** correct answer up to a maximum of **two** marks. **Indicative content** **Stages:** • introduction • evolution • growth • maturity • decline • replacement/retire/remove from sale • product extension.	**2 × 1 mark**	AO4 2a

Qu	Part	Marking Guidance	Total marks	AO
13		**Figures 4** and **5** show **two** different drawing types. State the drawing type used in **each** figure. **One** mark for **each** correctly identified drawing type. **Figure 4** – Isometric (drawing) **Figure 5** – Orthographic (projection)	**2 marks**	AO4 2a

Qu	Part	Marking Guidance	Total marks	AO
14		Name **two** primary research methods. **One** mark for **each** correct research method up to a maximum of **two** marks. **Indicative content** • client interviews • focus groups • surveys/questionnaires • product analysis/disassembly • practical testing/experiments • anthropometric data gathering • beta testing • site/location visits **Accept any other valid responses.**	**2 marks**	AO4 2a

<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></td><td>
Figures 6 and 7 show two mobility aids used to increase stability when standing and walking.
<table>
<tr><th></th><th>Figure 6</th><th>Figure 7</th></tr>
<tr><td>Frame material</td><td>Aluminium tube</td><td>Aluminium casting</td></tr>
<tr><td>Braking</td><td>None</td><td>Cable brakes with lever</td></tr>
<tr><td>Height adjustment</td><td>Telescopic tube and press button</td><td>None</td></tr>
</table>
Compare the suitability of the mobility aids for use around the home and garden.
<table>
<tr><td>Marks</td><td>Description</td></tr>
<tr><td>5–6 marks</td><td>The response provides analysis and evaluation of the mobility walkers using the full range of data provided to draw insightful conclusions regarding its appropriateness to the situation.</td></tr>
<tr><td>3–4 marks</td><td>The response provides a good analysis and evaluation of the mobility walkers using the majority of the information provided to relate to the situation.</td></tr>
<tr><td>1–2 marks</td><td>The response provides a basic analysis of the mobility walkers referring to some aspects of the information given.</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. Each point below shows a comparison and three comparative statements fully addressing the table of data would be sufficient for a mark in the top band.

• Figure 6 uses standard stock form of tube keeping manufacture cost low whereas Figure 7 is a formed frame requiring a specific mould increasing cost.
• Figure 6 requires no braking as it has no wheels reducing components and complexity and reducing risk to the user.
• Figure 7 uses cable operated brakes which require user application and may lead to accidents if not applied correctly.
• Figure 6 can be adjusted in height through telescopic tubes that can be set to the individual user. These are at set intervals that
</td><td>6 marks</td><td>AO3 2a
AO3 2b</td></tr>
</table>

		may not be ideal but keep the cost of production low. **Figure 7** has handle height adjustment with quick release. • **Figure 6** requires lifting and weight to be placed on feet while the frame is lifted. **Figure 7** rolls putting less pressure on feet and leg joints. • **Figure 6** is a basic frame with no extra seat and storage features, unlike **Figure 7** this keeps the cost of **Figure 6** down. • **Figure 6** has a simple fabricated design with temporary joints that can't be folded down by the user. **Figure 7** can be collapsed and easily stored by the user. • **Figure 6** is designed for ease of replacement due to standardised parts, whereas **Figure 7** requires higher cost replacement components. **Accept any other valid responses.**		

<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></td><td>
Figure 8 shows a water pump used in an isolated village.
<table>
<tr><th>Feature</th><th>Description</th></tr>
<tr><td>Power</td><td>Hand operated mechanical pump</td></tr>
<tr><td>Fabrication</td><td>Standardised nuts and bolts</td></tr>
<tr><td>Material</td><td>Low-carbon steel sheet</td></tr>
<tr><td>Design</td><td>Open-sourced</td></tr>
<tr><td>Finish</td><td>Galvanising</td></tr>
</table>
Analyse and evaluate the suitability of the water pump design for this isolated village.
<table>
<tr><td>Marks</td><td>Description</td></tr>
<tr><td>5–6 marks</td><td>The response provides analysis and evaluation of the water pump using the range of data provided to draw insightful conclusions regarding its appropriateness to the situation.</td></tr>
<tr><td>3–4 marks</td><td>The response provides a good analysis and evaluation of the water pump using some of the information provided to relate to the situation.</td></tr>
<tr><td>1–2 marks</td><td>The response provides a basic analysis of the water pump referring to aspects of the information given.</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.

• Use of standardised fixings makes repair easy.
• Hand operated means no reliance on power which may not be available or may be intermittent.
• Low cost components make theft unattractive meaning more likely to remain in working condition.
• Open-sourced design is free which makes the product accessible to all.
• Temporary fabrication methods meaning maintenance can be performed by locals without investment in specialist tools.
• Operation is intuitive and doesn’t require instructions or training.
• Galvanised finish will protect the pump from corrosion without chipping.
</td><td>6 marks</td><td>AO3 2a
AO3 2b</td></tr>
</table>

		• Sheet steel may become too hot to comfortably touch/use in a hot climate. **Accept any other valid responses.**		

Qu	Part	Marking Guidance	Total marks	AO
17		Explain the impact of a product recall on a manufacturer of electrical goods. Marks / Description 3–4 marks: The response gives a detailed explanation of the impact of a product recall on a manufacturer of electrical goods. 1–2 marks: The response gives a basic explanation of a product recall as an issue. 0 marks: No response or nothing worthy of credit. **Indicative content** The guidance provided is illustrative and not exhaustive. Credit any worthy points made in support of the band descriptors above. • The brand image will be damaged from the need for a recall. • The way the recall is handled will be analysed in the media and may cost jobs and profits. • All customers who have purchased the product will need contacting. • Products will need collecting/homes may need visiting for repairs to be conducted. • The product may need re-designing or adjustments to moulds/tooling. • All recalled products will need repairing or disposal. • All disposal will need to comply with WEEE regulations. All points have an associated cost implication. **Accept any other valid responses.**	**4 marks**	AO4 2c