



Oxford Cambridge and RSA

## **Cambridge National**

### **Engineering**

#### **R105/01: Engineering Design: Design briefs, design specifications and user requirements**

Level 1/2 Cambridge National Certificate/Award

### **Mark Scheme for June 2022**

OCR (Oxford Cambridge and RSA) is a leading UK awarding body, providing a wide range of qualifications to meet the needs of candidates of all ages and abilities. OCR qualifications include AS/A Levels, Diplomas, GCSEs, Cambridge Nationals, Cambridge Technicals, Functional Skills, Key Skills, Entry Level qualifications, NVQs and vocational qualifications in areas such as IT, business, languages, teaching/training, administration and secretarial skills.

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This mark scheme is published as an aid to teachers and students, to indicate the requirements of the examination. It shows the basis on which marks were awarded by examiners. It does not indicate the details of the discussions which took place at an examiners' meeting before marking commenced.

All examiners are instructed that alternative correct answers and unexpected approaches in candidates' scripts must be given marks that fairly reflect the relevant knowledge and skills demonstrated.

Mark schemes should be read in conjunction with the published question papers and the report on the examination.

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**MARKING INSTRUCTIONS****PREPARATION FOR MARKING****RM ASSESSOR**

1. Make sure that you have accessed and completed the relevant training packages for on-screen marking: *RM Assessor Assessor Online Training*; *OCR Essential Guide to Marking*.
2. Make sure that you have read and understood the mark scheme and the question paper for this unit. These are posted on the RM Cambridge Assessment Support Portal <http://www.rm.com/support/ca>
3. Log-in to RM Assessor and mark the **required number** of practice responses (“scripts”) and the **number of required** standardisation responses.

YOU MUST MARK 10 PRACTICE AND 10 STANDARDISATION RESPONSES BEFORE YOU CAN BE APPROVED TO MARK LIVE SCRIPTS.

**MARKING**

1. Mark strictly to the mark scheme.
2. Marks awarded must relate directly to the marking criteria.
3. The schedule of dates is very important. It is essential that you meet the RM Assessor 50% and 100% (traditional 40% Batch 1 and 100% Batch 2) deadlines. If you experience problems, you must contact your Team Leader (Supervisor) without delay.
4. If you are in any doubt about applying the mark scheme, consult your Team Leader by telephone or the RM Assessor messaging system, or by email.

## 5. Crossed Out Responses

Where a candidate has crossed out a response and provided a clear alternative then the crossed out response is not marked.

Where no alternative response has been provided, examiners may give candidates the benefit of the doubt and mark the crossed out response where legible.

### Rubric Error Responses – Optional Questions

Where candidates have a choice of question across a whole paper or a whole section and have provided more answers than required, then all responses are marked and the highest mark allowable within the rubric is given. Enter a mark for each question answered into RM assessor, which will select the highest mark from those awarded. *(The underlying assumption is that the candidate has penalised themselves by attempting more questions than necessary in the time allowed.)*

### Multiple Choice Question Responses

When a multiple choice question has only a single, correct response and a candidate provides two responses (even if one of these responses is correct), then no mark should be awarded (as it is not possible to determine which was the first response selected by the candidate). *When a question requires candidates to select more than one option/multiple options, then local marking arrangements need to ensure consistency of approach.*

### Contradictory Responses

When a candidate provides contradictory responses, then no mark should be awarded, even if one of the answers is correct.

### Short Answer Questions (requiring only a list by way of a response, usually worth only **one mark per response**)

Where candidates are required to provide a set number of short answer responses then only the set number of responses should be marked. The response space should be marked from left to right on each line and then line by line until the required number of responses have been considered. The remaining responses should not then be marked. Examiners will have to apply judgement as to whether a 'second response' on a line is a development of the 'first response', rather than a separate, discrete response. *(The underlying assumption is that the candidate is attempting to hedge their bets and therefore getting undue benefit rather than engaging with the question and giving the most relevant/correct responses.)*

### Short Answer Questions (requiring a more developed response, worth **two or more marks**)

If the candidates are required to provide a description of, say, three items or factors and four items or factors are provided, then mark on a similar basis – that is downwards (as it is unlikely in this situation that a candidate will provide more than one response in each section of the response space.)

**Longer Answer Questions** (requiring a developed response)

Where candidates have provided two (or more) responses to a medium or high tariff question which only required a single (developed) response and not crossed out the first response, then only the first response should be marked. Examiners will need to apply professional judgement as to whether the second (or a subsequent) response is a 'new start' or simply a poorly expressed continuation of the first response.

6. Always check the pages (and additional objects if present) at the end of the response in case any answers have been continued there. If the candidate has continued an answer there, then add a tick to confirm that the work has been seen.
7. Award No Response (NR) if:
  - there is nothing written in the answer space













Award Zero '0' if:

- anything is written in the answer space and is not worthy of credit (this includes text and symbols).

Team Leaders must confirm the correct use of the NR button with their markers before live marking commences and should check this when reviewing scripts.

8. The RM Assessor **comments box** is used by your team leader to explain the marking of the practice responses. Please refer to these comments when checking your practice responses. **Do not use the comments box for any other reason.**  
If you have any questions or comments for your team leader, use the phone, the RM Assessor messaging system, or e-mail.
9. *Assistant Examiners will send a brief report on the performance of candidates to their Team Leader (Supervisor) via email by the end of the marking period. The report should contain notes on particular strengths displayed as well as common errors or weaknesses. Constructive criticism of the question paper/mark scheme is also appreciated.*

10. Only these annotations, (including abbreviations), used in RMassessor3 for marking this examination must be used when marking R105/01.

Annotation	Meaning of annotation
	Blank page
	Vague
	Tick
	Incorrect, Noted but no credit given
	Unclear – cannot read
	Repeat
	Benefit of doubt
<b>Annotations to be used for Question 4c* only are below (note NO <b>Ticks</b> are used on this question part).</b>	
	Knowledge
	Development – Developed Knowledge <b>K</b> point
	Level 1 - See mark scheme pages 14-15 for Level descriptions
	Level 2 - See mark scheme pages 14-15 for Level descriptions
	Level 3 - See mark scheme pages 14-15 for Level descriptions

For additional extra pages to the exam booklet, use **BP** where the page is completely blank (extra pages only)

### 11. Subject Specific Marking Instructions – R105/01

Mark all questions using the **tick** when answer is correct, **BOD** (benefit of doubt) may be awarded on some occasions accompanied by the **tick**. Incorrect answers or those not worthy of the mark use **SEEN**. **You must not use X**

Where no answer / work is presented and left blank, use **SEEN** to shown that the answer has been seen, and entre **NR** (No Response). **Do not use 0** if there is no attempted answer.

**Q4c\*** the candidate is expected to discuss knowledge of the question. When knowledge points are valid this should be shown by inserting a K above the written text. If the knowledge point is explained/justified then **DEV** (development of point) should be added above the written text. Once the candidates answer has been read it should be awarded a level for the response according to the descriptors in the body of this mark scheme which should be indicated as **L1**, **L2**, **L3** with an appropriate mark awarded.

Question		Answer/Indicative content			Mark	Guidance	
1	(a)	One mark awarded for each correct answer			4	Accept these answers only	
			<b>Material name</b>	<b>Composite</b>			<b>Not composite</b>
		1	Aluminium				✓
		2	Carbon Fibre	✓			
		3	Concrete	✓			
		4	Copper				✓
		5	Fibre Glass	✓			
		6	MDF	✓			
	(a)	(ii)	Award up to two marks for a valid response e.g.			2	1 mark for reference to mixture or combination of material  1 mark for reference to the enhanced characteristic or property, or reference to making the material better  No additional mark given for reference to a composite example
			<ul style="list-style-type: none"> <li>• A material made from two or more different materials (1) that when combined, produce a different material with new characteristics. (1) e.g. stronger</li> <li>• A material with improved properties, such as strength / weight (1) that is made by combining two different materials (1).</li> </ul>				



Question		Answer/Indicative content	Mark	Guidance
	(b) (i)	<p>Award up to 2 marks for a valid response e.g.</p> <ul style="list-style-type: none"> <li>• Purchase of complex machinery (1)</li> <li>• Purchase of tooling (1)</li> <li>• Cost of finishing processes (1)</li> <li>• Difficult to cut / melt / form (1)</li> <li>• Requires lots of different processes (1)</li> <li>• More energy needed to process (1)</li> <li>• Machines heating up material (1)</li> <li>• Machines running longer (1)</li> <li>• Skilled workers and higher pay/salaries</li> <li>• Extraction of materials may require more work</li> <li>• Separating materials after extraction takes longer</li> </ul>	2	<p>Award other valid responses – must relate to costs associated with working with the material.</p> <p>Do not award the following:</p> <p>‘More time’ ‘More effort’ ‘Labour intensive’ ‘More spent’ ‘would cost more’ ‘more expensive materials cost more to process’</p> <p>Answers related to ‘time’ must be qualified to achieve 1 mark.</p>
	(b) (ii)	<p>Award up to 2 marks for a valid response e.g.</p> <ul style="list-style-type: none"> <li>• Expectations of the client (1)</li> <li>• Timescale (1)</li> <li>• Supply chain /material <u>availability</u> (1)</li> <li>• Labour costs (1)</li> <li>• Market conditions (1)</li> <li>• Legislative/safety requirements (1)</li> <li>• Complexity / technology used in the design (1)</li> <li>• Transportation (1)</li> <li>• Scale of Production (1)</li> <li>• Prototyping (1)</li> <li>• Testing (1)</li> <li>• User needs – e.g., aesthetic requirements, benefits and features, ergonomics and anthropometric issues (1)</li> </ul>	2	<p>Award other valid responses – must relate to the design phase, not production.</p> <p>Do not award the following:</p> <p>‘materials /parts needed...’ ‘money/costs’ ‘maintenance’ ‘size’ ‘quality’</p>
<b>Total</b>			<b>[10]</b>	

Question		Answer/Indicative content	Mark	Guidance
2	(a)	<p>Award one mark for each valid response up to a total of 2 marks i.e.</p> <ul style="list-style-type: none"> <li>• Strengths and weaknesses of competitors products (1)</li> <li>• Improvements in materials (1)</li> <li>• <u>New</u> manufacturing processes/innovation (1)</li> <li>• Budget (1)</li> <li>• Target cost of the product (1)</li> <li>• Similar and Iconic products (1)</li> <li>• Technology Push (1)</li> <li>• Client needs (1)</li> <li>• User needs (1)</li> <li>• Legislative issues (1)</li> <li>• The problem the product must solve (1)</li> <li>• Purpose of the product (1)</li> </ul>	2	Do not accept award of market research such as, 'Gap in the market' or 'trends.'
	(b)	(i)		
		<u>Market</u> pull (1)	1	Only correct answer Accept 'marketing'
	(b)	(ii)		
		Technological <u>push</u> (1)	1	Only correct answer

	<b>(c)</b>	<p>Award one mark for each valid response up to total of 2 marks i.e.</p> <ul style="list-style-type: none"> <li>• Primary research (1)</li> <li>• Secondary research (1)</li> <li>• Focus group (1)</li> <li>• Interviews (1)</li> <li>• Survey (1)</li> <li>• Questionnaire (1)</li> <li>• Internet research/social media reviews/market trends (1)</li> <li>• Books or (not both) journals (1)</li> </ul>	<b>2</b>	<p>Do not award:</p> <p>‘Testing’</p> <p>Accept: ‘products already being sold’</p>
	<b>(d)</b>	<p>Award up to four marks for a valid explanation e.g.</p> <ul style="list-style-type: none"> <li>• Market research allows designers to gather information about the users / consumers (1) this can allow them to build in/add features to the design that users / consumers want. (1) By understanding the market, designers have a greater chance of making a product that will sell (1) improving sales/profit for the business (1)</li> <li>• Identify what the customers are looking for/to respond problem to fix (1)</li> <li>• Satisfying their potential customers (1)</li> <li>• Making more money/profit (1)</li> <li>• Awareness of similar/successful/popular products (1)</li> <li>• Level of demand for a product (1)</li> <li>• Gap in market to be filled/identified (1)</li> </ul>	<b>4</b>	<p>Award 1 mark for supporting examples</p> <p>Award 1 to 2 marks for supported example with a justification</p>
<b>Total</b>			<b>[10]</b>	

Question		Answer/Indicative content	Mark	
3	(a)	<p>Award one mark for each valid response up to 2 marks i.e.</p> <ul style="list-style-type: none"> <li>• Insulated to ensure hot contents do not cause injury to the user (1)</li> <li>• Secure lid so hot contents cannot be released (1)</li> <li>• Strong material in case it is dropped (1)</li> <li>• Hygienic / easy to clean material (1)</li> <li>• Handle so don't touch hot surface (1)</li> <li>• Cup/lid to allow to cool down (1)</li> <li>• Sealed lid to prevent leaking hot liquid (1)</li> <li>• Grip/curved handle helps with holding the flask (1)</li> <li>• Good stability/flat base so it doesn't fall over (1)</li> </ul>	2	<p>Do not award:</p> <p>'No sharp edges' 'Rounded corners' 'Has a lid' or 'removable lid'</p> <p>Reference to the 'handle' must be qualified, do not award the single term 'handle'</p>
	(b)	<p>Award one mark for each valid response up to 2 marks e.g. any recognised warning label found on products:</p> <ul style="list-style-type: none"> <li>• Age restriction signs (1)</li> <li>• Do not burn/incinerate (1)</li> <li>• Flammable, corrosive, poisonous, laser inside, toxic, explosive, health hazard, hazardous to the environment, biological hazard (1)</li> <li>• Choking hazard, danger of death (1)</li> </ul>	2	<p>Cannot use: High Voltage sign or Radioactive sign</p> <p>Accept 'Hazardous' or 'Hazard'</p>

	<b>(c)</b>	<p>Award one mark for each valid response up to 2 marks e.g.</p> <p>The design could be tested to ensure it is safe (1) They could create a prototype to ensure the product is safe (1) and may apply a standard such as BSI or CE mark (1)</p> <p>The design could include error proofing (1) so the user cannot use the product incorrectly (1). A safety feature (1) could be used to stop the product working if not used properly (1) or by not using materials known to be unsafe or hazardous (1)</p>	<b>2</b>	<p>Do not award:</p> <p>‘ergonomics’ ‘no loose parts’ ‘add warnings/safety symbols’ ‘provide instructions’</p> <p>Award 1 mark for an example of testing e.g., physical or virtual testing, crash/destructive test etc.</p>
	<b>(d)</b>	<p>Award up to four marks for a valid explanation e.g.</p> <ul style="list-style-type: none"> <li>• Products may have to pass safety tests / meet legislation to be sold. (1) Ensuring a product is safe ensures it can meet these requirements/used correctly (1)</li> <li>• Consumers will have greater faith in products that are safe (1) which can improve sales. (1)</li> <li>• Products known to be safe will be purchased</li> <li>• Valid example/application which demonstrates understanding and links to product safety (1)</li> <li>• Poor safety = results in bad publicity (1)</li> <li>• Good safety = results in a good reputation (1)</li> <li>• Positive reviews through social media (1)</li> </ul>	<b>4</b>	<p>Do not award:</p> <p>‘Does not cause harm/injury’ ‘If someone gets hurt ...’ ‘No sharp edges’</p> <p>Do not award:</p> <p>‘Can be sued for injury’ – unless accompanied by an impact. i.e.: ‘lawsuit results in poor reputation’</p>
<b>Total</b>			<b>[10]</b>	

Question			Answer/Indicative content	Mark	
4	(a)	(i)	<p>Award one mark for a valid response i.e.</p> <ul style="list-style-type: none"> <li>• Making in batch reduces the cost <u>per unit</u> (1)</li> <li>• Monitor quality of each batch (1)</li> <li>• Maximise machinery / tooling use (1)</li> <li>• Optimise capacity of equipment e.g. bakery oven (1)</li> <li>• Produce varied batches e.g. colour / flavour (1)</li> <li>• Can produce a number of products/multiples at a time (1)</li> <li>• It is cost effective to batch produce, rather than off production (1)</li> <li>• Each product is identical/all products will be the same in a batch (1)</li> <li>• Respond to level/customer of demand (1)</li> </ul>	1	<p>Do not award:</p> <p>'Saves time' or 'faster' simply 'efficient'</p> <p>Allow:</p> <p>'Cheaper to produce ...' if qualified against other volumes e.g. one-off products.</p>
	(a)	(ii)	<p>Award one mark for a valid response e.g.</p> <ul style="list-style-type: none"> <li>• Increased inventory (1)</li> <li>• Manufacture in set quantities may result in additional products being made (1)</li> <li>• Down time when changing batches / tooling (1)</li> <li>• initial machine setup expensive (1)</li> <li>• Customer may need to wait for the next batch to be ready (1)</li> <li>• Demand may be too low for a whole batch (1)</li> <li>• May be left with products if the demand is not there, or demand may outstrip supply (1)</li> <li>• There is only a certain/limited amount manufactured in a batch (1)</li> <li>• If there is an error, the whole batch will have the same error (1)</li> </ul>	1	

	<b>(b)</b>	<p>Award one mark for each valid response up to 2 marks e.g.</p> <ul style="list-style-type: none"> <li>• The cost of some processes such as tooling / machinery (1) can only be offset by large quantities of products being produced (1)</li> <li>• Certain processes are repeatable (1) allowing for multiple / identical products to be made (1)</li> <li>• Some processes are labour intensive (1) which may make them unsuitable for large scale manufacture (1)</li> <li>• Automation can be used for mass production (1)</li> <li>• Can change the type of tools/machinery used (1) to speed of production (1)</li> <li>• May depend on the type of product being manufactured e.g., Plastic (1) product would be injection moulded, thus being a mass-produced item (1)</li> </ul>	<b>2</b>	<p>Answers must relate to process/specific process or machinery/tool, not just scale of production.</p> <p>Award given examples e.g.</p> <p>Mould used for mass production = 1</p>
	<b>Question</b>	<b>Guidance</b>	<b>Mark</b>	<b>Answer/Indicative content Guidance</b>
<b>4</b>	<b>(c)</b> *	<p>Award up to six marks for a discussion using examples of how just-in-time production is used in manufacturing.</p> <p><b>Level 3 (5–6 Marks)</b></p> <p>Learners provide a thorough discussion using examples of how just-in-time production is used in manufacturing. They show a clear understanding of the required question material. Specialist language and terms would be used in the appropriate areas being discussed and the required information will be well structured in its presentation.</p> <p>Good examples used to discuss how just-in-time production is used in manufacturing. Learner will demonstrate an accurate level of spelling, punctuation and grammar.</p>	<b>6</b>	<p>Examples and relevant points could include:</p> <ul style="list-style-type: none"> <li>• Just-in-time is a manufacturing principle that focuses on making components / products as they are required, at the right time</li> <li>• Components / products are manufactured at the right time and arrive at the assembly line just as they are needed</li> <li>• Suppliers will ship products to the manufacturer so they are delivered just as they are needed</li> <li>• Just-in-time allows the manufacturer to reduce inventory because materials / components are delivered as they are required</li> <li>• Inventory represents money that the company has spent on materials but not turned into saleable products. By reducing inventory there is less capital tied up in raw material</li> <li>• Just-in-time is implemented alongside other principles to improve quality and to remove defects. This means</li> </ul>

		<p><b>Level 2 (3–4 Marks)</b></p> <p>Learners provide an adequate discussion using examples of how just-in-time production is used in manufacturing. Some examples used.</p> <p>Some evidence of the use of specialist language although not always in the appropriate areas being discussed. Information, for the most part, will be reasonably structured but may contain occasional errors in spelling, punctuation and grammar.</p> <p><b>Level 1 (1–2 Marks)</b></p> <p>Learners provide a basic discussion which shows some understanding of the question material but uses little or no specialist language.</p> <p>Few or no examples used to show understanding of error proofing. Answers may be ambiguous or disjointed. Contains obvious errors in spelling, punctuation and grammar.</p> <p>0 marks = no response or no response worthy of credit. Annotate as 'Seen' at end of the response.</p>		<p>less time is spent on rework and products are delivered on time</p> <ul style="list-style-type: none"> <li>• Materials arriving as they are needed can help to increase the speed of production or reduce cycle times because the production line does not face delays when it is waiting for materials</li> <li>• Just-in-time is heavily reliant on the suppliers being able to deliver as required. Any delays at suppliers can have a dramatic impact on production causing costly delays</li> <li>• Each process in a just-in-time system is reliant on the one before it. If one process is affected this will have an impact on all the processes further down the production line</li> <li>• JIT is useful for materials that have a short shelf life such as in food production.</li> <li>• JIT is used to only produce the required amount, without excess materials to store.</li> </ul> <p>Look out of for key terms related to 'saving storage', 'products to be sold straight away'</p> <ul style="list-style-type: none"> <li>• Examples can be used to link to JIT e.g., bread, car parts, premanufactured and standard components.</li> </ul>
		<b>Total</b>	<b>[10]</b>	



Question		Answer/Indicative content	Mark	Guidance
5	(a)	<p>Award one mark for each valid response up to 2 marks</p> <ul style="list-style-type: none"> <li>• To share multiple ideas/solution to a problem (1)</li> <li>• To consider different aesthetic/looks of a solutions (1)</li> <li>• To gain customer feedback on different designs (1)</li> <li>• Client can choose which design they like best (1)</li> <li>• To include the best parts/choose the best of the designs (1)</li> <li>• To see which design best fits market gap (1)</li> <li>• To ensure a design can fit with the budget (1)</li> <li>• In case one or some of the ideas don't work (1)</li> </ul>	2	<p>Be careful not to award marks for a repeat of the question i.e. 'range of options'</p> <p>Award other valid responses</p>
	(b)	<p>Award one mark for a valid response i.e.</p> <ul style="list-style-type: none"> <li>• Hand drawn rendering (1)</li> <li>• 3D CAD models (1)</li> <li>• 2D Design software / PowerPoint (1)</li> <li>• Animations / simulations (1)</li> <li>• Computer rendered designs (1)</li> <li>• Prototypes/physical/virtual models/3D printing (1)</li> </ul>	1	<p>Do not award other types of engineering drawing e.g., Orthographic, sectional, exploded view drawing</p> <p>'Present' in the question means visual.</p> <p>Allow specific design software brands i.e. 2D design, Solidworks, Sketchup, etc.</p>
	(c)	<p>Award one mark for each valid response i.e.</p> <ul style="list-style-type: none"> <li>• Dimensions / Measurements/Sizes (1)</li> <li>• Tolerances (1)</li> <li>• Material used (1)</li> <li>• Units (1)</li> <li>• Surface finish (1)</li> <li>• Assembly information (1)</li> <li>• Sectioned views (1)</li> <li>• Scale/proportions (1)</li> <li>• Labelling of parts/annotation (1)</li> </ul>	3	<p>Do not award:</p> <p>'Scale of production'</p> <p>'Parts'</p> <p>'How it is built'</p> <p>'Colour'</p> <p>'Shape of the product'</p> <p>'Sketches'</p> <p>'Anthropometrics/ergonomics'</p> <p>Do award:</p> <p>'How it is put together'</p>

			Continued next page:  <ul style="list-style-type: none"> <li>• Placement of components (1)</li> <li>• Exploded view (1)</li> <li>• Allows you to observe different elevations (plan, side, front views) (1)</li> </ul>		
	<b>(d)</b>		Award up to four marks for a valid explanation e.g.  <ul style="list-style-type: none"> <li>• The engineering drawing tells the manufacturer what the expectations of the component / product are. (1)</li> <li>• They ensure components are made to the correct size (1) and that the surface finish is to an appropriate quality. (1)</li> <li>• This ensures when the component / product is assembled it all fits and meets client / user expectations. (1)</li> <li>• Reference to accuracy, quality, within tolerance, little variation (1)</li> </ul>	<b>4</b>	Award other valid responses  No marks awarded giving reference to 'allows you to make changes'
			<b>Total</b>	<b>[10]</b>	

Question			Answer/Indicative content	Mark	Guidance
<b>6</b>	<b>(a)</b>	<b>(i)</b>	Award one mark for each valid response up to 2 marks i.e.  <ul style="list-style-type: none"> <li>• Wind power/Wind turbine/Windmill/Wind (1)</li> <li>• Solar/Sunlight/Sun (1)</li> <li>• Hydroelectric (1)</li> <li>• Biomass/Wood (1)</li> <li>• Wave power (1)</li> <li>• Tidal power (1)</li> <li>• Geothermal energy (1)</li> </ul>	<b>2</b>	Do not award:  Batteries Nuclear energy 'Kinetic'  Accept: Dam = BoD

	<b>(a)</b>	<b>(ii)</b>	<p>Award one mark for each valid response up to 2 marks i.e.</p> <ul style="list-style-type: none"> <li>• Crude oil/Petroleum (1)</li> <li>• Oil (1)</li> <li>• Natural gas (1)</li> <li>• Coal (1)</li> <li>• Nuclear (1)</li> <li>• Fossil fuels (1)</li> <li>• Batteries (1)</li> </ul>	<b>2</b>	<p>Do not award repeats: e.g., Petrol/Diesel/Kerosene – only provide 1 mark – can award any</p> <p>If ‘Fossil fuel’ is given, the only remaining valid second answers are: Nuclear and Batteries (as all other possible responses fall under this generic heading of Fossil fuels).</p>
	<b>(b)</b>		<p>Award one mark for each valid response up to 2 marks i.e.</p> <ul style="list-style-type: none"> <li>• Cause less pollution / emissions/CO<sub>2</sub> (1)</li> <li>• Less damaging to natural habitats (1)</li> <li>• Does not harm the environment/contribute to climate change/Global warming (1)</li> <li>• Reduces mining / extraction (1)</li> <li>• Not reliant on finite resources that will eventually run out (1)</li> <li>• Never runs out (1)</li> <li>• The design of the product will be more sustainable (1)</li> <li>• improving reputation (1)</li> </ul>	<b>2</b>	<p>Do not to award:</p> <p>‘Cheaper’/‘Cheap to run’ Simply ‘Sustainable’ - answers must be qualified about the design being more sustainable.</p> <p>Phases below <u>are</u> acceptable and can be awarded as Benefit of the Doubt’ (BOD)</p> <p>Better for the planet (1) Environmentally friendly (1) Greener for the environment (1) No damage to the environment (1) Can be reused and recycled (1)</p>

	(c)	<p>Award up to four marks for a valid explanation e.g.</p> <ul style="list-style-type: none"> <li>• The product may be made from a recycled / recyclable material (1) which could affect the production process. (1)</li> <li>• A sustainable energy source may be used to power the product (1) which could impact on the components used. (1)</li> <li>• The product may need to be disassembled at the end of its life (1), or parts are able to be reused, which will influence the components / fixings used. (1) This can change the geometry of components (1) and the manufacturing / assembly process. (1)</li> <li>• Repair, recycling, material changes, end of life considerations and the impact they have on design (1)</li> <li>• Reference to customers preferring/considering sustainable usage and environmental impact of products they use and purchase (1)</li> <li>• Including changes to meet sustainability considerations can increase the cost of the design (1) as some sustainable materials may not be easy to use /cost effective (1)</li> <li>• Design for maintenance will extend the life the product, thus improving sustainability (1)</li> <li>• Regulations may impact on the design/functions (1)</li> <li>• Sustainable energy could be used in the manufacturing processes (1).</li> </ul>	4	<p>Correct answers must relate to the <u>design</u>, not the environmental impact.</p> <p>Award correct example e.g., electric car, paper straws etc.</p> <p>'longer lasting' must be qualified.</p> <p>Do not to award:</p> <p>Answers related to environmental impact, or cost implications:</p> <p>'Rare materials'</p> <p>'Prefer to buy eco-friendly/sustainable products'</p> <p>'Cheaper to run'</p>
		<b>Total</b>	<b>[10]</b>	

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