

Cambridge National

Engineering Design

R038/01: Principles of engineering design

Level 1/2 Cambridge National Certificate/Award/Diploma

Mark Scheme for June 2024

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.

It is also responsible for developing new specifications to meet national requirements and the needs of students and teachers. OCR is a not-for-profit organisation; any surplus made is invested back into the establishment to help towards the development of qualifications and support, which keep pace with the changing needs of today's society.

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.

© OCR 2024

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. For answers marked by levels of response:

- To determine the level** – start at the highest level and work down until you reach the level that matches the answer
- To determine the mark within the level**, consider the following

Descriptor	Award mark
On the borderline of this level and the one below	At bottom of level
Just enough achievement on balance for this level	Above bottom and either below middle or at middle of level (depending on number of marks available)
Meets the criteria but with some slight inconsistency	Above middle and either below top of level or at middle of level (depending on number of marks available)

Consistently meets the criteria for this level	At top of level
--	-----------------

11. Annotations

Annotation	Meaning
	Seen
	Tick
	Repetition
	Vague
	Unclear – <i>Must only to be used if the answer cannot be read / illegible</i>
	Benefit of the doubt (= a mark)
	Level 1
	Level 2
	Level 3

Applying the annotations

Every page must have an annotation stamp on it to indicate you have checked all the pages that are available. If a page is blank, use the 'seen' stamp.


Levels of response questions

- Do **not** use ticks, use the highlighter tool to indicate relevant sections. The number of highlighted sections does **not** equal the number of marks awarded.
- Always stamp the level number at the end of the question, e.g. L2.

Do **not** use crosses.

12. Subject Specific Marking Instructions

Question			Answer	Mark	Guidance
1			Accept any of the answers (a)(b)(c) or (d)	1	
2			(b) Material	1	Correct answer only
3			(a) Breadboarding	1	Correct answer only
4			(a) 30°	1	Correct answer only
5			(b) A design process where the designer focuses on the user and their needs	1	Correct answer only

Question			Answer	Mark	Guidance
6			(b) To show how parts are put together to make a final product.	1	Correct answer only
7			(a) Employee wages	1	Correct answer only
8			(d) Chrome plating a door handle	1	Correct answer only
9			(c)  (Radius)	1	Correct answer only
10			(a) Being able to disassemble a product at the end of its life for reusable parts.	1	Correct answer only

Question			Answer	Mark	Guidance
11	(a)	(i)	<p>One correct example of product produced in batches e.g.:</p> <ul style="list-style-type: none"> • Bread / food and drink products (1) • Clothes (1) • Circuit boards (1) • Furniture (1) • Clothes (1) • Paint (1) • Wallpaper (1) <p>Award credit for any other appropriate response</p>	1	<p>Award any valid batch produced product/s.</p> <p>Award a mark for most food / drink products except as noted below.</p> <p>Do not award:</p> <ul style="list-style-type: none"> • bespoke / personalised products • eggs • one-off products. <p>If in doubt, award BOD.</p>
11	(a)	(ii)	<p>Any one from:</p> <ul style="list-style-type: none"> • Aesthetics (1) • cost / budget (1) • customer / client / user (1) • environment (1) • size / weight / mass (1) • safety (1) • function / purpose (1) • material (1) 	1	Do not award 'Sustainability'

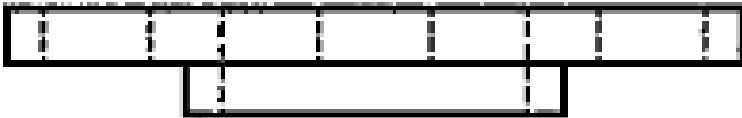
Question			Answer	Mark	Guidance												
11	(b)		<p>One mark for each correct process from the given list i.e.:</p> <table><tr><th>Product</th><th>Manufacturing process</th></tr><tr><td>Blow moulded bottle</td><td>Forming (1)</td></tr><tr><td>Riveted toolbox</td><td>Joining (1)</td></tr><tr><td>Polished aluminium tap</td><td>Finishing (1)</td></tr><tr><td>Circuit board and components</td><td>Assembly</td></tr><tr><td>Machine turned bolt</td><td>Wasting (1)</td></tr></table>	Product	Manufacturing process	Blow moulded bottle	Forming (1)	Riveted toolbox	Joining (1)	Polished aluminium tap	Finishing (1)	Circuit board and components	Assembly	Machine turned bolt	Wasting (1)	4	Award these answers only.
Product	Manufacturing process																
Blow moulded bottle	Forming (1)																
Riveted toolbox	Joining (1)																
Polished aluminium tap	Finishing (1)																
Circuit board and components	Assembly																
Machine turned bolt	Wasting (1)																
11	(c)	(i)	<p>One mark for each correct label from the given list, in the correct position i.e.:</p> <pre>graph LR Input[Input] --> Intruder[Intruder] Intruder -- "+" --> Sum(()) Sensors[Sensors] -- "-" --> Sum Sum -- "Error Signal" --> Control[Control] Control -- "Actuating Signal" --> Plant[Plant] Plant -- "Siren / Bell" --> Output[Output] Output --> Sensors Sensors -- "Feedback" --> Sensors Process[Process] --> Plant</pre>	3													

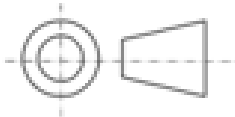
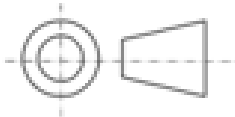
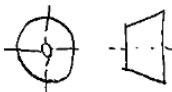
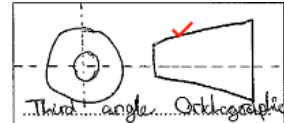
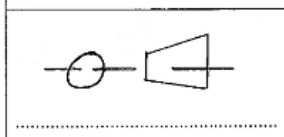
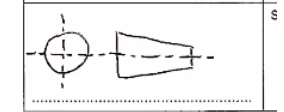
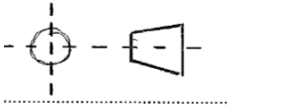
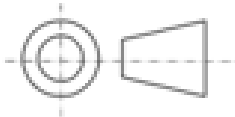
Question			Answer	Mark	Guidance																					
11	(c)	(ii)	Decision / question / choice (1)	1	Do not award ‘Yes / No’																					
12	(a)	(i)	One mark for each correct table entry as shown: <div><table><tr><th>Criteria</th><th colspan="6">Choice</th></tr><tr><th></th><th>Material A</th><th>Material B</th><th>Material C</th><th>Material D</th><th>Material E</th><th>Material F</th></tr><tr><td>Material Property</td><td>8</td><td>7</td><td>9</td><td>4</td><td>6</td><td>7</td></tr></table></div>	Criteria	Choice							Material A	Material B	Material C	Material D	Material E	Material F	Material Property	8	7	9	4	6	7	2	Correct answers only.
Criteria	Choice																									
	Material A	Material B	Material C	Material D	Material E	Material F																				
Material Property	8	7	9	4	6	7																				
12	(a)	(ii)	(Material) C	1	Correct answer only.																					

Question			Answer	Mark	Guidance
12	(a)	(iii)	<p>Any two valid points or one point plus extension, e.g.:</p> <ul style="list-style-type: none"> • Market research could show that users may not like the materials used in existing products (1) so research is necessary to find alternative materials (1) • Secondary research can be used to find out about material properties (1) to determine if there are more suitable materials / alternatives (1) • Reviews can be used to find out which materials users like / do not like (1) and how these feel / look / suit / in existing products (1) • Market research can be used to identify which materials are used in existing products (1) and use them in the new design (1) • Research can show which materials are suitable / have the correct properties for the intended use or users / or environment (1) • Different materials require different manufacturing processes (1) which impacts on the cost (1) • Research into the materials used gives designers ideas of how the product could be manufactured. (1) This helps them get a better idea of the costs (1) • Research shows which materials are more appealing (1) <p>Award credit for any other appropriate response</p>	2	<p>Award one mark for one valid point. Award two marks for two valid points. OR Award two marks for one valid point plus extension / explanation / example. OR Two relevant or different valid points made or a justified response = two marks.</p>

Question			Answer	Mark	Guidance
12	(b)	(i)	<p>Up to one mark for a valid example and up to one mark for a justification e.g.:</p> <ul style="list-style-type: none"> • They must consider the cost of the materials (1) because they will need to fit within the budget (1) • The materials may require several finishing / material removal (wasting) processes, (1) this will increase time required to manufacture (1) • The material strength must be considered (1) to ensure the material can withstand the load it is put under in operation (1) • The material may not be available in a form that can be processed. (1) There might not be available budget / equipment to process it (1) • Some materials may be reused (1) so other products can be made from them (1) <p>Award credit for any other appropriate response</p>	2	<p>One mark for example One mark for justification</p> <p>Answers may focus on: One thing could be:-</p> <ul style="list-style-type: none"> • Aesthetics / appearance / quality • availability / supply • budget • cost of forming / shaping • form of supply • joining /assembly • processing • product safety / safe to use • properties / suitability (e.g. strength, long lasting, waterproof etc.) • scale of production • sustainability / 6Rs • time.

Question			Answer	Mark	Guidance
12	(b)	(ii)	<p>A valid example, why the change is necessary and what the change is, or the impact of the change, e.g.:</p> <ul style="list-style-type: none"> Carbon fibre (1) panels may not be cost effective to produce for large scale production (1) because they add to production time for the formation and finishing of carbon fibre (1). Mahogany (1) is too expensive to transport from abroad adding to the cost of manufacture (1). A soft wood with a finish to look like mahogany is used instead (1). Bamboo (1) is difficult to join together (1) so the design was changed to use an alternative tubular material. (1) When the prototype is made and tested (1) it was necessary to change the material (1) Availability; the materials is in short supply (1) so a widely available alternative is used instead (1) <p>Award credit for any other appropriate response.</p>	3	<p>One mark for specific material or for a specific product example, or scenario.</p> <p>One mark for a valid example, even if the remainder of the answer is not worthy of marks.</p> <p>One mark for why change is necessary OR an example OR impact of the change.</p> <p>Responses might include addressing:</p> <ul style="list-style-type: none"> aesthetics availability / lack of / short supply cost customer choice environment function manufacturing capability size / form safety sustainability manufacturing capability quality

Question			Answer	Mark	Guidance
13	(a)	(i)	<p>Marks awarded for each correct aspect as shown. i.e.:</p> <ul style="list-style-type: none"> • Correct shape (1) • correct hole convention (all holes, dashed lines for hidden details) (1) • correct orientation of flange (correct way up) (1) 	3	<p>Scale / size and measurements and alignment are not required to be awarded marks.</p> <p>If upside down with correct hole convention, award two marks only.</p>

Question			Answer	Mark	Guidance																									
13	(a)	(ii)	<p>Marks awarded for each correct aspect, i.e.:</p> <ul style="list-style-type: none">Third Angle Projection symbolAbbreviation for 'Material' MAT, MATL or MatlAbbreviation for 'Drawing' DWG or DRG (drg) <table border="1"><tr><td colspan="3">ALL DIMENSIONS IN mm</td><td>DO NOT SCALE</td></tr><tr><td></td><td>Name</td><td>Date</td><td rowspan="4">Title: FLANGE SPACER</td></tr><tr><td>Drawn</td><td>OCR</td><td>01/06/2023</td></tr><tr><td>Checked</td><td></td><td></td></tr><tr><td>Approved</td><td></td><td></td></tr><tr><td colspan="3">MATL Aluminium</td><td>DRG No. 1230</td></tr><tr><td colspan="3"></td><td>Scale: 1:1</td></tr></table>	ALL DIMENSIONS IN mm			DO NOT SCALE		Name	Date	Title: FLANGE SPACER	Drawn	OCR	01/06/2023	Checked			Approved			MATL Aluminium			DRG No. 1230				Scale: 1:1	3	<p>Answers must be in the correct boxes.</p> <p>Third angle projection symbol must have two circles. The centreline is not required to be correct.</p> <p>Examples of acceptable (but not perfect /accurate) third angle project symbols:</p>   <p>Examples not worthy of a mark:</p>   
ALL DIMENSIONS IN mm			DO NOT SCALE																											
	Name	Date	Title: FLANGE SPACER																											
Drawn	OCR	01/06/2023																												
Checked																														
Approved																														
MATL Aluminium			DRG No. 1230																											
			Scale: 1:1																											

Question			Answer	Mark	Guidance
13	(a)	(iii)	<ul style="list-style-type: none"> • 3D printing / additive manufacture (1) • CAD, CAD design / CAD modelling (1) • CAM (1) • Block (1) • Physical prototype (e.g. turned on a lathe etc) (1) • Isometric / Oblique drawing <p>Award credit for any other appropriate response.</p>	1	<p>Award marks for named CAD packages i.e.: SolidWorks, AutoCAD, Fusion 360, Inventor, SpaceClaim etc. – internet search unfamiliar answers to check.</p>
13	(b)		<p>Explanation covering key points:</p> <ul style="list-style-type: none"> • 3D printing (1) can be used to make the designed product actual size (1) or to try different scales (1) • Making a physical model (1) can test if design is in proportion / fits to other parts of the design (1) so that they all fit together (1). • CAD (1) can be used to test the proportions of the design allowing it to be easily modified if required. (1) This allows designers to experiment with different proportions (1) • CAD (1) can be used to simulate the design functioning (1) to see if it fits with other parts correctly (1) • To see what it looks like (1) and see if there are any improvements needed (1) • To enable the product to be used to test it (1) <p>Award credit for any other appropriate response.</p>	3	<p>One mark for modelling example / scenario ('visual / physical, 3D printing etc)</p> <p>One mark for what is being tested (size, fit, suitability)</p> <p>One mark for appropriate justification / appropriate reason for testing / change.</p> <p>Do not award marks for merely 'test the proportion' as this is already given in the question stem.</p>

Question			Answer	Mark	Guidance
14	(a)		<p>Any one from:</p> <ul style="list-style-type: none"> • Micrometer (1) • vernier callipers [accept just 'vernier' or just 'callipers'] (1) • Steel rule (1) [accept 'ruler', 'tape measure'] • multimeter (1) • go – no go gauge (1) • scales (1) • measuring apps (1) <p>Award credit for any other appropriate response.</p>	1	
14	(b)		<p>Up to three marks for an example / scenario with an appropriate change and justification, e.g.:</p> <ul style="list-style-type: none"> • Testing of the design for a Bluetooth speaker showed that the speaker was not splashproof (1) leading to a change in the case design (1) to improve the splashproof feature when used outdoors / to meet the specification points (1) • Evaluation of the design for a car dashboard showed that changing the material finish to carbon fibre (1) added aesthetic possibilities as a feature (1) improving the appearance of the car (1) • User testing of a design for a smart watch showed that users prefer fewer buttons (1) so more touch screen features were added (1) increasing user appeal for the design. (1) • The design may be changed to lower cost (1) 	3	<p>One mark for an example or for a specific product example, or scenario.</p> <p>One mark for why the change is made.</p> <p>One mark for the impact of the change, or justification.</p> <p>Answers may just state a design feature change without stating why the change has become necessary.</p>

Question			Answer	Mark	Guidance
			Award credit for any other appropriate response.		

Question			Answer	Mark	Guidance
14	(c)		<p>Level 3 (5–6 marks) A thorough discussion of the advantages and limitations of carrying out user testing as early as possible, showing understanding of all the points stated. Consistent use of appropriate terminology. Typically, two or more points made with advantages AND limitations fully discussed.</p> <p>Level 2 (3–4 marks) An adequate discussion with some discussion of the advantages and limitations of carrying out user testing as early as possible, showing understanding of some of the points stated. Some use of appropriate terminology. One or two points made with advantages AND limitations discussed.</p> <p>Level 1 (1–2 marks) A brief discussion stating only either what user testing is or a method of testing, showing limited understanding. Little or no use of appropriate terminology. Typically, only one point covered.</p>	6	<p>Up to six marks for a discussion or detailed explanation of the advantages and limitations of carrying out user testing as early as possible in the design process.</p> <p>Responses may include reference to: Advantages:</p> <ul style="list-style-type: none"> • Designers use users to test the product or prototype to see if they like it, or if it works. • User testing allows designers to find out and analyse what users think of the design, and how users interact with the design. • Focus groups can be used to control who tests the product design. • Users test prototypes to give feedback which is then used to either inform the development, necessary changes and improvements, or confirm the design is suitable for the intended purpose or market. • Usually focus groups are given a physical model or prototype to test, the looks, feel, features, and functions of the product design.

Question			Answer	Mark	Guidance
			<p>Answers only cover one side of the discussion (advantages OR limitations).</p> <p>0 = a response that is irrelevant and/or not worthy of a mark.</p> <p>Annotate with 'Seen' at end of response.</p>		<ul style="list-style-type: none"> • Video games are one product example that undergoes user testing at different stages of the design to test the game features. • User testing can be used to test new materials, technology and designs in the intended environment. • User testing at the earlier stages of the design is important to ensure the design is fit for purpose, before going into full production or release. • If user testing is not carried out in earlier stages, time and resources could be wasted on aesthetics, materials, features and functions that may not work, or users do not like or need. • Feedback from users is used to modify and optimise the design. • User testing can ensure the design is the best as it can be within the limitations of technology, time and budget / costs. • User testing at the earlier stages of the design can reduce the cost of the designing process and reduce the time to produce a successful product. <p>Limitations:</p> <ul style="list-style-type: none"> • Releasing a design without user testing carries high risk of failure to meet user needs and wants, and lower product performance / sales.

Question			Answer	Mark	Guidance
					<ul style="list-style-type: none"> • Testing product designs is expensive. The design may not be ready or developed enough for user testing, wasting time and increasing costs. • Early user testing can require a prototype but materials and equipment may not be available in the early stages. • Materials and equipment used for an early prototype may not be able to be used in the final design. • Negative feedback received before the design is fully developed, could result in the design being scrapped, before all of the feature and benefits have been developed.
15	(a)	(i)	<p>One mark for a correct quantitative data and one mark for a correct qualitative finding from the given table:</p> <p>Quantitative data -</p> <ul style="list-style-type: none"> • 93 people said the product requires a 3 hours recharge time (1) • 64 people said the product requires an LED indicator to show charge status (1) • 51 people said a product requirement is that it must charge at least two devices at the same time (1) <p>Qualitative data finding –</p> <ul style="list-style-type: none"> • Modern design (1) • Sleek appearance (1) 	2	<p>Award marks where there is clear demonstration of knowledge of the difference between Quantitative and Qualitative data using the table.</p> <p>Answers may be an abbreviated or a similar description of the data in the table, and are not required to be an exact copy to be awarded the marks.</p> <p>Data values (i.e. 93) are not required to be awarded marks (3 hours charge time).</p>

Question			Answer	Mark	Guidance
			<ul style="list-style-type: none"> • Easily identifiable (1) • Can fit in pocket (1) 		
15	(a)	(ii)	<p>Award one mark for identifying a point of importance and one mark for explaining why it is important. e.g.:</p> <ul style="list-style-type: none"> • The design specification provides clear instructions (1) so that the product can be designed by someone else (1) • It gives information about the quality of standards that should be applied (1) which means that the product will be of the required / intended quality (1) • To outline the wants and needs of the customer (1) and how the product will solve the problem (1) • What the product requires (1) and how it can / should be made / assembled (1) 	2	<p>Award answers that are about the specification as a whole and / or answers that focus on a specific criteria within a specification.</p> <p>Award one mark for a point and one mark for a justification.</p> <p>OR</p> <p>Two marks for two separate points such as:</p> <ul style="list-style-type: none"> • Set of rules • how it can be manufactured • list of product requirements • set of criteria to be followed • suitable for the user / customer • what must be achieved.

Question			Answer	Mark	Guidance
15	(b)		<p>Award marks for a suitable form of material supply for the given material, and correct manufacturing method used in shaping / forming the material in product manufacture. E.g.:</p> <ul style="list-style-type: none"> - Aluminium (no mark) <ul style="list-style-type: none"> • Billet / sheet / plate (1) • Extrusion (1) laser cutting (1) - PVC / ABS / a polymer (no mark) <ul style="list-style-type: none"> • Pellet / granule / bead (1) • Injection moulding (1) / Extrusion (1) - Plywood (no mark) <ul style="list-style-type: none"> • Sheet (1) [accept 'plank' for 'wood'] • Laminating / bending (1) <p>Award credit for any other appropriate response.</p>	2	<p>The answers must relate to the material to be awarded marks.</p> <p>The form and method of shaping should be marked independently, and are not required to match.</p> <p>No marks for stating a material One mark for the form of supply – this should be a technical term.</p> <p>One mark for the shaping, forming or wasting process. This must a technical term as given below: Shaping processes include:</p> <ul style="list-style-type: none"> • Die casting • Injection moulding • Powder metallurgy • Sand casting • allow bending, extrusion. <p>Forming processes include:</p> <ul style="list-style-type: none"> • Forging • Moulding / moulding of composites • Pressing • Strip heating • Vacuum / thermal forming.

Question			Answer	Mark	Guidance
					<p>Wasting processes include:</p> <ul style="list-style-type: none"> • Drilling • Filing (accept sanding) • Laser-cutting • Milling • Routing • Sawing • Shearing • Threading • Turning.
15	(c)		<p>For each way, up to one mark for identifying the issue and up to one mark for explaining how it would limit production, e.g.:</p> <ul style="list-style-type: none"> • Large scale production can require larger premises for production and storage. (1) There might not be the money to buy larger premises. (1) • Mass production requires additional machinery / equipment. (1) The cost of buying the machinery / equipment needed for mass production is not within budget. (1) <p>Award credit for any other appropriate response.</p>	4	<p>One mark for identifying the issue. One mark for explaining how it would limit production for each answer (1&2).</p> <p>Cost must relate to capital cost, i.e.:</p> <ul style="list-style-type: none"> • Equipment / machinery / assets / set up costs • Land / premises <p>Do not award:</p> <ul style="list-style-type: none"> • energy • labour / workforce costs • materials <p>Materials in the context of inventory must relate to storage / holding / premises.</p>

Question			Answer	Mark	Guidance
16	(a)		<p>Linear design is a strategy where all stages are completed in a set sequence. (1) One stage is not started until the previous one is finished. (1)</p> <p>Each stage is only completed once. (1)</p> <p>Award credit for any other appropriate response.</p>	2	Award one mark for “step-by step process” or “stages”.
16	(b)	(i)	<p>Any two from:</p> <ul style="list-style-type: none"> • Exploded (1) • Freehand (1) • Geometric (1) • Isometric (1) • Oblique sketch/ drawing (1) • Orthographic (1) • Perspective (1) • Sketch (1) • Thick and thin line (1) • Using CAD (1) 	2	

Question			Answer	Mark	Guidance
16	(b)	(ii)	<p>Award up to 4 marks for evaluation of the benefits, e.g.:</p> <ul style="list-style-type: none"> • Anthropometric data can be used to design the equipment to comfortably fit the majority of the target group (1). • By using anthropometric data, users will comfortably and safely be able to reach handles used for pulling and lifting (1) • The seat height can be adjusted to fit the 5th to 95th percentile range. (1) • Average forearm to hand length data can be used to determine the position of handles (1) • To make sure it is the correct size (1) <p>Award credit for any other appropriate response.</p>	4	<p>Do not award marks for repeating the question stem.</p> <p>One mark per example point, and one mark for each point on evaluation, linked to the design of the gym equipment.</p> <p>Award marks for:</p> <ul style="list-style-type: none"> • An example of how the anthropometric data is used e.g. data is used to determine seat height, • How this benefits the user or manufacturer • Justification / impact of the benefit. <p>Ergonomic design must be linked to anthropometric data.</p>

Question			Answer	Mark	Guidance
16	(b)	(iii)	<p>Any two from:</p> <ul style="list-style-type: none"> • To test it (1) • To test the proportions (1) • To test the scale / size / measurements (1) • To test the ergonomics (1) • To test the function / how well it works (1) • To test the equipment is safe to use / for sharp edges (1) • To check the design against specification / quality standards (1) • Aesthetic design suits the surroundings / environment (1) • To identify improvements / fix errors (1) • To test it is comfortable to use (1) <p>Award credit for any other appropriate response.</p>	2	

Need to get in touch?

If you ever have any questions about OCR qualifications or services (including administration, logistics and teaching) please feel free to get in touch with our customer support centre.

Call us on

01223 553998

Alternatively, you can email us on

support@ocr.org.uk

For more information visit



ocr.org.uk/qualifications/resource-finder



ocr.org.uk



Twitter/ocrextams



/ocrextams



/company/ocr



/ocrextams



CAMBRIDGE
UNIVERSITY PRESS & ASSESSMENT

OCR is part of Cambridge University Press & Assessment, a department of the University of Cambridge.

For staff training purposes and as part of our quality assurance programme your call may be recorded or monitored. © OCR 2024 Oxford Cambridge and RSA Examinations is a Company Limited by Guarantee. Registered in England. Registered office The Triangle Building, Shaftesbury Road, Cambridge, CB2 8EA.

Registered company number 3484466. OCR is an exempt charity.

OCR operates academic and vocational qualifications regulated by Ofqual, Qualifications Wales and CCEA as listed in their qualifications registers including A Levels, GCSEs, Cambridge Technicals and Cambridge Nationals.

OCR provides resources to help you deliver our qualifications. These resources do not represent any particular teaching method we expect you to use. We update our resources regularly and aim to make sure content is accurate but please check the OCR website so that you have the most up-to-date version. OCR cannot be held responsible for any errors or omissions in these resources.

Though we make every effort to check our resources, there may be contradictions between published support and the specification, so it is important that you always use information in the latest specification. We indicate any specification changes within the document itself, change the version number and provide a summary of the changes. If you do notice a discrepancy between the specification and a resource, please [contact us](#).

Whether you already offer OCR qualifications, are new to OCR or are thinking about switching, you can request more information using our [Expression of Interest form](#).

Please [get in touch](#) if you want to discuss the accessibility of resources we offer to support you in delivering our qualifications.