



National
Qualifications
2026

2026 Design and Manufacture

Higher

Question Paper Finalised Marking Instructions

These marking instructions have been prepared by examination teams for use by Qualifications Scotland appointed markers when marking external course assessments.

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General marking principles for Higher Design and Manufacture

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

- (a) Always use positive marking. This means candidates accumulate marks for the demonstration of relevant skills, knowledge and understanding; marks are not deducted for errors or omissions.
- (b) If a candidate response does not seem to be covered by either the principles or detailed marking instructions, and you are uncertain how to assess it, you must seek guidance from your team leader
- (c) The term 'or any other valid response' allows for possible variation in candidates' responses. Always award marks according to the accuracy and relevance of an answer.
- (d) Where a question asks a candidate to **describe**, they must provide a statement or structure of characteristics and/or features. This should be more than an outline or a list. It may refer to, for example, a concept, process, experiment, situation, or facts, in the context of and appropriate to the question.
- (e) Where a question asks candidates to **explain**, they must relate cause and effect and/or make relationships between things clear, in the context of the question or a specific area within the question.
- (f) Where a question asks candidates to **discuss**, they must communicate ideas and information on a subject. It may be possible to debate two sides of the statement.

Marking instructions for each question

Section 1

Question			Expected response	Max mark	Additional guidance
1.	(a)		Candidates' explanations should relate to the materials chosen for the lamps and/or their component parts. Explanations are likely to include: Tripod studio spotlight Stained solid beech frame: • aesthetic appeal • strength, to support the weight of the spotlight • resistance to warping/straight grain • durable (wear and tear) Stainless steel spotlight casing: • resistant to heat • chemical resistant for cleaning • corrosion resistance • aesthetic appeal Acrylic spotlight lens: • transparent • easily moulded/shaped • shatter resistant • variety of colours (customisable)	6	Six valid explanations at 1 mark each. Candidates should give six different explanations. Candidates' explanations should relate to the materials chosen for the lamps and/or their component parts. Responses should include the properties of the materials chosen in relation to these products. No marks awarded for simply stating properties. No marks awarded for repetition of explanations. Exemplar responses: <i>Material suitable on the adjustable tripod spotlight is ABS is scratch resistant meaning if something hits it, it won't get damaged (0 marks).</i> <i>Material that is suitable on the adjustable tripod spotlight casing is stainless steel as it is chemical resistant, so can be cleaned with chemicals (1 mark) without fear of rusting (1 mark).</i> <i>Brass is suitable for the fixings as it is strong enough to support the weight of the lamp (0 marks), and its yellow colour adds aesthetic appeal (1 mark).</i>

Question			Expected response	Max mark	Additional guidance
			ABS on/off control switch: • good chemical resistance (easily cleaned) • durable (wear and tear) • scratch resistant (maintains aesthetics) • impact resistant (withstand knocks and bumps) Brass fittings: • aesthetic appeal • corrosion resistant Dimmable uplighter with reading lamp Chrome plated tubular mild steel frame: • durable (wear and tear) • corrosion resistant (only if chrome plating is referenced) • lightweight (if referenced to portable) Chrome plated mild steel shades: • corrosion resistant (only if chrome plating is referenced) • aesthetic appeal Mild steel base: • durable (wear and tear) • good strength/rigidity to withstand the weight of the lamp • heavy (stability) Any other suitable explanation.		

Question		Expected response	Max mark	Additional guidance
	(b)	Candidates are expected to name three appropriate manufacturing processes used in the production of the lamps and explain why each one is suitable. Explanations are likely to include: Tripod studio spotlight: • CNC machining (routing): to cut groove in shaped sections • CNC machining/sawing/thicknessing of multiple sections of same shape cut together • vacuum forming of acrylic lens • injection moulding of ABS on/off switch • press forming – stainless steel spotlight casing • die casting – casing support and handle • welding – of casing parts • piercing to provide holes for assembly (spotlight casing only) • die casting – standard components • drilling • staining for finishing	6	Any three appropriate mass manufacturing processes and their relationships regarding suitability explained. A maximum of 3 marks for naming of processes, where related to part of the product (1 mark for each process). A maximum of 3 marks for explanations of suitability. 1 mark for each explanation of suitability; where more than one explanation is given to a process, a maximum of 2 marks per process should be awarded. NB marks can be awarded for correct explanation for the feature produced if an incorrect process is given. Accept die casting when referring to the spotlight casing due to complexity of image. Accept laser cutting/injection moulding/compression moulding as alternative processes for the lens. Machining/routing must refer to CNC. Exemplar responses: <i>Injection moulding is suitable for the on/off switch as it can give surface texture (1 mark).</i> <i>Extrusion is suitable for the stainless-steel frame as it can create long hollow shapes (1 mark) with a continuous cross section (1 mark).</i> <i>Turning (0 marks) is suitable for part of the tripod light legs as it can create the cylindrical shape needed (1 mark).</i>

Question			Expected response	Max mark	Additional guidance
			Dimmable uplighter with reading Lamp: • extrusion of tubular mild steel • bending of tubular mild steel • blanking – lamp shades • piercing – reading lamp shade holes • press forming – lamp shade • die casting – control panel/reading handle • piercing to provide holes for assembly • drilling • casting – mild steel base Justification statements could include: • repeatability of process • accuracy of process • economies of scale (mass/batch) • shape/form is suitable for process • surface finish/no further finishing required • uniform cross section for extrusion • complexity of shape (injection moulding) • suitability of process to material • sheet metal suitable for press forming/blanking/piercing • creates accurate holes for fittings (only for drilling with jigs) Any other suitable explanation.		

Question			Expected response	Max mark	Additional guidance
	(c)		Candidates are expected to describe how function has influenced the design of the lamps. Descriptions are likely to refer to: • durability • easy to use • lightweight • balance/stability (explained) • foot switch (tripod lamp) • easy to adjust direction of light • easy to adjust height (tripod lamp) • easy to adjust brightness (uplighter) • self-assembly allows for easy transportation Or any other suitable description.	5	Five appropriate descriptions at 1 mark each. Up to a maximum of 5 marks.

Question			Expected response	Max mark	Additional guidance
	(d)		Candidates are expected to describe how different aesthetics have influenced the design of the lamps. (Candidates must refer to a range of aesthetic aspects in their answer) Descriptions are likely to refer to: • shape • line • form • proportion • pattern • light • texture • colour • fashion • style/brand • contrast • harmony • balance/symmetry • market trends • suitability for target market Any other suitable description.	4	Four appropriate descriptions at 1 mark each. Candidates can achieve full marks for valid descriptions of one aspect. Exemplar response: <i>Aesthetics has influenced the design of the reading lamp as it has a smooth shape making the design flow (1 mark).</i> <i>Brass fixings create contrast in colour, finish, and texture to the beech wood (1 mark).</i> <i>Repeated circle use in the reading lamp gives a sense of balance (1 mark).</i> <i>The colour of the dimmable lamp is silver (0 marks).</i> <i>Texture of the uplighter has been influenced by aesthetics as it is smooth and makes it seem sleek and high quality and futuristic and minimalistic (1 mark).</i> <i>Texture has influenced the first lamp as it is wooden, so it has a wood texture (0 marks).</i>

Question			Expected response	Max mark	Additional guidance
	(e)		Candidates are expected to describe how production and planning systems could be used to improve efficiency during the manufacture of products such as the lamps. Descriptions are likely to include: • use of production type (one off/batch/mass/flow) • quality assurance (as part of a production/planning system) • Gantt charts • flow charts • use of CNC, CAD/CAM • automation • jigs/patterns/templates • JIT • standard components • sub-contracting • rapid prototyping Any other suitable description.	4	Four appropriate descriptions at 1 mark each. Maximum of 3 marks per planning or production system. Exemplar responses: <i>Flow charts could be used to show the steps in order this allows the manufacturer to know what to do next without any technical language (0 marks).</i> <i>Standard components improve efficiency as they can be ordered cheaply in bulk meaning no time is wasted making them in-house (1 mark).</i> <i>JIT improves efficiency of manufacturing as stock is only ordered once needed so there is no need to hold excess stock cutting costs (0 marks).</i>

Section 2

Question			Expected response	Max mark	Additional guidance
2.	(a)		Candidates are expected to state the name of a suitable composite material and explain the benefits of using composite materials in the manufacture of products such as the badminton racket. Materials: • GRP • carbon fibre Explanations of benefits are likely to include: • reduced weight • increased strength • one part construction • dimensional stability • resistance to wear (durability) • no need to apply a finish • aesthetics (customisable) • impact resistance • UV resistance • improved strength/weight ratio • design flexibility (easier to form) • resistant to rot Any other suitable explanation.	3	1 mark is awarded for correct identification of a composite material. Two explanations at 1 mark each. Explanations must include reference to enhanced properties or a comparison to non-composite materials. Accept duralumin as a suitable material. Exemplar response: <i>Stainless steel (0 marks), is used as it is very strong compared to non-composite materials (1 mark).</i> <i>Carbon fibre (1 mark) as it has a good strength to weight ratio (0 marks) and it can be customised into different shapes and colours (1 mark).</i>

Question			Expected response	Max mark	Additional guidance
	(b)		Candidates are expected to describe the key stages of the following techniques that can be used to evaluate performance: • user trial • test rigs Descriptions are likely to include: User trial: • identify target market/gather focus group • distribute an existing product and give directions for use • gather feedback (detailed) • analyse information (detailed) Test rigs: • identify function to be tested • set up mechanism to carry out/repeat task • record results (detailed) • analyse information (detailed) Any other suitable description.	4	1 mark for each valid description of a key stage. Up to a maximum of 4 marks (3+1). No marks should be awarded for simply naming a research technique. Exemplar response: <i>User trial is when you establish the target market and distribute existing products (1 mark).</i> <i>Test rigs are used as they determine how strong the product is and how fit for purpose it is (0 marks).</i> <i>The first key stage of a test rig is to set up your product in a simulation area (1 mark) to see how well it works.</i>

Question			Expected response	Max mark	Additional guidance
	(c)		Candidates are expected to describe the benefits of launching under a successful brand name. Descriptions are likely to include: • free promotion through recommendation (word of mouth) • the brand can command a higher selling price • higher market share/consumer loyalty (increased turnover) • higher status (through consumer perception of quality) • consumer loyalty • exposure to a wider market • built-in trust and credibility • collaboration opportunities • retailers more likely to stock • stronger media and influencer interest Any other suitable description.	2	Two valid descriptions at 1 mark each. 2 marks may be awarded for an extended description. Exemplar responses: <i>A benefit of launching under a successful brand name is it easily recognised (0 marks).</i> <i>If people see a product by a well-known and trusted brand, they will be more inclined to buy it as they will have faith that it won't break on them (1 mark).</i> <i>Successful brands will have a reputation of good/high quality (1 mark).</i> <i>Customer base is already established as well as customer loyalty (1 mark).</i>

Question			Expected response	Max mark	Additional guidance
3.	(a)		Candidates are expected to identify two methods of protecting the IPR of products and outline what each method protects. Responses are likely to include: Method: • copyright • design-right/registering the design • trademark • patent Example: • copyright – ‘published materials’ such as literary works, art, photography, films, tv shows, music, web content. • design-right/registering the design – shape/configuration of design • trademark – name or identity/logo • patent – protect new inventions, how they work, how they are made and what they are made from Any other suitable response.	4	1 mark for correctly identifying an IPR method and 1 mark for correctly outlining what it protects. Up to a maximum of 4 marks (2+2). Award a maximum of 2 marks if a candidate refers to only one method of protecting IPR. Accept: watermarking – photo/video/audio; confidentiality – trade secrets, recipes, formulas

Question			Expected response	Max mark	Additional guidance
	(b)		Candidates are expected to describe the role of two other members of a design team. Descriptions are likely to include: Ergonomist: • provides advice on appropriate ergonomic information • ensure the product ‘fits’ the intended target market • advises on anthropometrics, physiology and psychology • can give information specific to target market in terms of age and gender Materials Technologist: • provides advice on the selection of suitable materials for product use • ensure that any materials selected are suited to the methods of production • will advise on environmental considerations Production Engineer: • provide advice on production planning and tooling for manufacture • work with material technologists to ensure that the product is produced as efficiently as possible	4	Four valid descriptions at 1 mark each. 2 marks may be awarded for an extended description. No marks should be awarded for answers related to lawyers. No marks awarded for simply identifying the team member. Accept descriptions for roles of accountant and retailers. Award a maximum of 3 marks if a candidate refers to only one design team member. Marks must only be awarded for two members. (3+1, 2+2) Exemplar responses: <i>Accountants are responsible for ensuring employees are paid correctly (1 mark). and produce cash budgets/income statements. (1 mark).</i> <i>The finance team make sure that projects run to the budget (1 mark) and employees get paid (1 mark).</i>

Question			Expected response	Max mark	Additional guidance
			Market Researcher: • will work with focus groups to find out their needs/wants • helps set prices for the product • provides advice on current trends • will have knowledge of competitor products • can predict sales volume and demand Project Manager: • make sure projects are completed on time • manages staff • manages budgets and estimates costs • plans activities and resources • monitors progress Designer: • provides the initial inspiration and creative input for the product • ensures product meets the needs/wants of the target market • explores and refines the idea to a proposal/solution Any other suitable description.		

Question			Expected response	Max mark	Additional guidance
4.	(a)		Candidates are expected to explain why ABS is suitable for the manufacture of the casing of the hairdryer. Justification: • lightweight (if reference to handheld made) • impact resistant • chemical resistant/easy to clean • heat resistance • scratch resistant • electrical insulation • can be made in any colour Any other suitable response.	2	Two valid explanations at 1 mark each. Exemplar response: <i>ABS is impact resistant as it can withstand being picked up and put down without breaking (0 marks).</i> <i>ABS is heat-resistant so the hairdryer won't melt or change shape whilst being used (1 mark).</i> <i>ABS is scratch resistant, meaning that it won't become damaged after repeated use and lose its aesthetic appeal (1 mark).</i>
	(b)		Candidates are expected to explain the benefits of brainstorming to generate ideas. Descriptions are likely to include: • different perspectives lead to a wider range of ideas • encourage free thinking as all suggestions are welcome • generates many ideas – more likely to find good solutions • can revisit to find different solutions Any other suitable explanation.	2	Two valid explanations at 1 mark each. Exemplar response: <i>Brainstorming allows for many people to be involved with the creation of the product (0 marks).</i> <i>Brainstorming gets you out of a creative slump (0 marks).</i> <i>Brainstorming allows for lots of ideas quickly from lots of different people (1 mark).</i>

Question			Expected response	Max mark	Additional guidance
	(c)		The candidate is expected to describe how graphic techniques could have been used to communicate during the following stages of the design process: • initial ideas • manufacture • marketing Descriptions are likely to include: Initial Ideas Types of graphics: • rough sketches 2D/3D • manual rendered illustrations Use: • helps show overall product • can be used to gain feedback • explore different options quickly • show key features and proportions of an idea • show how parts or components might fit or work together • can annotate to explain features, materials, or intended functions	6	Six valid descriptions at 1 mark each. A maximum of 6 marks may be awarded in one area (4+1+1, 3+2+1, 2+2+2). All 3 areas must be referenced to obtain full marks. Candidates do not need to reference specific graphic types to be awarded marks. No marks awarded for simply naming a type of graphic. Exemplar response: <i>In manufacture, graphic techniques could be used to show the inside of the product so that engineers can see any hidden detail or how things fit together (1 mark).</i> <i>Sketches could be used in the initial ideas stage as it is a quick way to generate ideas (1 mark).</i>

Question			Expected response	Max mark	Additional guidance
			Manufacturing Types of graphics: • orthographic drawings/working drawings produced manually or using CAD • exploded views • sectional views Use: • used to aid production • require a high degree of accuracy • contain dimensions/exact measurements • contain tolerances • surface finishes • parts list • production materials shown • production methods shown • used to show internal details/components • can show assembly details • helps manufactures to understand assembly • can be used to explore how components fit together Marketing Types of graphics: • product renderings – manual or CAD • point-of-sale displays/posters • branding/packaging • advertising layouts • infographics		

Question			Expected response	Max mark	Additional guidance
			Use: • show the product in its best light • connect with target market • brand appeal/recognition • catch consumer attention • explain benefits • compare to alternatives Any other suitable description.		
5.	(a)		Candidates are expected to explain what is meant by niche market. Explanations are likely to include: • focuses on a smaller, well-defined market segment • specific needs and wants • defined by distinct characteristics – Such as demographics, interests, location, or lifestyle. • less mainstream • the customer base is smaller Any other suitable explanation.	2	Award 1 mark for each valid point leading to a clear explanation. Up to a maximum of 2 marks. Exemplar responses: <i>A niche market is a small segment of the market (1 mark) with specific needs and wants (1 mark). This makes marketing and designing products easier compared to a mass market.</i> <i>A niche is a specific group of people (1 mark) identified by gender. (1mark)</i>

Question			Expected response	Max mark	Additional guidance
	(b)		Candidates are expected to explain how technology push and market pull have influenced the design of a product(s) with which you are familiar. Explanations are likely to include: Technology push: • touch screen technology • enhanced graphics • miniaturisation • wi-fi capability • improving audio technology • improvements in graphics/video technology • increased memory capability • 'cloud' storage • voice recognition • connected products • wireless charging • flexible/curved screens • augmented reality Market pull: • need for accessibility • affordability • portability • improved quality (of product) • health/fitness tracking • aesthetics – colour/style options • mobile payments • e-tickets (transport etc.) • online features	4	Four valid descriptions at 1 mark each. (3+1). 2 marks may be awarded for an extended description. No marks should be awarded for giving a definition of technology push or market pull. Ignore incorrect naming of technology push/market pull. <i>Facial recognition in mobile phones is an example of technology push (0 marks).</i> <i>Facial recognition has influenced the design of mobile phones, giving the user the ability to access their phone without touching it (1 mark).</i> <i>Mobile phones to be smaller so they are more portable (1 mark).</i>

Question			Expected response	Max mark	Additional guidance
			• compatibility with existing products/previous version(s) of products Any other suitable explanation.		
	(c)		Candidates are expected to explain the advantages of using CAD during the development of products such as the robot vacuum cleaner. Explanations are likely to include: CAD: • easier to alter the design • use library of parts (time saving) • carrying out testing such as stress analysis • easily rendered to provide visuals/animations for clients • easier to communicate design information with other members of the design team (collaborative working) • easily sent for rapid prototyping • reduced cost compared to physical modelling (after setup) • production drawings easily created • assisted production planning • parts list easily created Any other suitable explanation.	4	Four valid explanations at 1 mark each. 2 marks may be awarded for an extended explanation. Exemplar responses: <i>Stress and strain tests can be carried out on a CAD model (1 mark) which saves money and resources to test forces on a physical model (1 mark).</i> <i>An advantage of CAD is that it works with CAM, saving time (0 marks).</i> <i>An advantage of CAD is that you can check dimension and sizes of a product to make sure it is accurate (0 marks).</i>

Question			Expected response	Max mark	Additional guidance
6.	(a)		Candidates are expected to describe methods, other than symbols and labels, that could be used to identify woods, metals and/or plastics. Descriptions are likely to include: • flame test (only if clear indication of changes that occur is referenced) • float test (with reference to density) • scratch/cut test (looking for chips or slices) (plastic only) • testing for magnetism (metals) • grain pattern (wood only) • comparisons to other known materials (colour, weight) • colour (wood and metal) • acid testing (to identify gold) Any other suitable description.	3	1 mark for each valid description or 2 marks for a detailed description of one method. 0 marks for simply identifying a method. Candidates must correctly link the identification method to wood, metal or plastic. Exemplar responses: <i>Flame test is when a metal piece is heated and the flame changes colour and releases a smell (1 mark).</i> <i>A float test can be used. This is when a material is put in liquid to see the weight or density of it, allowing you to identify the material (0 marks).</i>
	(b)		Candidates are expected to explain the advantages of using knock-down fittings in the assembly of products. Descriptions are likely to include: • ability to assemble and disassemble • requires minimal tools • products can be shipped flat-packed • no specialist skills or tools required • easily to replace parts • supports modular design Any other suitable explanation.	3	1 mark for each valid explanation Up to 2 marks may be awarded for an extended answer. Exemplar response: <i>They are standard components so can be bought in bulk, speeding up assembly (0 marks).</i> <i>Knock-down fittings can be bought anywhere, so you can still assembly the product if there is a bit missing (1 mark).</i>

Question			Expected response	Max mark	Additional guidance
	(c)		Candidates are expected to explain the impact of fully automated production methods on the workforce and society. Explanations are likely to include: • reduced pay (less disposable income) • unemployment • retraining of skills • de-skilling of work force • changed work patterns • economic migration • increased safety of workplace • meet consumer demand • reduced cost of products • increased product availability Any other suitable explanation.	4	1 mark for each valid explanation. Up to a maximum of 4 marks. 0 marks for simply identifying issues. Exemplar responses: <i>Automation produces products that are cheaper and more accessible to a wider range of people improving the quality of life (1 mark).</i> <i>Manufacturers save money as there is less jobs, so less wages to pay (0 marks).</i> <i>Many people will lose their jobs affecting the local economy (1 mark).</i>

Question			Expected response	Max mark	Additional guidance
7.			Within their response, candidates are expected to describe how ergonomics has influenced the design of products with which they are familiar. (Candidates should refer to all three areas of ergonomics in their answer) Descriptions are likely to refer to some of the aspects below: Anthropometrics: Comments relevant to how the sizes of the product(s) have been influenced by sizes of specific parts of the body: • widths • lengths • heights • adjustability • grips • reach Physiology: Comments relevant to how the parts of the product(s) have been influenced by limitations of specific parts of the body: • weights • strengths • comfort • strain • pressures applied/required • rotation • fatigue • limitations relevant to age • limitations relevant to dexterity	8	This question is set to test the candidate's ability to present a detailed description of how ergonomics has influenced the design of products that they are familiar with. Although there is an underlying body of knowledge required to answer this question, there is a very wide range of possible answers. Therefore, the question is marked holistically. Candidates must refer to all three areas of ergonomics in their answer to be awarded marks in the top band. The features which are looked for are knowledge of the subject matter, and ability to comprehend the question and construct an answer which uses clear examples to support the points made. The table below is designed to assist with the placing of answers within the full mark range.

Question			Expected response	Max mark	Additional guidance
			Psychology: Comments relevant to how parts of the product(s) have been influenced by the senses: • smells • sounds • tastes • feels • looks Any other suitable reference (product specific)		

0-2 marks	3-4 marks	5-6 marks	7-8 marks
An answer which falls into this category may do so for a number of reasons. • limited knowledge of the subject matter and an understanding of anthropometrics, physiology or psychology will be demonstrated • there is little or no reference to products • very few points are made • much of the response does not answer the question • the answer is simply too thin	An answer which falls into this category may do so for a number of reasons. • some knowledge of the subject matter and an understanding of anthropometrics, physiology or psychology will be demonstrated. Minimum of two • the answer will be relevant to the question • some reference is made to a product(s) • although examples are used, points made are unclear	An answer which falls into this category may do so for a number of reasons. • secure knowledge of the subject matter and an understanding of anthropometrics, physiology or psychology will be demonstrated. Minimum of two • the answer will be relevant to the question demonstrating a good level of comprehension • detailed reference is made to at least one product • most points made are clear and examples are used to support them	An answer which falls into this category may do so for a number of reasons. • extensive knowledge of the subject matter and a secure understanding of anthropometrics, physiology and psychology will be demonstrated • the answer will be relevant to the question demonstrating a high level of comprehension • very detailed reference to at least one product • all points made are clear and examples are used to support them

[END OF MARKING INSTRUCTIONS]