# AQA A Level

Product Design

7552

SERIES B

## Sample paper ONE

Mark Scheme

PG ONLINE

1

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# A Level Design & Technology (Product Design)

**Sample paper B – Paper 1 mark scheme**

This sample paper and mark scheme has been carefully compiled and checked to ensure parity with the AQA guidelines available. It is the normal process for the mark schemes of live papers to go through a standardisation process where students' responses are analysed and any answers not covered in the mark scheme are discussed and legislated for. As this is a sample paper only, this process has not been undertaken. Whilst this paper and mark scheme have been technically proofread, there may be additional responses that are worthy of marks. Teachers discretion should be applied in these circumstances.

**Instructions for level of response marking**

Descriptors are provided for different levels of response along with appropriate marks for each level. Read through a students' answer, annotating to show the qualities that have been achieved, before applying the level based mark scheme.

**Determining a level**

Start with the lowest level of response in the mark scheme and assess if the different qualities indicated have been met. If they have, move to the next level and check to see if these have been met. Continue the process until you can match the level with the answer. With repetition it becomes easier and quicker to work up through the levels of the mark scheme.

The principle of 'best fit' should be adopted and if small elements of a level are missing but the majority has been covered, then this is the appropriate level to award.

**Determining a mark within a level**

Having decided on the level, the mark within the level must be determined. Use the descriptors to help with this along with the indicative content. Where there is any doubt, it is advisable to read back through the answers again and reapply it to the indicative content. Students do not need to cover all of the indicative content to reach the top marks. Additionally the indicative content is not designed to be exhaustive and alternative appropriate answers may well be taken into consideration.

Student answers that do not contain any relevent content must be awarded zero marks.

1. **Award 1 mark for each correct response as indicated below:** **[3 marks]**

   *Plywood sheet to beech veneer* - PVA (1)

   *HIPS sheet to acrylic rod* - Solvent cement (1)

   *Melamine formaldehyde veneer to MDF sheet* - Contact adhesive (1)

2. **Awards marks as shown.** **[2 x 2 marks]**

   (a) An alloy is a metal made up of two or more elements/a combination of metals or elements (do not accept materials) of which at least one is a metal (1), created to give improved/enhanced properties (1).

   (b) **Award 1 mark for each correct alloy up to a maximum of 2 marks.**

   Die steel / brass / bronze / duralumin / pewter (1). Accept any other alloy.

3. **Award 1 mark for simple description or 2 marks for a detailed description.**

   (a) PSE: **[2 marks]**

   - Detailed response - This is natural timber where one edge has been planed square to another (1). This allows accurate marking and measuring from one point of reference (1).
   - Detailed response: After conversion and seasoning, (1) natural timber is planed so one edge is square to another (1)
   - Simple response - The material is either square or rectangular in cross section profile
   - Simple response - Different to rough sawn timber where no edge or side is planed

   (b) Mouldings: **[2 marks]**

   - Detailed response - A strip of natural or manufactured wood machined to include decorative or shaped features (1) for a specific function e.g. architrave (door frame) or moulding for a picture frame etc. (1)
   - Simple response – A strip of wood manufactured with a decorative feature
   - Simple response – Architectural features

4. **Award marks as stated:** **[6 marks]**

   - Award 6 marks for six (or more) correctly sequenced stages
   - Award 5 marks for six correct stages with one minor error or omission in the sequence
   - Award 4 marks for six correct stages, but two or more errors in sequence
   - Award 3 marks for four or more stages identified, sequence not necessarily correct
   - Award 2 marks for three correct stages identified, sequence not necessarily correct
   - Award 1 mark for two correct stages identified, sequence not necessarily correct
   - 0 marks – No credit worthy response

   **Indicative content:** allow for logical variations such as those suggested

   1. Carefully read instruction on paint/product container to ensure safe and correct preparation, use and application. **The position for this is stage may vary**.
   2. Wear appropriate PPE for specific tasks undertaken
   3. Repair any holes and cut out and repair any damaged or decaying wood to avoid further degradation
   4. Rub down all surfaces using abrasive paper to provide a key (or smooth surface) for the finish to be applied
   5. Remove any dust and clean all surfaces
   6. Apply finish with a brush/roller/pad taking care to brush in the direction of the grain
   7. Rub down with a fine abrasive between coats (or as directed by product instructions)

8. Once dry, apply a second coat (if recommended) to increase durability and appearance of finish - **Position for this is stage could be after 9 if slow drying product used**
9. Thoroughly wash out and clean all equipment used during the painting process as directed by product instructions

5. **Award marks as stated.** **[4 marks]**

| | |
|---|---|
| 4 marks | A fully detailed definition of the term 'biodegradable polymer' with excellent reasoning and clarification of where used in product design |
| 3 marks | A clear understanding of the meaning of the term 'biodegradable polymer' but lacking detail in reasoning as to why they are used in product design |
| 2 marks | Two or more simple correct statements showing a limited understanding of the term 'biodegradable polymer. No explanation of use in commercial product design is given |
| 1 mark | One simple correct statement demonstrating limited understanding of the term 'biodegradable polymer'. |
| 0 marks | No credit worthy response |

**Indicative content:** accept alternative responses worthy of credit

Definition of the term:

- Polymers that degrade under certain conditions e.g. when buried or in contact with the soil
- A plastic that breaks down and decomposes over time
- Polymers made from renewable raw materials e.g. vegetable matter and even fungus (new developments)
- Polymers that are starch based from corn, wheat and potatoes
- Polymers that have additives to encourage degradation e.g. oxo-degradable polymers, dissolve with the presence of enzymes in the body
- Polymers that decompose when exposed to UV light

Evaluation of use in commercial product design:

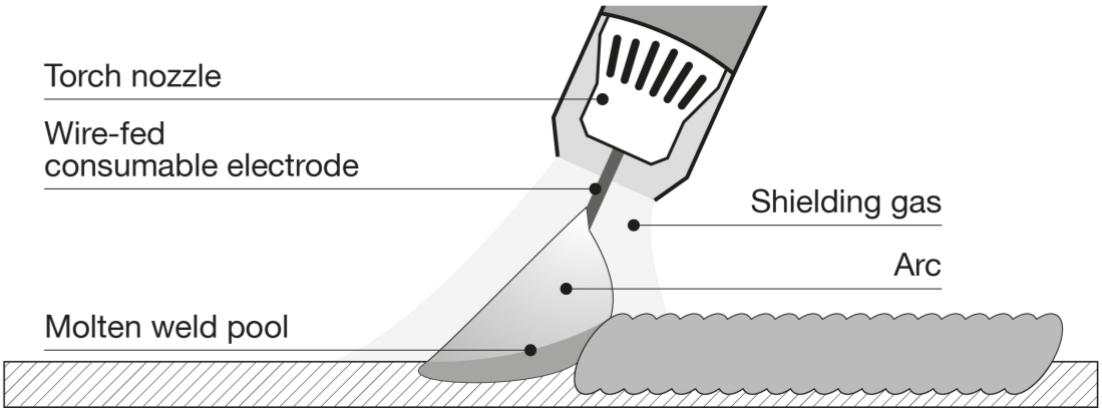
- To avoid further accumulation of oil-based polymer waste
- Increase/encourage use of more sustainable eco-friendly polymers with a reduced impact on society and the environment
- Bio-polymers are not as robust/long lasting for certain applications
- 'Green' credentials associated with bio-polymers can be a selling/marketing bonus
- Reduces carbon footprint of a product
- Can make recycling/end of life separation difficult
- Allow for use in domestic washing systems to contain detergent released by exposure to water in the washing cycle e.g. liquitabs
- Medical applications e.g. stitches/sutures, slow release contraceptives, slow release medicines for prolonged treatment internally/negate the need to remove stitches
- Reduce waste, litter pollution e.g. in China, western fast food outlets were only granted trading licences when they had demonstrated a commitment to reducing waste and litter by using biodegradable polymers
- Oxo-degradable packaging will decompose naturally after a given time

6. **Award marks as stated** **[9 marks]**

| | |
|---|---|
| 7-9 marks | Full description showing a detailed understanding of the MIG welding process using correct equipment and terminology. Complete, accurate description of how a bracket will be fabricated. |
| 4-6 marks | Partial description showing a reasonable understanding of the MIG welding process with some of the appropriate equipment identified. Some correct detail and reference to fabrication of the bracket. |
| 1-3 marks | Simple description using either notes or sketches only. A vague understanding of MIG welding. Response lacks understanding of how the bracket will be fabricated and lacks most technical terminology. |
| 0 marks | Nothing worthy of credit. |

**Indicative content:** Points made from the content evident in the diagram below.

For the top two band of marks it is likely sketches will show where welding will take place on the side frames and will relate the MIG welding process to the bracket/question context.




- Parts to be welded should be cleaned with white spirit
- Use abrasive paper / angle grinder to clean / prepare surfaces
- Use of jigs / wire / magnets / vice to hold parts in position during welding
- Parts to be welded should be earthed
- Use of PPE e.g. mask / goggles / heat resistant gloves and apron
- Clean up weld with angle grinder / abrasive paper

**Diagram(s) with detailed annotations can achieve full marks.**

7. **Award marks as stated** **[12 marks]**

| | |
|---|---|
| 9-12 marks | The response demonstrates excellent analysis and compares the two types of timber beams in detail with reference to aspects such as: physical and mechanical properties, aesthetic characteristics, and implications of each beam in terms of environmental impact, processing, construction and use. The response provides detailed evaluation of the suitability of each in the context of a construction material and draws justified conclusions. |

| | |
|---|---|
| 5-8 marks | The response demonstrates analysis and makes some comparison between the two types of timber beams with reference to characteristics such as: physical and mechanical properties, implications of each beam in terms of environmental impact, processing, construction and use. The response provides some evaluation of the suitability of each beam for construction. |
| 1-4 marks | Response provides a basic comparison of the two types of timber beams with reference to their characteristics. The response is descriptive rather than evaluative and a conclusion may not be drawn. |
| 0 marks | Nothing worthy of credit |

**Indicative content:** accept alternative responses worthy of credit

Solid timber beam:

- Cut from a single section of tree, therefore the tree/plank needs to be long enough for the desired length – could lead to more wastage
- Beam length is limited to the tree/plank length
- Complete end grain is visible on end section of timber which may have aesthetic appeal to traditional builders/building methods – no glued joints visible
- Needs to be erected quickly once cut to avoid warping and other faults along length
- More prone to distortion and movement over time due to environmental conditions
- Naturally occurring faults cannot be avoided such as loose knots and resin pockets
- No adhesives are necessary meaning it is a more natural product
- Once planed and routed/processed to shape, no further processing is needed before use
- Must be seasoned correctly to minimise distortion and movement when in use
- Both beams will last well, especially if end grain is treated (where splits occur) to stop water ingress and potential early rot

Laminated timber beam:

- Increased length over natural beams by laminating shorter lengths of timber together
- The glued joints are offset from each other which gives beams good strength avoiding potential weakness at the joints
- Increased stability through lengths being laminated together with end grain (direction of annual rings) in opposite directions to reduce timber movement
- Adhesives are used to bond lengths together
- Adhesives may not be environmentally friendly
- Increased strength – the use of modern adhesives to laminate the timber can provide a stronger bond than naturally occurring cellulose bonds
- Timber selection – modern glulam/laminated timber construction allows natural defects e.g. knots and resin pockets to be identified and the section of wood and removed prior to lamination
- Needs to be laminated using large equipment/plant, adhesives, pressure (heat) and time making the process longer and more expensive
- Space is required for the timber to be laminated and for the material to cure/dry
- Shorter and thinner lengths of timber can be used to make up larger beam
- Glulam/laminated beams are more resistant to water ingress due to the adhesives (waterproof) used and the reduction of split end grain
- Laminated timbers have greater stability
- End grain treatment is recommended to reduce potential delamination

8. **Award marks as stated**

(a) **[4 marks]**

| | |
|---|---|
| 2 marks<br><br>(1 mark for correct subtraction of internal tube area, 16 and/or 36 seen<br><br>and<br><br>1 mark with correct result with or without units) | NB easier to convert to cm straight away - Work out cross section:<br><br>$40 \times 20 = 800mm^2$ less $36 \times 16 = 576mm^2 = 224mm^2$<br><br>$4 \times 2 = 8\ cm^2$ less $3.6 \times 1.6 = 5.76\ cm^2 = 2.24\ cm^2$<br><br>Or<br><br>$40 \times 2 \times 2 + 16 \times 2 \times 2 = 224mm^2$<br><br>Or<br><br>$36 \times 2 \times 2 + 20 \times 2 \times 2 = 224mm^2$ |
| 1 mark | Work out required volume: $2.24 \times 240 = 537.6\ cm^3$<br><br>Or $537600mm^3$ |
| 1 mark | Work out mass:<br><br>$537.6 \times 2.7 = 1451.52$<br><br>Rounded to the nearest whole gram 1452g |

(b) **[4 marks]**

| | |
|---|---|
| 1 mark | Calculation using sine formula: sine = opp/hyp (no mark awarded for formula)<br><br>Correct substitution of values: sin75° = 500/hyp |
| 1 mark | Rearrange: hyp = 500/sin 75°<br><br>Award marks for alternative methods. |
| 1 mark | Working out: hyp = 517.638mm<br><br>Award marks for alternative methods. |
| 1 mark | Leg length will be:<br><br>518mm as both angles on the ends of each leg will be identical.<br><br>Rounded up to nearest whole mm. |

(c) Accept error carried forward from errors in calculations for part (b) **[3 marks]**

| | |
|---|---|
| 1 mark | Legs from each 5m length: |

| | |
|---|---|
| | 5000/518 = 9.65 or 9 legs from each length |
| 1 mark | Total number of 5m lengths required:<br><br>400/9 = 44.4 pieces and 45 lengths in total |
| 1 mark | Total cost: £12.82 × 45 = £576.90 |

(d) **Award 1 mark for each appropriate point up to a maximum of 3 marks. [3 marks]**

Change the colour of the final product / aesthetic reasons (1)
Improved resistance to wear and tear (1)
Hardwearing (1)
Suited for mass production (1)
Inhibit rusting due to encapsulation in a polymer coat / prevents oxidisation/rust by protecting from exposure to the environment / moisture (1)

(e) **[5 marks]**

| | |
|---|---|
| 5 marks | Five correctly sequence stages |
| 4 marks | Five correct stages with one minor error or an incorrect order in the sequence |
| 3 marks | Three or more stages identified in sequence or correct stages in the wrong order |
| 2 marks | Three correct stages identified, may be errors in order |
| 1 mark | One correct stage identified |
| 0 marks | No credit worthy response |

**Indicative content:** some stages can vary very slightly in order and include:

- Workpiece is rubbed down / cleaned / prepared /degreased
- Workpiece is connected to ground/earth
- Polymer / resin and various additives are fed into spray gun
- When gun trigger is pressed, compressed air forces out the particles at speed
- The workpiece attracts the charged particles as the object is grounded
- Sprayed object then moves slowly through / is placed in a curing oven
- Applied finish cures/bakes onto the workpiece and is left to cool
- Object is removed and checked for surface quality before being passed

9. **Award marks as stated:**

(a) **Award 1 mark for a correctly named polymer. [1 mark]**

ABS / polycarbonate / nylon (1). Possibly fibre strengthened nylon may be mentioned.

(b) **Award 1 mark for a correctly named polymer. [1 mark]**

Natural rubber / polybutadiene / silicone (1)

(c) **Award 1 mark for each point and a further 1 mark for relevant explanation.** **[2 marks]**

Provides enhanced/softer grip (1), more comfortable to use (1)

Provides increased friction (1), less likely to drop / increases safety

Material is elastic / will return to original shape when pressure released (1) allowing multiple users with different shaped hands to hold with comfort/ease (1)

Dampens and reduces vibration on the user's hand/arm (1) more comfortable to use (1)

(d) **Award marks as stated:** **[6 marks]**

| | |
|---|---|
| 5-6 marks | Full and comprehensive explanation of injection moulding and the benefits it can bring, specifically to the manufacturer of the cordless drill. Candidates may have considered additional injection moulded products to develop their answer. |
| 3-4 marks | Good description of how a manufacturer might use injection moulding in product manufacture. Response might not be linked to features on the specified cordless drill. |
| 1-2 marks | Vague response with one or two credit worthy points focussing on benefits of injection moulding. Limited / no consideration of specific features on the cordless drill. |
| 0 marks | Nothing worthy of credit. |

**Indicative content:** accept alternative responses worthy of credit

- Highly accurate process; can work to small tolerances
- Reduced labour costs due to highly automated process
- Waste or default parts can be reprocessed/recycled in house
- Injection moulding is compatible with over moulding which is required e.g. for grip
- Self-finishing process adding to efficiency of process
- Complex shapes can be achieved
- Set-up costs are high but can be spread across the number of units produced (economies of scale) such as this mass-produced drill
- Efficient use of materials; internal fins and ribs can be used to increase strength while reducing the overall material needed
- Can run 24/7 with little/no down time required for maintenance, cost effective
- Multiple types of plastic can be used simultaneously
- Reliably produces consistent outcomes
- Creates units quickly; molten polymer is cooled rapidly within the moulds
- Injection moulding can be used in conjunction with polymer fillers and additives which help enhance performance/reduce costs of materials

10. **Award marks as stated in the table for both parts (a) and (b).** **[2 x 4 marks]**

| | |
|---|---|
| 4 marks | A detailed explanation considering both designers and manufactures and how the specific question element ensures products are safe for consumers to use. |
| 3 marks | Explanation of how the specific question element ensures products are safe for consumers to use. Expect evidence of consideration of both the designer and manufacturer, but in variable detail. |
| 2 marks | A limited description (one point in detail or two briefly) explaining how the specific question element impacts on making a product safe to use by the consumer. No specific reference to either the designer or manufacturer. |
| 1 mark | One simple point how the specific question element impacts on making a product safe to use for the customer. |
| 0 marks | Nothing worthy of credit. |

(a) **Indicative content:**

British Standards Institute (BSI)

- Designers/manufacturers needs to be aware of any relevant safety standards if they want their product to hold the BSI Kitemark™ e.g. BS EN 71 (toy safety) to ensure their designs will not harm the user
- BSI produce specific standards on a range of issues e.g. finger traps, component size, toxicity etc. to inform designers/manufacturers what level of safety they need to design in to their products
- Manufacturers pay to have their products independently tested so they know that they are safe to use
- Manufacturers know that the production techniques are safe to use and appropriate to pass rigorous and independent tests
- Manufacturers can exhibit a Kitemark™ on their products after successful testing to show that it has passed set standard tests e.g. flammability, and reassure the consumer

(b) **Indicative content:**

Consumer Rights Act (2015)

- Encourages designers and manufacturers to design products of an acceptable/satisfactory quality and fit for purpose in the first place as consumers have automatic rights to replacement or refund if goods are unsafe, defective etc.
- Provides additional reassurance to the consumer that products are being manufactured as described with safety in mind to satisfy legislation
- Replacement or repair is a legal obligation within the first 6 months of purchase; the manufacturer has one chance to undertake an effective repair which encourages high quality design and manufacture in order to uphold company reputation and make a profit
- The act has tightened up rules on what manufacturers can sell online and how they must meet the same quality standards, including safety, as products sold in shops
- Designer must make sure their designs are ‘fit for purpose’ and do what they say they should, otherwise the consumer has rights to demand a refund, exchange or money back

11. **Award marks as stated in the table for both parts (a) and (b).** **[2 x 4 marks]**

| | |
|---|---|
| 4 marks | A thorough explanation, indicating a detailed understanding of the heat treatment and how it is undertaken. Response clarifies in what way the metal is enhanced. |
| 3 marks | Explanation showing some detail and understanding of the heat treatment. Attempt to explain how the metal is enhanced or why it is necessary/used. |
| 2 marks | Basic description about the heat treatment with two or more correct points made. |
| 1 mark | One simple point made demonstrating a very limited understanding about the heat treatment. |
| 0 marks | Nothing worthy of credit. |

(a) **Indicative content:**

Case hardening:

- A technique where steels with a low-carbon content (below 0.3% carbon) can be hardened
- The process involves heating a metal component to a temperature in excess of 750°C and exposing the outer surface to pure carbon / dipping into carbon powder
- Processes is repeated until desired thickness of carbon is achieved (about 3-4 times)
- Finally, heat, dip in carbon powder and quench in cold water/oil
- The outer surface is then hard, but the internal structure of the component is still relatively 'soft' but tough and durable making it resistant to shocks and sudden impacts

(b) **Indicative content:**

Hardening and tempering:

- Hardening – a process used to change the effects of the carbon content in medium to high carbon steels 0.3 - 2% carbon
- Heating the metal to a 'critical point' changes the carbon structure and, if it is then rapidly cooled e.g. quenched in water or oil, it 'freezes' the structure in a set position, both hardening and strengthening the material, however it becomes more brittle
- Tempering is the process of re-heating steel after hardening to reduce the brittleness created during the hardening process
- The temperature range for tempering is between 175 – 350°C
- A hardened tool may break easily or snap e.g. a garden fork, unless some of the stresses set-up in the carbon structure are not released/relaxed slightly through tempering

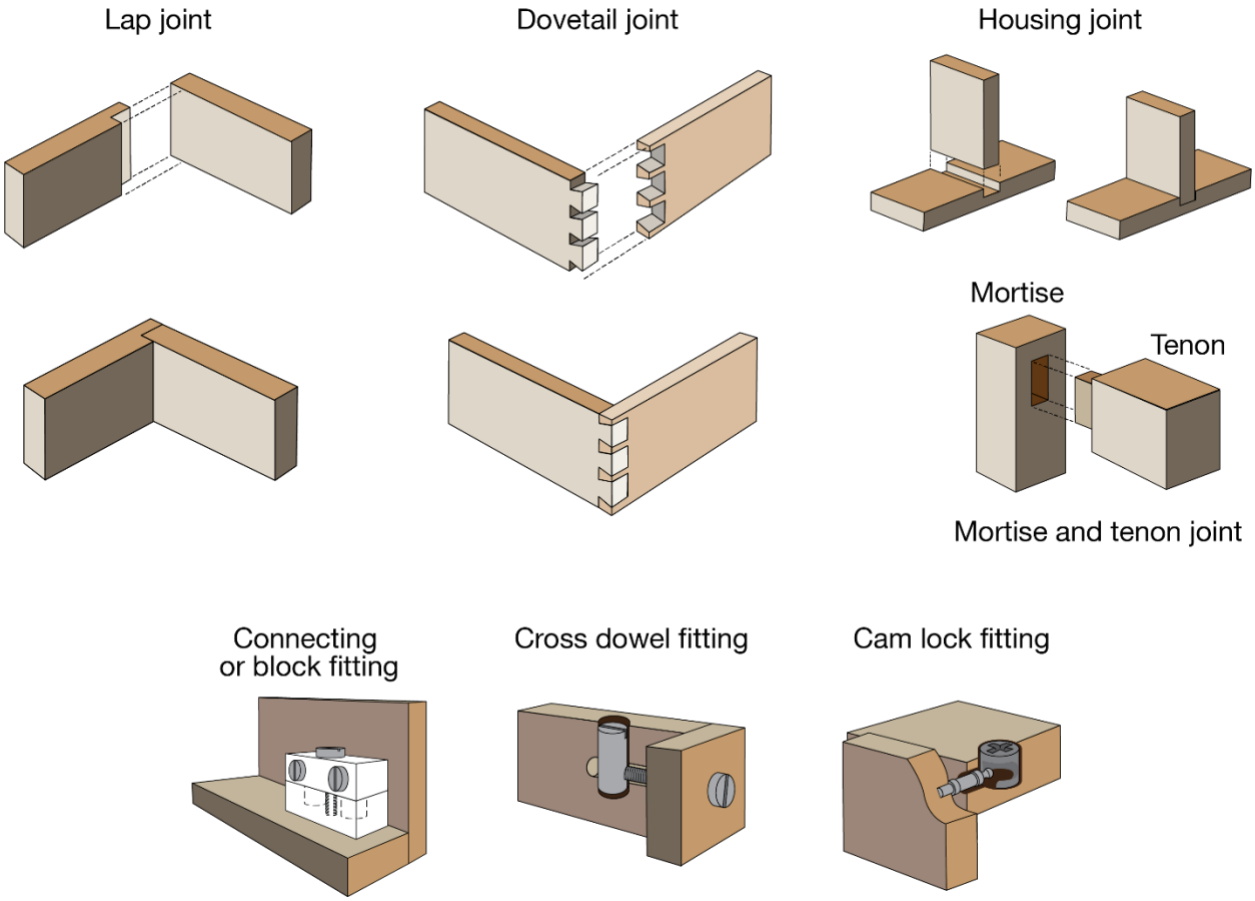
12. **Award 1 mark for each correctly named timber joint / KDF and up to a further 3 marks, as stated in the table, for each of the three joints. [3 x 4 marks]**

| | |
|---|---|
| 3 marks | Accurate and well-proportioned sketch with all relevant features of the named joint identified. |
| 2 marks | Recognisable as named joint but lacking detail in all specific features. |
| 1 mark | Very limited detail but sketch is just recognisable for named joint. Award mark if sketch is of a correct joint for the category but is not the one named. |
| 0 marks | No/unrecognisable sketch provided. |

**Indicative content:**

NB. Some wood joints tend to be listed in both categories but ensure **two different** correct wood joints are covered to achieve marks in each section. Accept wood joints if drawn in the incorrect category.

- Traditional timber frame joints including: bridle, corner halving, T-halving, mitre, mortise and tenon, butt, lap, cross-halving etc.
- Traditional timber carcase/box joints including; housing, dovetail, comb/finger, butt, lap etc.
- Knock down fitting including: modesty block/block fitting, cross dowel, cam lock etc.




**Clear diagrams required for full marks. Diagrams may or may not be exploded.**

13. **Award marks as stated.** **[12 marks]**

| | |
|---|---|
| 9-12 marks | Full and comprehensive comparison between the signs in terms of suitability of materials used and fabrication and construction. Expect detail considering location of use, installation and use to help with evaluation. Detailed evaluation considering the pros and cons of the suitability of each sign in its intended environment. |
| 5-8 marks | Evidence of comparison between the signs with reference to materials used and fabrication and construction. Expect some additional detail looking at location, installation and use to help with evaluation. Do not expect to see detailed evaluation as to suitability of each type of sign. |
| 1-4 marks | Limited description of features about materials used and fabrication and construction. Expect generalisations about materials used and no evaluation as to suitability of each sign. |
| 0 marks | No response worthy of credit. |

**Indicative content:** Lists are not exhaustive – accept alternative valid responses

| Suitability of the polymer 'sold' sign | Suitability of the metal road sign |
|---|---|
| Materials used:<br><br>Fluted polypropylene sheet e.g. Correx / Corriflute / Protecta Board™:<br><br>• Waterproof and resistant to fungal and insect attack, suitable for outdoor conditions<br>• Corrugations give strength and stability against the elements e.g. strong winds - will bend rather than break/snap<br>• Good strength to weight ratio<br>• Lightweight for ease of transportation and installation<br><br>Bolts to fix sign to post:<br><br>• Readily available<br>• Easy to assemble/disassemble<br>• Coated/treated for outdoor use to prevent rust (plated, galvanised)<br>• Excellent shear strength<br><br>Graphics:<br><br>• Paint for screen printing; suited to low volume production, block/single colour prints, less durable<br>• Possibly vinyl for information / lettering: self-adhesive for easy application, durable, application to substrate is more labour | Materials used:<br><br>Sheet aluminium for sign:<br><br>• Will not rust, suitable for outdoor use<br>• Plentiful supply, readily available<br>• Can be recycled effectively at end of life (signs will be replaced sporadically)<br>• Good strength to weight ratio<br><br>Sheet steel with a zinc coating – pole / brackets nuts and bolts<br><br>• Readily available<br>• Easy to assemble/disassemble<br>• Coated/treated for outdoor use to prevent rust (plated, galvanised)<br>• Excellent shear strength<br><br>Graphics:<br><br>• Graphic added using self-adhesive / contact adhesive reflective polymer: Weather resistant, waterproof, increases visibility, durable<br>• Possibly UV inks for printing: High quality print finish, durable<br>• Recent polymer technology allows for reflective decals to be applied |

| | |
|---|---|
| intensive, suitable for outdoor conditions, durable, ideal for single colour graphics<br>• Both give a clear and crisp graphic<br><br>Softwood such as pine for sign post<br><br>• Fast growing, cheap and readily available, suitable for a product of this lifespan<br>• Easy to work with and install e.g. can be drilled with self-tapping screws to wall or driven into grass like a steak<br>• Relatively lightweight so easy to transport and will not exert heavy loads wherever it is installed<br>• Paint finish: easy to apply, will start to degrade/flake but can be repaired, suitable finish for a product of this lifespan | making a sign far more effective than contrasting colours alone<br><br>Galvanised steel post<br><br>• Steel in strong and durable; suitable for a sign that will used for many years<br>• Galvanised finish: one of the most durable finishing techniques to prevent rust on ferrous metals, relatively low-cost finish |
| Fabrication and construction:<br><br>Corriflute manufactured by extrusion:<br><br>• Sheet can be pre-coloured during manufacture to avoid a surface finish application<br>• Self-finishing process that can be performed in a single operation, reduces cost of material<br>• Produces large sheet material can be cut to desired/stock size<br>• Stock material – low cost and provides a suitable substrate for branding / graphics<br><br>Sign and post<br><br>• 'Sold' banner on sign assembled using nylon fasteners (nut and bolt) – easy to install and disassemble on sign as required<br>• Manufacture using a series of pre-drilled holes and semi-permanent fasteners for ease of dismantling and reuse at another property<br>• Softwood post can be shaped for easy insertion into the ground or nailed / bolted to wall etc.<br><br>Graphics:<br><br>• Screen printing/application of vinyl is more labour intensive but better suited to batch produced products such as the sold sign<br>• Use of CAD/CAM to produce screen/vinyl detail for crisp and accurate graphics | Fabrication and construction:<br><br>• Aluminium sheet is lightweight but malleable - often requires stiffening, possibly addressed with added ribs/cross members on back<br>• Pop riveting to assemble components e.g. bracket on back of sign<br>• Some students might suggest security features such as one-way screw or similar to prevent malicious damage / removal<br><br>Sign and post<br><br>• Cut using press / bandsaw / guillotine / CNC router<br>• Holes for assembly are drilled or punched before assembly on site<br>• Sign bolted / embedded into concrete base for stability<br>• Post extruded and cut to length from a stock material |

14. **Award marks as stated.** **[9 marks]**

| | |
|---|---|
| 7-9 marks | A thorough and detailed evaluation of all three elements: copyright, patents and registered designs, in respect to the featured product. Detailed, informed and fully justified discussion of the advantages and disadvantages of protecting intellectual property. |
| 4-6 marks | A good evaluation of at least two elements: copyright, patents and registered designs, in respect to the featured product. A clear discussion of some of the advantages and disadvantages of protecting intellectual property. May lack understanding of differences between copyright, patents and registered designs in places. |
| 1-3 marks | Limited points made in the evaluation. Basic reference to at least one of the three elements: copyright, patents and registered designs. Little/no reference to featured product. Weak understanding or limited ability to discriminate between copyright, patents or registered designs. |
| 0 marks | Nothing worthy of credit |

**Indicative content:**

Copyright:

- Protects someone's work and stops others from using it without permission
- Allows the designer to protect their work from use by a third party without express permission to do so
- Automatic – no need to apply or pay a fee
- Used to protect written work and images / anything created by a person e.g. in the case of Dyson, applies to brand, illustrations, layout etc.
- Protects work from being copied, distributed, publishing online/hardcopy versions without permission
- Copyright is automatically granted to the creator but can be difficult to prove without formal evidence e.g. getting product published online or getting product to market as quickly as possible constitutes formal evidence – may be easier for established brands, such as Dyson, to prove.
- Offers protection in most countries worldwide
- Enforced for fixed period of time
- Usually for 70 years after the death of the creator

Patents:

- Patents must be applied for, this is a long and costly process
- Patents expire / require renewal
- Patents only cover certain regions e.g. UK/EU patents, Worldwide patents
- A protection for inventions and in particular how they work/function e.g. James Dyson patented the cyclone technology used in his cleaners, famously took Hoover to court and stopped them from selling their Hoover vortex cleaner
- Protection offered to inventor in exchange for disclosing detail of an invention into the public domain, may inform further inventions/technological progress
- Usually enforced for a period of 20 years but can be reapplied for
- Invention must not be on the excluded list held by the Patent Office – if it is a patent cannot be issued
- Getting a Worldwide patent can be a long and expensive process but, for a global brand like Dyson, this is what is required to fully protect intellectual property

- The invention being registered must be new and unlike anything already patented – only certain specific aspects of the Dyson cleaner product could be protected
- A patent pending can be awarded while further checks are made before a full patent and patent number is awarded. During this time, details of invention must be released into the public domain, including competitors
- Legally allows you to protect your design from use by other people/companies
- Undertaking court proceedings can be a long and expensive process and relies on the third-party product being noticed
- They must be lodged with the Intellectual Property Office (IPO) and all component parts of the design coded/identified
- Anyone wanting to use a patented design must ask the registered designer for permission to do so
- The patent holder can license the use of their invention to 3rd parties and receive appropriate royalties

Registered designs:

- The external design or appearance of a product can be registered e.g. appearance, physical shape, configuration, decoration of Dyson
- Gives the registering party exclusive rights to make use, sell, import and export any product which includes the registered design
- Attempts to prevent counterfeit copies of products being made
- Third parties can be fined for buying and/or selling counterfeit goods displaying/using a registered design
- Must be applied for at the Intellectual Property office (IPO)
- Limited to 25 years and must be renewed every 5 years
- Often awarded to a design where a patent is not appropriate i.e. does not have a particular function that can be replicated
- Shapes of objects may already be protected automatically through copyright but registering the design makes any legal action easier
- Designs must fulfil certain criteria to be registered: must be new, inoffensive, not incorporate emblems/logos or flags from others

**END OF MARK SCHEME**