

**CAMBRIDGE INTERNATIONAL EXAMINATIONS**  
International General Certificate of Secondary Education

**MARK SCHEME for the May/June 2014 series**

**0445 DESIGN AND TECHNOLOGY**

**0445/31**

Paper 3 (Resistant Materials), maximum raw mark 50

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

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## Section A

- 1 (a) Aluminium [1]
- (b) Lightweight, light, corrosion resistant, good strength-weight ratio, low density [1]
- 2 Handle tight, pins in line, blade facing correct way, wood held securely, blade tight, blade is not damaged, blade is sharp (2×1) [2]
- 3 (a) Accuracy of drawing: two parallel edges for 2 marks (0–2) [2]
- (b) Safe edge correctly labelled [1]

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Tool	Name	Specific use
	Guillotine, bench shears	Cutting thin metal/small section metal
	Jack plane	Preparation of material, quick removal of waste material

(4×1) [4]

- 5 (a) Vacuum forming, injection moulding [1]
- (b) Release from mould [1]
- (c) To add strength, rigidity [1]
- 6 2 measurements indicated: floor to behind knee, behind knee to backside, backside to lumber area (2×1) [2]
- 7 1 mm thick mild steel: scribe, odd legs, scribing gauge, scribing block
- 3 mm thick acrylic: chinagraph pencil, marker pen, felt-tip, leave backing paper on or apply masking tape and use pen or pencil [2]
- 8 Sheet metal shown between folding bars (1)
- Folding bars shown in vice (1)
- Use of mallet or hammer and scrap wood (1) [3]

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- 9 (a) Soft solder [1]
- (b) Tinplate work, plumbing [1]
- 10 Two advantages of moulded polypropylene include: weather resistance, durability, more easily moved around, comfortable armrests, will not rust, easier to clean, stronger must be qualified (2×1) [2]

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## Section B

- 11 (a)** Suitable joints include: M&T, halving, bridle, dowel  
Award 0–3 dependent upon accuracy of sketch (0–3)  
Must be in correct orientation otherwise max. 2 marks  
1 dowel only shown = 2 marks max.  
Suitable joint named to match sketch (1) **[4]**  
[Do not accept tenon or mortise on their own]
- (b) (i)** Variety of glues include: trade names such as Evo-Stik Resin W, Cascamite, or generic synthetic resin, PVA  
[Do not accept epoxy resin]  
Time to set to correspond with named glue: PVA 1–4 hours, synthetic resin 6–24 hours **[2]**
- (ii)** Sash cramps **[1]**
- (iii)** 2 checks include: square, flat, joints pulled together, removal of excess glue, measure diagonals, use of scrap wood to spread pressure or prevent damage, clamped straight, clamps not over tightened, clamps tight/secure (2×1) **[2]**
- (c)** Table of drilling machine shown (1)  
Some form of 'wedge' to provide 20° angle or rotate table and lock (1)  
Work piece secured/clamped (1) **[3]**
- (d)** Some form of base (1)  
Male and female formers/rods (0–2)  
Method of retention (1)
- OR**
- Male and female formers (0–2)  
Retention at start of bend (1)  
Method of force (1) **[4]**
- (e)** Award up to 3 marks max. for practical method that is hidden behind frame (0–3)  
Use of glued blocks/KD fittings/visible bracket/corner plates max. 2 marks  
Award 0–1 for details of sizes and materials (0–1) **[4]**
- (f)** Frame:  
Award 1 mark for recognition that frame needs to be in 4 separate parts (0–1)  
Use of KD fittings/dowel/screws to connect separate parts (0–2)
- Rods:  
Award 1 mark for recognition that rods need to be in 3 separate parts (0–1)  
Method of connecting 3 separate parts for each rod (0–1) **[5]**

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**12 (a)** 2 benefits include: check sizes, appearance, will it work, cheaper than making it from wood [Do not accept references to a template] (2×1) [2]

**(b)** Suitable method: dowel, M&T, added metal or wood support on surface of base  
Award 0–3 dependent on technical accuracy (0–3) (0–3)

Award up to max. 3 marks for support shown into mortise without shoulders

1 dowel only = max. 2 marks

Use of screws or nails from underneath = max. 2 marks

1 nail or screw = max. 1 mark

Name of method to correspond to sketch (1) [4]

**(c) (i)** Quicker, more accurate, cuts fibres of wood, cannot be rubbed off (2×1) [2]

**(ii)** Acceptable methods:

Use of plane, hand-powered router, band saw table tilted at 45° angle (1)

Wood secured for plane and hand-powered router

Band saw requires fence/guide (1)

Technical accuracy of named tools and equipment (1) [3]

**(d)**

<b>Process</b>	<b>Tools/equipment used</b>
Mark out	Pencil, rule, sliding bevel, marking knife, mitre square
Saw off waste	Tenon saw, coping saw, various machine saws including Hegner, band saw, jig saw
Make sawn edges smooth	Sanding disc, file, chisel, plane, glasspaper/sandpaper

(3×1) [3]

**(e) (i)** Panel pins, oval wire, oval nail, round nail, round head, round wire, lost head [1]

**(ii)** PVA, synthetic resin, contact [impact] ,accept trade names such as Resin W. [Do not accept epoxy resin, animal or scotch glue] [1]

**(iii)** Easier to clean, remove debris, allows water to escape [1]

**(f)** Problems involve weather/climate:

too hot or cold, too wet or dry, fungal/insect attack, windy conditions

woods can shrink or expand, rot

metals can rust, plastics can fade

award 1 mark for each sensible problem identified (2×1)

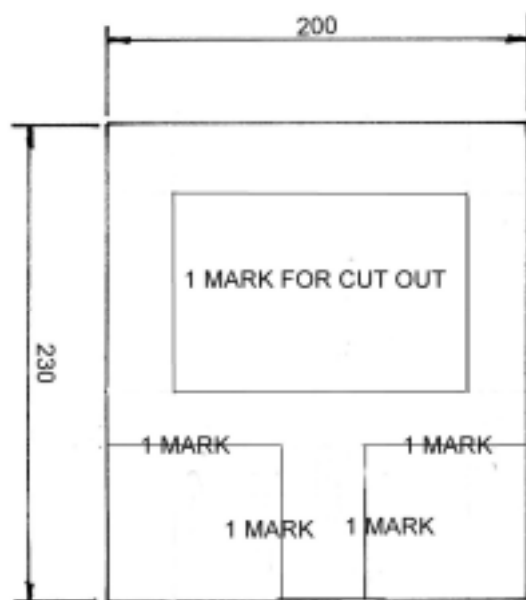
award 1 mark for each method to overcome problem

e.g. painted to protect, choice of material for specific environment (2×1) [4]

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- (g) End of **D** [or support] shaped to fit under roof (1)  
 Reinforced using block or strip of wood (1)  
 [Do not accept screwing of roof to shaped end of support]  
 Details of materials and constructions used (0–2) **[4]**

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- (a)
- (i) Award 1 mark for each cut shown above (5×1) **[5]**  
 Incorrect orientation = 0 marks
- (ii) Quicker, more accurate, repetitive accuracy (2×1) **[2]**  
 Template can be used as a 2D model
- (b) (i) Sketch to show work low in the vice to prevent it cracking (0–2)  
 Added notes to describe how problem is overcome (0–1) **[3]**
- (ii) Award work piece clamped in position/use of machine vice (1)  
 Award work piece supported underneath (1)  
 Award slow speed of drill/correct cutting angle/pilot drills (1) **[3]**
- (c) Use of wet and dry paper, polishing wheel, mop and compound/polish (2×1) **[2]**  
 Award any 2 items of equipment described
- (d) Heated over a line bender/strip heater/hot air gun to become soft (1)  
 Use of former or round bar (1)  
 Softened acrylic draped over former/round bar and held (1)  
 Technical accuracy (1) **[4]**
- (e) Practical solution/ concept (0–3)  
 Details of sizes and constructions (0–3) **[6]**  
 [Materials used must be appropriate for 4 mm thick acrylic otherwise 0 marks]