

**CAMBRIDGE INTERNATIONAL EXAMINATIONS**

Cambridge International General Certificate of Secondary Education

## **MARK SCHEME for the May/June 2015 series**

### **0445 DESIGN AND TECHNOLOGY**

**0445/31**

Paper 3 (Resistant Materials), maximum raw mark 50

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

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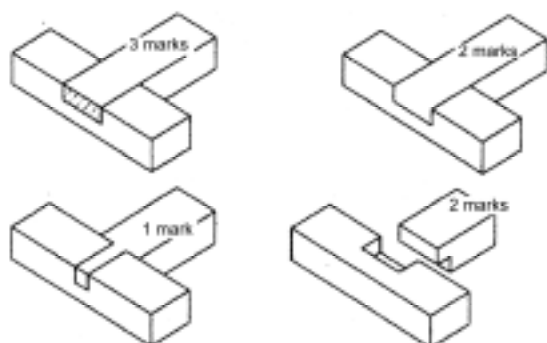
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### Section A

- 1 Marking gauge (1)  
 Micrometer (1)  
 Odd legs/odd leg calipers/Jenny[s] calipers. (1) [3]
- Not** calipers
- 2 Benefits: new blade is sharper, blades selected to cut different materials,  
 new blade rather than replace whole tool, broken/blunt blades can be replaced,  
 keeps blade sharp. (2 × 1) [2]  
**Not** different lengths.
- 3 Kevlar® (1)  
 Glass reinforced plastic (1) [2]
- 4 (a) brazing, welding, epoxy resin, Araldite (1)
- (b) acrylic/plastic cement, Tensol [cement] (1) [2]  
**Not** epoxy resin, Araldite
- 5 (a) A dowel joint (1)  
 B [corner] bridle joint, open mortise and tenon (1) [2]
- (b) greater surface area to be glued (1) [1]
- 6 (a) A [circular split] die (1)  
 B tap, plug tap (1) [2]
- (b) cut screw thread on rod/bar, external [male] thread, (1) [1]
- (c) cut screw thread inside hole, internal [female] thread (1) [1]  
 If 'cut a screw thread' is used for (b) and (c) award 1 mark only.
- 7 Award 0–3 dependent upon technical accuracy (0–3) [3]



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- 8 Hardwood not seasoned correctly, central heating,  
table top fixed to legs/rails without allowance for movement (2 × 1) [2]  
Award mark to answers relating to the wood drying out due to heat **not** excessive moisture.
- 9 Shape of sander fits into hand comfortably, quick replacement of abrasive paper,  
dust collection for health and safety, appropriate size to handle (2 × 1) [2]
- 10 (a) [High density] polyethelene/polythene. [1]
- (b) Can be recycled [1]  
**Not** 'it has been recycled'.

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### Section B

- 11 (a)** 4 stages: 4 × 1 Award any practical stage in process:  
 mark out length, mark out centres for holes, cut to length, square cut end,  
 drill holes (4)  
 Do **not** reward references to glasspaper/cork block
- Award 0–1 for technical accuracy (1)  
 Award 1 mark for Technical Accuracy **only** if minimum 3 stages are given  
 If no sketches are provided maximum mark 3 dependent on overall  
 quality of answer. [5]
- (b)** Jig with minimum of 3 holes correctly spaced (0–2)  
 Award 1 mark for 1 or 2 holes shown only.  
 Award 1 mark only if not correctly spaced.
- Jig fits over width of strip **and** block or fits into base board (0–2)  
 Award 1 mark only if not positively located.
- ‘Stopped’ at one end (0–2)  
 Named materials (0–1) [7]
- (c) (i)** Advantage: preserve, protect, enhance appearance, create interest,  
 more durable/hardwearing (1)
- (ii)** Disadvantage: paint or varnish can chip and look unattractive,  
 children may put in their mouth (1) [2]  
**Not** ‘increased cost’ or ‘takes longer’.
- (d)** Specific materials used (0–1)  
 Appropriate processes (0–3)  
 2 relevant/appropriate sizes: e.g. minimum Ø50 of wheel (0–2)  
 Technical accuracy (0–2) [8]
- If CAM/CNC machining is given answers must include details of process;  
 e.g. designed by CAD and downloaded to machine, machine parameters set,  
 material positioned in machine.
- (e)** Round section wood: dowel [1]
- (f)** Advantages: inherent colour, self-finished, moulded/intricate shapes possible,  
 hygienic, lightweight, no splinters, durable/hardwearing,  
 better resistance to weathering/external use. (2 × 1) [2]
- Not** cheaper, more attractive, easy to mass produce.

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12 (a) 4 bend lines (4 × 1) [4]  
Award 4 marks for correctly **stated** sizes even if drawing is not accurately proportioned.

(b) 3 stages, **in correct sequence** include:  
use of scraper,  
wet and dry [silicon carbide] abrasive paper [medium grit],  
wet and dry abrasive paper [silicon carbide] [fine grit],  
polishing mop and compound  
Brasso, acrylic polish. (3 × 1) [3]

**Do not** award marks for any filing process.

**Do not** award marks for emery cloth.

Award **2 stages** with different grades of wet and dry paper only.

**Do** accept 'wet and dry sand paper'.

(c) (i) **Do not** award marks for marking out.  
drill hole in acrylic (1)  
insert blade of coping saw, Hegner saw, abra file and cut out waste (1)  
file edges smooth **or** use of wet and dry paper (1) [3]

If chain drilling is described, award 2 marks for chain drilling and 1 mark for filing.

If CAM/CNC machining is given answers must include details of process;  
e.g. designed by CAD and downloaded to machine, machine parameters set,  
material positioned in machine.

(ii) 2 precautions: appropriate drill speed, clamp acrylic securely,  
slow feed for drill, support under acrylic, use of masking tape, drill pilot hole,  
use gradually increasing diameters of drill, little pressure (2 × 1) [2]

(d) Method of softening acrylic: strip heater or line bender (1)  
**Do not** accept oven or hot air gun to heat acrylic.

Appropriate shaped former (1)  
Clamp acrylic to retain shape (1)  
Technical accuracy (1) [4]

Award 1 mark for Technical Accuracy only if minimum 2 stages are provided.

(e) Practical idea: some form of 'shelf' or extended base. (0–2)

Appropriate materials and constructions (0–2) [4]  
Allow use of Araldite/epoxy resin **only** to join acrylic to wood or acrylic to metal.

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- (f) **Do not** award marks for marking out.  
Accept any 3 stages: (3 × 1)

Use of a wooden former/folding bars/jig  
Aluminium sheet secured while bent to shape [vice or cramps]  
Method of force: mallet or hammer **and** scrap wood.

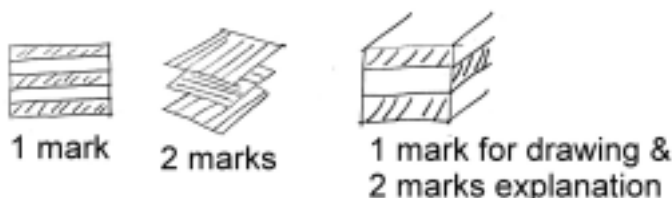
**Do not** award marks for hammer **without** scrap wood. [3]  
Accept bending machine: for maximum marks details must be provided. (0–3)

- (g) Self-finished: no applied finish (1)  
material is cleaned and prepared with appropriate abrasives (1) [2]

- 13 (a) Smooth finish, consistent density, relatively easy to cut and shape, no splinters, takes paint well, easier to work with, better finish, finer grain, no need to glasspaper, (2 × 1) [2]  
**Not** 'cheaper'.

- (b) Rounded corners, appropriate size, interesting puzzle shapes, different colours, lightweight, simple puzzle, tray to keep pieces, pieces too small to swallow (3 × 1) [3]

- (c) (i) Construction shown clearly (0–2)  
Notes to explain alternating grain producing stability/strength (0–1) [3]



- (ii) **Do not** award marks for marking out **or** use of a hole saw to remove shape.

Accept **any 3 stages** from the following:

Drill hole inside circular shape

Insert blade of appropriate saw and cut out shape or use of Surform tool or rasp to remove most of waste

Use of file to make smooth [**not** rasp]

Use of abrasive paper to make smooth (3 × 1)

Technical accuracy:

appropriately named saw and file and wood held securely (0–2) [5]

e.g. coping, Hegner, scroll, fret, pad

e.g. half-round, round or rat tail file

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- (iii) Top and bottom pieces of plywood shown clamped together (0–2)  
 At least 2 cramps shown **or** statement refers to use of cramps plural.  
 Suitable glue: PVA, Cascamite, synthetic resin, Gorilla glue. (1)
- Do not** award marks for Araldite/epoxy resin.
- Suitable cramps: G cramps, F cramps. (1) **[4]**
- (iv) Two advantages: speed of production, lighter weight, colours available, comfortable moulded shape, coloured without painting, easier to clean, consistent quality when batch produced. (2 × 1) **[2]**  
**Do not** award marks for 'easier to make', 'cheaper'.
- (d) Computer Aided **Design/Drafting** (1)  
 Computer Aided **Manufacture/Machining** (1) **[2]**
- (e) Two quality control checks applied to the puzzle and/or the tray: checks for dimensional accuracy/sizes/tolerances, overall finish, surface finish, consistency of materials used. (2 × 1) **[2]**
- (f) Manufactured boards can be made from recycled materials, therefore reducing the impact on the number of trees grown. Use of manufactured boards can reduce need for oil based products, plastics do not decompose, some manufactured boards use waste materials. (2 × 1) **[2]**