



**Cambridge International Examinations**  
Cambridge International General Certificate of Secondary Education

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**DESIGN AND TECHNOLOGY**

**0445/31**

Paper 3 Resistant Materials

**May/June 2016**

MARK SCHEME

Maximum Mark: 50

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**Published**

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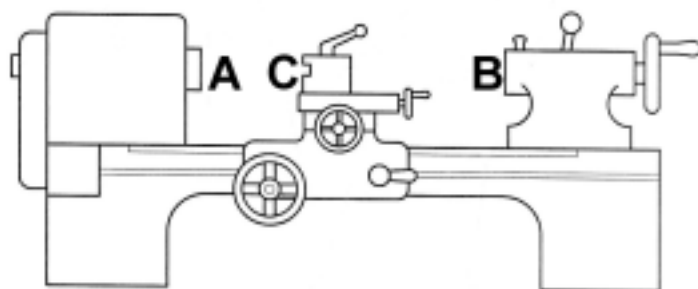
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### Section A

- 1 (a) Smoothing: not jack [1]
- (b) Grain shown either horizontal or emerging from right to left.  
Do not accept an arrow. Grain must be drawn on wood. [1]
- 2 3 specification points. The desk tidy must:  
store a variety of items, be attractive, allow for easy access of items, be stable,  
fit specific location, easy to move, compact, easy to clean  
Accept any other valid points 3 × 1 [3]
- 3 Carbon steel [1]
- 4 Award 0–3 dependent upon accuracy of sketch 0–3 [3]
- 5 (a) Polystyrene, polypropylene [1]
- (b) (i) Keeps food hot 1
- (ii) Can produce litter, cannot be recycled, does not decompose 1 [2]
- 6 (a) Mortise [1]
- (b) Thick handle, squarer/stronger blade, [leather] washer/shock absorber  
Handle with ferrule to withstand blows from matter. 2 × 1 [2]
- 7 3 ergonomic features: buttons easy to see, comfortable/rounded shape in hand,  
appropriate size to fit in hand, colour coded buttons for ease of operation,  
rubber buttons for better selection. 3 × 1 [3]
- 8 Award 0–2 dependent upon accuracy of sketch 0–2 [2]
- 9 (a) Steam bending, laminating [1]
- (b) Fewer joints to construct, sturdier construction, attractive curved appearance,  
less waste, stronger must be qualified [1]

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[3]

## Section B

- 11 (a) (i) Redwood, pine, parana pine, whitewood, fir [1]
- (ii) Manufactured board: hardboard, plywood, MDF [1]  
Suitable thickness: 4.6 or 9mm standard thickness [1]
- (b) (i) 2 benefits: ready-made, available from D-I-Y centres, professional finish, variety of materials, range of sizes 2 × 1 [2]
- (ii) Award 1 mark for correct position in the cabinet and 1 mark for brief description of how it would be fitted.
- Handle: attached to either left or right side of vertical rail [stile] of door using screws and/or glue. [2]
- Butt hinge: attached to **any** part of the door frame using screws. [2]
- Magnetic catch: 2 parts attached to side opposite butt hinge using screws. [2]
- Wall plate: screwed to the back of the cabinet then screwed to the wall. [2]
- (c) Suitable permanent joint, butt pinned and glued, half lap, dovetail, finger [comb] joint, dowel named  
Award 0–3 dependent upon accuracy of sketch 0–3 [4]
- (d) Use of pegs or pins or pre-manufactured studs 1  
3 different positions 1  
Technical accuracy: materials, spacing, sizes 1 [3]
- (e) (i) Suitable joint: dowel, mortise and tenon, corner halving, corner bridle named [1]
- (ii) Use of rebate, groove or applied beads 0–1  
Method of production 0–1  
Correct size/proportion 0–1 [3]
- (f) Benefit: lighter weight, see-through is convenient, could be cheaper [1]

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12	(a) (i) Mild steel: stronger, less likely to bend, cheaper, durable <b>OR</b> Aluminium: lighter, does not corrode, needs to finish		1 1 [1]
	(ii) Some form of insert/bush/sleeve/plate Materials named. Not rubber.		0–2 0–1 [3]
	(b) (i) Epoxy resin mixed in equal quantity with hardener Epoxy resin applied to both parts and held while resin sets		1 1 [2]
	(ii) Add hot water to granules of polymorph to soften them Remove from water and wrap it around the metal rod Mould to shape of hand grip		1 1 1 [3]
	(c) (i) Use of grub screw, pin, rivet Technical accuracy of sketch and added notes		0–1 0–2 [3]
	(ii) 4 stages: Granules fed into hopper Plastic granules heated to liquid form Forced by screw into injector Injected into mould Accept any valid intermediary stages given by candidates		1 1 1 1 [4]
	(iii) Cost of tooling is very expensive to produce Large quantities are needed to recover the costs		1 1 [2]
	(d) [Sand] casting		[1]
	(e) Scoring system must meet spec points: Use of rods/sliding counters, flip cards or similar to show score Fixed to cabinet Record maximum 5 goals scored Materials and fittings used		0–2 1 1 0–2 [6]
13	(a) (i) 2 benefits: quicker, more accurate, easier to mark out on paper/card and transfer, can be used as a model, wastes less material		2 × 1 [2]
	(ii) When large quantities are to be marked out a paper or card template would not last. Therefore a resistant material that would stand up to wear is required.		1 1 [2]
	(b) (i) Self-finished means no applied finish The material can be cleaned and buffed to a high quality		1 1 [2]

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- (ii)\* **Aluminium**  
 Cut out using combination of:  
 Abra file aw, tinships, junior hacksaw 0–2  
 Edges smooth using files and emery cloth 0–2  
 Tools and equipment named 0–1 **[5]**
- \*OR**
- Acrylic**  
 Cut out using coping, Hegner, scroll, band, tenon saw 0–2  
 Edges smooth using files and wet and dry paper 0–2  
 Tools and equipment named 0–1 **[5]**
- (c) (i) Bending acrylic:  
 strip heater/line bender 1  
 use of former 1  
 method of retention 1 **[3]**
- (ii) Bending aluminium:  
 use of folding bars, vice and scrap wood 1  
 use of former 1  
 method of force: mallet or hammer and scrap wood 1 **[3]**
- (d) Countersink head screws remove thickness from the material making it too thin. 1  
 Round head screws make no impact on thickness of material and support the material. 1 **[2]**
- (e) The hardwood shelf can expand and contract depending on room temperature and humidity and therefore must have allowance for movement. 1  
 No allowance for movement is provided when glued, therefore there is a danger that the hardwood will split. 1 **[2]**
- (f) Modifications include: recessed or housed slot in shelf or additional folds to a modified bracket  
 Security front to back 1  
 Security vertically up and down 1  
 Technical accuracy/added notes 0–2 **[4]**