Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

DESIGN AND TECHNOLOGY **0445/32**

Paper 3 Resistant Materials **May/June 2016**

MARK SCHEME

Maximum Mark: 50

Published

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** Screwdriver [not posidrive or Phillips] 1
B Spanner, socket, wrench, torque wrench 1
C Allen key, hexagon key 1 **[3]**

2 Award 0–2 dependent upon accuracy of sketch 0–2 **[2]**

3 **(a)** **A** finger or comb joint 1
B dovetail joit 1 **[2]**

(b) Reason: finger joint can be pulled apart in two directions and the dovetail joint can only be pulled apart in one direction **[1]**

4 Round tube 1
Angle, angle iron 1 **[2]**

5 **(a)** Knurled **[1]**

(b) To provide grip **[1]**

(c) Centre lathe, lathe, CNC lathe, metal lathe **[1]**

6 **A** Cutting gauge 1
B Marking gauge [not mortise gauge] 1 **[2]**

7 2 advantages: lighter weight means greater fuel economy, speed, environmentally more friendly, does not corrode, more suitable for small production runs, less dense, higher strength-weight ratio.

Not: more impact resistant, easier to mould/shape, stronger 2×1 **[2]**

8 3 ways suitable for children: colourful parts, appropriate height/reach, hardwearing materials, sound construction, rounded edges, non-toxic paint.
Accept individual anthropometric features.
Not: lightweight, aesthetically pleasing, simple to use [must be justified with specific feature]
no small pieces that could be swallowed 3×1 **[3]**

9 High voltage, electric shock hazard, danger electricity. Not: electric current. **[1]**
Flammable, fire hazard **[1]**

10 Malleable: aluminium, copper, brass, gilding metal, lead, low carbon steel, wrought iron, mild steel, precious metals. Not: iron, tin.

Corrosion resistant: aluminium, copper, brass, gilding metal, lead, zinc, stainless steel. Precious metals, titanium.

Electrical conductivity: aluminium, copper, brass, silver, steel, gold. Not: iron **[3]**

Section B

11 **(a)** 2 advantages: lighter weight appearance, lightweight, less weight, less expensive than solid piece, fewer problems of warping/shrinkage, less waste

Not: easy to make, stronger 2×1 **[2]**

(b) Only acceptable:
mortise and tenon, dowel, biscuit, butt [nailed **or** screwed **and** glued] 1

Award 0–3 dependent upon accuracy of sketch 0–3 **[4]**
Award max 2 marks for butt joint nailed **or** screwed **and** glued
Award 0 marks if butt has no nails or screws and glue
Award max 3 for 2 dowels shown in proportion with correct orientation
Award max 1 mark if 1 dowel only is shown

(c) **(i)** Name of cramps: sash, F cramp 1
2 or 3 cramps shown spaces appropriately across frame 1
Use of scrap wood 1 **[3]**

(ii) Frame held in vice 1
Use of smoothing, jack or bench plane 1
Use of glasspaper to make smooth 1
Correctly named tools and equipment 1 **[4]**

(d) Use of screws, dowels and adhesive.
Award 0–2 dependent upon accuracy of sketch **[2]**
Do not reward modified stand

(e) Practical idea: [do not reward increased height of ledge]
Must be separate, additional components 0–2
Details of materials and fittings used, including sizes 0–2 **[4]**

(f) Practical idea: some form of stand or support 0–2
Adjusts to 3 positions and held securely 0–2
Materials, constructions and fittings 0–2 **[6]**

12 (a) 2 reasons: hardwearing, close-grained, will not chip/splinter easily, takes a good finish, hardwood. 2 × 1 **[2]**
Tough, durable and strong acceptable **only** if justified: e.g. Strong enough to withstand knocks.
Not: easy to work with, lightweight, non-toxic, aesthetically pleasing.

(b) (i) Chinagraph pencil, marker pen, felt-tip pen, marking pen, permanent marker **[1]**

(ii) Reward 4 separate stages 4 × 1 **OR** 3 stages 3 × 1 + good technical accuracy + 1
Drill hole 1
Insert blade from appropriate saw and cut out shape 1
Use of files/scraper/wet and dry to make smooth 1
Technical accuracy 1
If laser cutter is used for maximum 4 marks full details **must** be provided.
If no sketches are provided award maximum 2 marks. **[4]**

(iii) Process: drilling 1
Solution: clamp securely, support with scrapwood, drill speed 1

Process: sawing **or** filing 1
Solution: clamp securely, low in the vice 1

Process: bending 1
Solution: heat to the correct temperature before bending 1 **[4]**

(c) Practical acceptable method named: 1
Acceptable methods: plough plane, power router, CNC router, circular saw [bench or portable], chisel and mallet, drilled holes, tenon saw.

Award 0–2 dependent upon technical accuracy of sketches 0–2 **[3]**
Do not reward marking out or cleaning up with glasspaper

(d) Acceptable methods:
band saw [tilted table/jig for correct angle]
tenon saw [from both ends]
handsaw [vertical]
use of smoothing, jack and bench plane
linisher, belt sander

Look for 3 stages: secure work piece, remove waste, clean up to final shape 3 × 1
Accuracy of named tools and equipment 0–1 **[4]**

(e) Preparation:
mark diagonals on end
centre drill, centre punch, bradawl
draw circle on end
make saw cut along one diagonal
plane off corners to 45° 3 × 1 **[3]**

(f) **(i)** 3 advantages: ready coloured, wide range of colours available, hygienic/easily cleaner, smooth surface finish, no danger of splinters, no finish required, water proof/resistant, will not warp or shrink, less waste material
Not: lighter than beech, faster to make 3×1 **[3]**

(ii) Process: extrusion, injection moulding **[1]**

13 **(a)** **(i)** **A** scriber/odd leg calipers/odd legs 1
B centre/dot punch 1
C dividers 1 **[3]**

(ii) marking/engineers blue, spirit marker **[1]**

(b) Drill hole/s in sheet 1
Insert blade of abra file saw, piercing saw, Hegner saw and cut out. 1
Not: hacksaw, jig saw
File to shape 1
Use of abrasive paper 1 **[4]**

(c) **(i)** Self-finishing: use of emery cloth and/or wet and dry paper, polishing mop/compound. Not: filing
Award 0–3 for specific stages and/or specific information relating to the grade of paper used. **[3]**

(ii) Reason for anodising: to protect, enhance appearance, prevent tarnishing, change colour. **[1]**

(d) **(i)** 2 tools/equipment: chisel, mallet, router, mortise machine, mortise drill, drilling machine and saw tooth/forstner bit, drill.
Accept 2 different types of router.
Accept any appropriate tool or item of equipment. 2×1 **[2]**

(ii) Suitable adhesive: epoxy resin, Araldite, impact adhesive 0–1
Not: superglue
Clamp in position or use of weights 0–1
Use of scrap wood to protect surface and distribute pressure 0–1 **[3]**

(e) 2 benefits: great accuracy, more accurate, each keyhole will be identical, quicker than traditional methods 2×1 **[2]**

(f) Practical ideal
Method includes use of brackets attached to back of keyrack and to wall or use of keyhole slot in plate recessed into back. 0–2
Holes drilled in wall and use of dowel, screws or pins = 1 mark max.
Accept screw holes visible in brackets or support strips used.

Materials, constructions and fittings 0–2 **[4]**

(g) Environmental impact of aluminium in products:
aluminium is plentiful in terms of the ore bauxite.
greenhouse gases are produced during extraction and processing.
aluminium can be recycled.

Description	0–1	
Expanded/explained	0–1	**[2]**