

**CAMBRIDGE INTERNATIONAL EXAMINATIONS**

Cambridge Ordinary Level

## **MARK SCHEME for the October/November 2015 series**

### **6043 DESIGN AND TECHNOLOGY**

**6043/01**

Paper 1, maximum raw mark 95

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### Part A

- 1 Any **two** valid processes – cutting from solid, vacuum forming, casting, etc. (1 × 2) [2]
- 2 Sketch of:
- (a) Padsaw
- (b) Junior hacksaw (2 × 2) [4]
- 3 **Two** reasons for using a flux: prevents oxidation, breaks down surface tension, and chemically cleans. (1 × 2) [2]
- 4 (a) Name - hot wire cutter
- (b) Cutting polystyrene foam (1 × 2) [2]
- 5 **Three** wood finishes named from paint, oil, wax, varnish etc. (1 × 3) [3]
- 6 The term 'annealing' explained – heating metal to make it softer (by relieving internal stresses) (1 × 2) [2]
- 7 **Three** factors to consider for desk – size of person, position of body, functions/storage, desk equipment, etc. (1 × 3) [3]
- 8 **Three** ways of holding work on a lathe between centres, face plate.  
3 jaw chuck, 4 jaw chuck (1 × 3) [3]
- 9 **Two** reasons why aluminium – lightweight, hygienic, easily shaped, re-useable, etc. (1 × 2) [2]
- 10 Suitable plastic:
- A Expanded polystyrene (foam)
- B Melamine (formica).
- C P.V.C. (leathercloth), polyester polyurethane (foam)
- D Acrylic. (1 × 4) [4]

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**Part B**

**11 (a) Three tools identified and purpose stated.**

- A** Claw hammer for general nailing work but can also remove unwanted nails.
- B** Rawhide mallet used for bending and shaping thin metal.
- C** Screwdriver used for driving screws into position. (2 × 3) [6]

**(b) (i)** Scrap wood is used as an aid when using the claw part of the head. It provides extra leverage and protects the work surface

**(ii)** The rolled cow hide is stronger than wood and will not split on sharp metal.

**(iii)** The screwdriver handle needs to be insulated when the tool is being used on any electrical equipment or fittings. Due to the dangers of electrocution. (2 × 3) [6]

**(c)** Sketch of:

**(i)** Nail punch.

**(ii)** Pincers. (2 × 2 + plus 1) [5]

**12 (a) Materials considered:**

- A** Aluminium – can easily form the shape, good colour, will not rust, etc. Will oxidize in time, may bend or lose its shape at this thickness.
- B** Beech – good colour and close grain, strong. Difficult to form shape from solid better from lamination
- C** Acrylic – easily form shape, range of colours, easy to clean, etc. May break under pressure as the material is brittle. (2 × 3) [6]

**(b) How heat and steam are used when forming shape.**

**(i)** Aluminium is quite a soft material but it may need to be heated with a blow torch to help with the bending. It is coated with soap which turns black at 400°C; aluminium is softened or annealed at 350°C.

**(ii)** If made from beech it will need to be put into a steam bender to make it more pliable and easier to form shape. Once softened the wood is then held to a shaped former until it dries out.

**(iii)** The acrylic needs to be placed on a strip heater and heated at the bend points. This softens the acrylic and then allows bending around a former. (2 × 3) [6]

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**(c) Reasons:**

- (i)** Being a metal, aluminium will have sharp edges which could be dangerous. So they must be made safe.
- (ii)** Being a timber beech will need some form of protection and wax will not only protect but allow the natural colour to show through.
- (iii)** The paper is to protect the surface of the acrylic from scratches and marks but also allows marking to take place. (1 × 3 + 2 = 5) [5]

**13 (a) How the materials are modified:**

- A Glass fibres are added to form a lamination which reinforces the resin.
- B The oak is cut into strips and glued back together in the form of a lamination around a shaped former.
- C The chisel blade is heated to a cherry red then quenched in water to harden, it is then cleaned and reheated gently until the correct oxide colour forms and quenched again. This tempers the blade, which is now hard and tough. (2 × 3) [6]

**(b) Action explained:**

- (i)** A mould is used which may be an inside or an outside mould. The face next to the mould gives the smooth finish the other side shows the glass fibres.
- (ii)** Metal or wooden formers are made. The oak material is cut into strips. These are then glued and placed around the former. They are cramped together until the glue has set.
- (iii)** If regrinding is not done carefully the blade cutting edge can overheat due to friction. This in effect changes the structure of the metal and makes it soft again. (2 × 3) [6]

**(c) Improved materials:**

- (i)** The melamine gives the blockboard a hard heat proof surface.
- (ii)** The carbon is added to the surface of mild steel by a system of heating and quenching. This gives the mild steel a hard outer surface.
- (iii)** The setting time of the plastic may be speeded up by using an accelerator. It is important to keep the catalyst and accelerator apart during storage. (1 × 3 + 2 = 5) [5]

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**14 (a) Two** properties: tough, lightweight, colourful, easy to work, etc. (1 × 2) [2]

**(b) Two** processes from:

- (i)** Injection moulding – plastic granules, hopper, screw, heaters, ram, molten plastic split mould, etc.
- (ii)** Casting – split pattern, cope and drag, sand, sieve, parting powder, strickling, sprue pins, etc.
- (iii)** Turning on a wood lathe – blank, ends prepared, mounted between centres, tool rest, tools, turn to round, etc. (1 × 7 × 2 + plus1) [15]

**15 Any two** processes:

- (a)** Plastic coating the mild steel wire rack – clean mild steel, wire support, heat in oven or with blow torch, turn on fluidising tank, plastic power, compressed air, floating particles, dip, action, reheat, etc.
- (b)** Marking and cutting – marking gauge, ruler, try square, marking fingers, work in vice, tenon saw, cutting vertical lines, coping saw, cutting horizontal lines, chisel waste etc.
- (c)** Size of rivets, marking out holes, blue, scribe, engineering square, centre punch, holding, drilling holes, countersinking holes, fitting rivet, support, ball – pein hammer, working, etc. (1 × 8 × 2 + plus 1) [17]

**16 (a) Two** properties – such as tough, strong, lightweight, weather resistant, etc. (1 × 2) [2]

**(b)** Making the winding device sides:

- (i)** Marking out – ruler, pencil, marking knife, try square, dividers, working as a pair.
- (ii)** Holding two sides together, g-cramp, setting up on drill table, support, cramp, drill, size, action.
- (iii)** Sides must be drilled at the position of the handle holes, thin metal pins or dowel can now be knocked into position. (1 × 4 × 3 plus 1 extra detail) [13]

**(c)** This may be rounding corners and edges, some form of grip added to handle. (1 × 2) [2]

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17 (a) Material and reason:

(i) Suitable material – polythene, polypropylene, steel, aluminium, pine, MDF, HIPS.  
Reason such as stable, lightweight, hard wearing. (1 × 2) [2]

(b) Making the work station – Stages of making the work station such as using vacuum forming machine, plastic sheeting, clamping, heating, soft and flexible, mould, air removed, sheet pressed down, etc. (1 + 1 × 8 = 9) [9]

(c) Sketches showing methods of holding table equipment – may be grooves, holes, clips, etc. (1 × 6) [6]

18 (a) Terms explained:

**A Soft soldering** – Is a low temperature method of joining two metals together using another metal alloy. The joint is first fluxed, and then a copper bit is heated and tinned with solder. This is then run over the joint leaving a thin flow of solder. May be electrical components method.

**B Knock down fittings** – Used to make furniture normally called flat pack construction that can be taken to pieces and reassembled later. The fittings replace the permanent joints and come in many different types from simple blocks to more complex devices.

**C Blow moulding** – Is the shaping of a thermoplastic with aid of heat and air. The plastic is heated in an oven until soft then quickly put into a jig. Air is then blown onto the plastic which now inflates and forms the required shape. This is then allowed to cool.

**D Knurling** – This is done on the lathe and is a special tool that is used to press a diamond or straight pattern onto the metal surface, it is done to provide extra grip. (1 × 4 × 4 + plus 1 = 17) [17]