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O Level

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Cambridge Ordinary Level

DESIGN AND TECHNOLOGY **6043/01**

Paper 1 **October/November 2016**

MARK SCHEME

Maximum Mark: 100

Published

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Part A

Attempt **all** questions.

1 **(a)** HDPE (High-Density Polyethylene), Polypropylene. [1]

(b) Range of colours, easily moulded, water proof. [1]

2 Sketches of

(a) marking gauge – stock/locking screw/fence/ spur. [2]

(b) scriber – slender (knurled handle), sharp point. [2]

3 **(a)** **(i)** Ductility - ability to be drawn into wire – permanently deformed without cracking when in tension. [1]

(ii) Elasticity – returns to original shape after deformation. [1]

(b) **(i)** e.g. aluminium, mild steel. [1]

(ii) e.g. rubber, polypropylene, nylon. [1]

4 Centre drill. [1]

Enable location of drilling procedure usually on lathe. [1]

5 **(a)** Dovetail joint. [1]

(b) Drawer, wall cabinet. [1]
Mechanical strength, aesthetic quality. [1]

6 Two from – rounded corners, smooth finish, taper for ease of removal of plastic, vent holes. (1×2) [2]

7 Two from – weather resistant, easy to extrude shape, no additional finish required. (1×2) [2]

8 **(a)** Wet and dry paper. [1]

(b) Glasspaper, garnet paper. [1]

(c) Emery cloth. [1]

9 Sketch showing sacrificial piece or use of shooting board, plane in from both ends. [2]

10 **(a)** Two from – use of template, marker, chinagraph pencil. [2]

(b) Correct use of tensol, solvent cement. [2]

Part B

Attempt **four questions**, **two** from Section 1 and **two** from Section 2.

Section 1 – Tools and Materials

11 (a) Three tools identified and use stated
A – **Hacksaw** – cutting metal or plastic.
B – **Coping saw** – cutting curved shapes in wood or plastic.
C – **Tenon saw** (accept Dovetail saw) cutting straight lines in wood. (2 × 3) [6]

(b) (i) Frame size does not restrict depth of cut. [2]

(ii) Sprung frame, slots at each end, handle tightens. [2]

(iii) Keeps the saw blade straight for efficient and accurate cutting. [2]

(c) Sketches of
(i) tension file (frame or pad handle) purpose – cutting curves and intricate shapes. [3]

(ii) hole saw, purpose - cutting large diameter holes. [3]

12 (a)

Smart Material	Properties/function	Product application
Colour changing materials	Thermo-chromic materials change colour as the temperature changes. Photochromic materials change colour according to different lighting conditions.	contact thermometers made from plastic strips and test strips on the side of batteries (where the heat comes from a resistor under the thermochromic film). Food packaging materials that indicate the product is cooked to the right temperature. Photochromic - security markers that can only be seen in ultraviolet light
Shape memory alloys	Can remember a shape, will return to original shape on heating (Nitinol)	Door locks, fire alarms, Electrical connectors, Spectacles, Triggers to start the sprinklers in fire alarm systems, controllers for hot water valves in showers or coffee machines and for spectacle frames
Quantum-tunnelling composite	Quantum-tunnelling composite (QTC) is a flexible polymer which contains tiny metal particles. normally an insulator but if it is squeezed it becomes a conductor.	QTC can be used to make membrane switches like those used on mobile phones, pressure sensors and speed controllers.
Piezo electric materials	When a piezoelectric material is squeezed rapidly, it produces a small electrical voltage for a moment. voltage put across the material makes a tiny change in shape.	Contact sensors for alarm systems and in microphones and headphones.

1 mark for property/function, 2 marks for application (application should indicate how the property is utilised) $(1 \times 4 + 2 \times 4)$ [12]

(b) For any **two** material groups

(i) destruction of rain forest, better use of manufactured board, not easily recycled.

(ii) recyclable, many ores running out (copper, rare ores), energy required to process/manufacture.

(iii) some recyclable, uses non-renewable source, vast usage, transporting oil.

(3×2) [6]

13 (a) Four items named and use stated
A – **Dust mask** – sanding or dust creating activities.
B – **Apron** – general practical/bench work to protect clothing.
C – **Heat proof gloves/rubber gloves/gauntlets** – carrying out heat processes, working with chemicals, casting, brazing.
D – **Goggles** – drilling/turning, chip/particle creating activities, solvent gluing. (2 × 4) [8]

(b) (i) Care holding sharp edge down when carrying, both hands behind cutting edge.

(ii) Tool/workpiece secure, correct lathe speed, no distractions.

(iii) Well-ventilated area, avoid skin contact. (2 × 3) [6]

(c) Sketch and description for
work held secure. [1]
sacrificial piece underneath. [1]
care when drilling with portable drill. [2]

14 (a) Two from – impact resistance, weather resistance, easy to shape into form, lightweight. [2]

(b) (i) Too heavy, will corrode.

(ii) Crack easily, sharp edges easily created.

(iii) Difficult to create shape. (2 × 3) [6]

(c) Simple test to check impact, weather resistance, shaping possibilities, accept any other valid test.
Reference to property 1mark test 2 marks [3]

(d) (i) One from – expanded polystyrene, ABS, polycarbonate. [1]

(ii) Sketch - tools could be – drill, pad saw/coping saw, file. (3 × 2) [6]

Section 2 – Processes

15 (a) One from – acrylic, polystyrene, aluminium, laminated hardwood (birch/beech). [1]
Appropriate finish. [1]

(b) Sketches for

(i) appropriate marking out of slots alignment, centres, parallel slot. [4]

(ii) appropriate cutting to shape of slots, drill, saw, file. [4]

(iii) forming of bends. [5]

(c) Sketch an appropriate modification. [3]

16 Any **two** stages, Sketches for

(a) bridle joint – marking out.
– cutting sides - tenon saw.
– cutting female section – coping saw/chisel.
– cutting shoulders – chisel.
– hammer and block to test fit. most stages 9

(b) blow moulding – details of parison.
– details of split mould.
– heat and air pressure.
– remove and trim. most stages 9

(c) turning – blank in 3 jaw chuck.
– face off.
– taper turn (compound slide).
– centre drill/drill.
– part off. most stages 9

(2×9) [18]

17 (a) Suitable materials:
Shade – aluminium, acrylic, polystyrene, laminated named hardwood.
Frame – named hardwood, aluminium, mild steel (with finish) ABS, Polypropylene.
Base – named hardwood, aluminium, acrylic, polystyrene.

Sketches for

(i) processes could be – laminated/steam bent, heat formed, metal bent round former.
Material [1] process [4] [5]

(ii) processes could be – cut from cylinder, using former.
Material [1] process [4] [5]

(iii) processes could be – cast aluminium, turned hardwood, vacuum formed plastic.
Material [1] process [4] [5]

(b) Sketch an appropriate functional attachment. [3]

18 (a) (i) Named hardwood, HDPE, MDF.

(ii) Nylon, aluminium, mild steel.

(iii) Named hardwood, nylon, HDPE.

(Material and reason 1 mark) (1 × 3) [3]

(b) Sketches for

(i) appropriate process for cutting support – coping saw/drilling/filing. 4

(ii) appropriate method of joining guide rails to support – drilling/ using adhesive. 4

(iii) appropriate process for making bead – turning, plastic casting. 4

(4 × 3) [12]

(c) Method of applying colour – child friendly paint, anodized aluminium, stain for bead, different coloured nylon/acrylic rod for rail. [3]