CAMBRIDGE INTERNATIONAL EXAMINATIONS

GCE Ordinary Level

MARK SCHEME for the October/November 2013 series

6043 DESIGN AND TECHNOLOGY

6043/01 Paper 1, maximum raw mark 95

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Part A

1 Each colour gives a guide to the temperature and degree of hardness of the steel when heated. (1 × 2) [2]

2 Sketch of bradawl = 2; used to make small holes to start screws or nails. (1 × 3) [3]

3 **(a)** Process – injection moulding. [1]

(b) The plastic will need to be in a molten state. [1]

4 **(a)** Boxes – cope and drag named. (1 × 2) [2]

(b) Used for holding sand in the casting process. (1 × 2) [2]

5 Three sketches showing simple nailed bottom, rebate, groove. (1 × 3) [3]

6 **(a)** Solvent bonding such as Tensol cement. [1]

(b) The masking tape helps to protect the area around the joint from solvent. [1]

7 **(a)** Working metal in a hot state by hammering. (1 × 2) [2]

(b) As the metal is very hot it can burn hands, body, clothes etc. [1]

8 Two wood finishes such as French polish, oil, wax, varnish, paint etc. (1 × 2) [2]

9 Workshop processes using their face mask – sanding, G.R.P work cutting polystyrene, grinding etc. [1]

Using rubber gloves – handling glass fibre, resin, acid bath etc. [1]

10 **(a)** Two suitable plastics:
Squeezy bottle – low density polythene.
Hot drinks cup – expanded polystyrene. (1 × 2) [2]

(b) Reasons:
Low density polythene – flexible, soft, wide range of colours etc.
Expanded polystyrene – heat insulator, very lightweight. (1 × 2) [2]

Part B

11 (a) Three measuring tools identified and purpose explained.

A metric steel ruler – used for small general marking out and checking sizes.
B metric steel tape ruler – used for large distance measuring and checking.
C micrometer – used for measuring small items with great accuracy. (2 × 3) [6]

(b) Notes and sketches showing:

(i) Cut out end odd leg calliper set to edge of metric ruler, scriber end pulled to distance.

(ii) How ruler can expand and retract in distance, how it can lock at a certain distance, flexible.

(iii) Sketch of micrometer anvils checking the diameter of a round bar. (3 × 3) [9]

12 (a) The effect on the following:

(i) The softwood bench would dry out and start to shrink causing it to crack and split. It would also start to fade in colour.

(ii) The dripping water would cause the steel to rust and in time weaken the support.

(iii) As the heat from the flame is close to the acrylic it would start to soften and in time melt.

(2 × 3) [6]

(b) The helpful examples explained.

(i) Steam heating can be helpful when bending timber as it has the effect of softening the structure. This allows timber to bend without breaking.

(ii) Heating metal allows us to change its structure, we can soften it or make it hard etc. It can be worked into different shapes or positions etc.

(iii) Air can be used in different ways with plastic, first with plastic powder making it float like a liquid for coating other materials. Or it can be used to blow soft plastic into different shapes.

(2 × 3) [6]

(c) Examples of how the working environment is affected by workshop practice. They may be in different forms such as noise from machines, hammering, sawing etc. fumes from cutting certain materials, mixing chemicals etc. Dust and grit from sanding, grinding etc. Plus any other dangerous or damaging practice. (1 × 5) [5]

13 (a) Three fixings identified and example of use stated.

A round headed nail – used for general joinery work.
B countersunk headed screw – used to join wood to wood when a flush head is needed.
C hexagonal headed bolt – used when a strong joining system is needed such as metal to metal, wood to wood. Works with the addition of a nut. (2 × 3) [6]

(b) Sketches of the three tools required.

A Some form of hammer.
B A screwdriver.
C A spanner. (3 × 3) [9]

(c) Different materials are used for fixings for a number of reasons – appearance such as brass, bronze, copper etc. or for protection such as stainless steel or a coating of zinc.
(1 × 2) [2]

14 (a) **Two** safety factors that need to be considered such as:
no small parts, sharp edges, toxic materials, weight of material etc. (1 × 2) [2]

(b) Notes and sketches:

(i) Method of joining – reduced axle/threaded end holes in wheels, nuts/pins etc.
(1 × 3) [3]

(ii) Description of preparing wheels and axle for joining. Axle will need to be turned or reduced in size for shoulder, end section threaded, or holes drilled for split pins, wheel holes drilled, added nut/washer etc. (1 × 4) [4]

(c) Preparing and painting the toy, tools and materials needed, primer, undercoat, top coat. Time, action etc. (1 × 5) [5]

(d) Sketch showing the connection between push stick and toy. May be slot, groove, hook etc.
(1 × 3) [3]

15 (a) Advantages and disadvantages of **two** of the methods listed – built up, vacuum formed, casting, injection moulding. (2 × 2) [4]

(b) Making the container by **one** of the methods listed – tools or equipment all must relate to material, such as injection moulding – mould, plastic granules, hopper, heater, molten plastic, screw, ram, cooling etc. (1 × 8) [8]

(c) Forming the arm shape explained with notes and sketches, such as round material, heating to soften, jig, former, vice, hammer. Holes in the sides of container. (1 × 5) [5]

16 (a) Suitable sheet material such as mild steel, aluminium, acrylic, beech, veneers etc. Strong, durable, easy to shape, colourful, flexible etc. (1 × 2) [2]

(b) Processes described – actions and tools must relate to chosen material.

(i) Marking out – plastic would be scriber, odd legs, engineers square, dividers etc. (1 × 5) [5]

(ii) Cutting to shape – wood would be woodworkers vice, G-cramp, coping saw, chisel, abrasive material etc. (1 × 5) [5]

(iii) Forming bend – for plastic, would be making former, strip, heater, heating plastic, state, gloves, bending, cooling etc. (1 × 5) [5]

17 Notes and sketches on **two** of the following –

(a) Soft soldering tinplate joint – cleaning metal, soldering iron, applying, flux, zinc chloride, material, tinning bit, heating, flow etc.

(b) Turning on lathe – preparing blank, lathe set up method, rough turning, tools, turning to size, finishing, checking for size etc.

(c) Blow moulding – mould, machine, plastic, sheet, clamps, heater, plastic state, hot air, cooling etc.

(1 × 8 × 2 + 1 for extra detail) [17]

18 Explaining the terms:

- Fluidising – making a plastic powder act as a liquid by blowing air through it so that hot objects may be dipped and covered.
- Case hardening – a method of putting a hard coating onto the surface of a steel for extra wear. It is done by heating the metal and burning carbon on its surface and quenching in water.
- Lamination – by bonding together thin layers of materials to form thicker sections. Mainly used in wood and plastic when needed to form large sections or complex shapes.
- Extrusion – this is the continuous forcing of molten plastic through a metal die resulting in the production of tubes and I type sections.

(1 × 4 × 4 + 1 extra detail) [17]