MARK SCHEME for the May/June 2015 series

0445 DESIGN AND TECHNOLOGY

0445/32 Paper 3 (Resistant Materials), maximum raw mark 50

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.

Cambridge will not enter into discussions about these mark schemes.

Cambridge is publishing the mark schemes for the May/June 2015 series for most Cambridge IGCSE®, Cambridge International A and AS Level components and some Cambridge O Level components.
Section A

1   Marking gauge
    Micrometer
    Odd legs/odd leg calipers/Jenny[s] calipers.

2   Benefits: new blade is sharper, blades selected to cut different materials,
    new blade rather than replace whole tool, broken/blunt blades can be replaced,
    keeps blade sharp.
    Not different lengths.

3   Kevlar®
    Glass reinforced plastic

4 (a) brazing, welding, epoxy resin, Araldite
    (b) acrylic/plastic cement, Tensol [cement]
        Not epoxy resin, Araldite

5 (a) A dowel joint
    B [corner] bridle joint, open mortise and tenon
    (b) greater surface area to be glued

6 (a) A [circular split] die
    B tap, plug tap
    (b) cut screw thread on rod/bar, external [male] thread,
    (c) cut screw thread inside hole, internal [female] thread
    If ‘cut a screw thread’ is used for (b) and (c) award 1 mark only.

7   Award 0–3 dependent upon technical accuracy
8 Hardwood not seasoned correctly, central heating, table top fixed to legs/rails without allowance for movement (2\times1) [2]
Award mark to answers relating to the wood drying out due to heat not excessive moisture.

9 Shape of sander fits into hand comfortably, quick replacement of abrasive paper, dust collection for health and safety, appropriate size to handle (2\times1) [2]

10 (a) [High density] polyethelene/polythene. [1]

(b) Can be recycled
Not 'it has been recycled'. [1]
Section B

11  (a)  4 stages: 4 × 1  
Award any practical stage in process:  
mark out length, mark out centres for holes, cut to length, square cut end,  
drill holes  
Do not reward references to glasspaper/cork block  
Award 0–1 for technical accuracy  
Award 1 mark for Technical Accuracy only if minimum 3 stages are given  
If no sketches are provided maximum mark 3 dependent on overall quality of answer.  

(b)  Jig with minimum of 3 holes correctly spaced  
Award 1 mark for 1 or 2 holes shown only.  
Award 1 mark only if not correctly spaced.  
Jig fits over width of strip and block or fits into base board  
Award 1 mark only if not positively located.  
‘Stopped’ at one end  
Named materials  

(c)  (i)  Advantage: preserve, protect, enhance appearance, create interest, more durable/hardwearing  
(ii)  Disadvantage: paint or varnish can chip and look unattractive, children may put in their mouth  
Not ‘increased cost’ or ‘takes longer’.  

(d)  Specific materials used  
Appropriate processes  
2 relevant/appropriate sizes: e.g. minimum Ø50 of wheel  
Technical accuracy  
If CAM/CNC machining is given answers must include details of process; e.g. designed by CAD and downloaded to machine, machine parameters set, material positioned in machine.  

(e)  Round section wood: dowel  

(f)  Advantages: inherent colour, self-finished, moulded/intricate shapes possible, hygienic, lightweight, no splinters, durable/hardwearing, better resistance to weathering/external use.  
Not cheaper, more attractive, easy to mass produce.
12  (a) 4 bend lines  
Award 4 marks for correctly stated sizes even if drawing is not accurately proportioned.

(b) 3 stages, in correct sequence include:  
use of scraper,  
[medium grit],  
[fine grit],  
polishing mop and compound  
Brasso, acrylic polish. 
Do not award marks for any filing process.  
Do not award marks for emery cloth.  
Award 2 stages with different grades of wet and dry paper only.  
Do accept ‘wet and dry sand paper’.

(c) (i) Do not award marks for marking out.  
[1]  
drill hole in acrylic  
insert blade of coping saw, Hegner saw, abra file and cut out waste  
file edges smooth or use of wet and dry paper  
If chain drilling is described, award 2 marks for chain drilling and 1 mark for filing. 
If CAM/CNC machining is given answers must include details of process;  
e.g. designed by CAD and downloaded to machine, machine parameters set,  
machine positioned in machine.  
(ii) 2 precautions: appropriate drill speed, clamp acrylic securely,  
slow feed for drill, support under acrylic, use of masking tape, drill pilot hole,  
use gradually increasing diameters of drill, little pressure  

(d) Method of softening acrylic: strip heater or line bender  
Do not accept oven or hot air gun to heat acrylic. 
Appropriate shaped former  
Clamp acrylic to retain shape  
Technical accuracy  
Award 1 mark for Technical Accuracy only if minimum 2 stages are provided.

(e) Practical idea: some form of ‘shelf’ or extended base.  
Appropriate materials and constructions  
Allow use of Araldite/epoxy resin only to join acrylic to wood or acrylic to metal.
(f) **Do not** award marks for marking out.

Accept any 3 stages: 

- Use of a wooden former/folding bars/jig
- Aluminium sheet secured while bent to shape [vice or cramps]
- Method of force: mallet or hammer **and** scrap wood.

**Do not** award marks for hammer without scrap wood. 

Accept bending machine: for maximum marks details must be provided. [3]

(g) Self-finished: no applied finish

- Material is cleaned and prepared with appropriate abrasives [2]

13 (a) Smooth finish, consistent density, relatively easy to cut and shape, no splinters, takes paint well, easier to work with, better finish, finer grain, no need to glasspaper, 

**Not** ‘cheaper’. [2]

(b) Rounded corners, appropriate size, interesting puzzle shapes, different colours, lightweight, simple puzzle, tray to keep pieces, pieces too small to swallow [3]

(c) (i) Construction shown clearly

- Notes to explain alternating grain producing stability/strength [3]

(ii) **Do not** award marks for marking out or use of a hole saw to remove shape.

Accept any 3 stages from the following:

- Drill hole inside circular shape
- Insert blade of appropriate saw and cut out shape or use of Surform tool or rasp to remove most of waste
- Use of file to make smooth [not rasp]
- Use of abrasive paper to make smooth [3]

**Technical accuracy:**
- Appropriately named saw and file and wood held securely
- E.g. coping, Hegner, scroll, fret, pad
- E.g. half-round, round or rat tail file [5]
(iii) Top and bottom pieces of plywood shown clamped together
At least 2 cramps shown or statement refers to use of cramps plural.
Suitable glue: PVA, Cascamite, synthetic resin, Gorilla glue.

Do not award marks for Araldite/epoxy resin.

Suitable cramps: G cramps, F cramps.

(iv) Two advantages: speed of production, lighter weight, colours available,
comfortable moulded shape, coloured without painting, easier to clean,
consistent quality when batch produced.

Do not award marks for ‘easier to make’, ‘cheaper’.

(d) Computer Aided Design/Drafting

Computer Aided Manufacture/Machining

(e) Two quality control checks applied to the puzzle and/or the tray:
checks for dimensional accuracy/sizes/tolerances, overall finish,
surface finish, consistency of materials used.

(f) Manufactured boards can be made from recycled materials,
therefore reducing the impact on the number of trees grown.
Use of manufactured boards can reduce need for oil based products,
plastics do not decompose, some manufactured boards use waste materials.