CAMBRIDGE INTERNATIONAL EXAMINATIONS

International General Certificate of Secondary Education

MARK SCHEME for the May/June 2013 series

0445 DESIGN AND TECHNOLOGY

0445/31 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 2013 series for most IGCSE, GCE Advanced Level and Advanced Subsidiary Level components and some Ordinary Level components.

CAMBRIDGE
International Examinations

Section A

1 Lightweight/light, corrosion resistant, ductile, can be welded, durable, self-finished, good strength-to weight ratio. (2 × 1)
Do **not** accept: tough, easily joined, strong, malleable, attractive. **[2]**

2

Radius **A**	Half round.
Corner **B**	Hand file (Accept safe-edge file).
Hole **C**	Round/Rat tail.

[3]

3 **(a)** Corrosive **[1]**

(b) Toxic **[1]**

4 Accuracy of completed joint. (0–3)
Butt joint shown = 2 marks. T&G or alternative construction = 1 mark. **[3]**

5

Tool	Name	Specific use
	Smoothing plane	Making surfaces flat / smooth /plane to size/removing wood Do not accept 'planing' on its own.
	Marking gauge	Marking lines [parallel to an edge] on wood Do not accept 'marking' on its own, '90° to an edge'.

[4]

6 **(a)** Cold chisel. **[1]**

(b) Tin snips, snips, hacksaw, junior hacksaw, piercing saw, shears, guillotine.
Do **not** accept 'saw' on its own. **[1]**

7 Lightweight to move about, corrosion resistant, comfortable moulded shape, stackable, self-finishing, variety of colours, easier to clean, does not warp.
Only accept 'cheaper' if qualified, e.g. reference to manufacturing process, etc. (2 × 1) **[2]**

8 Wide range suitable. Accept PVA, synthetic resin [urea formaldehyde], contact [impact] adhesives and trade names, epoxy resin/Araldite, animal glue, Scotch glue, glue gun, hot glue gun. (2 × 1)
Do **not** accept superglue. **[2]**

9 **(a)** Pencil, rule, try square, cutting gauge, marking knife/knife. **[1]**

(b) Tenon saw, chisel, coping saw, band saw, vibro saw or equivalent. **[1]**
Do **not** accept jig saw, 'saw' on its own, file.

10 18.71

Above datum	18.00	18.00	(1)
Below datum	0.50	18.50	(1)
Thimble	0.21	18.71	(1)

[3]

Section B

11 (a) (i) Wide boards available, large sizes available, stable boards, cheaper.
Accept environmental advantages, e.g. uses up waste materials, includes recycled materials, reduces number of trees felled. (2 × 1) **[2]**
Do **not** accept lighter, easier to work, range of sizes.

(ii) More easily damaged, unsightly edges need hiding, references to less attractive. **[1]**

(b) Screwed only
Head hidden [countersunk or counterbored or pocket screwed]. (1)
Length of screw indicated. (1)
Clearance hole or other details. (1)
Award 0 marks if screwed through top into rail.

OR

Use of bracket/block/KD fitting
Practical idea. (0–2)
Added notes. (0–1) **[3]**

(c) (i) Use of dowel jig.
Drill hole in end of rail, insert dowel stud, line up on side and make indentation, remove and drill corresponding hole.

OR

Use of panel pins.
Mark out centre line on end of rail, insert panel pin, snip off head, line up on side and make indentation, remove and drill corresponding hole.

Award 0–4 dependent on detail provided shown clearly by sketches and notes.
Award maximum 0–3 for description of marking out **without** use of jig dependent on accuracy of method. **[4]**

(ii) Award 0–3 marks for sketch of construction and 0–1 mark for added notes/name.
Accept M&T/wedged M&T/cam lock, scan fitting, use of additional materials to increase thickness to allow alternative constructions, e.g. pin or screw and glue.
Award maximum marks for a M&T without reference to gluing.
Alternative constructions **must** refer to gluing for max. marks otherwise maximum 3. Do **not** accept biscuit joint, screws through ends into rails. **[4]**

(iii) Recognised KD fitting. (1)
Correct position to join rail and side. (0–2) **[3]**

(d) Faster than by hand, less effort required, more even finish, can cover large areas, better finish. (2 × 1) **[2]**

(e) Main stages include:
Glue dowels into ends of rails.
Insert glue into holes in one side and join rails to side.
Repeat for opposite side.
Position table top on rails and screw from underneath.
Accept other specific stages such as wipe off surplus glue, wait for glue to dry before fitting table top, test for squareness.
Award 0–4 marks for 4 stages and 0–2 marks for clarity of sketches.
For maximum 4 marks table must include gluing together otherwise maximum 3 marks.
Do **not** accept use of sash cramps. **[6]**

12 (a) (i) Polystyrene, HIPS, ABS, acrylic, polycarbonate, HDPE. **[1]**

(ii) Fast/quick process [once mould is made], repetitive accuracy, variety of shapes possible, little waste. Do **not** accept 'accurate'. (2 × 1) **[2]**

(b) Sloping sides [draft angle], radiused corners, no undercuts, smooth surfaces, not too deep, not too complicated shapes, air holes. (2 × 1) **[2]**

(c) Award 0–5 for 5 main stages and award 0–3 for technical accuracy.
Stages include:
Place mould in machine [on platen].
Clamp plastic in place.
Bring heater across to soften plastic.
Check flexibility of plastic.
Bring up mould into soft plastic.
Turn pump on to remove air.
Lower mould [on platen].
Leave to cool. **[8]**

Do accept a single drawing of a vacuum forming machine with added labels/notes.
Do **not** reward making the mould.

(d) Large shapes easy to handle, variety of shapes, durable materials, no splinters,colours used.
Do accept safety features including: no sharp edges, no small parts to swallow, non-toxic finish. (2 × 1) **[2]**

(e) Between-centres turning

Main stages include: mark out centres on both ends, draw a circle on one end, plane of sharp corners, make saw cut in one end, mount between centres [using fork and dead centres], set up tee rest, use of gouge/scraper to shape, use of calipers to check for required diameter, glasspaper, remove from lathe and saw off, smooth.

OR

Faceplate turning

Preparation of softwood block, glue to wooden disc, paper between for ease of removal, set up on lathe, use of gouge/scraper to shape, use of calipers to check for required diameter, glasspaper, remove from lathe.

Reward **3** stages:	**1** Marking out/preparation/setting up.	(0–2)
	2 Turning to shape.	(0–2)
	3 Smoothing finished shape/glasspapering.	(0–2)
AND	Technical accuracy/quality of communication.	(0–2)

OR

Sawing from sheet/block and making round.

Main stages include: mark out diagonals/circle on wood, secure to bench/flat surface, use of tenon saw to remove most waste or use of Hegner/vibro saw or equivalent, e.g. coping saw with wood held in vice, use of files and glasspaper to make round or use of sanding disc.

Reward **3** stages:	**1** Marking out/preparation.	(0–2)
	2 Producing round shape.	(0–2)
	3 Smoothing finished shape/glasspapering.	(0–2)
AND	Technical accuracy/ quality of communication.	(0–2)

[8]

(f) Quality control checks can apply to **any** part of the manufacture of the toy: the tray or individual shapes, including checks to see if shapes fit into spaces in tray, check quality of vacuum formed plastic tray, check for sharp or rough edges. (2×1) **[2]**

Do **not** accept vague answers such as ‘check it is safe’.

13 (a) Relatively cheap, easily machined/shaped, joined, durable, malleable, can take a surface finish. (2 × 1) **[2]**

(b) Sawn: use of hacksaw to cut angle with steel held in vice. (0–2)
Filed: use of triangular/half round/flat/hand file with steel held in vice. (0–2) **[4]**
Award maximum 2 marks for written description only without sketches.

(c) Five additional stages include: clean/degrease, apply flux to joint, clamp joint together, position on brazing hearth, heat up joint, apply spelter [brazing rod], heat until spelter runs, allow to cool. (5 × 1) **[5]**

(d) (i) Plastic coated to protect guitar head from scratches. **[1]**

Do **not** accept 'to protect'.

(ii) Plastic [dip] coating by fluidisation includes: clean/degrease metal, heat metal [to 180° in oven], dip metal into fluidised plastic powder, return to oven to fuse coating, leave to cool.

Award 0–3 for relevant stages and award 0–2 for technical accuracy of sketches. **[5]**

(e) Jig to fit over blank. (0–1)
2 holes drilled in jig to position quickly and accurately. (0–1)
Method of securing blank when it is being drilled:
use of lipping/edging to locate in/against jig. (0–2) **[4]**

Award only 1 mark for use of clamps to secure.

(f) SLOT Slot cut into upright tube or back plate for up and down adjustment. (0–2)
Slot can be elongated or a series of individual holes.

SECURE Details of nuts and bolts/screws to secure back plate to upright. (0–2) **[4]**