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**DESIGN AND TECHNOLOGY**

**0445/32**

Paper 3 Resistant Materials

**May/June 2017**

MARK SCHEME

Maximum Mark: 50

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**Published**

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.

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This document consists of **6** printed pages.

Question	Answer	Marks
1	PVA	1

Question	Answer	Marks
2	Point = 1 mark 'Step' = 1 mark	2

Question	Answer	Marks
3	Smart	1

Question	Answer	Marks
4	Award 1 mark for each correctly drawn groove and rebate	2

Question	Answer	Marks
5	<b>A</b> nut and bolt <b>B</b> [pop] rivet <b>C</b> screw <b>D</b> nail Accept incorrectly named screw or nail. <b>Not</b> cut tack.	4

Question	Answer	Marks
6	Completed drawing showing grain at 90° to previous layers	1

Question	Answer	Marks
7	Electric plug body                      Urea/phenol formaldehyde                      1 Plastic blister packaging                      Polythene, PVC, PET                      1 Knife handle                      Phenol formaldehyde, ABS                      1	3

Question	Answer	Marks
8(a)	Chipboard	1
8(b)	Very small particles of scrap/wood chips                      1 With an adhesive                      1 <b>Not</b> sawdust. Ignore references to recycled wood	2
8(c)	Cost	1

Question	Answer	Marks
9(a)	1.5–3 mm. Do <b>not</b> accept ranges of thicknesses.	1
9(b)	Two methods of permanent joining: brazing [soldering], welding, riveting <b>Not</b> pop rivets, epoxy resin	2

Question	Answer	Marks
10(a)(i)	Stainless steel, mild steel	1
10(a)(ii)	Aluminium, brass, copper	1
10(b)	Base fitted: to collect crumbs, add rigidity to rack, stability Prevent scratches to surfaces, pick up more easily <b>Not</b> wider surface area.	2

**Section B**

<b>Question</b>	<b>Answer</b>	<b>Marks</b>	
11(a)	Two good design features include: angled for comfort [ergonomics], storage unit useful, ledge prevents pens/pencils/paper sliding off, rounded corners for safety	<b>2</b>	
11(b)	Board Storage unit Ledge Support	plywood, <b>faced</b> chipboard only, MDF, Blockboard, Laminboard, <b>not</b> chipboard PVC, ABS, HIPS, acrylic polystyrene accept any suitable named hardwood mild steel, stainless steel, aluminium, <b>not</b> steel	1 1 1 1
11(c)(i)	Power saw: jig saw, circular saw	<b>1</b>	
11(c)(ii)	No trailing leads, no loose clothing, long hair tied back, work secured, face mask, safety of hands, ear defenders <b>Not</b> goggles, gloves	<b>1</b>	
11(d)(i)	Two features of mould design: draft angle, rounded edges/corners, no undercuts <b>Not</b> vent holes	<b>2</b>	
11(d)(ii)	If the plastic is overheated = 1 If the plastic is not hot enough = 1 Plastic can be moulded to the shape of the former = 1 Plastic is made soft = 1	it will melt = 1 it will not form to the mould = 1 1 1	<b>2</b>
11(e)(i)	The drawing board is only 15mm thick and the metal rod would not be secure or the holes would wear and the support work loose. Additional blocks provide a thicker material to provide deeper holes Makes more stable/stronger Hole will be visible		<b>2</b>
11(e)(ii)	Metal rod bent: Held in vice or clamped to a bench Vice, former or anvil around which the rod can be bent Method of force hammer <b>and</b> scrap wood or mallet <b>Not</b> hammer on its own		1 1 1
11(f)	Practical method: Angled Stable and secure Named materials Constructions Total redesign of board = max 3		1 0–2 1 0–2
11(g)	Portable sander benefits: faster than by hand, more even pressure exerted. Produces a smooth surface, removes marks and scratches.		<b>2</b>

Question	Answer	Marks
12(a)	Two reasons include: easily formed, self-coloured, durable outdoors, waterproof, easily cleaned, corrosion resistant, windproof <b>Not</b> self-finishing.	<b>2</b>
12(b)	Hole saw	<b>1</b>
12(c)(i)	Hegner saw or equivalent, scroll saw, band saw, jig saw	<b>1</b>
12(c)(ii)	Half-round file, round [rat tail] file, spokeshave, scraper, bobbin sander	<b>1</b>
12(c)(iii)	Safety glasses, goggles, eye protection, no loose clothing, long hair tied back, finger safety	<b>1</b>
12(d)	Sketch showing: butt joint glued and pinned/screwed, dowel, half-lap, dovetail, finger, biscuit  Award use of adhesive Technical accuracy of joint  <b>Not</b> mitre joint, hot glue gun	<b>3</b>  1 0–2
12(e)(i)	Two items of equipment: chinagraph pencil, marker pen, wax pencil, crayon, pencil on protective paper, felt-tip pen. <b>Not</b> scribe	<b>2</b>
12(e)(ii)	lower acrylic in vice, support behind acrylic while sawing, fine tooth blade, speed of sawing, clamping/securing acrylic.  Award 1 mark for 1 point and 1 mark for additional description <b>OR</b> Award 2 marks for 2 separate points.	<b>2</b>
12(f)	Method of shaping roof: 3 stages: Heat plastic in oven, hot air 'gun' use of former over which to shape acrylic Method of retention Technical accuracy of stages/equipment used	<b>3</b>   0–1
12(g)(i)	Two features of mould include draft angle, smooth surfaces, radiused edges/corners, no undercuts	<b>2</b>
12(g)(ii)	Vacuum forming process involves numerous stages:  Position mould on platen, clamp plastic to machine, heat plastic, test for flexibility, lift platen into plastic, turn on blower to suck out air, lower platen, leave to cool, trim edges of plastic, finish edges appropriately  Award 1 mark for 6 specific stages	<b>6</b>

Question	Answer	Marks
13(a)	MDF, plywood, chipboard, blockboard, laminboard	1
13(a)(ii)	Reason for choice: durable, hardwearing, stable, references to recycled materials, cheaper than...[qualified], MDF [ <b>only</b> ] low risk of splinters <b>Not</b> cheap.	1
13(b)(i)	Suitable joint: mortise and tenon, dowel, bridle named Technical accuracy of joining method <b>Not</b> butt joint, screwed joint, mitre joint Must be in correct orientation/proportion for maximum marks	1 0–3 4
13(b)(ii)	Support joined using screws/KD fitting/nuts and bolts, brackets technical accuracy of details provided	1 0–2 3
13(c)(i)	Medium grade glasspaper: used to clean hardwood and remove small scratches and marks  Fine grade glasspaper: used <b>after</b> medium grade to produce an even smoother finish <b>Progression</b> through 2 grades of glasspaper  Damp cloth: used to remove dust following glasspapering  Cork block: used to wrap glasspaper around to provide more even pressure	1  1  1  1 4
13(c)(ii)	Polyurethane varnish is hardwearing, tough, easily cleaned, stain resistant, durable, gives protection, attractive/aesthetic, waterproof/resistant.	2
13(d)(i)	Length of computer desk top dependent on items to be positioned on the top, anthropometric measurements	1
13(d)(ii)	Height of desk dependent on seat height of user	1
13(e)	Drawer supported under desk top and made to slide in and out  Use of runners, rebates or grooves for drawer to run on and be supported Award 0–2 for practical idea Joined to supports = 1 mark  Two important sizes  Details of materials and constructions used	0–2  0–2  0–2 6
13(f)	Two drawbacks: some methods of construction may not be as durable, parts sometimes missing, limited consumer skill, difficult instructions, tools not available.  References to strength of materials and/or constructions must be qualified otherwise 0 marks.	2