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**DESIGN AND TECHNOLOGY**

**0445/31**

Paper 3 Resistant Materials

**May/June 2018**

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.

Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

Cambridge International will not enter into discussions about these mark schemes.

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**PUBLISHED****Generic Marking Principles**

These general marking principles must be applied by all examiners when marking candidate answers. They should be applied alongside the specific content of the mark scheme or generic level descriptors for a question. Each question paper and mark scheme will also comply with these marking principles.

**GENERIC MARKING PRINCIPLE 1:**

Marks must be awarded in line with:

- the specific content of the mark scheme or the generic level descriptors for the question
- the specific skills defined in the mark scheme or in the generic level descriptors for the question
- the standard of response required by a candidate as exemplified by the standardisation scripts.

**GENERIC MARKING PRINCIPLE 2:**

Marks awarded are always **whole marks** (not half marks, or other fractions).

**GENERIC MARKING PRINCIPLE 3:**

Marks must be awarded **positively**:

- marks are awarded for correct/valid answers, as defined in the mark scheme. However, credit is given for valid answers which go beyond the scope of the syllabus and mark scheme, referring to your Team Leader as appropriate
- marks are awarded when candidates clearly demonstrate what they know and can do
- marks are not deducted for errors
- marks are not deducted for omissions
- answers should only be judged on the quality of spelling, punctuation and grammar when these features are specifically assessed by the question as indicated by the mark scheme. The meaning, however, should be unambiguous.

**GENERIC MARKING PRINCIPLE 4:**

Rules must be applied consistently e.g. in situations where candidates have not followed instructions or in the application of generic level descriptors.

**GENERIC MARKING PRINCIPLE 5:**

Marks should be awarded using the full range of marks defined in the mark scheme for the question (however; the use of the full mark range may be limited according to the quality of the candidate responses seen).

**GENERIC MARKING PRINCIPLE 6:**

Marks awarded are based solely on the requirements as defined in the mark scheme. Marks should not be awarded with grade thresholds or grade descriptors in mind.

Question	Answer	Marks
1(a)	Polypropylene	1
1(b)	Tough, hardwearing, colourful, can be injection moulded, light to carry, durable, impact resistant, easily moulded shape	1

Question	Answer	Marks
2(a)	Flat, hand file	1
2(b)	Jack, smoothing, try, block plane	1

Question	Answer	Marks
3	Pins or screws shown in 2 directions Use of adhesive only	2 1 2

Question	Answer	Marks
4(a)	Brass, copper, gilding metal, aluminium	1
4(b)	Easy to bend, attractive finish, malleable	1

Question	Answer	Marks
5	1 way: strengthen corners using gusset, metal fasteners 1 way: insert cross rails	0–2 0–2 4

Question	Answer	Marks
6	From the top to bottom: ash      blockboard      MDF	3 × 1 3

Question	Answer	Marks
7	Retaining strips positioned on the base in front and behind acrylic, use of grooves/housings	2 × 1 2

Question	Answer	Marks
8	Thermochromic	1

Question	Answer	Marks
9	Award 0–3 dependent on technical accuracy	3

Question	Answer	Marks
10(a)	Cost of tooling is high High volume production necessary to recover costs/make profit	1 1 2
10(b)	Plastics dependent on oil which is a finite resource Plastics not biodegradeable Disposed of at landfill When burnt give off toxic fumes	1 1 1 1 2

Question	Answer	Marks
11(a)(i)	Red deal, pine, parana pine, whitewood, yew	1
11(a)(ii)	Materials must not be affected by moisture as a result of steam Materials used to co-ordinate with existing colour scheme/style	1
11(b)(i)	Butt joint pinned and glued, finger [comb] joint, dowel, mitre, dovetail, lapped, KD block Award 0–3 dependent on technical accuracy Named joint appropriate	1 4

Question	Answer	Marks
11(b)(ii)	Methods include: groove or rebate [by removal or applied beads] KD block Award 0–3 dependent on technical accuracy	<b>3</b>
11(c)	Handle shape Material Construction	1 1 1 <b>3</b>
11(d)	Accept <b>any appropriate part</b> of the storage unit: e.g. cutting sides to length, positions for holes to attach uprights to boxes. Appropriate part stated Jig or device to speed up batch production: award 0–4 dependent on technical accuracy/additional detailed notes	1 <b>5</b>
11(e)	2 screws required to join uprights to boxes Additional details	2 × 1 1 <b>3</b>
11(f)	Accept any appropriate <b>functional</b> improvement; e.g. 'feet' to raise storage unit off the floor, some form of cleaning holes/slots in base of boxes to assist cleaning, partitions.	<b>3</b>
11(g)	Reasons include: satisfaction of constructing the product themselves, generally cheaper than ready-assembled products, some self-assembly products can be disassembled for storage, easier to transport home	2 × 1 <b>2</b>

Question	Answer	Marks
12(a)	Wide variety of hardwoods available	<b>1</b>
12(b)	Extremely hard, attractive appearance, non-corrosive, durable, tough	2 × 1 <b>2</b>
12(c)(i)	saw tooth, forstner bit, flat bit, auger, twist drill	2 × 1 <b>2</b>
12(c)(ii)	Scrap wood provides support to prevent splintering as the drill/bit emerges Scrap wood protects the surface from drilled holes Clamping is safer as work piece cannot 'spin' and snag	<b>2</b>
12(d)(i)	Scriber, permanent marker, pencil , marking blue	2 × 1 <b>2</b>

Question	Answer	Marks
12(d)(ii)	Centre punch: provides an indentation to guide the drill Prevents the drill from slipping and damaging work piece	1 1 <b>2</b>
12(d)(iii)	Tools/equipment named/shown: vice, mallet, hammer and scrap wood Sketches showing process: Award 0–3 dependent on technical accuracy Correct order:	0–2 0–3 0–1 <b>6</b>
12(e)	Metal can become work hardened when it is shaped. Annealing will reduce internal stress and ‘soften’ the metal.	2 × 1 <b>2</b>
12(f)	Some form of ‘block’ to act as a spacer Appropriate method of construction joining the front to the back of rack Named material/s 2 important sizes	1 0–2 1 2 <b>6</b>

Question	Answer	Marks
13(a)(i)	Red deal, pine, parana pine, whitewood, yew	<b>1</b>
13(a)(ii)	Generally cheaper than hardwood, can be left bare or painted	<b>1</b>
13(b)	Softwood positioned/located securely Accurate length can be sawn Technical accuracy	1 1 0–2 <b>4</b>
13(c)(i)	Diagonals marked, saw cut across one diagonal, circle marked on ends, corners planed off	2 × 1 <b>2</b>
13(c)(ii)	Outside calipers, digital calipers	<b>1</b>
13(c)(iii)	Scraper, gouge, parting tool, glasspaper and cork block [rubber], chisel, relevant and appropriate PPE	2 × 1 <b>2</b>
13(d)	Stub axle or continuous rod Method of retention: nut, ‘cap’, star washer Move freely: clearance holes, use of washers	1 1 1 <b>3</b>

<b>Question</b>	<b>Answer</b>	<b>Marks</b>
13(e)(i)	Jack, smoothing, block plane	<b>1</b>
13(e)(ii)	Bench stop clearly shown Softwood shown in position against bench stop	1 0–2 <b>3</b>
13(f)(i)	Modifications include: draft angle on sides Rounded edges/corners	0–2 0–2 <b>4</b>
13(f)(ii)	Polystyrene [HIPS], acrylic, ABS	<b>1</b>
13(f)(iii)	2 checks include: plastic clamped securely, correct temperature achieved to soften plastic, blower on long enough to withdraw air	2 × 1 <b>2</b>