

Mark Scheme (Results)

Summer 2007

GCSE

GCSE Design and Technology: Resistant Materials Technology Foundation Tier (1973/3973)

Marking Guidance

Give / State / Name

Normally a one or two word answer, at the very most a short sentence.

Describe

Normally, one or two sentences which form a description, making reference to more than one point. All points must be linked for a complete answer.

Explain

Normally, one or two sentences which form an explanation. This requires a clear or detailed account of something and includes a relevant justification, reason or example.

Evaluate

Normally one or two sentences where the quality, suitability or value of something is judged. This can include both positive and negative points, with each point normally requiring a relevant justification.

The mark scheme contains a range of possible answers for all questions. For some questions it is possible to provide a finite number of acceptable answers. However, in some instances it is not possible to provide every conceivable answer. In these instances objective guidance is provided.

For all answers candidates are not expected to give the exact wording contained in this mark scheme. However, to gain credit their answer must demonstrate the same meaning as detailed in the mark scheme.

It is the examiner's responsibility to apply their professional judgement in determining if what the candidate has written has the same meaning as the answer detailed in the mark scheme. For all answers the '*Key words*' have been written in bold text.

For describe and explain questions, candidates may give a different combination of the marking points listed in the mark scheme. In such instances candidates can be rewarded for the marking points provided that they are suitably linked. However, candidates cannot be rewarded for the same point repeated in two different combinations.

Examiners must mark in red pen using ticks and crosses in the body of the script.

Design & Technology: Resistant Materials Technology (1973/2F)
Full Course Foundation Tier Mark Scheme

Question Number	Question		
1973_2F_Q01ai-ii	<p>The table below shows some tools, components and equipment.</p> <p>Complete the table by:</p> <p>(i) naming each tool, component or piece of equipment</p> <p>(ii) describing its use</p>		
	Answer	Part Mark	Total Mark
	Name: mallet (<i>only answer</i>) Use: striking/hitting/knocking a chisel/wood/joints together	1 1	
	Name: drill (<i>any answer with 'drill' in it is correct</i>) Use: drilling / making holes	1 1	
	Name: safety goggles/specs Use: protecting / stop bits getting into eyes	1 1	
	Name: nut (<i>only answer</i>) Use: fixing/joining/holding/fastening/securing/screwing onto bolts	1 1	
	Name: vacuum former/moulder / vacuum forming machine / blow moulder / blow moulding machine Use: making product cases/ hollow shells / heating / forming/ shaping / moulding plastic	1 1	(10)

Question Number	Question		
1973_2F_Q01bi	The drawing shows a try square. The surface of the metal blade has been plated. Give <u>one</u> reason why the metal blade is plated.		
	Answer	Part Mark	Total Mark
	One reason given from: <ul style="list-style-type: none"> • stops it from rusting/corroding • more decorative/make it look nice • more durable / harder wearing / last longer 	1	(1)
Question Number	Question		
1973_2F_Q01bii	The metal face is made from brass, an alloy. Mark with a cross <u>one</u> other alloy from the list below.		
	Answer	Part Mark	Total Mark
	Mild steel (<i>Only answer</i>)	1	(1)
Question Number	Question		
1973_2F_Q01ci	A student needs to mark out 10 copies of the shape below. The shape is marked out onto an acrylic sheet using a template and a marking-out tool. Name <u>one</u> marking-out tool which can be used to mark around the template.		
	Answer	Part Mark	Total Mark
	One tool named from: <ul style="list-style-type: none"> • scriber • marking knife • pen/pencil/Chinagraph/felt tip 	1	(1)

Question Number	Question		
1973_2F_Q01cii	Give <u>two</u> reasons for using a template.		
	<p>Answer</p> <p>Two reasons given from:</p> <ul style="list-style-type: none"> • saves time/faster • do not have to mark it out • complex shape to draw around • more consistent / identical shape • more accurate • repeats the shape • less waste material /shape can be nested to maximise material <p><i>(Do not accept 'easier')</i></p>	Part Mark	Total Mark
		2x1	(2)
Question Number	Question		
1973_2F_Q01d	<p>The original template was designed and manufactured on a CAD/CAM system.</p> <p>Choose terms from the list to complete the statements below about the design and manufacture of the template.</p> <p>Each term may be used once or not at all.</p>		
	<p>Answer</p> <ol style="list-style-type: none"> 1. virtual 2. e-mail 3. batch 	Part Mark	Total Mark
		3x1	(3)

Question Number	Question		
1973_2F_Q01ei	A manufacturer has been asked to make 10,000 of the shapes, in acrylic, using CNC machinery. Give <u>two</u> advantages for the manufacturer of using CNC machinery to produce the shapes in acrylic.		
	Answer	Part Mark	Total Mark
	Two advantages given from: <ul style="list-style-type: none"> • can work 24/7 / once set up can run non-stop • greater accuracy • several sheets/layers/shapes can be cut at once • no edge finishing is required • fewer workers required • less wages to be paid • no marking out required <i>(Do not accept 'quicker'/'easier'/'cheaper'/'faster')</i>	2x1	(2)
Question Number	Question		
1973_2F_Q01eii	Explain <u>one</u> reason why CNC machinery is not normally used for one-off production.		
	Answer	Part Mark	Total Mark
	One reason explained: set up costs are expensive / it takes a long time to set up the machine and therefore a one-off does not justify this cost / better suited to mass/batch production / it is not effective use of time/money	2x1	(2)
(Total 22 marks)			

Question Number	Question		
1973_2F_Q02a	<p>The drawing shows a garden spade used for digging in a garden.</p> <p>The wooden shaft has been made from a hardwood.</p> <p>Mark with a cross <u>one</u> hardwood from the list which is suitable for the wooden shaft.</p>		
	Answer	Part Mark	Total Mark
	Ash (<i>Only answer</i>)	1	(1)
Question Number	Question		
1973_2F_Q02bi	<p>One property of the metal used for the blade is hardness.</p> <p>Name <u>two</u> other properties the metal for the blade must have.</p>		
	Answer	Part Mark	Total Mark
	<p>Two properties named from:</p> <ul style="list-style-type: none"> • high impact strength/toughness / withstands sudden shock loading • high compressive strength / does not dent/bend easily • malleability / can be formed/made without tearing/cracking • will not rust/corrode • durability / last a long time • high quality / can take a smooth finish <p>(Do not accept 'strong'/'hard'/'strength'/'sharpness' on their own)</p>	2x1	(2)

Question Number	Question		
1973_2F_Q02bii	Give <u>three</u> reasons why the metal for the blade must have the property of hardness.		
	Answer	Part Mark	Total Mark
	<p>Three reason given from:</p> <ul style="list-style-type: none"> • cut through soil/roots • will not damage cutting edge / will keep edge • will not bend/break when levered/bent backwards/snap = tough • can take the pressure/force of a foot being pressed on it = compression • will not wear away/get damaged 	3x1	(3)
Question Number	Question		
1973_2F_Q02ci	ABS has been used for the plastic handle. ABS has the property of plasticity. Give <u>three</u> other properties of the ABS plastic.		
	Answer	Part Mark	Total Mark
	<p>Three properties given from:</p> <ul style="list-style-type: none"> • high impact strength/toughness/withstand sudden shock loading • durability / last a long time / can withstand UV exposure • lightweight • high quality surface finish • electrical insulator (will not conduct electricity) • weatherproof/waterproof / will not rust/corrode <p><i>(Do not accept anything that relates to plasticity ie 'shaping'/'moulding'/'forming')</i> <i>(Do not accept 'strong'/'strength' on their own)</i></p>	3x1	(3)

Question Number	Question		
1973_2F_Q02cii	The ABS plastic handle is formed using an injection moulding process. Explain <u>one</u> reason why ABS plastic needs the property of plasticity.		
	Answer	Part Mark	Total Mark
	One reason explained from:		
	<ul style="list-style-type: none"> so it does not break/crack / can be easily squeezed/flows easily when injected into the mould / reformed 	2x1	(2)
1973_2F_Q02d	Give <u>three</u> advantages for the user of the garden spade having passed the British Standards test.		
	Answer	Part Mark	Total Mark
	Three advantages given from:		
	<ul style="list-style-type: none"> greater reliability / less likely to break has been subjected to rigorous tests and has passed / acceptable level of quality / high quality it is safe to use / quality assurance / enhanced product value gives consumers confidence in the product / it has a guarantee 	3x1	(3)
1973_2F_Q02e	A lot of wood is wasted in the production of the shaft for the garden spade. Describe <u>two</u> effects on the environment of wasting wood.		
	Answer	Part Mark	Total Mark
	Two effects described from:		
	<ul style="list-style-type: none"> deforestation gives rise to soil erosion / flooding / changing landscapes / loss of species of animals/animal habitats imbalance of greenhouse gases / changes to oxygen/CO₂ can give rise to global warming disposal of waste wood means burning/landfill 	2x1 2x1	(4)

Question Number	Question		
1973_2F_Q02f	<p>The wooden shaft of the garden spade is manufactured using CAD/CAM.</p> <p>Explain <u>two</u> effects on a company's workforce of using CAD/CAM to manufacture the wooden shaft.</p>		
	<p>Answer</p> <p>Two effects explained from:</p> <ul style="list-style-type: none"> • fewer manual workers needed therefore they may move away from the area/get made redundant • smaller/higher skilled workforce required therefore they may have to be paid higher wages / have new skills/career opportunities • might have to work unsociable shift patterns because CNC machines run 24/7 • workforce becomes less skilled therefore more difficult to find skilled workers when required 	<p>Part Mark</p> <p>4x1</p>	<p>Total Mark</p> <p>(4)</p>
		(Total 22 marks)	

Question Number	Question																										
1973_2F_Q03a	<p>A wine bottle storage system is needed for use in the home.</p> <p>The specification for the wine bottle storage system is that it must</p> <ul style="list-style-type: none"> • not fall over and hold up to five bottles • be flat pack for assembly without any tools • allow each bottle to be easily removed • be made using materials and processes suitable for one-off production <p>In the spaces, use sketches and, where necessary, brief notes to show two different design ideas for the wine bottle storage system that meet this specification.</p>		<table border="1"> <thead> <tr> <th>Answer</th> <th>Part Mark</th> <th>Total Mark</th> </tr> </thead> <tbody> <tr> <td> <p>Design Idea 1 Each point of the specification has two marking points.</p> <p>1 mark should be awarded for evidence of each point of the specification resolved in the design.</p> <p>Where an answer does not viably answer a specification point</p> </td> <td>0 marks</td> <td></td> </tr> <tr> <td>For each specification point with only one element viably satisfied</td> <td>1 mark</td> <td></td> </tr> <tr> <td>For each specification point with both elements viably satisfied</td> <td>2 marks</td> <td></td> </tr> <tr> <td colspan="3">Candidates may answer any specification point in either graphical form or by annotation.</td> </tr> <tr> <td colspan="3">No marks are awarded for the quality of communication.</td> </tr> <tr> <td> <p>Not fall over and hold up to five bottles</p> <ul style="list-style-type: none"> • evidence given/shown that it will not fall over </td> <td>1</td> <td></td> </tr> <tr> <td> <ul style="list-style-type: none"> eg wide base area • evidence given/shown that it will hold up to five bottles eg Is there space for five bottles, holes/shelves </td> <td>1</td> <td></td> </tr> </tbody> </table>	Answer	Part Mark	Total Mark	<p>Design Idea 1 Each point of the specification has two marking points.</p> <p>1 mark should be awarded for evidence of each point of the specification resolved in the design.</p> <p>Where an answer does not viably answer a specification point</p>	0 marks		For each specification point with only one element viably satisfied	1 mark		For each specification point with both elements viably satisfied	2 marks		Candidates may answer any specification point in either graphical form or by annotation.			No marks are awarded for the quality of communication.			<p>Not fall over and hold up to five bottles</p> <ul style="list-style-type: none"> • evidence given/shown that it will not fall over 	1		<ul style="list-style-type: none"> eg wide base area • evidence given/shown that it will hold up to five bottles eg Is there space for five bottles, holes/shelves 	1	
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Be flat pack for assembly without any tools:

- evidence given/shown that it is flat pack
eg Knock down fittings/hinges/folding mechanisms/dowel pegs
- evidence given/shown that it can be assembled without any tools
eg Use of joints/folding/slot together

1

1

Allow each bottle to be easily removed:

- evidence that each bottle can be removed
eg Ease of access/clear space
- evidence given/shown bottles can be easily removed
eg Pulled out/no obstructions/clearance sizes

1

1

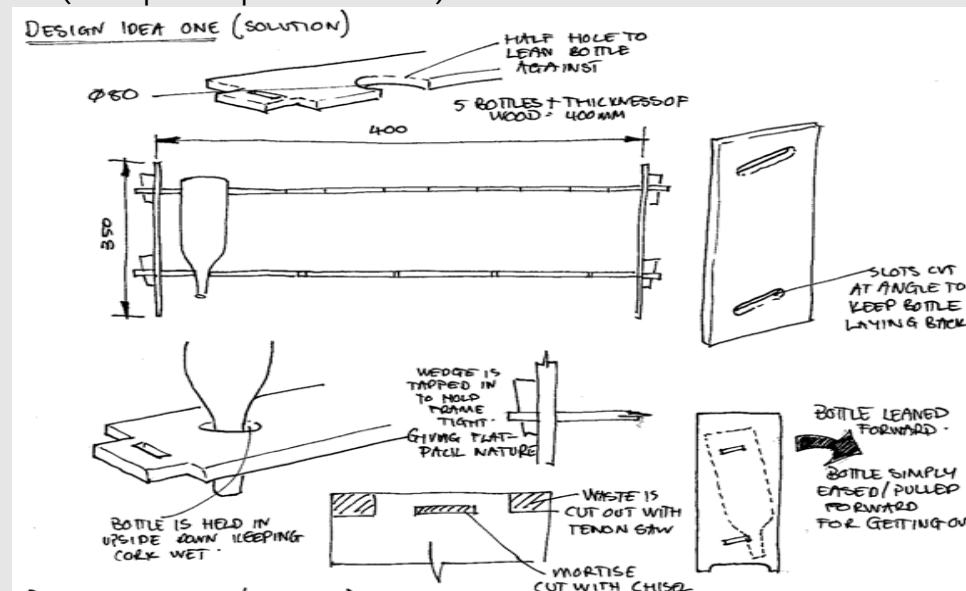
Be made using materials and processes suitable for one- off production:

- evidence given/shown of a specific material suitable for one-off production
(One specific material named)
- evidence given/shown of a specific process suitable for one-off production.
(One specific process named)

1

1

(8)



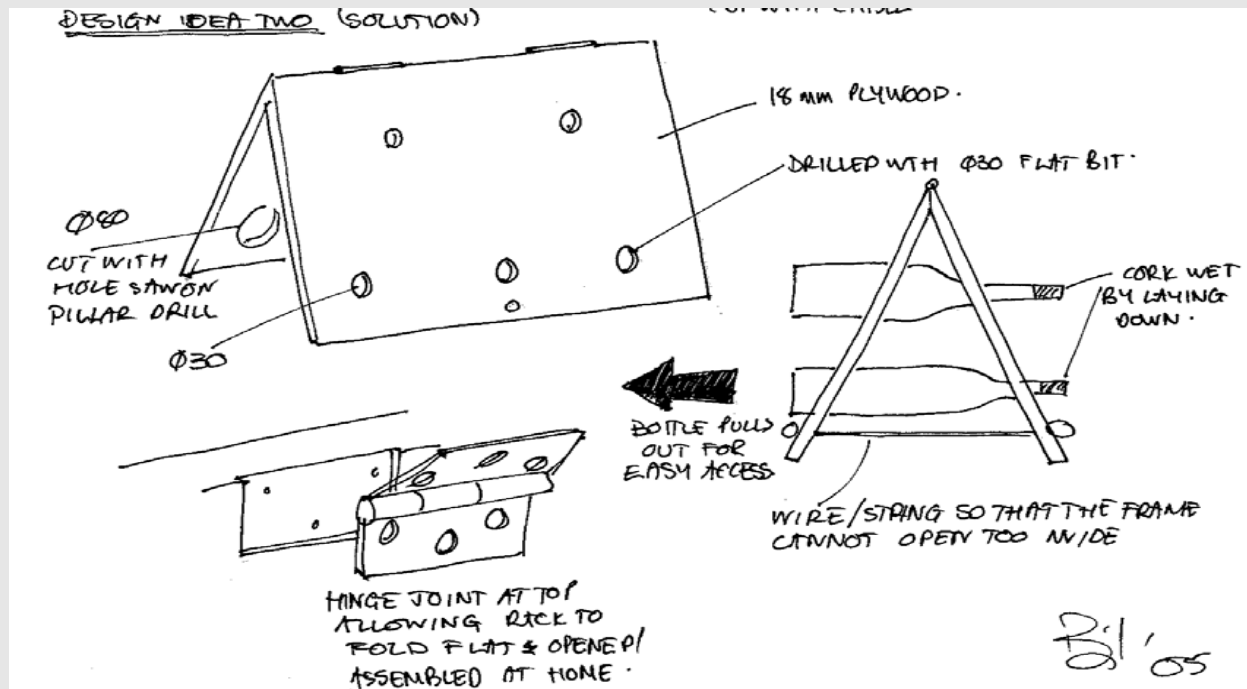
DESIGN IDEA 2

To score a mark for design idea 2, each specification point must be resolved again in the second design idea but the second design idea **must be technically / conceptually different in design and construction** from the first and not a simple variation on a theme to score the mark. Use exactly the same criteria as design idea 1 to mark design idea 2.

- A different method of not falling over
- A different method of holding at least five bottles
- A different method of being flat pack
- A different method of construction without tools
- A different method of removing bottles
- A different method of being able to easily remove bottles
- A different specific material named
- A different method of construction named/given

1
1
1
1
1
1
1
1

(8)



Question Number	Question		
1973_2F_Q03b	<p>Three of the original specification pints are repeated below.</p> <p>Evaluate how <u>one</u> of your chosen design ideas succeeds or fails to meet each of the specification points.</p> <p>(i) The wine bottle storage system must not fall over and hold up to five bottles.</p> <p>(ii) The wine bottle storage system must be flat packed for assembly without any tools.</p> <p>(iii) The wine bottle storage system must allow each bottle to be easily removed.</p>		
	<p>Answer</p> <p>Each point clearly evaluated.</p> <p>If a candidate has indicated design idea 1 and then evaluates design idea 2 for all or part of (i), (ii) or (iii) then the idea in greater evidence should be marked.</p> <p>The evaluation of the design must contain reference to either positive or negative aspects not simply just a description of the design.</p> <p>Award 1 mark for a correct evaluation/justification relating to each design feature and how it succeeds or fails.</p> <p>Repetition of original spec scores 0.</p> <p>(i) Evaluation of: not fall over and hold up to five bottles Positive or negative reasons relating to:</p> <ul style="list-style-type: none"> • stability of design/base area • reference made to five bottles being held <p>(ii) Evaluation of : flat pack for assembly without tools Positive or negative reasons relating to:</p> <ul style="list-style-type: none"> • the flat pack nature of the design • how it is assembled at home 	<p>Part Mark</p> <p>2x1</p> <p>2x1</p>	<p>Total Mark</p> <p>(2)</p> <p>(2)</p>

(iii)	Evaluation of: each bottle to be easily removed: Positive or negative reasons relating to: <ul style="list-style-type: none"> • one bottle being removed • how easy it is to remove the bottle 	2x1	(2)
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(Total 22 marks)

Question Number	Question
1973_2F_Q04a	<p>The drawing shows a ballpoint pen.</p> <p>Two specification points for the ballpoint pen are that it must:</p> <ul style="list-style-type: none"> • clip onto a shirt when not in use • provide a steady flow of ink when being used <p>Under each of the following headings, give <u>one</u> more point that should be included in the specification for the ballpoint pen.</p> <p>For each point, give <u>one</u> reason why it should be included.</p>

Answer	Part Mark	Total Mark
<p>Three each of the following:</p> <p>Specification points</p> <p>Reasons</p> <p><i>(Do not accept repetition of the specification points given)</i></p> <p><u>Quality</u></p> <p>Point: smooth edges Reason: so no injury is caused to the user / comfortable to use /easy to hold</p> <p>Point: accurate fitting of the ball bearing Reason: so that it does not fall out/leak/waste ink</p> <p>Point: tight fitting of cap onto the barrel Reason: so it does not fall off/get lost/get swallowed</p> <p>Point: smooth hard ball Reason: to give smooth writing action / so it does not rip/tear the paper</p>	<p>3x1</p> <p>3x1</p>	(6)

Point: any part made from a quality material
Reason: longer life span/improved use/greater reliability

Point: full ink tube
Reason: will last longer

Point: non-toxic materials
Reason: people chew pens and must not be harmed/poisoned
(Do not accept anything relating to quality control checks/generic manufacturing)

Environment

(must relate to materials and processes not the environment in which it is to be used)

Point: parts should be recycled once they are finished with/run out
Reason: so it reduces the need for new parts to be made / less landfill / less waste produced / damage to the environment

Point: parts could be made from recycled/recyclable materials
Reason: so that natural resources can be saved

Market

Point: cheap to make/purchase
Reason: made in high volume/low material/unit costs

Point: used as promotional gifts
Reason: cheap way to advertise company name/logo

Point: suitable for everyone to use
Reason: need to write

Point: sold in multiple packs
Reason: better value for money

Some flexibility should be given as some points may cross over descriptions.

Question Number	Question		
1973_2F_Q04b	<p>The ball bearing is made from silver steel.</p> <p>One reason why the ball bearing is made from silver steel is that it will not rust.</p> <p>Give <u>two</u> other reasons why silver steel is a suitable material from which to make the ball bearing.</p>		
	<p>Answer</p> <p>Two reasons given from:</p> <ul style="list-style-type: none"> • hard / withstands abrasive wear/indentation • can be ground accurately to form a ball shape • tough / durable • smooth finish can be achieved • good compressive strength • will retain its shape • recyclable <p><i>(Do not accept 'strong')</i></p>	Part Mark	Total Mark
		(2x1)	(2)
Question Number	Question		
1973_2F_Q04c	<p>The cap is manufactured by injection moulding.</p> <p>Give <u>two</u> reasons why injection moulding is a suitable process to manufacture the cap.</p>		
	<p>Answer</p> <p>Two reasons given from:</p> <ul style="list-style-type: none"> • good surface finish / self finishing • no additional surface finishing required • suitable for high volume/mass/batch production / repeatability • many can be made in one mould • high tolerance / very accurate • colours can be easily changed • unit costs are low once the mould has been paid for • can produce different internal and external form / complex form <p><i>(Do not accept 'easy'/'quick'/'cheap' unless qualified)</i></p>	Part Mark	Total Mark
		2x1	(2)

Question Number	Question		
1973_2F_Q04d	<p>The barrel is made from acrylic.</p> <p>Give <u>two</u> properties of acrylic that make it suitable for the barrel.</p> <p>For each property give <u>one</u> reason why it makes acrylic suitable for the barrel.</p>		
	<p>Answer</p> <p>Two properties and reasons given from:</p> <p>Property: lightweight Reason: does not make the pen too heavy</p> <p>Property: available in a range of colours Reason: so that the body of the pen can be made in the same colour as the ink inside</p> <p>Property: toughness Reason: will withstand little knocks and bumps</p> <p>Property: plasticity / easily moulded Reason: so it can be easily injected into the mould</p> <p>Property: transparency / see through Reason: can see how much ink is left/colour of ink</p> <p>Property: durable Reason: will withstand weathering/deterioration</p> <p>Property: non-toxic Reason: no harm caused to user</p> <p>Property: waterproof Reason: does not absorb water <i>(Do not accept 'strong')</i></p>	<p>Part Mark</p> <p>2x1 2x1</p>	<p>Total Mark</p> <p>(4)</p>

Question Number	Question		
1973_2F_Q04e	The end cap is made from blue material. Explain <u>one</u> reason why the end cap is made from a blue material.		
	Answer	Part Mark	Total Mark
	One reason explained from: <ul style="list-style-type: none"> it means that the pen contains blue ink and therefore allows thousands of clear bodies to be made / enables the user to choose the correct coloured pen / know what colour it will write clear bodies can be made in higher volumes rather than changing the colour of the plastic granules which means that the pens will be cheaper to make and sell indicates the colour of the ink and therefore saves having to scribble on bits of paper to find out 	2x1	(2)
Question Number	Question		
1973_2F_Q04f	The ink tube is manufactured by extrusion. Extrusion is a self-finishing process. Explain why a self-finishing process is used to manufacture the ink tube.		
	Answer	Part Mark	Total Mark
	One reason explained from: <ul style="list-style-type: none"> the smooth finish achieved by extruding reduces processing costs /time processing time is faster because no secondary finishing is required / final shape is produced <i>(Do not accept 'quick'/'easy' unless qualified)</i>	2x1	(2)

Question Number	Question	Part Mark	Total Mark
1973_2F_Q04gi-ii	<p>Two purposes of the ballpoint pen are to:</p> <ul style="list-style-type: none"> • clip onto a shirt pocket when not in use • provide a steady flow of ink <p>Explain, under the following headings, how the ballpoint pen achieves these purposes.</p>		
	<p>Answer</p> <p>(i) Clip onto a shirt pocket when not in use One explanation given from:</p> <ul style="list-style-type: none"> • the cap/barrel is shaped/designed to trap/grip/hold the pocket/cloth/material • the small/narrow gap between the clip and the body allows it to trap/grip/hold the pocket edge <p>(ii) Provide a steady flow of ink One explanation given from:</p> <ul style="list-style-type: none"> • the ball bearing rotates when in contact with the paper surface and therefore transfers ink from the ink tube onto the paper • the viscosity of the ink allows a constant flow and therefore the ball does not get clogged up disrupting the flow of ink • the ball bearing is held within the nib unit in such a way as to allow it to rotate 	<p>2x1</p> <p>2x1</p>	<p>(4)</p>
		(Total 22 marks)	
TOTAL FOR PAPER: 88 MARKS			

Design & Technology: Resistant Materials Technology(3973/2F)
Short Course Foundation Tier Mark Scheme

Question Number	Question		
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	<p>Answer</p> <p>Name: mallet (<i>Only answer</i>) Use: striking/hitting/knocking a chisel/wood/joints together</p> <p>Name: drill (<i>Any answer with 'drill' in it is correct</i>) Use: drilling / making holes</p> <p>Name: safety goggles/specs Use: protecting / stop bits getting into eyes</p>	<p>Part Mark</p> <p>1 1 1 1</p>	<p>Total Mark</p> <p>(6)</p>

Question Number	Question		
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	Answer	Part Mark	Total Mark
	One reason given from:		
	<ul style="list-style-type: none"> • stops it from rusting/corroding • more decorative/make it look nice • more durable / harder wearing / last longer 	1	(1)
Question Number	Question		
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	Answer	Part Mark	Total Mark
	Mild steel (<i>only answer</i>)	1	(1)
Question Number	Question		
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	Answer	Part Mark	Total Mark
	One tool named from:		
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		(Total 11 marks)	
Question Number	Question		
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	Answer	Part Mark	Total Mark
	Ash <i>(Only answer)</i>	1	(1)

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	Answer	Part Mark	Total Mark
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3973_2F_Q02bii	Give <u>three</u> reasons why the metal for the blade must have the property of hardness.		
	Answer	Part Mark	Total Mark
	Three reason given from: <ul style="list-style-type: none"> • cut through soil/roots • will not damage cutting edge / will keep edge • will not bend/break when levered/bent backwards/snap = tough • can take the pressure/force of a foot being pressed on it = compression • will not wear away / get damaged 	3x1	(3)

Question Number	Question		
3973_2F_Q02ci	ABS has been used for the plastic handle. ABS has the property of plasticity. Give <u>three</u> other properties of the ABS plastic.		
	Answer	Part Mark	Total Mark
	<p>Three properties given from:</p> <ul style="list-style-type: none"> • high impact strength/toughness/withstand sudden shock loading • durability / last a long time / can withstand UV exposure • lightweight • high quality surface finish • electrical insulator (will not conduct electricity) • weatherproof/waterproof / will not rust/corrode <p><i>(Do not accept anything that relates to plasticity ie shaping/moulding/forming)</i> <i>(Do not accept 'strong'/'strength' on their own)</i></p>	3x1	(3)
Question Number	Question		
3973_2F_Q02cii	The ABS plastic handle is formed using an injection moulding process. Explain <u>one</u> reason why ABS plastic needs the property of plasticity.		
	Answer	Part Mark	Total Mark
	<p>One reason explained from:</p> <ul style="list-style-type: none"> • so it does not break/crack / can be easily squeezed/flows easily when injected into the mould / reformed 	2x1	(2)

Question Number	Question
3973_2F_Q03a	<p>The drawing shows a ballpoint pen.</p> <p>Two specification points for the ballpoint pen are that it must</p> <ul style="list-style-type: none"> • clip onto a shirt when not in use • provide a steady flow of ink when being used <p>Under each of the following headings, give <u>one</u> more point that should be included in the specification for the ballpoint pen. For each point, give <u>one</u> reason why it should be included.</p>

	Answer	Part Mark	Total Mark
	<p>Three each of the following:</p> <p>Specification points</p> <p>Reasons</p> <p><i>(Do not accept repetition of the specification points given)</i></p> <p><u>Quality</u></p> <p>Point: smooth edges Reason: so no injury is caused to the user / comfortable to use /easy to hold</p> <p>Point: accurate fitting of the ball bearing Reason: so that it does not fall out/leak/waste ink</p> <p>Point: tight fitting of cap onto the barrel Reason: so it does not fall off/get lost/get swallowed</p> <p>Point: smooth hard ball Reason: to give smooth writing action / so it does not rip/tear the paper</p> <p>Point: any part made from a quality material Reason: longer life span/improved use/greater reliability</p> <p>Point: full ink tube Reason: will last longer</p>	<p>3x1</p> <p>3x1</p>	<p>(6)</p>

Point: non-toxic materials

Reason: people chew pens and must not be harmed/poisoned

(Do not accept anything relating to quality control checks/generic manufacturing)

Environment

(must relate to materials and processes not the environment in which it is to be used)

Point: parts should be recycled once they are finished with/run out

Reason: so it reduces the need for new parts to be made / less landfill / less waste produced / damage to the environment

Point: parts could be made from recycled/recyclable materials

Reason: so that natural resources can be saved

Market

Point: cheap to make/ purchase

Reason: made in high volume/low material/unit costs

Point: used as promotional gifts

Reason: cheap way to advertise company name/logo

Point: suitable for everyone to use

Reason: need to write

Point: sold in multiple packs

Reason: better value for money

Some flexibility should be given as some points may cross over descriptions.

Question Number	Question		
3973_2F_Q03b	<p>The ball bearing is made from silver steel. One reason why the ball bearing is made from silver steel is that it will not rust.</p> <p>Give <u>two</u> other reasons why silver steel is a suitable material from which to make the ball bearing.</p>		
	<p>Answer</p> <p>Two reasons given from:</p> <ul style="list-style-type: none"> • hard / withstands abrasive wear/indentation • can be ground accurately to form a ball shape • tough / durable • smooth finish can be achieved • good compressive strength • will retain its shape • recyclable <p><i>(Do not accept 'strong')</i></p>	<p>Part Mark</p> <p>2x1</p>	<p>Total Mark</p> <p>(2)</p>

Question Number	Question	Part Mark	Total Mark
3973_2F_Q03c	<p>The cap is manufactured by injection moulding.</p> <p>Give <u>two</u> reasons why injection moulding is a suitable process to manufacture the cap.</p>		
	<p>Answer</p> <p>Two reasons given from:</p> <ul style="list-style-type: none"> • good surface finish/self finishing • no additional surface finishing required • suitable for high volume/mass / batch production / repeatability • many can be made in one mould • high tolerance/very accurate • colours can be easily changed • unit costs are low once the mould has been paid for • can produce different internal and external form / complex form <p><i>(Do not accept 'easy'/'quick'/'cheap unless qualified)</i></p>	2x1	(2)

Question Number	Question		
3973_2F_Q03d	<p>The barrel is made from acrylic.</p> <p>Give <u>two</u> properties of acrylic that make it suitable for the barrel.</p> <p>For each property give <u>one</u> reason why it makes acrylic suitable for the barrel.</p>		
	<p>Answer</p> <p>Two properties and reasons given from:</p> <p>Property: lightweight Reason: does not make the pen too heavy</p> <p>Property: available in a range of colours Reason: so that the body of the pen can be made in the same colour as the ink inside</p> <p>Property: toughness Reason: will withstand little knocks and bumps</p> <p>Property: plasticity / easily moulded Reason: so it can be easily injected into the mould</p> <p>Property: transparency / see through Reason: can see how much ink is left/colour of ink</p> <p>Property: durable Reason: will withstand weathering/deterioration</p> <p>Property: non-toxic Reason: no harm caused to user</p> <p>Property: waterproof Reason: does not absorb water <i>(Do not accept 'strong')</i></p>	<p>Part Mark</p> <p>2x1 2x1</p>	<p>Total Mark</p> <p>(4)</p>

Question Number	Question		
3973_2F_Q03e	The end cap is made from blue material. Explain <u>one</u> reason why the end cap is made from a blue material.		
	Answer	Part Mark	Total Mark
	<p>One reason explained from:</p> <ul style="list-style-type: none"> it means that the pen contains blue ink and therefore allows thousands of clear bodies to be made / enables the user to choose the correct coloured pen / know what colour it will write clear bodies can be made in higher volumes rather than changing the colour of the plastic granules which means that the pens will be cheaper to make and sell indicates the colour of the ink and therefore saves having to scribble on bits of paper to find out 	2x1	(2)
Question Number	Question		
3973_2F_Q03f	The ink tube is manufactured by extrusion. Extrusion is a self-finishing process. Explain why a self-finishing process is used to manufacture the ink tube.		
	Answer	Part Mark	Total Mark
	<p>One reason explained from:</p> <ul style="list-style-type: none"> the smooth finish achieved by extruding reduces processing costs /time processing time is faster because no secondary finishing is required / final shape is produced <p><i>(Do not accept 'quick'/'easy' unless qualified)</i></p>	(2x1)	(2)

Question Number	Question	Part Mark	Total Mark
3973_2F_Q03gi-ii	<p>Two purposes of the ballpoint pen are to:</p> <ul style="list-style-type: none"> • clip onto a shirt pocket when not in use • provide a steady flow of ink <p>Explain, under the following headings, how the ballpoint pen achieves these purposes.</p>		
	<p>Answer</p> <p>(i) Clip onto a shirt pocket when not in use One explanation given from:</p> <ul style="list-style-type: none"> • the cap/barrel is shaped/designed to trap/grip/hold the pocket/cloth/material • the small/narrow gap between the clip and the body allows it to trap/grip/hold the pocket edge <p>(ii) Provide a steady flow of ink One explanation given from:</p> <ul style="list-style-type: none"> • the ball bearing rotates when in contact with the paper surface and therefore transfers ink from the ink tube onto the paper • the viscosity of the ink allows a constant flow and therefore the ball does not get clogged up disrupting the flow of ink • the ball bearing is held within the nib unit in such a way as to allow it to rotate 	<p>2x1</p> <p>2x1</p>	<p>(4)</p>
			(Total 22 marks)
TOTAL FOR PAPER: 44 MARKS			

