



GCSE

Design and Technology: Resistant Materials

45601

Mark scheme

June 2016

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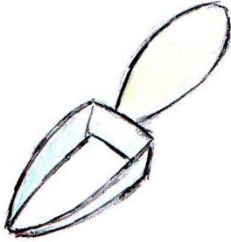
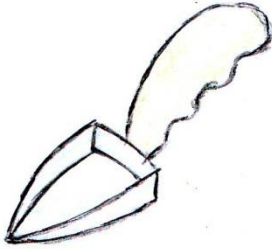
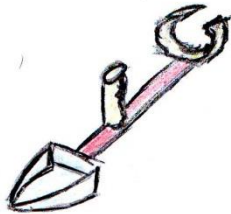
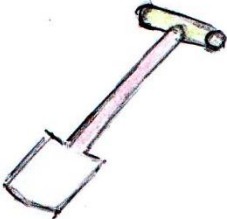
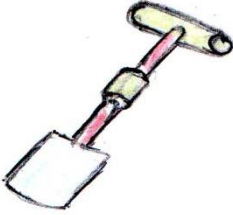
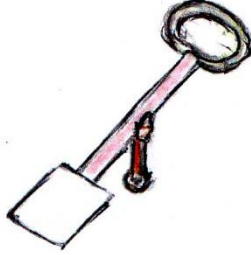
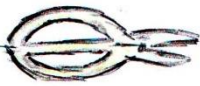
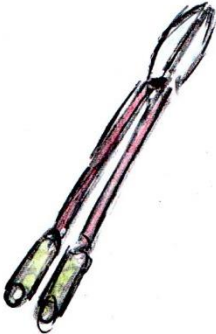
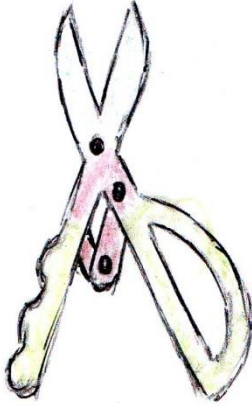
Mark schemes are prepared by the Lead Assessment Writer and considered, together with the relevant questions, by a panel of subject teachers. This mark scheme includes any amendments made at the standardisation events which all associates participate in and is the scheme which was used by them in this examination. The standardisation process ensures that the mark scheme covers the students' responses to questions and that every associate understands and applies it in the same correct way. As preparation for standardisation each associate analyses a number of students' scripts. Alternative answers not already covered by the mark scheme are discussed and legislated for. If, after the standardisation process, associates encounter unusual answers which have not been raised they are required to refer these to the Lead Assessment Writer.

It must be stressed that a mark scheme is a working document, in many cases further developed and expanded on the basis of students' reactions to a particular paper. Assumptions about future mark schemes on the basis of one year's document should be avoided; whilst the guiding principles of assessment remain constant, details will change, depending on the content of a particular examination paper.


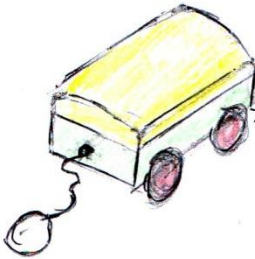
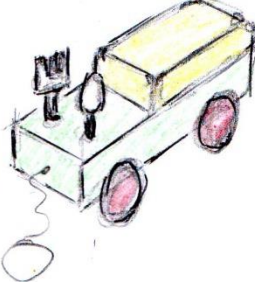
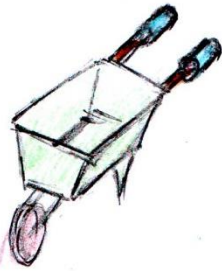
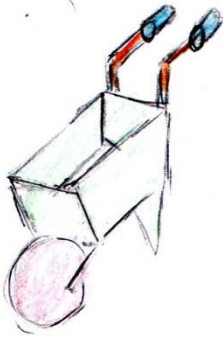
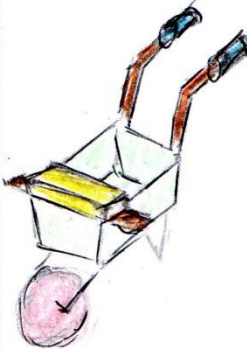
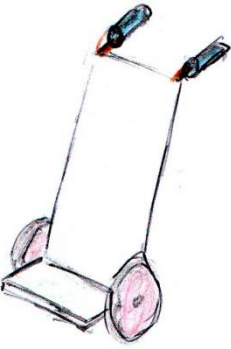
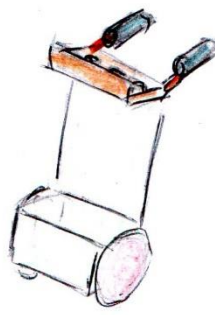
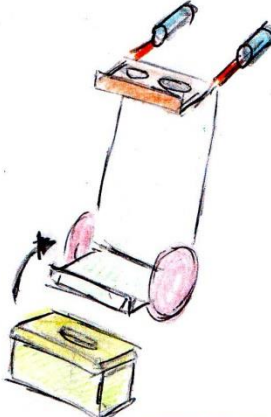
Further copies of this mark scheme are available from aqa.org.uk

1	<p>Give three design requirements of devices that will help the people when gardening.</p> <p>Explain each of your answers.</p> <p>An example has been completed for you.</p> <p>Requirement: The devices should not be affected by water.</p> <p>Explanation: The devices are for use in the garden where they could get wet and could rot or corrode.</p> <p style="text-align: right;">[3 x 3 marks]</p> <p>Award 1 mark for a correct Requirement and up to 2 marks for a correct Explanation.</p> <p>Note: Each Requirement numbered below corresponds with the equivalently numbered Explanation. Candidates may gain marks for a correct Explanation even if the Requirement is incorrect. Candidates may also give you both the Requirement and the Explanation in one part of their answer.</p> <p>Any three correctly identified requirements.</p> <p>Note: Candidates may refer to people in general or a specific group of people such as the elderly or handicapped.</p> <p>Possible responses:</p> <ol style="list-style-type: none"> 1. It should be easy to move 2. It should be lightweight 3. It should be capable of being manufactured in quantity 4. It should be safe to use 5. It should ergonomically designed 6. It should blend into the garden environment 7. It should stand out in the garden 8. It should be compact 9. It should be environmentally friendly 10. It should be cost effective 11. It should be durable/robust <p style="text-align: right;">(3 x 1 marks)</p> <p>Any three relevant explanations.</p> <p>Possible responses:</p> <ol style="list-style-type: none"> 1. Because this will make it easy to handle as some people are not that strong 2. Because this will make it easy for some people to carry as they are not that strong
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		<p>3. Because making things in bulk reduces the unit cost and some people do not have a large disposable income/have certain values regards value for money</p> <p>4. Because no one should be injured when using the device, some people don't mend very well</p> <p>5. Because it should be easy and comfortable to use, some people cannot grip as hard as they once use to.</p> <p>6. Because it should not look unpleasant in the garden, some people value tradition and nature</p> <p>7. Because the elderly have poor eyesight and may not be able to see it.</p> <p>8. Because it should not take up too much room when being stored and smaller devices are easier to move around</p> <p>9. Because we should reduce the amount of non-renewable materials we use as this will help protect the environment</p> <p>10. Because not all some people have a large disposable income/ have certain values regards to value for money</p> <p>11. Because it will be need to withstand use with tools and equipment in the outdoor environment without breaking.</p> <p style="text-align: right;">(3 x 2 marks)</p>	<p>Total 9 marks</p>
2	a	<p>Use the information in the Design Brief on page 2 and your answers in Question 1, to help you sketch two different ideas for devices that will help elderly people when gardening.</p> <p>Marks will be awarded for creativity</p> <p style="text-align: right;">[3 x 3 marks]</p> <p>Mark each idea out of 3 using the following scale:</p> <ul style="list-style-type: none"> • A repeat idea 0 mark • A simple idea, with one feature that helps elderly people when gardening e.g. larger moulded handles 1 mark • An idea with two features that helps elderly people when gardening. e.g. larger, textured handle 2 marks • An original idea that helps elderly people when gardening e.g. longer handles with larger hand holes and a textured grip. 3 marks 	<p>Total 9 marks</p>

		1 mark A simple, obvious idea	2 marks An idea that shows some originality	3 marks An original and creative idea.
				
				
				
2	b	<p>Use the information in the Design Brief on page 2 and your answers in Question 1, to help you sketch three different ideas for devices that will help elderly people move gardening tools and equipment around the garden.</p> <p>Marks will be awarded for creativity.</p>		

		<p style="text-align: right;">[2 x 3 marks]</p> <p>Mark each idea out of 3 using the following scale:</p> <ul style="list-style-type: none"> • A repeat idea 0 mark • A simple idea that helps elderly people move tools and equipment around the garden e.g. a wheel barrow with a balloon wheel. 1 mark • An idea that helps elderly people move tools and equipment around the garden e.g. a wheel barrow with a balloon wheel and a seat. 2 marks • An original idea that helps elderly people move tools and equipment around the garden e.g. a wheel barrow with a balloon wheel, a seat and drinks holder. 3 marks 	Total 6 marks
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1 mark A simple, obvious idea	2 marks An idea that shows some originality	3 marks An original and creative idea.
		
		
		
<p>3</p>	<p>Choose your best idea from Question 2 (a) or 2 (b).</p> <p>Use notes and sketches to show how you would develop your design.</p> <p>Marks will be awarded for:</p> <ul style="list-style-type: none"> • details of materials and finishes (explain your choices) <p style="text-align: right;">[3 marks]</p>	

		<ul style="list-style-type: none"> • constructional details [3 marks] • design features and sizes [3 marks] • details of how you have considered the needs of elderly people [3 marks] <p>Development details could include:</p> <ul style="list-style-type: none"> • Materials and finishes <p>One or more specific material(s) and one or more relevant finish(es) identified and both justified. 3 marks</p> <p>One or more specific material(s) or one or more relevant finish(es) identified and only one justified 2 marks</p> <p>One or more specific material(s) or one or more finish(es) identified. 1 mark</p> <p>Generic materials (wood, metal plastic) and an inappropriate finish(es) 0 marks</p> <p style="text-align: right;">(Max 3 marks)</p> <ul style="list-style-type: none"> • Constructional details <p>Award up to three marks for constructional details</p> <p>A simple reference to a method of construction 1 mark</p> <p>A reference to two methods of construction or outline of a method of construction 2 marks</p> <p>A reference to three methods of construction or detailed information relating to a method of construction 3 marks</p> <ul style="list-style-type: none"> • Design features and sizes <p>Award one mark each for details relating to up to two design features.</p> <p>Award one mark each for up to two relevant sizes.</p> <p>Note: All dimensions should be in mm unless otherwise stated. Imperial measurements are acceptable. All dimensions should be realistic to be awarded a mark (Max 3 mark)</p> <ul style="list-style-type: none"> • The needs of elderly people <p>Award up to three marks for details of how the needs of elderly people have been considered.</p>	
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		<p>Reference to one simple ergonomic feature that is specific to the needs of elderly people. 1 mark</p> <p>Reference to two simple ergonomic features that are specific to the needs of elderly people. 2 marks</p> <p>Reference to two ergonomic features or three or more ergonomic features that are specific to the needs of elderly people. 3 marks</p> <p>Note: A candidate may give details of a design feature and gain a mark under 'design feature'. They may well go on to explain how this is an advantage to elderly people and gain a mark under 'the needs of elderly people'.</p>	Total 12 marks
4	a	<p>Name a suitable metal for the bird feeder. Explain why you have chosen this metal. [3 marks]</p> <p>Award one mark for a metal:</p> <p>Possible responses:</p> <ul style="list-style-type: none"> • Steel (low carbon/mild) • Stainless steel • Aluminium • Brass • Copper <p>Not: Gold, silver, pewter, lead 1 mark</p> <p>Award up to two marks from any of the following:</p> <p>Note: Candidates may refer to two material properties or one material property and expand their answer.</p> <p>Possible responses:</p> <ul style="list-style-type: none"> • It should be strong – it will need to hold the weight of the food, birds and possibly animals • It should be durable – it will need to last a number of years and withstand harsh use. • It should be weatherproof – it will be outside in all conditions • It should be stylish – it should enhance the appearance of the garden/ more people will buy it if it is attractive. • It should be cost effect – people don't want to spend too much on a bird feeder. 2 marks 	Total 3 marks
4	b	<p>Use notes and sketches to clearly show how you would make a batch of ten garden bird feeders in a school workshop.</p>	

		<p>At each stage, name all the tools, equipment and/or software you would use.</p> <p style="text-align: right;">[16 marks]</p> <p>Stage 1: Marking out (traditional)</p> <p>Sufficient detail for most of the design to be marked out by a third party, as a one off. Most tools and equipment given.</p> <p style="text-align: right;">1 - 2 marks</p> <p>Sufficient detail for most of the design to be marked out by a third party, in quantity, using a template. Most tools and equipment given.</p> <p style="text-align: right;">3 – 4 marks</p> <p>Or</p> <p>Stage 1: Marking out Computer Aided Design (CAD)</p> <p>Sufficient detail for the design to be drawn by CAD by a third party. Most tools and equipment given. Look for details relating to:</p> <ul style="list-style-type: none"> Computer hardware Naming software Net on screen Use of different coloured lines <p style="text-align: right;">1 – 4 marks</p> <p>Max 4 marks for Stage 1</p> <p>Stage 2: Cutting and shaping (traditional)</p> <p>Sufficient detail for some of the design to be cut and shaped by a third party as a one off. Most tools and equipment given. Saws and files.</p> <ul style="list-style-type: none"> Hacksaw (junior) Bandsaw Jig saw Scroll saw (Hegner) <p style="text-align: right;">1 – 2 marks</p> <p>Sufficient detail for most of the design to be cut and shaped by a third party, in quantity, use of a template. Most tools and equipment given. Guillotine and files.</p> <p style="text-align: right;">3 – 4 marks</p> <p>Or</p>	
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	<p>Stage 2: Cutting and shaping Computer Aided Manufacture (CAM)</p> <p>Sufficient detail for the design to be manufactured by CAM. Most tools and equipment given. Look for details relating to:</p> <p>Transfer of data to CAM Plasma/laser cutter Power setting Safety</p> <p>Stage 3: Bending/forming the tray/back</p> <p>Sufficient detail for some of the design to be bent/formed by a third party as a one off. Some tools and equipment given.</p> <p>Possible responses:</p> <p>Bending metal in a vice using a hammer 1 -2 marks</p> <p>Bending metal in a vice using a hammer/mallet whilst protecting the metal 3 - 4 marks</p> <p>Sufficient detail for most of the design to be bent/formed by a third party, in quantity, using a bending machine. Most tools and equipment given.</p> <p>Possible responses:</p> <p>Folding bars Gabro Break press 3 - 4 marks</p> <p>Stage 4: Joining the roof to the back</p> <p>Limited details of a suitable method of joining the roof to the back. Some tools and equipment given 1 – 2 marks</p> <p>A detailed description of a suitable method of joining the roof to the back. Most tools and equipment given 3 – 4 marks</p> <p>Possible methods:</p> <p>Pop riveting Riveting Use of nuts and bolts Screwing (self tapping) Gluing</p>	
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			Welding Soldering	Total 16 marks
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5	a	i	<p>Explain why beech has been used to make the wooden spoon. [2 marks]</p> <p>Award up to two marks from any of the following:</p> <p>Note: Candidates may refer to two material properties or one material property and expand their answer</p> <p>Possible responses:</p> <ul style="list-style-type: none"> • Beech is strong • Beech does not splinter • Beech is durable • Beech is a close grained timber • Beech is aesthetically pleasing • Food safe 	Total 2 marks
5	a	ii	<p>Explain why melamine has been used to make the plastic spoon. [2 marks]</p> <p>Award up to two marks from any of the following:</p> <p>Note: Candidates may refer to two material properties or one material property and expand their answer</p> <p>Possible responses:</p> <ul style="list-style-type: none"> • Plastic is self coloured • Plastic is hygienic • Plastic is durable • Plastic is cost effective • Plastic is strong • It is a thermosetting plastic therefore will not melt 	Total 2 marks
5	a	iii	<p>Explain why stainless steel has been used to make the metal ladle. [2 marks]</p> <p>Award up to two marks from any of the following:</p> <p>Note: Candidates may refer to two material properties or one material property and expand their answer</p> <p>Possible responses:</p> <ul style="list-style-type: none"> • Stainless steel is very strong • Stainless steel is very shiny • Stainless is hygienic • Stainless steel does not rust • Doesn't deform with heat 	Total 2 marks

5	a	iv	<p>Explain why a finish has not been applied to the kitchen utensils. [3 marks]</p> <p>Award up to three marks from any of the following:</p> <p>Note: Candidates may refer to three material properties or one/two material properties and expand their answer</p> <p>Possible responses:</p> <ul style="list-style-type: none">• The plastic and the metal spoons are waterproof• The plastic and the metal spoons have a smooth surface• The plastic and the metal spoons have a naturally shiny finish• A finish could contaminate the food• All the materials are naturally aesthetically pleasing• Adding a finish would increase the cost• A finish could flake off	Total 3 marks
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5	b	<p>The watering can has been made by an industrial process. Explain the advantages and disadvantages manufacturing the water can by an industrial process.</p> <p style="text-align: right;">[6 marks]</p> <p>Note: The candidate must address the advantages and the disadvantages. Where a candidate fails to address both the advantages and disadvantages they can only gain a maximum of 4 marks.</p> <p>Indicative content:</p> <p>Advantages:</p> <ul style="list-style-type: none"> • An Industrial process is a quick process • An Industrial process is a cost effective process • An Industrial process produces a consistent product • An Industrial process produces an accurate product • An Industrial process reduces labour costs • An Industrial process reduces waste <ul style="list-style-type: none"> • Increases employment <p>Disadvantages:</p> <ul style="list-style-type: none"> • An Industrial process has a high initial set up cost • An Industrial process requires expensive moulds to be produced • An Industrial process uses a lot of electrical energy • An Industrial process is harmful to the environment <ul style="list-style-type: none"> • Causes unemployment 	Total 6 marks
6	a	<p>Describe two improved ergonomic features of the handle used on Crutch B.</p> <p style="text-align: right;">[4 marks]</p> <p>Award 1 mark each for identifying an improved feature and one mark for providing a correct description.</p> <p>Possible responses:</p> <ul style="list-style-type: none"> • The handle has a moulded grip providing an improved ergonomic shape • The handle has a softer grip that is comfortable to hold • The handle has a 'hilt' (a raised section at the end) preventing the hand slipping off • The handle is a wider diameter making it comfortable to hold 	Total 4 marks
6	b	<p>Use notes and sketches to compare the effectiveness of the different methods of adjustment used on each crutch.</p> <p style="text-align: right;">[6 marks]</p> <p>Award 1 mark each for identifying the method of adjustment used and up to two marks for any comment relating to its effectiveness.</p>	





		<p>Possible responses:</p> <p>Crutch A</p> <p>Method of adjustment</p> <ul style="list-style-type: none"> • Uses wing nuts (accept nuts or nuts and bolts) <p>Effectiveness</p> <ul style="list-style-type: none"> • Slow to use • Awkward • Can be dropped • Can be lost • Can be too tight to operate <ul style="list-style-type: none"> • Need equipment to adjust nuts and bolts <p>Crutch B</p> <p>Method of adjustment</p> <ul style="list-style-type: none"> • Spring clip / detent button/ push button <p>Effectiveness</p> <ul style="list-style-type: none"> • Quick to use • Can't be lost • Can be too stiff to operate • Easier to adjust <ul style="list-style-type: none"> • No tools required 	Total 6 marks
6	c	<p>Evaluate the sustainability of the two crutches.</p> <p style="text-align: right;">[6 marks]</p> <p>Award 1 mark each for identifying a sustainable issues and up to expanded answer.</p> <p>If only one crutch is evaluated then maximum of 5 marks applies.</p> <p>Do not reward environmental issues e.g. global warming/acid rain CO₂</p> <p>Possible responses:</p> <p>Crutch A</p> <p>Sustainability</p> <ul style="list-style-type: none"> • Wood comes from trees 	

		<ul style="list-style-type: none"> • Trees are a renewable resource • Hardwoods are durable • Wood can be re used • Wood is recyclable • Wood can be repaired • Parts can be replaced <p>Crutch B</p> <p>Sustainability</p> <ul style="list-style-type: none"> • Metal/plastic comes from non renewable sources • Metal/plastic is durable • Processing metals/plastics uses fossil fuels • Metal/plastic can be re used • Metal/plastic is recyclable • Parts can be repaired 	Total 6 marks
7	a	<p>Produce a labelled drawing of a simple drilling jig that would be used when drilling the holes into the sides of the wooden bookcases. [4 marks]</p> <p>Note: No marks for details relating to the marking out of each individual hole.</p> <p>Award marks using the following scale:</p> <p>simple paper layout of the holes stuck to the side of the bookcase 1 mark</p> <p>a jig made from a durable material e.g. plywood, clamped to the side of the bookcase 2 marks</p> <p>a jig made from a durable material e.g. plywood, with X or Y registers 3 marks</p> <p>a jig made from a durable material e.g. plywood, with X and Y registers 4 marks</p>	Total 4 marks
7	b	<p>Explain the advantages of using jigs, moulds and templates when manufacturing products. [8 marks]</p> <p>The answer clearly identifies, describes and explains the advantages of using jigs moulds and templates. 7 – 8 marks</p>	

		<p>The answer clearly identifies, describes and explains several advantages of using jigs moulds and templates. 5 – 6 marks</p> <p>The answer clearly identifies, describes and explains the some advantages of using jigs moulds and templates or the answer clearly identifies several advantages of using jigs moulds and templates but fails to describe or explain all of them. 3 – 4 marks</p> <p>The answer identifies, describes and explains the one advantage of using jigs moulds and templates or the answer identifies some advantages of using jigs moulds and templates but fails to describe or explain them. 1 – 2 marks</p> <p>Indicative content</p> <p>Accuracy: The level of accuracy is improved as human error is limited.</p> <p>Consistency: The level of consistency is improved as all the products will be identical.</p> <p>Speed: The time taken to produce a product is reduced as there is no requirement for marking out.</p> <p>Cost: The cost of producing products is reduced as the use of jigs, moulds and templates means less labour is required.</p> <p>Skill: Reduce the level of skill used in manufacture</p>	<p>Total 8 marks</p>
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8		<p>A health food restaurant named ‘Healthy Foods’ would like to redesign the furniture in their children’s area. Describe the roles of the client, the designer, the manufacturer and the user in the product development of new tables and chairs. Explain how they interact with each other. Quality of written communication will be assessed in this question. [8 marks]</p> <p>Note: Initially mark the answer for technical content, then apply to the mark boundaries and be prepared to increase/decrease the initial mark depending on the quality of QWC. Bullet pointed answers are fully acceptable.</p> <p>Award 1 mark each for identifying and describing each role.</p> <p>Possible responses:</p> <p>The client is ‘Healthy Foods’ and they have commissioned the table and chairs. The designer will produce ideas for the tables and chairs The manufacturer will make the tables and chairs The users are the children and they will sit at the table and chairs</p> <p>Award 1 mark each for details relating to the interaction of each role.</p> <p>Possible responses:</p> <p>The client will ask the designer to produce ideas for the tables and chairs. The designer will research the needs of the user. The designer will present a range of ideas to the client The designer will liaise with the manufacturer to find the most efficient method of manufacture The manufacturer will make the tables and chairs to specification The user will test the tables and chairs The client will fund the project</p> <p>A fully detailed and comprehensive response that includes details of many of the examples above. The answer is well-structured, with good use of appropriate design & technology terminology and showing a good grasp of grammar, punctuation and spelling.</p> <p style="text-align: right;">7 – 8 marks</p> <p>A fairly detailed response which refers to some of the examples above. The answer is fairly well structured, with some use of design & technology terminology and with a small number of errors in grammar, punctuation and spelling.</p> <p style="text-align: right;">5 – 6 marks</p> <p>A response which contains a one or two of the examples above. The answer has some structure, with some use of design & technology terminology and with a number of errors in grammar, punctuation and spelling.</p>	
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			3 – 4 marks													
		<p>A response which contains very limited reference to any of the examples above. The answer is vague or poorly structured, with little use of design & technology terminology and with a considerable number of errors in grammar, punctuation and spelling.</p>														
			1 – 2 marks													
		<p>A response which is poorly structured with no relevant examples. There is very little or no use of design technology terminology and with many errors in grammar, punctuation and spelling.</p>														
			0 marks	Total 8 marks												
9	a	<p>Complete the table by:</p> <ul style="list-style-type: none"> • Describing the safety precautions you would carry out before using the drilling machine • Describing the hazard each precaution will prevent. 														
		<table border="1" style="width: 100%;"> <thead> <tr> <th style="width: 50%;">Precaution</th> <th style="width: 50%;">Hazard</th> </tr> </thead> <tbody> <tr> <td> <p>Award 1 mark for:</p> <p>Wear safety goggles / wear safety glasses/visor</p> </td> <td> <p>Cuttings (swarf) could damage your eyes</p> </td> </tr> <tr> <td> <p>Long hair should be tied back</p> </td> <td> <p>Award 1 mark for:</p> <p>Your hair could get caught in the drill</p> </td> </tr> <tr> <td> <p>Award 1 mark for:</p> <p>Make sure your work is securely clamped e.g. vice, mole grip, G Clamp,</p> </td> <td> <p>The work could spin out of your hands</p> </td> </tr> <tr> <td> <p>Make sure there is no one inside the safety zone</p> </td> <td> <p>Award 1 mark for:</p> <p>You could be distracted / knocked and hurt yourself</p> </td> </tr> <tr> <td> <p>Award 1 mark for a suitable precaution:</p> <p>Possible responses:</p> <ul style="list-style-type: none"> • Wear an apron • Make sure the chuck key is removed • Make sure the drill guard is down </td> <td> <p>Award 1 mark for a suitable hazard:</p> <p>Possible responses:</p> <ul style="list-style-type: none"> • Loose clothing could get caught in the chuck • The chuck key could fly out and hit you • A snapped drill could fly out and hit you </td> </tr> </tbody> </table>	Precaution	Hazard	<p>Award 1 mark for:</p> <p>Wear safety goggles / wear safety glasses/visor</p>	<p>Cuttings (swarf) could damage your eyes</p>	<p>Long hair should be tied back</p>	<p>Award 1 mark for:</p> <p>Your hair could get caught in the drill</p>	<p>Award 1 mark for:</p> <p>Make sure your work is securely clamped e.g. vice, mole grip, G Clamp,</p>	<p>The work could spin out of your hands</p>	<p>Make sure there is no one inside the safety zone</p>	<p>Award 1 mark for:</p> <p>You could be distracted / knocked and hurt yourself</p>	<p>Award 1 mark for a suitable precaution:</p> <p>Possible responses:</p> <ul style="list-style-type: none"> • Wear an apron • Make sure the chuck key is removed • Make sure the drill guard is down 	<p>Award 1 mark for a suitable hazard:</p> <p>Possible responses:</p> <ul style="list-style-type: none"> • Loose clothing could get caught in the chuck • The chuck key could fly out and hit you • A snapped drill could fly out and hit you 		Total 6 marks
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9	b	<p>Complete the table by:</p> <ul style="list-style-type: none"> • giving the meaning of the sign • explaining a precaution you should take when you see each sign in a workshop. 		
		Sign	Meaning [1 mark]	Precaution [1 mark]
			This product is flammable	Keep away from naked flames
			This product is poisonous/toxic	Do not ingest/eat/drink
			Danger electricity Danger of electric shock	Do not open Do not touch Isolate
	This is a harmful or irritant material	Avoid contact with skin e.g. wear gloves		
			Total 8 marks	