GCSE

Engineering

48501

Mark scheme

4850

June 2016

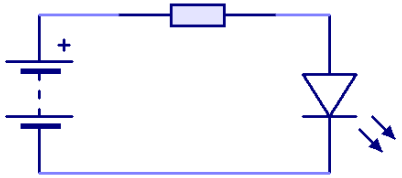
Version: 1.0 Final

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

Question	Part	Sub Part	Marking Guidance	Mark	Comment
1	a		**Describe the function of each labelled part.** **Control knob – Answers such as:** • Allows the operator to turn the Mixer on/off • Allows the operator to vary the speed at which the blender operates • Allows the operator to 'pulse' the motor **[1 mark per point made max 2]** **Locating holes – answers such as:** • Ensures the 2 halves of the case align • Provides a method of attaching the 2 halves of the case together • Allows screws to be used to secure the case together **[1 mark per point made max 2]** **Ventilation slots – answers such as:** • Allows cool air to flow into the case • Allows warm air to be expelled from the case • Prevents the motor/internals from overheating **[1 mark per point made max 2]**	**6**	Award marks for either 1 point well explained or as multiple points.

Question	Part	Sub Part	Marking Guidance	Mark	Comment
1	b	i	**In the spaces below, identify the components labelled A to C on the circuit diagram.** A – Battery/cell B – Push to make switch C - Motor **[1 mark for each correct answer]**	3	
1	b	ii	**Some electrical tools have Light Emitting Diodes (LEDs) that light up. Complete the circuit diagram below to include an LED and resistor.** **Marks awarded for correctly edited circuit with symbols as below:**  **LED** **Resistor** **1 mark for each symbol correctly drawn. LED must be correctly orientated for polarity.** **Circuit may not necessarily function correctly for 2 marks.**	2	

Question	Part	Sub Part	Marking Guidance	Mark	Comment
1	b	iii	**Describe the function of an electrical switch** **1 mark for identifying function, 2 marks for description.** **For example:** • **A switch can be used to make/break an electrical circuit (1 mark)** • **A switch could be used to divert current (1)** • **A switch can be used to break an electrical circuit by preventing the flow of current (2 marks)** • **A switch can be used to turn on/off a circuit (1 mark)** • **A switch can be used to turn on a circuit by making a connection which allows current to flow (2 marks)**	**2**	Allow 'electrons'
1	b	iv	**Describe the function of a resistor** **1 mark for identifying function, 2 marks for description.** **For example:** • **A resistor restricts the flow of current (1 mark)** • **A resistor restricts the flow of current to prevent damaging components (2 marks)**	**2**	

Question	Part	Sub Part	Marking Guidance	Mark	Comment
2			**Describe three differences between the two types of whisk.** Award 1 mark for identifyinf differences (max 3) then 2nd mark for description of relevance/effect. Differences such as: Power source Ease of use Energy type Materials Safety Ergonomics Aesthetics Manufacture Size of blade Example: Figure 4 whisk is safer (1) as it has a casing which protects the user from internal moving parts (1) **[3+3 marks (max 6)]**	**6**	

<table>
<tr><th>Question</th><th>Part</th><th>Sub Part</th><th>Marking Guidance</th><th>Mark</th><th>Comment</th></tr>
<tr><td>3</td><td>a</td><td></td><td>Complete the table below. The first one has been completed for you as an example
<table>
<tr><th>Metal</th><th>Category</th><th>Typical use</th></tr>
<tr><td>Aluminium</td><td>Non-Ferrous</td><td>Drinks cans</td></tr>
<tr><td>Stainless-Steel</td><td>Ferrous</td><td>Kitchen appliances, cutlery, surgical instruments, watches (accept any other correct response)</td></tr>
<tr><td>Copper</td><td>Non-ferrous</td><td>Electrical components, wiring, water pipes, building materials (roofs) (accept any other correct response)</td></tr>
<tr><td>Cast Iron</td><td>Ferrous</td><td>Vices, pots, pans, radiators/heating equipment, garden furniture, street furniture. (accept any other correct response)</td></tr>
</table>
[1 mark for each correct category and use. (max 3 from each). Award marks for correct use even if category incorrect and vice versa]</td><td>6</td><td>Cast Iron: Do not award ‘tools’ unless a group/type of tool is given.
i.e plane/smoothing plane</td></tr>
</table>

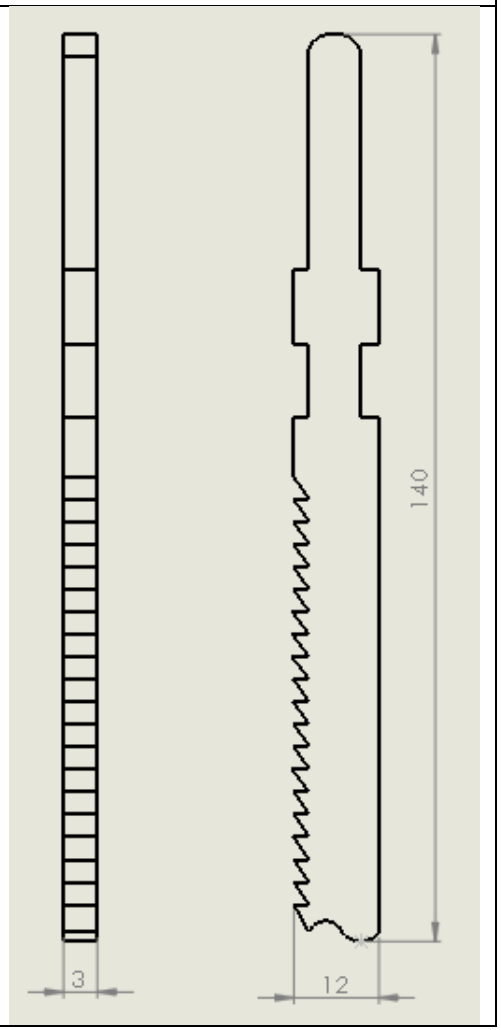
Question	Part	Sub Part	Marking Guidance	Mark	Comment
3	**b**		**Using notes and sketches describe the welding process.** **Candidates may cover any welding process including but not limited to: MIG/TIG, Gas/Oxy-acetylene, friction, solvent.** **Notes and sketches to include the following stages:** **Preparation of surface** **2 or more work pieces** **Method of holding work pieces in place** **Use of energy/fuel/solvent** **Use of a filler** **Fusing materials together** **[1 mark for each stage (max 4 marks)]**	**4**	
3	**c**		**Riveting is a method of joining sheet materials together.** **Give one advantage and one disadvantage of using riveting. Explain your answers.** **Award as follows:** **1 mark for identifying a valid adv/disadv.** **2nd mark for explanation with limited understanding** **3rd mark for detailed explanation with in depth understanding/justification** **<u>Riveting</u>** **Accept answers such as:** **Advantages:** Can join 2 different materials together The join can be undone if necessary (non-permanent) Durable Speed of process Equipment used is readily portable/can be used virtually anywhere	**6**	

			Semi-skilled personnel required **Disadvantages:** Requires overlap of the sheets Requires holes to be pre-drilled/aligned Does not necessarily give an air/fluid-tight seal Semi/permanent join (do not allow if this was also given as an advantage) Labour intensive **[1 mark for each correct adv/disadv with 2 marks for reason (max 3 adv and 3 disadv)]**		
Question	**Part**	**Sub Part**	**Marking Guidance**	**Mark**	**Comment**
4	**a**		**Name three health and safety hazards when handling or cutting sheet metal.** **For each one, suggest a safety measure.** Answers such as: **Hazards:** **Sharp edges** **Injury caused by lifting** **Injury caused by dropping** **Damage to hearing** **Trip over/cut through cable** **Electrocution** **Sharp blades** **Broken/damaged blades** **Swarf/debris getting into operators eyes** **Risk of burn from heat generated by friction** **Dust Inhalation** **Safety measures:** **Wear gloves/correct PPE when handling** **Wear goggles/correct PPE when cutting** **Wear ear defenders/PPE**	**6**	**Do not award repetition – i.e. the same item of PPE for 2 different hazards.**

			Cable management **Use lifting equipment/apparatus** **Keep hands clear of cutting/moving parts** **Dust extraction/PPE** **Carry out regular maintenance/servicing** **Ensure safety guard in place** **[1 mark for each correct response – accept other suitable responses]**		
4	**b**	**i**	**In the space below explain how you would instruct a CNC device to cut a design from a sheet of material.** **Answer should include processes such as:** **Transfer drawing into CAD/2-D software (or similar)** **Convert 2-d file to G-code** **Load G-code into CNC device** **Simulate cutting operation** **Turn CNC device to correct settings for chosen material** **Load material** **Run operation** **Marks awarded as follows:** **No answer worthy of credit (0 marks)** **• Simple statements based on 1 or more of the processes outlined above. Candidate will tend to respond superficially with little detail given. Response is structured poorly with little or no use of Engineering terminology with numerous errors in grammar, punctuation and spelling. (1-2 marks)** **• Sound understanding of the processes with candidate**	**6**	If response is not technically accurate then DO NOT award full marks

			commenting on 3 or more processes above. Response is well structured with good use of appropriate Engineering terminology. Candidate shows a good grasp of grammar, punctuation and spelling. (3-4 marks) **• Excellent understanding of the processes above. Candidate covers 4 or more of the processes. Response shows excellent use of engineering terminology and is well structured. Candidate displays high levels of grammar, punctuation and spelling to give a technically accurate response. If structured using bullet points then detailed sentences must be employed. (5-6 marks)**		
4	**b**	**ii**	**Give two advantages and two disadvantages of using CNC devices to cut materials instead of cutting them by hand.** **Advantages such as:** **Less labour intensive** **More cost effective for large batches/mass production** **Less risk of injury to personnel** **Longer working periods/higher productivity** **More accurate/precise** **Disadvantages such as:** **More expensive to setup** **Scheduled maintenance causes downtime/loss of production** **Breakdowns/equipment failure can halt production** **Skilled staff required to operate CNC equipment/machinery** **[1 mark for each (max 2+2)]**	**4 marks**	

Question	Part	Sub Part	Marking Guidance	Mark	Comment
5			**Suggest three user requirements a designer would need to research before producing a specification for the trimmer.** **For each requirement, state one reason why the designer would need the information.** **Accept the following user requirements:** **Ergonomics** **Anthropometrics** **Material choice** **Size** **Cost** **Aesthetics** **Power source** **Type of use (domestic or commercial)** **Blade design** **Safety** **Then 1 mark for each relevant reason.** **For instance –** **The designer would need to research Ergonomics to make sure that the trimmer was easy/comfortable to hold (1)** **The designer would need to research materials to ensure that the blades would be suitable for outdoor use (1)** **The designer would need to research power sources so that they can decide whether the trimmer can be cordless or not. (1)**	6	

Question	Part	Sub Part	Marking Guidance	Mark	Comment
6			**Using standard drawing conventions, label the drawing below with the length, width and thickness.** **1 mark for 2 correct dimensions (max 1)** **1 further mark for each correct convention: (Conventions must be applied consistently to be awarded a mark)** **Leader lines** **Solid arrow heads** **Dimension centred and above line** **Correct orientation of text** **(max 3)**	**4**	

Question	Part	Sub Part	Marking Guidance	Mark	Comment
7	**a**		**Describe the process of accurately marking and drilling the holes.** 1 mark for each point made as follows: Layout ink (engineers blue/copper solution or similar) Use of a measuring device such as a steel rule Use of dividers/odd leg calliper Use of Engineers square Scribe to mark the position of the holes Centre punch to prevent drill skipping Vice/clamp to hold the work piece Correct size twist drill **[max 4 marks]**	**4**	
7	**b**	**i**	**A manufacturer wants to make a batch of 100 of the bars shown in Figure 8. Using notes and sketches show how the holes are drilled in the correct position without marking them out.** **4 marks – use of notes and sketches which show a feasible/workable solution which includes reference to a jig/template. Method is repeatable.** **2-3 marks – use of notes and or sketches showing a feasible/workable solution but which lacks sufficient detail.** **1 mark – a solution which may not be feasible but which refers to a jig/template/method of repeatedly drilling the bar.**	**4**	

7	**b**	**ii**	**Give four benefits of using jigs or templates when manufacturing products.** Accept responses such as: Repeatable Increases speed of production Ensures that products are consistent Requires a lower skill level Reduces the cost of manufacture Requires less tools/equipment Reduces the risk of human error Increases accuracy (**1 mark for each correct response. Max 4)**	**4**	