



Mark schemes are prepared by the Principal Examiner 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 examiners 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 examiner understands and applies it in the same correct way. As preparation for standardisation each examiner 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, examiners encounter unusual answers which have not been raised they are required to refer these to the Principal Examiner.

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Question	Part	Sub Part	Marking Guidance	Mark	Comment
1	(a)		A material that will not allow electrical flow. Suitable example.	1	
			<i>(For Example, Glass, PVC, Polystyrene, acrylic, wood, rubber, etc.)</i>	1	
1	(b)		A material containing iron.	1	
			Suitable example <i>(For Example, Any of the various forms of Iron or Steel or other modern alloys that contain iron etc.)</i>	1	

Question	Part	Sub Part	Marking Guidance	Mark	Comment
2	(a)		The number of oscillation / cycles	1	
			In a set time period	1	
2	(b)		The joining/assembly of parts	1	
			To form a system/object/product	1	

Question	Part	Sub Part	Marking Guidance	Mark	Comment
3			Linear motion – Input shown	1	
			Linear motion – output shown	1	
			System produces amplification	1	
			The amplification produced is by factor of 2	1	

Question	Part	Sub Part	Marking Guidance	Mark	Comment																																				
4	(a)		<table border="0"> <tr> <td>A</td> <td>B</td> <td>C</td> <td>Q</td> </tr> <tr> <td>0</td> <td>0</td> <td>0</td> <td>0</td> </tr> <tr> <td>0</td> <td>0</td> <td>1</td> <td>0</td> </tr> <tr> <td>0</td> <td>1</td> <td>0</td> <td>0</td> </tr> <tr> <td>0</td> <td>1</td> <td>1</td> <td>0</td> </tr> <tr> <td>1</td> <td>0</td> <td>0</td> <td>1</td> </tr> <tr> <td>1</td> <td>0</td> <td>1</td> <td>1</td> </tr> <tr> <td>1</td> <td>1</td> <td>0</td> <td>0</td> </tr> <tr> <td>1</td> <td>1</td> <td>1</td> <td>1</td> </tr> </table> <p>Every 2 correct output lines (4 possible pairs)</p>	A	B	C	Q	0	0	0	0	0	0	1	0	0	1	0	0	0	1	1	0	1	0	0	1	1	0	1	1	1	1	0	0	1	1	1	1	4 x 1	Max 4 marks
A	B	C	Q																																						
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1	0	1	1																																						
1	1	0	0																																						
1	1	1	1																																						
4	(b)		<p>Buzzer and power supply shown</p> <p>Suitable sensor <i>(For Example – Any sensor or sensing system that can be made to change its output state when detecting a characteristic of boiling water – 100 degrees, production of steam, increase in pressure etc.)</i></p> <p>Suitable diagram/ circuit (1)/ correctly connected (1)</p>	<p>1</p> <p>1</p> <p>2</p>																																					

Question	Part	Sub Part	Marking Guidance	Mark	Comment
5	(a)		Sketch showing 10 LED's	1	Max 12 marks
			Power supply provided	1	
			LED's correctly connected	1	
			System/component for producing delay (1) of 5 sec (1)	2	
			System/component for producing sequence (1) Suitable for 10 outputs (1)	2	
			Connections of Subsystem (1) All subsystems (2)	2	
			Explanation / Flowchart (each relevant point 1)	4	
5	(b)		Suitable amplification component <i>(For example – Relay, Transistor, FET etc.)</i>	1	Max 4 marks
			Capable of managing loading	1	
			Correct connections, including lamp power supply (1) / explanation (1)	2	
5	(c)		Suitable method identified / indicated	1	Max 4 marks
			Modification capable of fulfilling requirement	1	
			Correct connections (1) / explanation (1)	2	

Question	Part	Sub Part	Marking Guidance	Mark	Comment
6	(a)	(i)	<p>Suitable method of cutting material (For example – Laser cutter, miller/router + method of squaring corners, hand tools and processes, etc.)</p> <p>Suitable accuracy possible and how achieved (For example – How the hole is marked out, how the design is produced and outputted to the CNC device, how accurate movement is produced on a manual machine or CNC machine etc.)</p> <p>Description of tooling / machinery</p> <p>Description of process – broken down (each point 1)</p> <p>Suitable sketch</p>	<p>1</p> <p>1</p> <p>1</p> <p>3</p> <p>1</p>	Max 7 marks
6	(a)	(ii)	<p>Suitable method of cutting material (For example – Laser cutter, miller/router + method of squaring corners, hand tools and processes, etc.)</p> <p>Suitable accuracy possible / how achieved (For example – How the hole is marked out, how the design is produced and outputted to the CNC device, how accurate movement is produced on a manual machine or CNC machine etc.)</p> <p>Description of tooling / machinery</p> <p>Description of process – broken down (each point 1)</p> <p>Suitable sketch</p>	<p>1</p> <p>1</p> <p>1</p> <p>3</p> <p>1</p>	Max 7 marks
6	(b)		<p>Suitable method of joining acrylic</p> <p>Permanent method of joining</p> <p>Joint preparation required before joining (e.g. increase gluing area / degrease / etc.)</p> <p>Suitable sketch that aids explanation</p> <p>Explanation with sketch – broken down (each point 1) (e.g. close fitting joint / degrease / clamp / apply solvent / runs through joint due to capillary action)</p>	<p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>3</p>	Max 6 marks

Question	Part	Sub Part	Marking Guidance	Mark	Comment
7	(a)	(i)	Suitable prime mover <i>(e.g. dc motor, ac motor, stepper motor, compressor powering a pneumatic motor etc.)</i>	1	Max 4 marks
			System capable of driving output shaft <i>(e.g. Linkage between prime mover and output, or a system for varying speed of motor output shaft)</i>	1	
			Capable of producing slow rotation (1) with explanation (1) <i>(e.g. Electrical control system for prime mover, mechanical linkage such as gears or pulleys, etc.)</i>	2	
7	(a)	(ii)	Suitable prime mover <i>(e.g. dc motor, ac motor, stepper motor, compressor powering a pneumatic motor etc.)</i>	1	Max 4 marks
			System capable of driving output shaft <i>(e.g. Linkage between prime mover and output)</i>	1	
			Capable of producing slow rotation (1) with explanation (1) <i>(e.g. Electrical control system for prime mover, mechanical linkage such as gears or pulleys, etc.)</i>	2	
7	(b)	(i)	Suitable activation system <i>(e.g. cam, slotted disc, magnet etc.)</i>	1	Max 4 marks
			Suitable sensing system <i>(e.g. micro-switch, light source and LDR, reed switch etc.)</i>	1	
			Production of electrical pulse – Power supply shown	1	
			Output shown	1	
7	(b)	(ii)	Input connection for pulse shown	1	Max 8 marks
			Motor shown	1	
			Power supply for motor shown	1	
			How input activates circuit shown (1) / explained (1) <i>(e.g. How the input activates a relay, transistor network, mechanical reversing system etc.)</i>	2	
			Power supply for circuit shown	1	
			Reversing system shown or explained – Forward (1) Reverse (1)	2	

Question	Part	Sub Part	Marking Guidance	Mark	Comment
7	(c)		<p>Marks will be awarded for:</p> <p>The turntable</p> <p style="padding-left: 20px;">Turntable with size</p> <p style="padding-left: 20px;">Capable of 270 degrees of rotation</p> <p>Turntables correct speed and movement</p> <p style="padding-left: 20px;">Reference to speed of prime mover</p> <p style="padding-left: 20px;">Reference to output speed</p> <p style="padding-left: 20px;">System for matching of speeds – Shown (1) & explained (1)</p> <p>The sensing and control system.</p> <p style="padding-left: 20px;">Sensing of end of travel - Clockwise</p> <p style="padding-left: 20px;">Sensing of end of travel – C/Clockwise</p> <p style="padding-left: 20px;">Activation of control circuit</p> <p style="padding-left: 20px;">Reversal of prime mover – (forward (1) reverse (1))</p> <p style="padding-left: 20px;">Interlink of limiting systems</p> <p>Assembly – (Each sub-system suitably connected 1 mark)</p> <p>Selection of materials and components (each pair of suitable materials or Components 1 mark)</p>	<p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>2</p> <p>1</p> <p>1</p> <p>1</p> <p>2</p> <p>1</p> <p>4</p> <p>4</p>	Max 20 marks