General Certificate of Secondary Education

Engineering

48503

Mark scheme

4850

June 2015

Version/Stage: 1: 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.

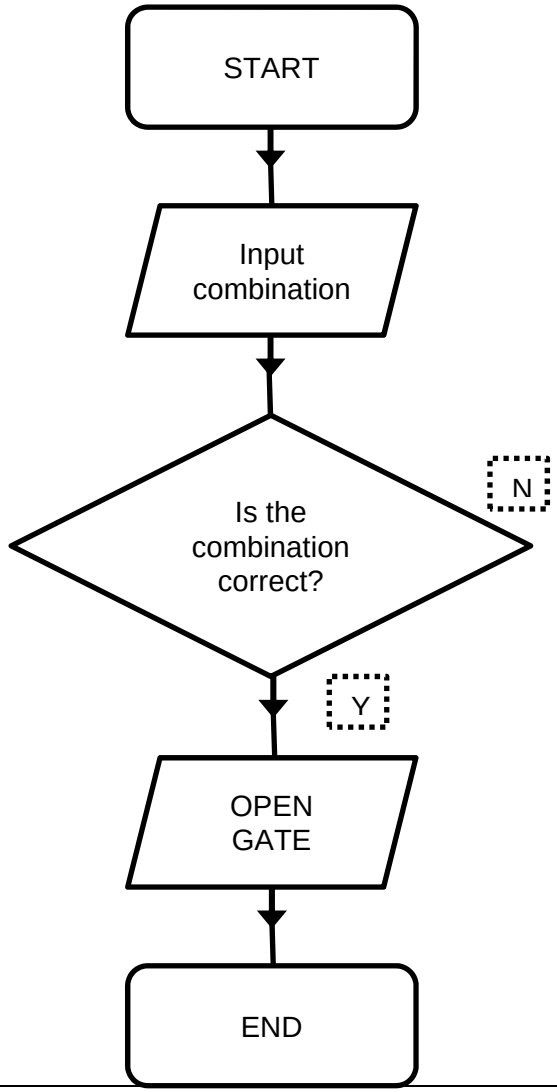
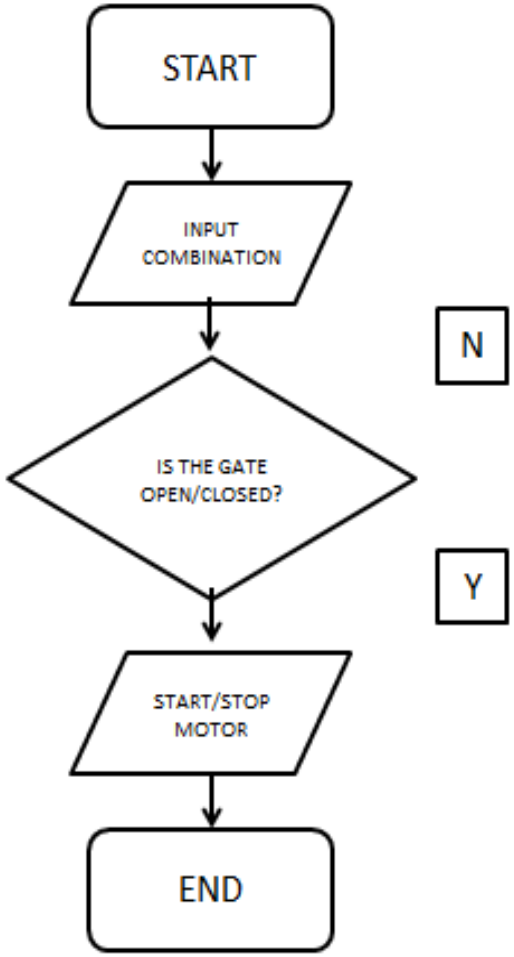
It must be stressed that a mark scheme is a working document, in many cases further developed and expanded on the basis of students' reactions to a particular paper. Assumptions about future mark schemes on the basis of one year's document should be avoided; whilst the guiding principles of assessment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

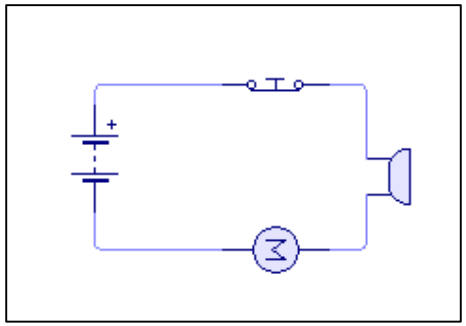
Further copies of this Mark Scheme are available from aqa.org.uk

		Expected answers	Mark	notes
1	**(a)**	**A** - Pipe/Hollow shaft/tube/hollow bar **(1)** **B** - Centre Line **(1)**	**2**	Also accept 'break in a shaft'
1	**(b)**	Title Projection symbol Original Scale Date Name Units of Dimensions **1 mark for each (max 4)**	**4**	
1	**(c)**	**A** – Chamfer **B** – Groove **C** – Thread **D** – Knurling	**4**	
				Total (10 marks)

2	**(a)**	Up to 3 marks awarded for clear explanation covering 2 or more spec points. If only 1 point discussed then max 2 marks **unless** multiple areas are discussed regarding 1 specification point. **PLUS** Up to 3 marks available for command of English. • Some attempt made **(1)** • Logical, structured answer possibly with some punctuation and grammar inaccuracies**. (2)** Technically correct and well punctuated in good flowing English. **(3)**	**6**	
2	**(b)**	1 mark for each valid reason **(max 2)** Accept reasons such as: • no manufacturing setup cost • speeds up manufacture/lead time • components can be ordered in accordance with demand for product • no need for manufacturing facility (saving money/resources)	**4**	
				Total (10 marks)

3	**(a)**	Go/nogo gauge	**1**	
3	**(b)**	Clear notes and sketches showing how the device chosen would be used/interact with the component	**4**	If vernier/micrometre/ruler chosen for above then 4 marks can still be awarded for clear description. If ***only*** notes ***or*** sketches used then max 2 marks.
				Total (5 marks)

4	**(a)**	**Inputs** – Keypad **(1)** Sensor **(1)** **Output** – Motor **(1)**	**3**	
4	**(b)**	 Complete decision box **(1)** Feedback loop including Y and N **(1)** Motor operation/open gate **(1)**	**3**	accept alternative: 

4	**(c)**	 PTB switch **(1)** Motor **(1)** Buzzer **(1)** Correctly drawn circuit **(1)**	**4**	
				Total (10 marks)
5	**(a)**	**Accept answers such as:** Smart materials have properties that can change **(1)** in response to changes in their environment **(1)**	**2**	
5	**(b)(i)**	**Property –** State what the material does **(1)** State how it is activated **(1)** **For example –** Shape memory alloy remembers its shape **(1)** and returns to this shape when heated **(1)** **Application –** Correct application **(1)** **For example –** A heating thermostat Shape memory spectacles	**3**	Accept specific applications only – do not accept Medicine, Aerospace etc.

5	**(b)(ii)**	**Property –** State what the material does **(1)** State how it is activated **(1)** **For example** – QTC generates an electrical current **(1)** when manipulated/moved/stressed/placed under pressure **(1)** **Application –** Correct application **(1)** **For example –** Pressure sensors Transducers Sports equipment (automatic targets/scoring systems)	**3**	Accept specific applications only – do not accept Medicine, Aerospace etc.
5	**(b)(iii)**	**Property –** State what the material does **(1)** State how it is activated **(1)** **For example -** They come in a range of different colours They change colour as the temperature goes up and down The inks are expensive compared to normal inks to buy The inks can be applied to most surfaces. **Application –** Correct application **(1)** **For example –** Food industry: indicate when food packaging has reached correct temperature, thermometer, labels for packaging, dyes for clothing.	**3**	
				Total (11 marks)

6	**(a)**	**1 mark for each correct benefit** Accept: assists with time management **(1)** labour/personnel management **(1)** resource management **(1)** ensures consistency of quality **(1)** **(max 2)**	**2**	
6	**(b)**	**1 mark for identifying a benefit, 1 mark for describing it.** **For example -** CIM allows components to be automatically ordered during the design stage **(1)** which means that the components are in stock ready for manufacture **(1)** CIM can adjust shift patterns automatically **(1)** to ensure that enough staff are available for certain stages of an assembly line **(1)**	**4**	
6	**(c)**	Accept: • Spray painting • Assembly lines • Welding • Packaging **Spray Painting:** Decreased risk to workers **(1)** from exposure of paint fumes **(1)** Or Increased productivity **(1)** as robots don't need to take regular breaks **(1)** **Welding:** Reduces health and safety risk to workers **(1)** from risks of burns/damage to eye sight **(1)** Or Increases consistency of welds **(1)** as removes human error **(1)**	**3**	
				Total (9 marks)

7	**(a)**	**1 mark for method + 1 mark for description** **For example -** Change the design of the product to use more energy efficient manufacturing processes **(1)** to reduce the amount of energy used **(1)** Or Improve the insulation of the building **(1)** to prevent energy being wasted by heat escaping **(1)** Or Encourage employees to turn off equipment/machinery when not in use **(1)** to avoid wasting electricity **(1)** improve insulation of equipment	**6**	**Alternative suggestions could include:** • improve insulation of buildings • install more modern efficient equipment • change the design of a product to use materials that require less energy in production or processing • change the method of transport of goods • purchase materials in bulk • burn waste to generate power • turn off lights/electrical equipment when not in use
7	**(b)**	Answers such as: An energy source which won't run out/inexhaustible **(1)** because it is naturally occurring/self-replenishing **(1)**	**2**	
7	**(c)**	• tidal • solar • wind • wave • hydro-electricity • geothermal **1 mark for each**	**2**	
				Total (10 marks)

8	**(a)**	**1 mark for each correct response.** • aesthetics • corrosion resistance • enhance mechanical or physical properties • grip **(max 2)**	**2**	
8	**(b)**	**1 mark for each correct stage** • clean • dip • molten zinc • remove and cool 1 mark for each described process **(max 4)**	**4**	Max 3 marks if candidate does not include 'zinc' in their response.
8	**(c)**	Candidates may be answering with reference to any surface finishing, including galvanising, painting, plastic dip/powder coating, anodising so please award marks accordingly. **1 mark for each risk with 1 mark for associated control measure (max 2)** Accept: Burns/hot materials – wear gloves/ppe Damage to eyes – wear goggles/ensure guards are in place Inhalation of fumes – ventilation/masks Trapped limbs/injury from moving parts – ensure guards are in place/keep workers clear of moving parts	**4**	
				Total (10 marks)
				Total marks for paper (75 marks)