



GCSE MARKING SCHEME

SUMMER 2018

**DESIGN & TECHNOLOGY
SYSTEMS AND CONTROL
4121/01**

GCSE DESIGN & TECHNOLOGY: SYSTEMS AND CONTROL

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Q	Part	Answer	Marks	Total
1.	(a)	(i) Batch Production underlined. (only acceptable answer)	1	1
		Incorrect answer / wrong scale of production circled.	0	
		(ii) Full answer should demonstrate understanding e.g. the cover provides protection for the used or new brushes being stored. Or Keeps dust / dirt away from brushes, clean / hygienic storage in a visible transparent case.	1	1
		Incorrect answer / wrong answer	0	
		(iii) Full answer should demonstrate understanding e.g. The average family has 4 members so each person has their own brush but uses the same handle. Or For various people to use their own individual brush head and to keep spares.	2	2
		Limited answer e.g. for different people or replace broken ones.	1	
		One word responses like spares.	0	
		(b) (i) Full answer should demonstrate understanding e.g. There are 34,000 strokes per minute, timing for 2 minutes and auto alert to clean teeth properly, and different modes for teeth / gums etc. Or The toothbrush helps people clean their teeth more effectively than by hand because it is timed, different modes to suit, auto alert for coverage.	2	2
		Limited answer e.g. people will clean their teeth better than by hand / without device. Plastic cover keeps brushes clean.	1	
		Inappropriate or incorrect answer e.g. better toothbrush.	0	
		(ii) Full and detailed response e.g. the electronic brush is rechargeable, can be used multiple times without replacing batteries. Or The toothbrush uses replaceable heads meaning you do not need to buy new handsets or dispose of old ones. (less waste). Or You only buy one toothbrush for the family instead of multiple – reducing cost and materials.	2	2
		A weaker response worthy of some credit e.g. the toothbrush is rechargeable.	1	
	Inappropriate or incorrect answer.	0		
	(c) A full and detailed response e.g. The base is rounded and slimline and looks modern and stylish. The chrome matches taps / fittings in bathrooms. Or The white colours are clean and clinical and the colour coded brush heads are easy to identify individual brush attachment.	2	2	
	A weaker response with some credit e.g. fits in with bathroom colour schemes.	1		
	Inappropriate or incorrect answer.	0		

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	(d)	(i)	Popularity increases once the product has been released. Or Sales increase as the product becomes more popular / more people buy and trend patterns occur.	1	1
			Inappropriate or incorrect answer.	0	
		(ii)	Correct calculation method and correct answer e.g. $20/100=5$, $5*450=2250$ Or $450/20=22.5$, $22.5*100=2250$	2	2
			Correct answer, no workings OR correct workings wrong answer	1	
			Incorrect answer, incorrect or no workings.	0	
		All	Unexpected answers – candidates may respond in a way that is unexpected or does not fit with the marking scheme. Examiners to follow code of practise and contact team leader.		
					15

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2.		(i)	Block diagram with three main boxes, Input, Process, and Output. Components in relevant box e.g. LDR, Transistor, PIC or similar, LEDs and buzzer or piezo. Unexpected answers might appear here. No answer or inappropriate answer.	3 x 1 0	3
		(ii)	Accurate and clear sketching of the external features of the healthy eating device including all the specification points. Clear sketching meeting most details of the specification. Clear sketching meeting some details of the specification. Limited information meeting some of the specification points. No answer or inappropriate answer.	4 3 2 1 0	4

Q	Part	Answer	Marks	Total
	(iii)	Fully labelled circuit diagram of a system that will work. Symbols and conventions correct and accurate. Comprehensive details of a PIC, transistor switch system or other that would be fully functioning meeting the specification.	[up to 4/5]	5
		Labelled circuit diagram that shows some conventions and components correct, some use of suitable components but may not function fully.	[up to 2/3]	
		Labelled circuit diagram with several errors or details missing. One or two components or conventions correct.	[up to 1]	
		No answer or inappropriate answer.	0	
	(iv)	Clear details of a fun themed product which encourages healthy eating and fits a refrigerator door.	2	2
		Some details of a method, maybe some errors / partially correct.	1	
		No answer or inappropriate answer.	0	
	(v)	Two or more dimensions given. Main material / s named. High quality sketching, communication. Conventions used.	4	4
		At least one dimension given or one material named. Sketching, communication and Conventions generally accurate.	3	
		Lacks appropriate dimensions and/or materials, Some errors, basic levels of sketching and communication.	2	
		No specific / appropriate dimensions or materials. Offered, weak quality sketching and Communication.	1	
		No answer or inappropriate answer.	0	
				18/60

Q	Part		Answer	Marks	Total
3.	(a)	(i)	Crank and slider.	1	1
			No answer or inappropriate answer.	0	
		(ii)	Linear or reciprocating	1	1
			No answer or inappropriate answer.	0	
		(iii)	Pawl and ratchet.	1	3
			A clear and detailed response. E.g. When the ratchet wheel rotates anti-clockwise, the pawl will drop into the next tooth. The Pawl stops the ratchet from rotating clockwise.	2	
			A less clear understanding but some truth e.g. The pawl and ratchet will move round one way but not the other.	1	
			No answer or inappropriate answer.	0	
	(b)	(i)	Photovoltaic cell (accept solar cell or solar panel or PV cell).	1	1
			No answer or inappropriate answer.	0	
		(ii)	Correct calculation method and correct answer e.g. Ratio is 1:20, $120/20 = 6\text{rpm}$.	2	2
			or RV of driver x teeth = RV of driven x teeth. $250 \times 1 = 20 \times ?$, $120/20 = 6\text{rpm}$.	2	
			Correct answer, no workings OR correct workings wrong answer.	1	
			No answer or inappropriate answer.	0	
		(iii)	A clear and detailed response. E.g. The PV cell needs to have more UV light exposure to generate more electricity to make the motor rotate faster.	2	2
			Or The gear ratio of the Worm drive and spur needs to be reduced so that the buggy goes quicker. E.g. less teeth on the spur $1:15 = 16.6\text{rpm}$.	2	
			Or Add additional PV cells in series with the one pictures to increase input voltage.		
			Or Increase the diameter of the back wheels which would increase the speed.		
			Or Reduce the overall weight of the buggy by using less or lighter materials and components.		
			A less developed response e.g. The motor needs to go faster / provide more rpm.	1	
			No answer or inappropriate answer.	0	

Q	Part	Answer	Marks	Total	
	(c)	(i)	<p>A clear and detailed response. Look for 3 strands. E.g. When the SPDT is in position Y, the capacitor begins to charge.</p> <p>This creates a time delay. (controlled by VR and Cap).</p> <p>Once almost full, the capacitor activates the NPN transistor. This turns on the outputs (Buzzer and LED).</p> <p>Reduce marks x 1 as responses become weaker / thinner. Incorrect answer, some correct workings.</p> <p>No answer or inappropriate answer e.g. to make the circuit work properly.</p>	<p>3</p> <p>1</p> <p>1</p> <p>1</p> <p>0</p>	3
		ii	<p>A clear and detailed response. E.g. Component A is a capacitor. It provides a time delay because it takes time to charge. The capacitor creates a rising voltage at the base of the transistor, eventually switching it on.</p>	2	2
			<p>A less developed response e.g. This is a capacitor which charges up. Or This component creates a time delay.</p>	1	
			No answer or inappropriate answer.	0	
					15/85

Q	Part	Answer	Marks	Total	
4.	(a)	(i)	False False	1 1	2
			No response or inappropriate answer.	0	
		(ii)	A clear and detailed response e.g. The device will still need to operate if mains power is cut or lost, therefore the battery back-up is essential.	2	2
			A less developed response e.g. To make sure the device is powered.	1	
		No response or inappropriate answer.	0		
	(b)	<p>Completed flowchart (decisions require yes / no label to be correct).</p> <pre> graph TD START([START]) --> GL[Green Lights On] GL --> D1{Is preset temperature reached?} D1 -- Yes --> YLO[Yellow Light On] YLO --> SO[Siren On] SO --> D1 D1 -- No --> YL[Yellow Light Off] YL --> D2{Is smoke present?} D2 -- Yes --> RL[Red Light Flash] RL --> SO2[Siren On] SO2 --> D1 D2 -- No --> RLO[Red Light Off] RLO --> SO3[Siren Off] SO3 --> D1 </pre> <p>Marks reduced x1 as errors appear</p>	8x1	8	
	(c)	<p>A clear and detailed response e.g. Look for 3 reasons:</p> <ul style="list-style-type: none"> A PIC is a small device able to fit inside the control panel and / or ceiling mount. A PIC can control a number of Inputs and Outputs simultaneously as required for the fire detection device. A PIC can be powered by a mains / battery supply. A PIC can be re-programmed to specific needs / circumstances. <p>No response or inappropriate answer.</p>	3 x1 0	3 	
		Note: Flow chart could gain some marks if vertical lines are reversed/vice versa.			
				15/120	