

Design & Technology

Eduqas GCSE

How electronic systems provide functionality

Materials required for questions

- Pencil
- Rubber
- Calculator

Instructions

- Use black ink or ball-point pen
- Try answer all questions
- Use the space provided to answer questions
- Calculators can be used if necessary
- For the multiple choice questions, circle your answer

Advice

- Marks for each question are in brackets
- Read each question fully
- Try to answer every question
- Don't spend too much time on one question

Good luck!

Q1. In the systems approach, which block contains a sensor such as an LDR or thermistor?

- A** Input
- B** Process
- C** Output

Q2. What happens to the resistance of an LDR as the light level increases?

- A** It increases
- B** It decreases
- C** It stays the same

Q3. Which flowchart symbol is used for a decision with a yes/no answer?

- A** Rectangle
- B** Parallelogram
- C** Diamond

Q4. Which of the following is a closed loop system?

- A** A toaster that runs for a set time
- B** A central heating thermostat that turns the boiler off when the room is warm
- C** A torch with an on/off switch

Q5. Which of the following is a digital sensor?

- A** Push switch
- B** Thermistor
- C** Potentiometer

Q6. A flashing bike light turns its LED on and off at a set rate. Which control function is this?

- A** Counting
- B** Switching
- C** Timing

Q7. Modern street lights switch on automatically when it gets dark. Explain how LDRs (Light Dependent Resistors) work in modern street lighting. **(2 marks)**

Q8. Precise control of an electric iron is achieved through feedback. A temperature sensor sends information to a microcontroller, which switches the heater on or off depending on whether the iron is hot enough for the temperature setting.

Q8a. The iron uses a thermistor. Describe the function of a thermistor when the iron is in use. **(2 marks)**

Q8b. Most irons use a light emitting diode (LED) as an output signal. Explain two benefits of using LEDs in a product. **(2 marks)**

Q9. A children's night light turns on automatically when it gets dark. It also has an on/off button. Complete the missing information in the table below for the night light. **(4 marks)**

Function	Input or output	Electronic component
Detects light and produces a signal		
Produces light	Output	
	Input	Switch

Q10. A pedestrian crossing unit has a push button for pedestrians to press, and shows a green "walk" symbol and a red "halt" symbol. Describe the part of the control system which is the input and the output. **(2 marks)**

Q11. The table below describes the block diagrams of two types of control system.

System	Block diagram
System A	Input → Process → Output
System B	Input → Process → Output, with a feedback loop from the output back to the input

Use examples to explain the differences between the two types of control system. **(3 marks)**

Q12. A laptop computer can be shown as a system block diagram. Complete the table by adding one component that could be used in each block. **(4 marks)**

Block	Component
Input	
Input	
Process	
Output	

Q13. A head torch used for camping is powered by a battery supply, has a slide switch, and lights three LEDs. Using standard circuit symbols for each component, produce a circuit diagram in the space below. **(5 marks)**



Answers

Q1. A

Q2. B

Q3. C

Q4. B

Q5. A

Q6. C

Q7.

For example:

- LDRs are used to detect light levels in the street (1)
- Their resistance decreases as the light intensity increases (1)
- In the dark, the resistance of an LDR is high (1) and little current can flow through it (1)
- In bright light, the resistance is low (1) and more current can flow (1)
- Turning on the street light (1)

Q8a.

Answers must relate to a thermistor in an iron. 1 mark for a clear understanding of the function of a thermistor and 1 mark for describing its use in the iron. For example: a thermistor is a temperature sensing component (1) that produces an analogue signal that changes as the temperature rises (1). It measures and controls the temperature of the iron, based on how it is interfaced with the microcontroller (1).

Q8b.

1 mark for each benefit explained in full. A maximum of 1 mark can be awarded without an explanation. Benefits of LEDs:

- Long life (they don't burn out)
- Energy efficient (therefore cheaper to run)
- Ecologically friendly and free from toxic chemicals
- Can be recycled
- Design flexibility (can be combined into any shape)
- Operate in both cold and hot temperatures

- Available in many different colours

Q9.

1 mark for each correct answer. Must be appropriate for a night light used by children.

Function	Input or output	Electronic component
Detects light and produces a signal	Input (1)	Light dependent resistor/LDR (1)
Produces light	Output	Light emitting diode/LED/bulb/lamp (1)
Makes/breaks the circuit, switches the night light on/off (1)	Input	Switch

Q10.

One mark each for simply stating the button as the input and the walk/halt symbols as the outputs. Two marks only if the answer is described, not just stated. For example:

- The button is the input. When it is pressed, it alerts the system that a pedestrian is waiting and requests a "walk" signal
- The walk and halt symbols are the outputs. The system completes its cycle before displaying the walk or halt symbol
- Accept answers that refer to the green man and red man as the outputs

Q11.

- Example of an open loop system for System A, e.g. a toaster on a timer (1)
- Example of a closed loop system for System B, e.g. a central heating thermostat (1)
- Understanding of the part played by feedback in a closed loop system, e.g. the output is measured and the information is used to adjust the system (1)

Q12.

One mark for each correct response, up to a maximum of 4 marks. The response must be an identifiable component, NOT what the component does. Do not accept RAM/ROM, chip, motherboard or "sensor".

Block	Correct components
Input	Mouse, keypad/keyboard, stylus, switch or button, microphone, camera, named specific sensor (e.g. touch pad)
Process	Microcontroller, microprocessor, integrated circuit, timer, clock, graphics card, video chip, CPU, GPU, hard drive
Output	Screen/monitor, indicator lights, headphones, speaker, LEDs

Q13.

- A maximum of three marks for correctly using three different component symbols: cell/battery, switch, LED (3 × 1)
- 1 mark for joining the component symbols
- 1 mark for correct LED orientation

The final diagram must look like a suitable circuit diagram to be awarded full marks.