

Design & Technology

Edexcel GCSE

Sensors

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. A lamp is designed to automatically switch on in dark conditions. What is the input in this system?

- A** Light sensor
- B** Microcontroller
- C** Pressure sensor

Q2. Which component is the output in a temperature warning system?

- A** Temperature sensor
- B** Lamp
- C** Microcontroller

Q3. What happens to the resistance of an LDR in bright light?

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

Q4. Which switch closes when a magnet is brought near it?

- A** Reed switch
- B** Tilt switch
- C** Push switch

Q5. Which sensor is used in security lights to detect people moving?

- A** Thermistor
- B** Passive infrared (PIR) sensor
- C** Moisture sensor

Q6. Which switch only completes the circuit while it is being pressed?

- A** Toggle switch
- B** Reed switch
- C** Push switch

Q7. A firefighter's uniform has electronic sensors built into it to detect heat.

Name an electronic sensor that is used to sense heat. **(1 mark)**

Q8. Modern street lights switch on automatically when it gets dark.

Explain how LDRs (light dependent resistors) work in modern street lighting. **(2 marks)**

Q9. Precise control of an electric iron is achieved through feedback. A temperature sensor sends a signal to a microcontroller, which controls the heater.

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

Q10. A children's night light turns on automatically when it gets dark.

Complete the missing information in the table below. For each function, state whether it is an input or output, and name the electronic component. **(4 marks)**

Function	Input or output / Electronic component
Detects light and produces a signal	 /
Produces light	Output /
Makes or breaks the circuit to switch the night light on and off	Input /

Q11. Trainer designers are exploring the use of pressure sensors in footwear to monitor movement and stability.

Give one example of a sensor that is used in another product. Explain how it works and improves the functionality of that product. **(3 marks)**

Name of sensor:

Answers

Q1. A

Q2. B

Q3. C

Q4. A

Q5. B

Q6. C

Q7.

Thermistor (1) or thermocouple (1).

Q8.

Up to 2 marks, e.g.: 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). This turns on the street light (1). Credit any other appropriate response.

Q9.

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. E.g.: a thermistor is a temperature sensing component (1) that produces an analogue signal that rises when the temperature rises (1). It measures and controls the temperature of the iron, based on how it has been interfaced with the microcontroller (1).

Q10.

1 mark for each correct answer (4 marks):

- Detects light and produces a signal: Input (1); light dependent resistor/LDR (1)
- Produces light: light-emitting diode/LED/bulb/lamp (1)
- Makes or breaks the circuit: switch (1)

Q11.

1 mark for a sensor, 1 mark for how it functions, and 1 mark for relating it to a specific use in a product/system. E.g.:

- Movement sensors (1) can automatically switch lights on (1) when movement is detected (1)
- Moisture sensor (1) can sense when an object is wet or dry and set off an alarm (1), e.g. when a bath is full or a plant needs watering (1)
- A heat sensor/smoke detector (1) can detect heat or smoke and set off a warning alarm (1) to alert to a potential fire (1)
- A light sensor can detect when it is dark (1) and switch on a night light automatically (1) to help with security (1)
- Also accept parking sensors (electromagnetic or ultrasonic), lane sensors, braking sensors, tyre pressure sensors