MODULE J HARDWARE AND EMERGING TECH · J4

Automated systems: sensors, microprocessors and actuators

Original practice questions · 22 marks · ~25 minutes · Cambridge 0478 syllabus 6.1.1, 6.1.2

Name _____ Date _____

Instructions. Answer all questions in the spaces provided. The marks for each part are shown in brackets [ ]. The total for this worksheet is **22 marks**.

1

Total: 4 marks

Automated systems use sensors, a microprocessor and actuators working together.

Tick (✓) **one** box in each row to show which component each description is about. **[4]**

Description	Sensor	Microprocessor	Actuator
Measures the amount of water in the soil of a field			
Compares a reading with a stored value and decides whether action is needed			
Opens a valve so that water flows into a tank, when it receives a signal			
Takes readings of the air pressure and sends them to be processed			

2

Total: 2 marks

A sports centre uses an automated system to switch on the floodlights for its outdoor courts when it gets dark. The system uses a light sensor, a microprocessor and an actuator.
A manager says: "The light sensor switches the floodlights on when it gets dark."

Explain why the manager's description is **not** correct. **[2]**

3 **Total: 4 marks**

A railway station has automatic sliding doors at its main entrance. An automated system opens the doors when a person walks up to them.

Complete the description of how the automated system works. Use words from the list. Each word may be used once or not at all. **[4]**

actuator · compares · continuously · deletes · microprocessor · once · router · sensor

An infra-red sensor above the doors takes readings _____ and sends the data to the _____. The microprocessor _____ each reading with stored values. If a person is detected near the doors, the microprocessor sends a signal to an _____ (a motor), which slides the doors open.

4 **Total: 6 marks**

A road tunnel has an automated ventilation system. Gas sensors in the tunnel measure the level of harmful exhaust gases in the air. When the level is too high, the system switches on large fans that blow fresh air into the tunnel.
Before the system was installed, employees walked through the tunnel with hand-held gas meters and switched the fans on from a control panel.

(a) Explain **two** advantages of using the automated ventilation system instead of employees. **[4]**

Advantage 1

Advantage 2

(b) Explain **one** disadvantage of using the automated ventilation system. **[2]**

5 **Total: 6 marks**

A science laboratory keeps cell samples in an incubator. An automated system keeps the temperature inside the incubator between 36.5 °C and 37.5 °C. The incubator has a temperature sensor, a microprocessor, a heater and a cooling fan. Actuators switch the heater and the cooling fan on and off.

Describe how the temperature sensor, the microprocessor and the actuators are used to keep the temperature inside the incubator between 36.5 °C and 37.5 °C. **[6]**

Total for this worksheet: 22 marks