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Exam Preparation and Free Resources

Name of the Student:_____

Max. **Marks : 25 Marks**   **Time : 25 Minutes**
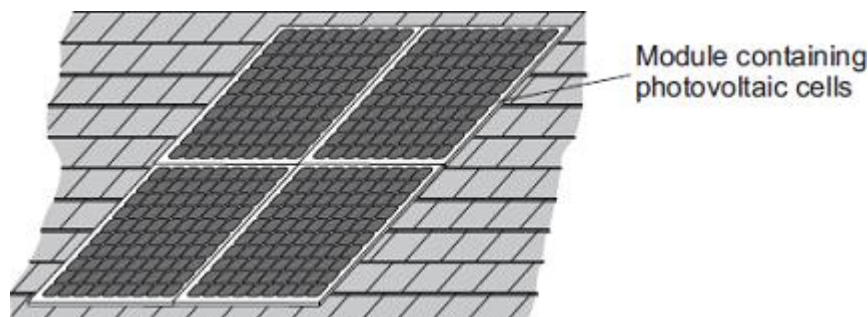
Q1.

Solar panels are often seen on the roofs of houses.

(a)   Describe the action and purpose of a solar panel.

_____

_____

_____

_____

(2)

(b)   Photovoltaic cells transfer light energy to electrical energy.

In the UK, some householders have fitted modules containing photovoltaic cells on the roofs of their houses.

Four modules are shown in the diagram.

Module containing photovoltaic cells

The electricity company pays the householder for the energy transferred.

The maximum power available from the photovoltaic cells shown in the diagram is 1.4×10^3 W.

How long, in minutes, does it take to transfer 168 kJ of energy?

_____

_____

_____

_____

_____

_____ Time = _____ minutes

(3)

(c) When the modules are fitted on a roof, the householder gets an extra electricity meter to measure the amount of energy transferred by the photovoltaic cells.

(i) The diagram shows two readings of this electricity meter taken three months apart. The readings are in kilowatt-hours (kWh).

21 November | 0 | 0 | 0 | 4 | 4 |

21 February | 0 | 0 | 1 | 9 | 4 |

Calculate the energy transferred by the photovoltaic cells during this time period.

_____

Energy transferred = _____ kWh

(1)

(ii) The electricity company pays 40p for each kWh of energy transferred.

Calculate the money the electricity company would pay the householder.

_____

_____

Money paid = _____

(2)

(iii) The cost of the four modules is £6000.

Calculate the payback time in years for the modules.

_____

_____

Payback time = _____ years

(3)

(iv) State an assumption you have made in your calculation in part **(iii)**.

_____

_____

(1)

(d) In the northern hemisphere, the modules should always face south for the maximum transfer of energy.

State **one** other factor that would affect the amount of energy transferred during daylight hours.

_____

_____

Q2.

(a)   A student set up the circuit shown in the diagram. The student uses the circuit to obtain the data needed to plot a current - potential difference graph for a diode.
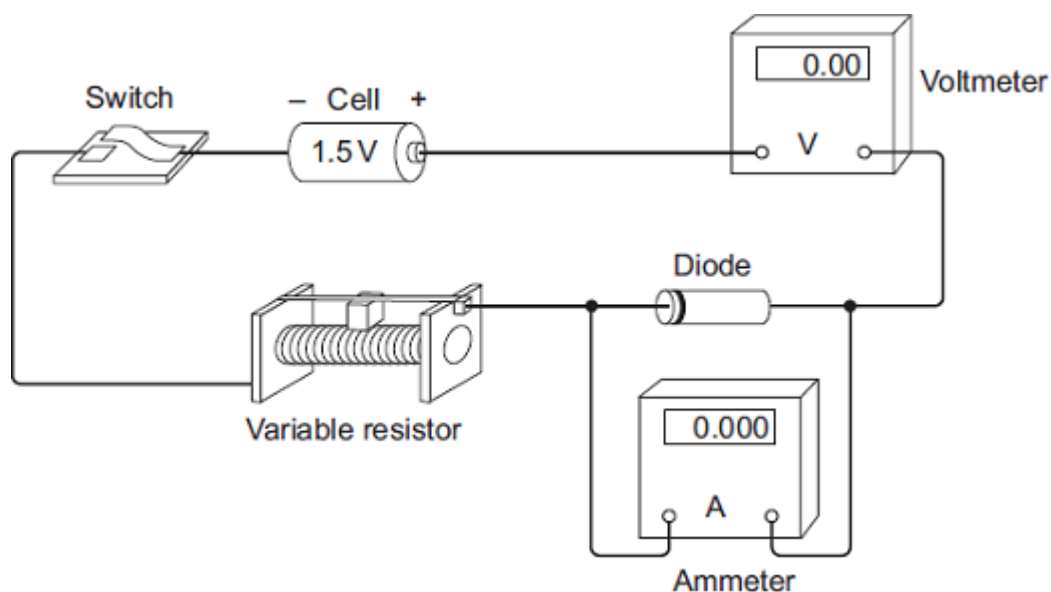
(i)   Draw, in the boxes, the circuit symbol for a diode and the circuit symbol for a variable resistor.

Diode	**Variable resistor**
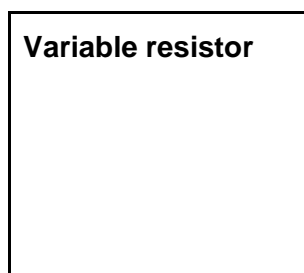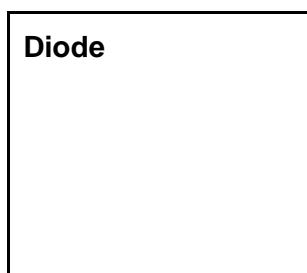
(2)

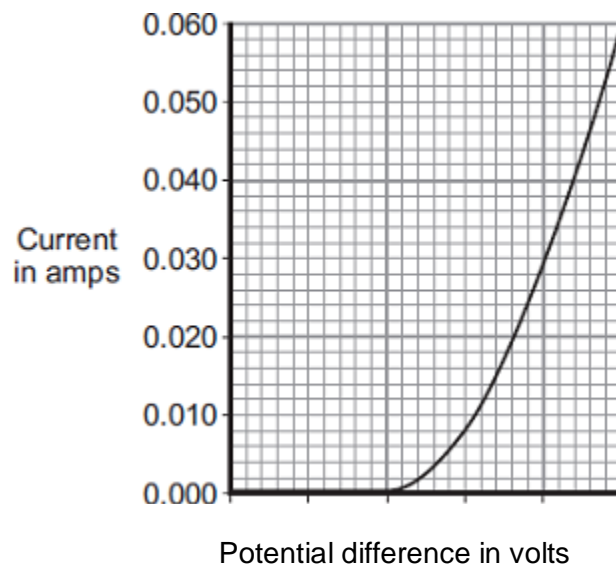(ii)   The student made two mistakes when setting up the circuit.

What **two** mistakes did the student make?

1. _____

_____

2. _____

_____

(2)

(b)   After correcting the circuit, the student obtained a set of data and plotted the graph below.

Potential difference in volts

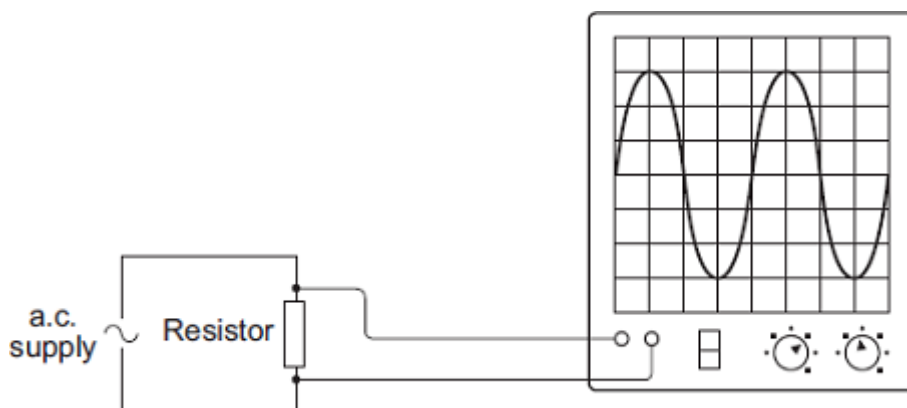(i) At what potential difference did the diode start to conduct an electric current?

_____ V

(1)

(ii) Use data from the graph to calculate the resistance of the diode when the potential difference across the diode is 0.3 V.

_____

_____

_____

Resistance = _____ ohms

(3)

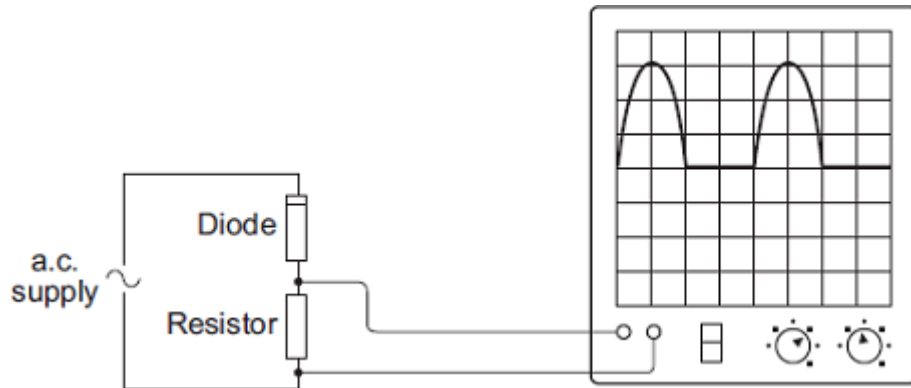(c) The diagram shows the trace produced by an alternating current (a.c.) supply on an oscilloscope.

Each horizontal division on the oscilloscope screen represents a time of 0.01s.

(i) Calculate the frequency of the a.c. supply.

_____

_____

_____

Frequency = _____ hertz

(2)

(ii)   A diode is now connected in series with the a.c. power supply.

Why does the diode cause the trace on the oscilloscope screen to change?

_____

_____

_____

_____

(2)
(Total 12 marks)