Name of the Student:_____
Max. Marks : 24 Marks **Time : 24 Minutes**

Q1.

(a) The resistance of a 24 W, 12 V filament lamp depends on the current flowing through the lamp. For currents up to 0.8 A, the resistance has a constant value of 2.5 Ω.

(i) Use the equation in the box to calculate the potential difference across the lamp when a current of 0.8 A flows through the lamp.

potential difference = current × resistance

Show clearly how you work out your answer.

_____

_____

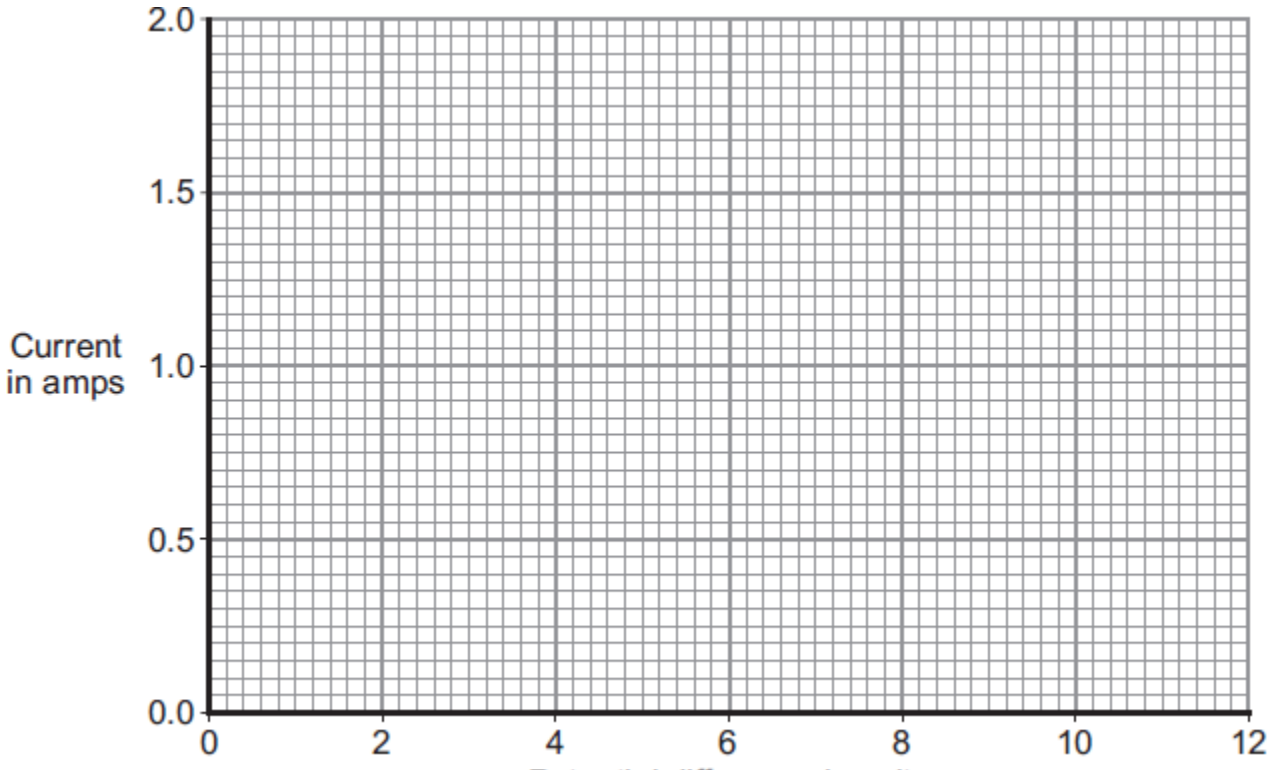
Potential difference = _____ V

(2)

(ii) When the potential difference across the lamp is 12 V, the current through the lamp is 2 A.

On the axes below, draw a current–potential difference graph for the filament lamp over the range of potential difference from 0 to 12 volts.

Downloaded from www.merit-minds.com



(2)

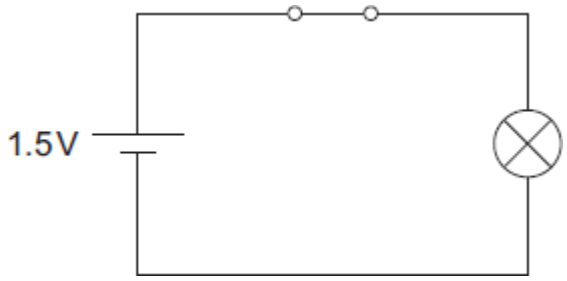
(iii) Why does the resistance of the lamp change when the current through the lamp exceeds 0.8 A?

_____

_____

(1)

(b) The lamp is now included in a circuit. The circuit is switched on for 2 minutes. During this time, 72 coulombs of charge pass through the lamp.



Use the equation in the box to calculate the energy transformed by the lamp while the circuit is switched on.

energy transformed = potential difference × charge

Show clearly how you work out your answer.

_____

_____

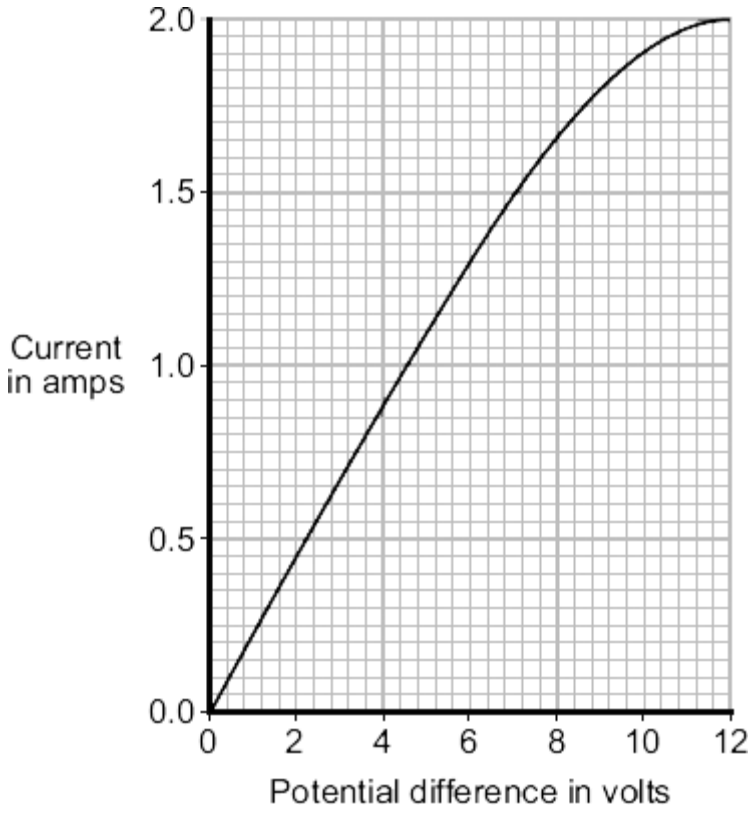
Energy transformed = _____ J

Downloaded from www.merit-minds.com

(2)
(Total 7 marks)

Q2.

The graph shows how the electric current through a 12 V filament bulb varies with the potential difference across the bulb.



(a) What is the meaning of the following terms?

electric current

_____

_____

potential difference

_____

_____

(2)

(b) The resistance of the metal filament inside the bulb increases as the potential difference across the bulb increases.

Explain why.

_____

_____

_____

_____

Downloaded from www.merit-minds.com

_____

_____

_____

_____

(3)

(c) Use data from the graph to calculate the rate at which the filament bulb transfers energy, when the potential difference across the bulb is 6 V.

Show clearly how you work out your answer.

_____

_____

Rate of energy transfer = _____ W

(2)

(Total 7 marks)

Q3.

(a) The picture shows a person using a set of electronic 'Body Fat Scales'. When the person stands on the scales, a small, harmless, electric current passes through the person's body. The scales then calculate the resistance of the person's body and convert the resistance into a *prediction* of body fat content.



(i) The scales contain two 3 V cells joined in series.

Calculate the resistance of a person's body, if when he stands on the scales, a current of 0.12 mA passes through his body.

1000 mA = 1 A

Show clearly how you work out your answer and give the unit.

_____

_____

_____

Resistance = _____

Downloaded from www.merit-minds.com

(3)

(ii) The scales can only produce a *prediction* of body fat content and not an accurate measurement.

Suggest why.

_____

_____

_____

(1)

(iii) It is recommended that the scales are **not** used immediately after a person has drunk a large amount of water.

Suggest why.

_____

_____

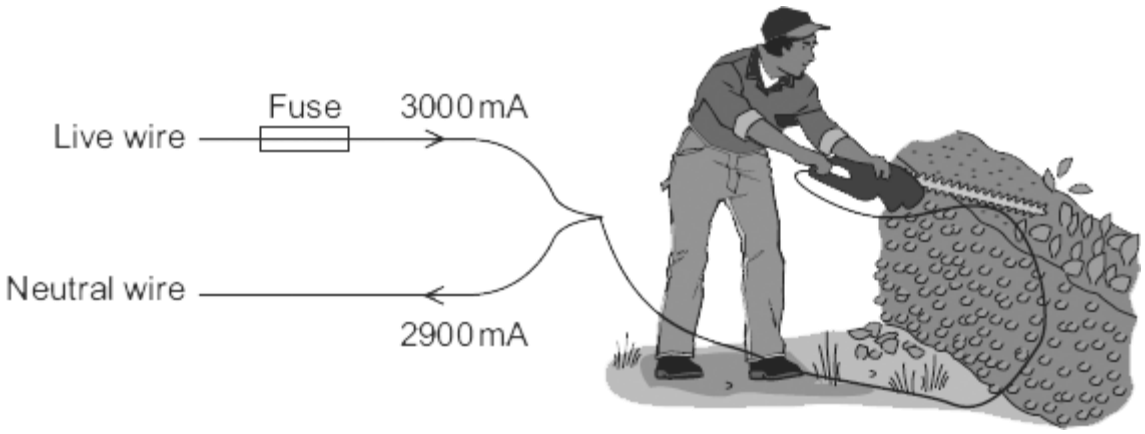
_____

_____

_____

(2)

(b) The diagram shows how someone could get an electric shock from accidentally cutting into an electric cable. If this happens, and a Residual Current Circuit Breaker (RCCB) is being used, the circuit will switch off automatically.



(i) A faulty appliance or circuit can be switched off by a RCCB or a fuse.

Compare the action of a RCCB with the action of a fuse.

_____

_____

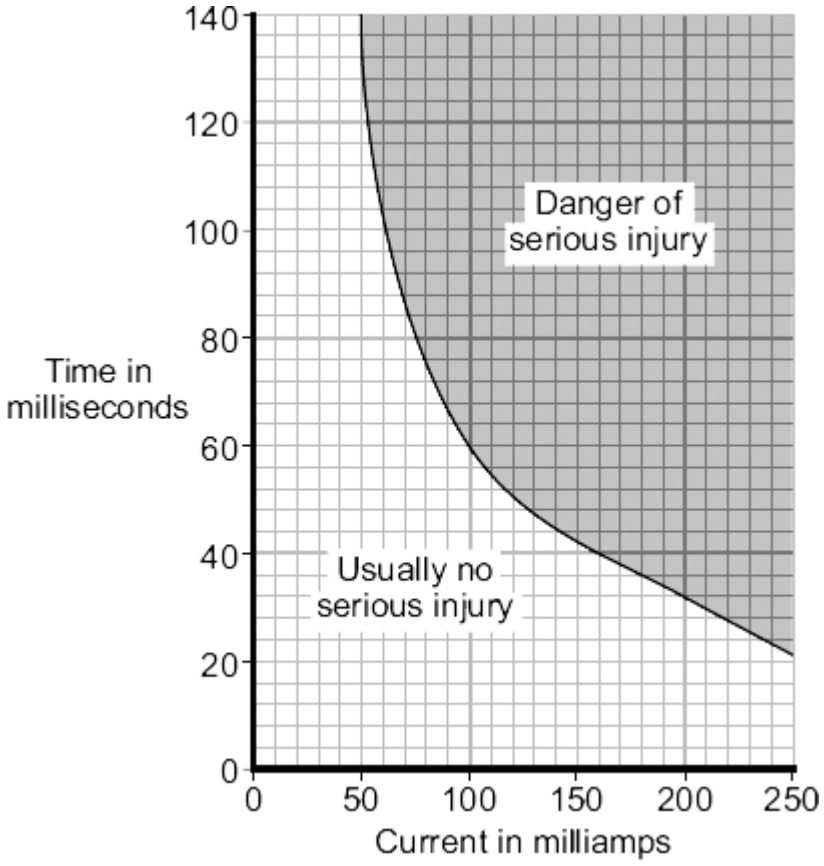
_____

_____

Downloaded from www.merit-minds.com

(2)

(ii) The graph shows how the severity of an electric shock depends on the size of the current and the time that the current flows through the body.



Using the RCCB helps prevent an electric shock seriously injuring the person using the hedge trimmers.

Using information from both the diagram and the graph explain how.

(2)
(Total 10 marks)

Downloaded from www.merit-minds.com