Physics ATAR - Year 11

Electrical Physics Unit Test 2017

Mark:	/ 63
=	%

Name:

Time Allowed: 50 minutes

Notes to Students:

- You must include **all** working to be awarded full marks for a question.
- Marks will be deducted for incorrect or absent units and answers stated to an incorrect number of significant figures.
- **No** graphics calculators are permitted – scientific calculators only.

Question 1 **(7 marks)**

During a laboratory practical session, James connects a simple light circuit to a 12.0 V DC power supply.

(a) Calculate the work done in Joules as one electron travels around the circuit.

(2 marks)

(b) Calculate the charge that passes through the circuit in 2.00 minutes if the current through the circuit is 0.500 A.

(3 marks)

(c) Calculate the number of electrons that are required to pass through the circuit to produce the charge in (b).

(2 marks)

Question 2 **(8 marks)**

A car battery supplies a voltage of 12.6 V. It is connected in parallel to the dashboard lights (which have a total resistance of 7.12 kΩ) and the headlights (which have a total resistance of 6.00 Ω).

(a) Draw a simple circuit diagram to represent this arrangement.

(2 marks)

(b) Calculate the potential difference across and current through the headlight bulbs.

(3 marks)

(c) Determine the power of the **dashboard** lights.

(3 marks)

Question 3 **(6 marks)**

Tungsten filament light globes are classified as non-ohmic devices.

(a) With the aid of two graphs, describe the differences between the current, voltage and resistance characteristics of ohmic and non-ohmic devices.

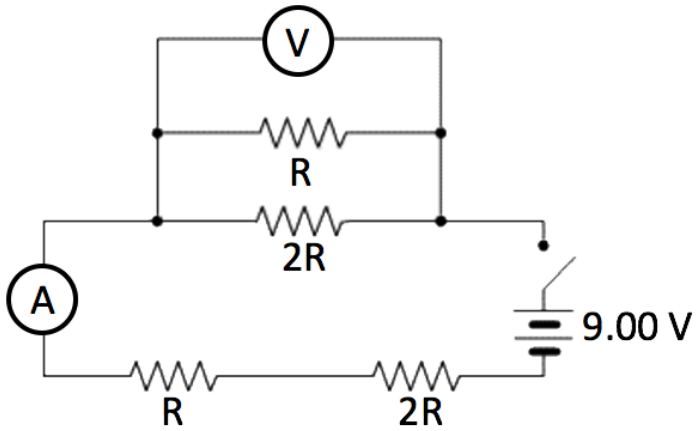
(3 marks)

(b) Older tungsten filament light globes often fail just as they are turned on, explain why this is so.

(3 marks)

Question 4 **(7 marks)**

The following questions refer to the below circuit diagram, where 'R' represents a resistor of resistance 'R Ω'. Leave all your responses in terms of 'R' if applicable. You may leave your answer as a fraction or decimal.



(a) When the switch is closed, calculate the current displayed by ammeter A.

(5 marks)

(b) When the switch is closed, calculate the voltage displayed on Voltmeter V.

(2 marks)

Question 5 **(10 marks)**

An electric heater is constructed by applying a potential difference of 1.20 x 10^2 V to a Nichrome wire that has a total resistance of 8.00 Ω.

(a) Determine the current carried by the wire.

(2 marks)

(b) Determine the power rating of the heater.

(2 marks)

(c) If the heater is used for 3.00 hours each night for a week and the consumer pays 15.0 c per kilowatt hour for energy purchased, determine the cost of running the heater over one week.

(3 marks)

(d) A different Nichrome wire has a diameter of 1.30 mm. Calculate the length of wire needed to obtain a resistance of 4.00 Ω. (ρ_{Nichrome} = 1.50 x 10^{-6} Ωm, $R = \frac{\rho L}{A}$)

(3 marks)

Question 6 **(10 marks)**

While investigating an electricity failure in a workshop it becomes apparent that a fuse has melted within the main electrical panel, leaving an open circuit and preventing charge from flowing. In order to restore the electricity, an operator places a small piece of iron between the two open terminals in order to allow the flow of charge. This enables the workshop to keep operating as per normal.

(a) Explain why this was not an appropriate fix for this problem and justify your response. (4 marks)

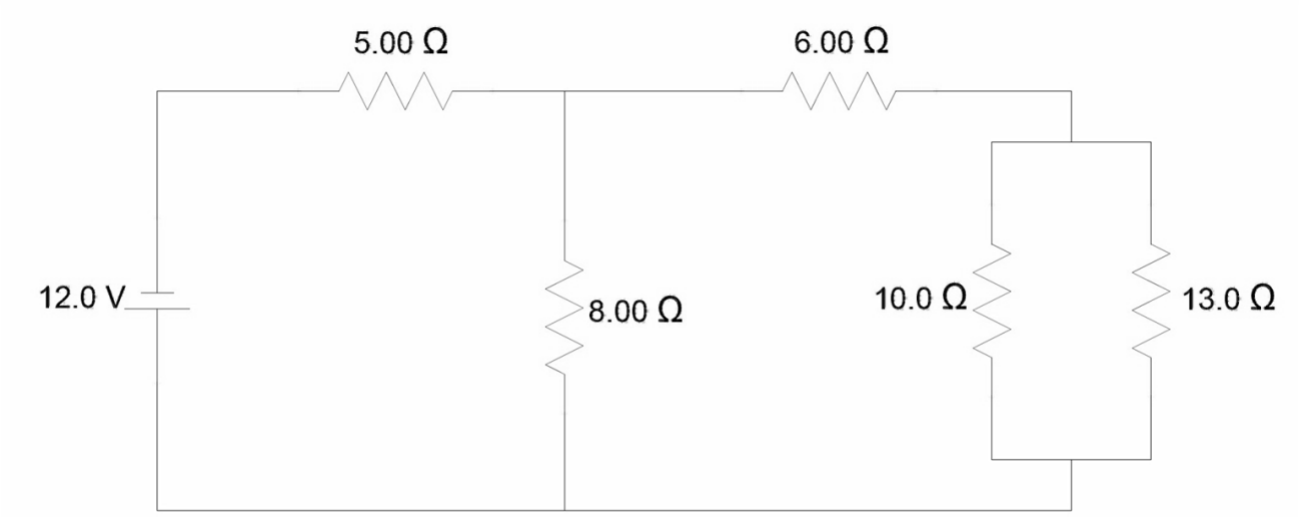
(b) Fuses are being phased out of household use. Name an alternative common safety device that performs the same function as a fuse and describe how it functions. (3 marks)

During a storm, the workshop can sometimes become flooded. This creates an additional hazard due to water potentially coming into contact with live wires.

(c) Explain why water is considered an electrical hazard. (3 marks)

Question 7 **(15 marks)**

Refer to the circuit diagram below. Note you must show full and clear working to receive full marks.



(a) Calculate the total resistance of the circuit.

(6 marks)

(b) Calculate the total current flowing through the battery.

(2 marks)

(c) Calculate the voltage across the 5.00 Ω and the 8.00 Ω resistor.

(3 marks)

(d) Calculate the current through the 10.0 Ω resistor.

(4 marks)

END OF TEST