Physics ATAR - Year 11

Electrical Physics Unit Test 2018

Mark: / 64
= %

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 **(18 marks)**

A simple series circuit is composed of six 1.50 V cells connected in series to an ammeter, an open switch, a light globe and a variable resistor.

(a) In the space below draw the circuit diagram that would represent this simple series circuit.

(4 marks)

(b) State the EMF of this circuit.

(1 mark)

(c) When the switch is closed, a total of 2.50×10^{19} electrons flow through the ammeter in a time of 5.00 seconds. Calculate the current reading on the ammeter.

(3 marks)

(d) On your diagram use an arrow to indicate the direction of electron current.

(1 mark)

(e) When the current is flowing, determine the total resistance of this circuit.

(3 marks)

(f) If the variable resistor used has its resistance **increased,** explain what happens to:

(i) the current

(2 mark)

(ii) the brightness of the globe

(2 mark)

(iii) the EMF of the circuit

(2 mark)

Question 2 **(5 marks)**

This question is related to the concepts of potential difference, work done, electric potential energy and energy transformations.

(a) Explain why the voltage measured across a component in a circuit is referred to as the "potential difference".

(2 marks)

(b) In an experiment, students measured a current of 4.35 A flowing through a resistor that has a measured potential difference of 9.42 V across it. Calculate the work done per minute as the current passes through the resistor.

(3 marks)

Question 3 **(11 marks)**

A house uses outdoor floodlights for security. Each floodlight is rated at 7.50 x10^2 W. A voltage of 250.0 V is supplied across their terminals.

(a) Calculate the current one floodlight would draw when it is on.

(2 marks)

(b) The house has a number of floodlights connected to the same circuit that switch on automatically when activated by individual sensors. Explain the type of circuit that would be used such that each light could operate independently of the others.

(3 marks)

(c) Determine the number of floodlights that could be activated at one time if they are all connected to a fuse that is rated at 15.0 A.

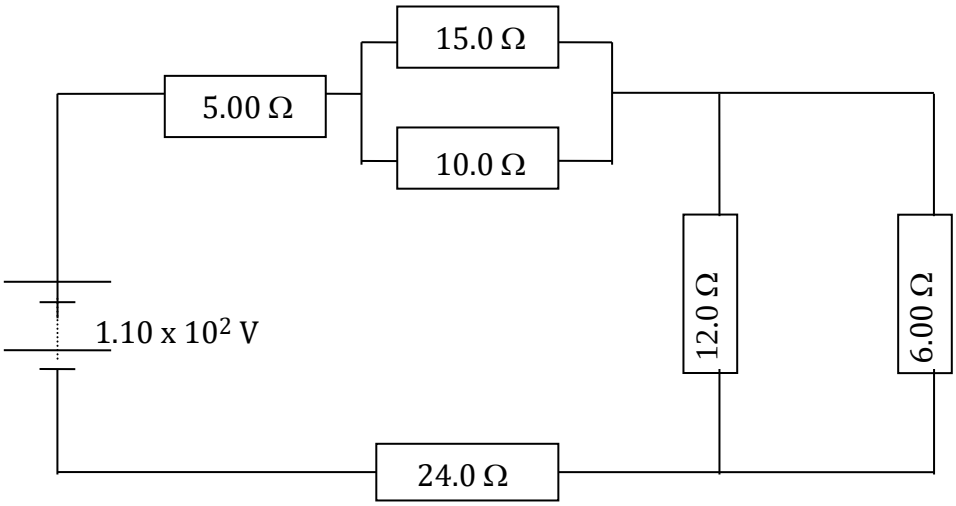
(3 marks)

(d) Explain the purpose of the fuse.

(3 marks)

Question 4 **(9 marks)**

Consider the circuit below.



(a) Calculate the total resistance of the circuit.

(3 marks)

(b) Calculate the current flowing from the battery.

(2 marks)

(c) Calculate the potential difference across the 12.0 Ω resistor.

(2 marks)

(d) Calculate the current flowing through the 6.00 Ω resistor.

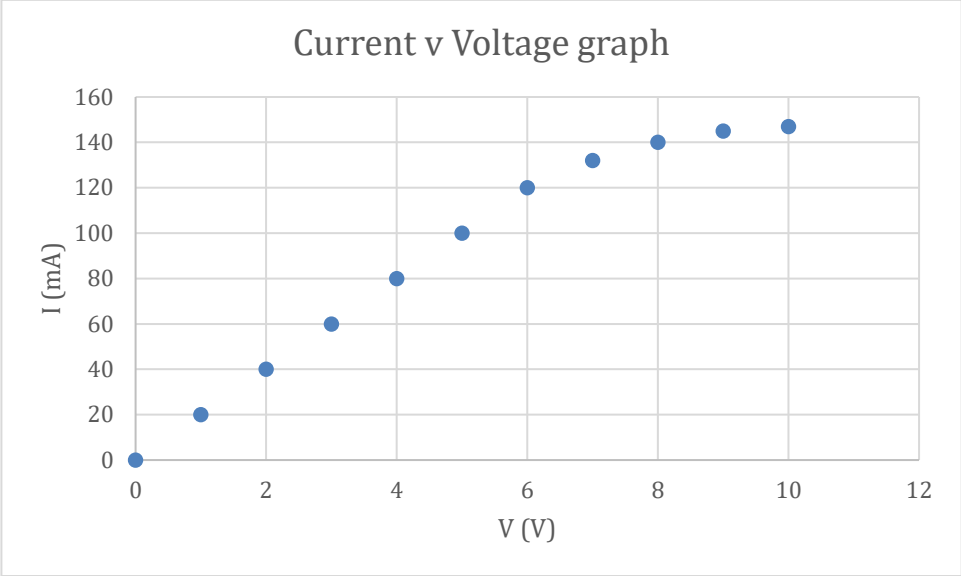
(2 marks)

Question 5 **(6 marks)**

A 5.00 m piece of an unknown wire is being used in an experiment. When connected to a 10.0 V battery in a simple circuit it is found to allow a current of 2.50 A to pass through it. A student using a micrometer, measures the diameter of the wire as 1.00 mm. Determine the resistivity of the wire used in the experiment.

Question 6 **(10 marks)**

A voltage source is connected across a filament light bulb and the current is measured for different voltages. The graph is shown below.



(a) . Draw a line of best fit for the data shown in the graph above.

(1 mark)

(b) State the range of voltages where the light bulb is behaving as an ohmic conductor.

(1 mark)

Range: _____

(c) Use the graph above to calculate the average resistance of the light bulb when it is behaving as an ohmic conductor.

(3 marks)

(d) Calculate the resistance of the filament light bulb when the voltage is at 8.00 V.

(2 marks)

(e) Explain and account for the difference in values for parts c) and d).

(3 marks)

Question 7 **(5 marks)**

A typical household in City Beach uses a reverse cycle air-conditioner for a 22.0 day period heat wave during summer to keep their house cool. The main living area uses a 2250 W air conditioner that is left on for 14 hours every day over the 22.0 day period. Every night 2 other smaller air conditioners are switched on to cool 2 bedrooms: a 1.10 $x10^2$ W unit is switched on for 8.00 hours every night to cool the master bedroom, and a 8.50 $x10^2$ W unit is switched on for 10.0 hours every second night to cool another bedroom. If the cost of electricity is 23.3c per unit, calculate the cost of running the air conditioners for the 22.0 day period.

END OF TEST