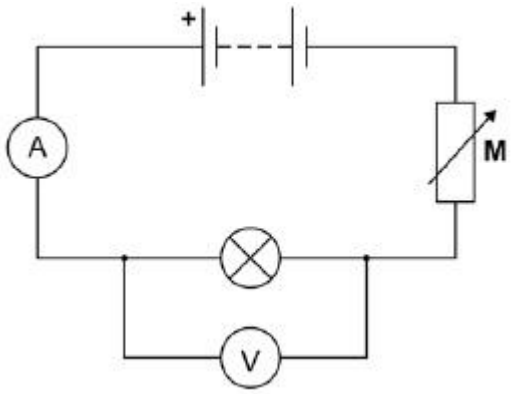
Name of the Student:_____

Max. Marks : 21 Marks **Time : 21 Minutes**

Q1.

The diagram shows the circuit used to obtain the data needed to plot the current-potential difference graph for a filament lamp.



(a) Why is component **M** included in the circuit?

Tick **one** box.

To keep the current constant. ☐

To keep the potential difference constant. ☐

To vary the current. ☐

(1)

(b) Why does the resistance of the lamp increase as the potential difference across the lamp increases?

_____

_____

_____

(1)

(c) The potential difference across the lamp is 12.0 V

Calculate the energy transferred by the lamp when 8.5 C of charge flows through the lamp.

Use the equation:

energy transferred = charge flow × potential difference

_____

_____

_____

Energy transferred = _____ J

(2)

(d) The table gives data about two types of lamp that householders may use in their homes.

Type of lamp	Energy efficiency	Mean lifetime in hours
Halogen	10%	2000
LED	90%	36000

Both types of lamp produce the same amount of light.

Describe the environmental advantages of using the LED lamp compared with the halogen lamp.

_____

_____

_____

_____

_____

(2)

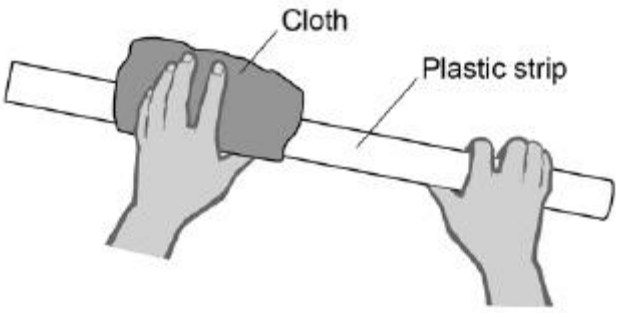
(Total 6 marks)

Q2.

A student used some everyday items to investigate static electricity.

Figure 1 shows a flexible plastic strip being rubbed with a cloth.

Figure 1



(a) Complete the sentence.

Choose the answer from the box.

electrons	**neutrons**	**protons**

Rubbing the plastic strip with the cloth causes the strip to become

negatively charged because _____ move from the cloth

onto the plastic strip.

(1)

(b) Complete the sentence.

Choose the answer from the box.

a negative	**a positive**	**zero**

The cloth is left with _____ charge.

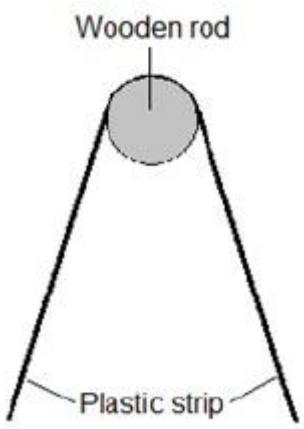
(1)

(c) The student hung the plastic strip over a wooden rod.

The ends of the strip moved away from each other.

Figure 2 shows the position of the plastic strip on the wooden rod.

Figure 2



What **two** conclusions should the student make about the forces acting on the two halves of the plastic strip?

1. _____

_____

2. _____

_____

(2)

(d) Another student repeated the experiment using the same method and found the plastic strip moved in the same way.

Complete the sentence.

Choose the answer from the box.

an anomaly	**repeatable**	**reproducible**

The investigation was _____ .

(1)

(Total 5 marks)

Q3.

Most electric kettles use the ac mains electricity supply.

(a) Complete the sentence.

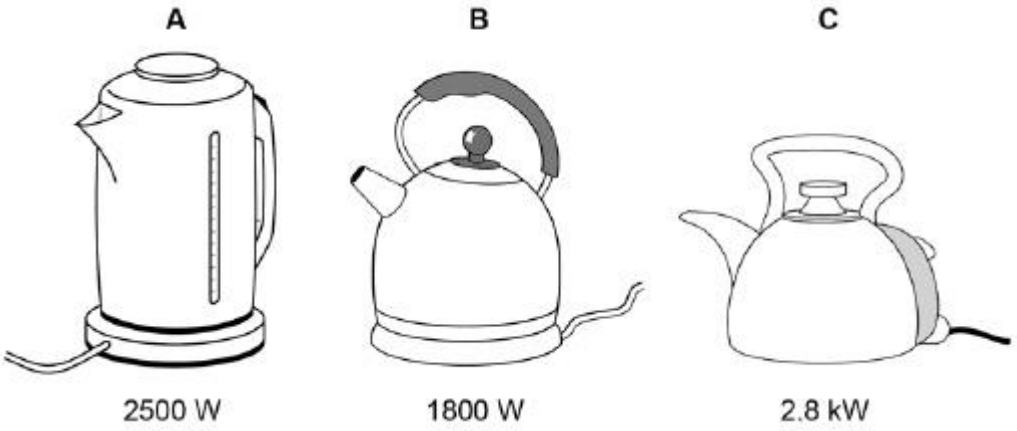
The ac mains supply has a potential difference that continuously

_____ polarity

(1)

Figure 1 gives the power output of three electric kettles.

Figure 1



A student investigated how the power output of a kettle affected the time taken to boil a fixed volume of water.

The water in all three kettles had an initial temperature of 25 °C.

(b) What type of variable was the time?

Tick **one** box.

Control ☐

Dependent ☐

Independent ☐

(1)

(c) Which kettle will boil the water in the shortest time?

Give a reason for your answer.

Kettle _____

Reason _____

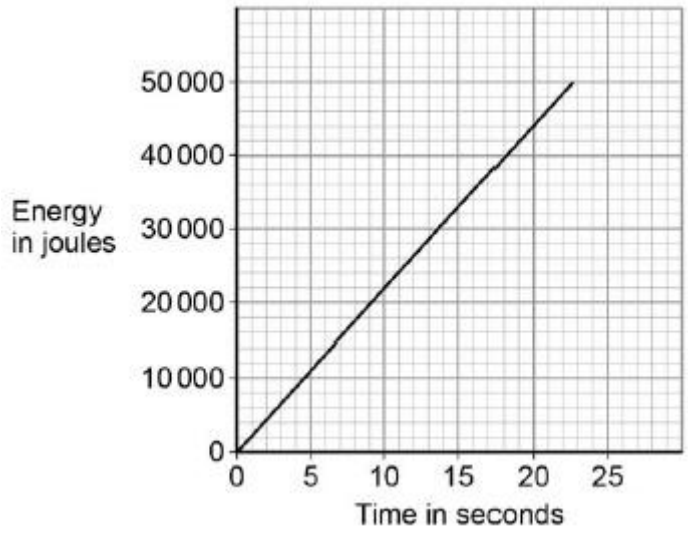
_____

_____

(2)

(d) **Figure 2** shows how the amount of energy transferred by a kettle varies with time.

Figure 2



The power output of the kettle is given by the gradient of the graph.

Calculate the power output of the kettle.

_____

_____

Power output = _____ W

(2)

(e) Write down the equation that links charge flow, current and time.

_____

(1)

(f) Calculate the current through the kettle when 2400 coulombs of charge flows in 250 seconds.

_____

_____

_____

Current = _____ A

(3)

(Total 10 marks)