

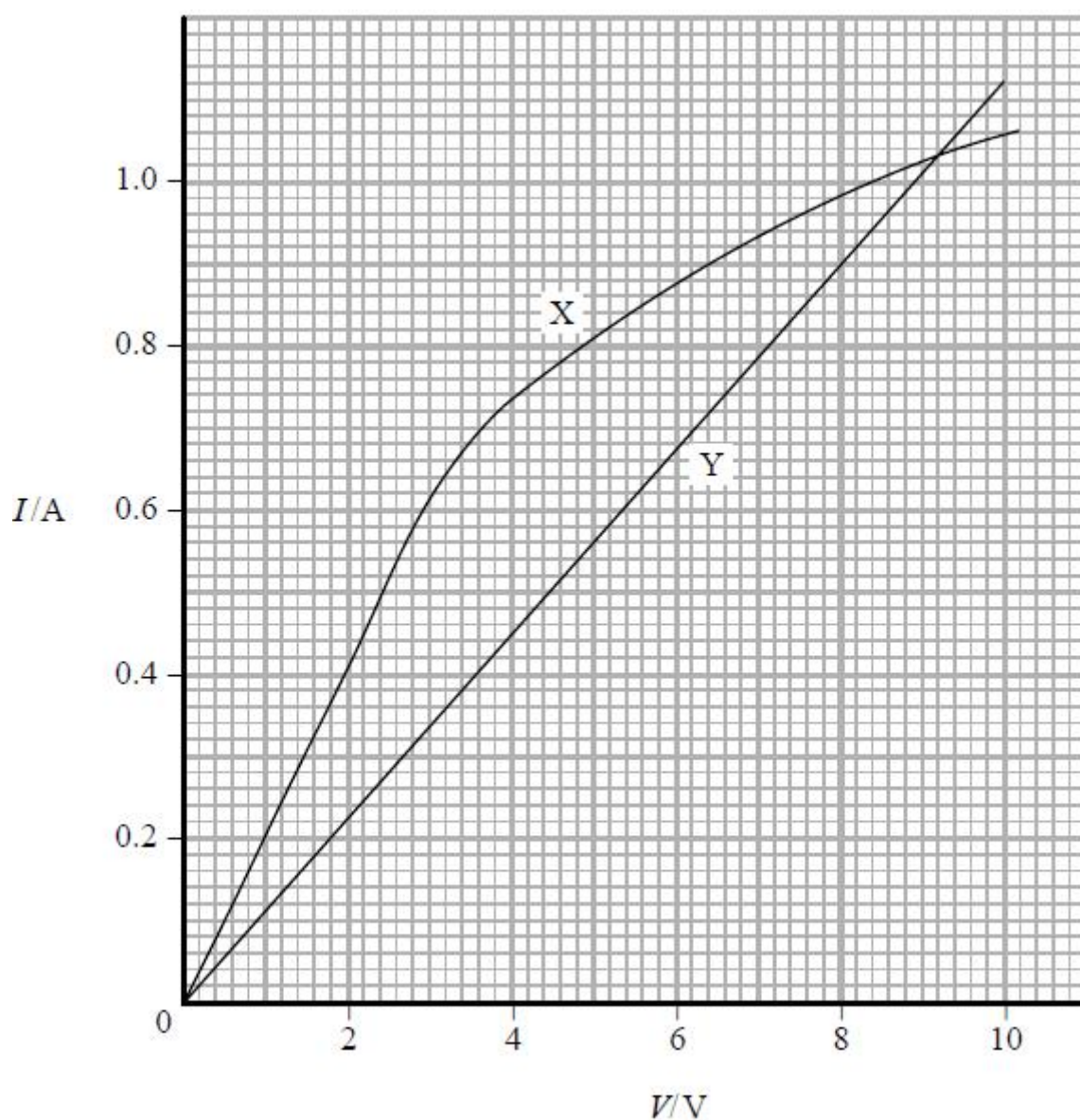
Name of the Student: _____

Max. Marks : 19 Marks

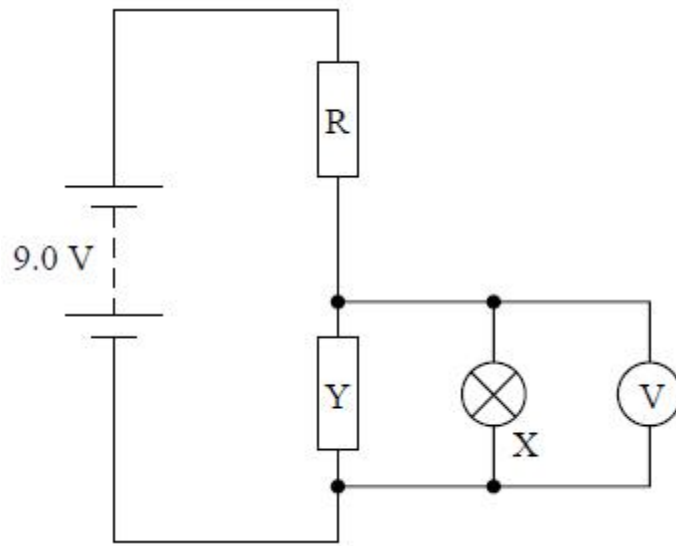
Time : 19 Minutes

Q1.

The graph shows the variation of current I with potential difference V for two electrical components X and Y.
X is a filament bulb and Y is a fixed resistor.



A potential divider circuit consisting of components X and Y is connected to a 9.0 V supply in series with a fixed resistor R as shown. The supply has a negligible internal resistance.



The reading on the voltmeter is 3.0 V.

- (i) Determine the current in the fixed resistor R.

(2)

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Current in the fixed resistor R =

- (ii) Component X is removed from the circuit.

Explain, without further calculation, how this would change the voltmeter reading.

(3)

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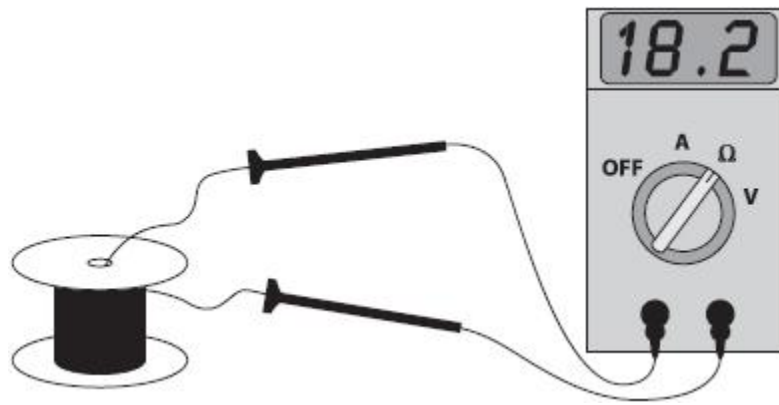
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(Total for question = 5 marks)

Q2.

A student carried out an experiment to determine the resistivity of nichrome wire.

He used an ohmmeter to measure the resistance of a length of nichrome wire as shown.



The diameter of the wire was measured as $0.27 \text{ mm} \pm 0.01 \text{ mm}$.

The length of the wire was measured as $1.25 \text{ m} \pm 0.05 \text{ m}$.

Determine which of the three measurements introduces the greatest uncertainty into the value for the resistivity.

Your answer should include calculations.

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(Total for question = 4 marks)

Q3.

Filament and fluorescent are two types of light bulb.

Filament light bulbs contain a tightly coiled wire filament, surrounded by an inert gas and encased in a thin glass bulb. When the potential difference (p.d.) across the bulb is sufficient, the filament heats up, emitting visible light.

Fluorescent light bulbs use a long tube of glass containing a small amount of mercury. When a sufficient p.d. is applied across the ends of the tube, electrons moving through the tube cause the mercury to become a vapour and emit photons in the ultraviolet part of the electromagnetic spectrum. The collisions of these photons with the phosphor coating of the tube result in the emission of photons of visible light.

filament



Filament bulb



Fluorescent bulb

(i) Explain how the wire in the filament lamp gets hot when a p.d. is applied.

(2)

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(ii) Explain how the fluorescent bulb emits photons when sufficient p.d is applied.

(2)

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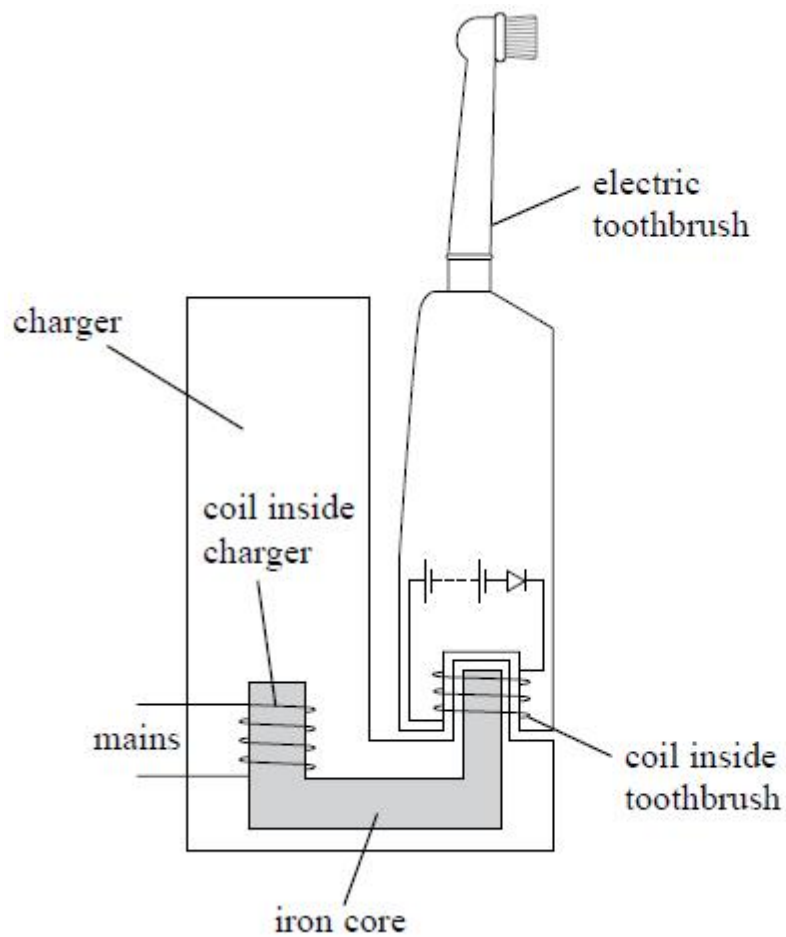
(Total for question = 4 marks)

Q4.

The diagram shows the inside of an electric toothbrush and a charger.

The charger contains a coil wrapped around an iron core. The coil is plugged into the mains a.c. supply.

The toothbrush also contains a coil that sits around the iron core when the toothbrush is placed on the charger to recharge the battery of the toothbrush.



* Describe how the charger is able to charge the low-voltage battery.

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(Total for question = 6 marks)