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A Level · OCR · Physics

⏱ 11 mins   ❓ 11 questions

Multiple Choice Questions

Resistance & Resistivity

Resistance / Ohm's Law & I-V Characteristics / Investigating Electrical Characteristics of Components / The Light-Dependent Resistor (LDR) / Resistivity / Determining the Resistivity of a Metal / Thermistors
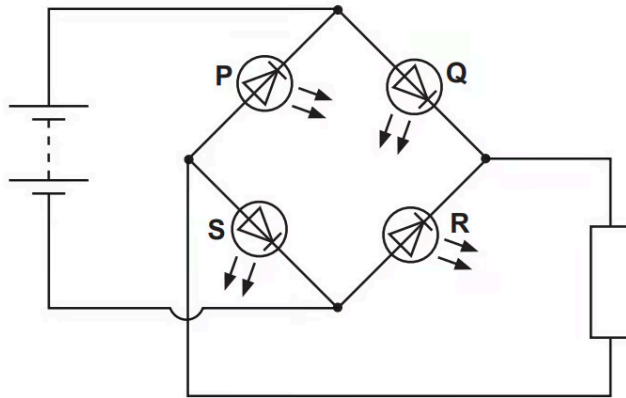
Medium (6 questions)	/6
Hard (5 questions)	/5
Total Marks	**/11**

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Medium Questions

1   A circuit with four light-emitting diodes (LEDs) **P**, **Q**, **R** and **S** is shown below.

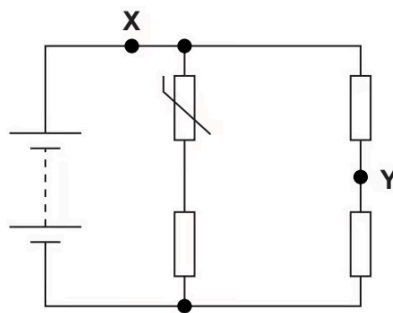Two LEDs are lit in this circuit. Which **two** LEDs are lit?

   A. P and **Q**

   B. P and **R**

   C. Q and **R**

   D. Q and **S**

(1 mark)

2   A circuit is shown below.

The battery has negligible internal resistance. The temperature of the NTC thermistor is **decreased**.

Which of the following statements is/are correct?

1. The current at **X** increases.

2. The current at **Y** remains the same.

3. The potential difference across the thermistor increases.

    A. 1, 2 and 3

    B. Only 2 and 3
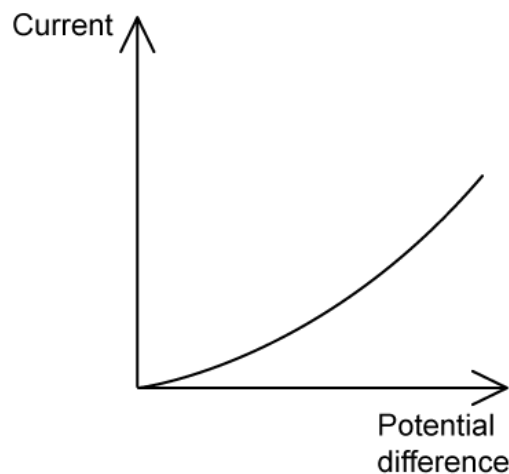
    C. Only 3

    D. Only 2

(1 mark)

3 Determine the current flowing through a 5 Ω resistor when a 6 V voltage supply is applied across it.

    A. 11.0 A

    B. 0.83 A

    C. 4 A

    D. 1.2 A

(1 mark)

4 Below is the current-voltage curve for a NTC thermistor.

Which of the following statements is/are correct?

1. The higher the current passing through a NTC thermistor, the higher the resistance.

2. As the potential difference across a NTC thermistor increases, its resistance decreases.

3. NTC thermistors obey Ohm's law.

A. 1, 2 and 3

**B.** Only 2

C. 2, 3

D. 1 and 3

(1 mark)

5 A metal wire with circular cross-section has a length of 2.0 m and a diameter of 5.0 mm. The wire's resistance is determined experimentally and found to have a value of 4.0 Ω. Calculate the resistivity of the metal making up the wire.

A. $6.0 \times 10^{-5} \, \Omega \, m$

B. $4.0 \times 10^{-5} \, \Omega \, m$

C. $2.0 \times 10^{-5} \, \Omega \, m$

D. $1.6 \times 10^{-4} \, \Omega \, m$

(1 mark)

6 A student is tasked with determining the resistivity ? of a wire represented by the resistor in the following diagram. The student measures the diameter of the wire using a vernier caliper and its length using a ruler. The student now needs to calculate the resistance of the wire before combining these results with his measurements of the length and diameter of the wire to calculate the resistivity.

The diagram below shows the circuit used by the student to perform the experiment:
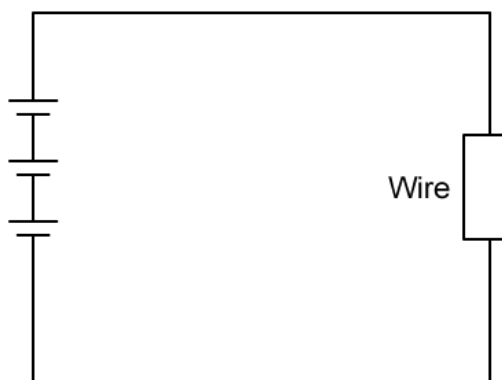

Which electronic components, that are needed to determine the resistance of the wire, are missing from the diagram?

A. Only an ammeter placed in series with the wire.

B. A voltmeter placed in series and an ammeter placed in parallel with the wire.

C. A voltmeter placed in parallel and an ammeter placed in series with the wire

D. Only a voltmeter placed in series with the wire.

(1 mark)

Hard Questions

1   The diagram below shows the graph of current against voltage for a filament lamp.
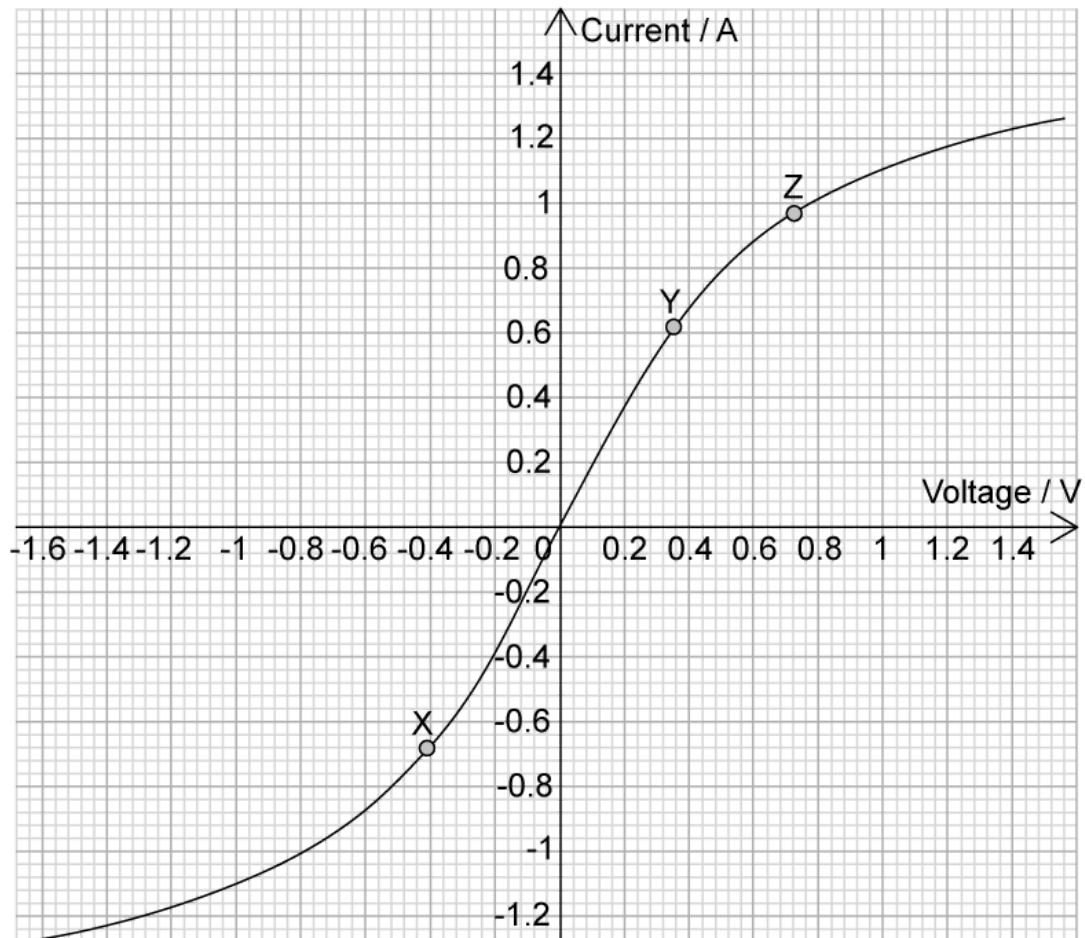
Which of the following statements about the results in the graph is/are incorrect?

1. The resistance of the lamp at Y is higher than the resistance at Z.

2. The power dissipated by the lamp at X is less than the power dissipated at Y.

3. The current increases with voltage at a decreasing rate.

A. Only 1

B. Only 2

C. 1 and 2

D. 1, 2 and 3

(1 mark)

2 A student wishes to cut an aluminium wire of uniform diameter to the same weight and resistance as a copper wire of length 50 cm.

Aluminium has a resistivity that is 1.5 times greater than that of copper, and is about 3 times less dense than copper.

How long should the aluminium wire be to satisfy the experimenter's requirements?

A. 33 cm

B. 68 cm

C. 71 cm

D. 135 m

(1 mark)

3 A circular hoop is made of metal wire with resistivity ρ, diameter D, and thickness d. The hoop is connected to a circuit at points A and B, as shown in the diagram below.

Two points on the hoop separated by a quarter of the hoop's circumference are pinched and soldered together at point P to create a shape consisting of two squashed hoops with points A and P.
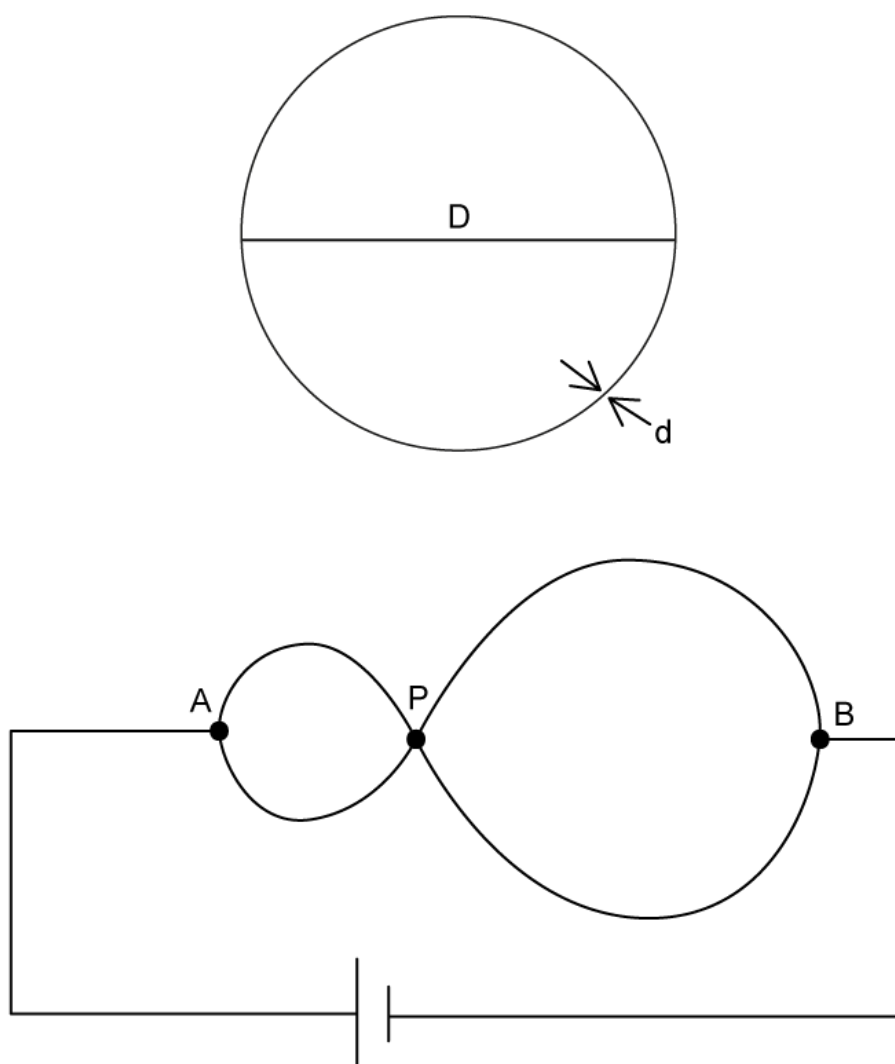
Terminals A and B of a battery with an e.m.f ε and internal resistance r are positioned to ensure pairs of equal-length paths from A to P and from B to P.

What is the total current passing through the circuit?

A. $I = \dfrac{\varepsilon d^2}{d^2 r - 4\rho D}$

B. $I = \dfrac{4\varepsilon d^2}{\rho D}$

C. $I = \dfrac{\varepsilon}{r + \dfrac{5\rho D}{4d^2}}$

D. $I = \dfrac{\varepsilon}{r + \dfrac{\rho D}{d^2}}$

(1 mark)

4 An NTC thermistor is connected to a variable voltage source.

Which of the following statements about the thermistor is/are correct:

1. As the voltage across the thermistor gradually increases, its resistance decreases linearly

2. As the temperature of the thermistor decreases, the current passing through the thermistor increases exponentially

3. The gradient of the current-voltage curve for an NTC thermistor increases with voltage

A. Only 1

B. Only 3

C. 1 and 3

D. 1, 2 and 3

(1 mark)

5 A wire with uniform circular cross-section is stretched until its radius is reduced by half. The volume of the wire remains uniform throughout the stretching process.

Once the wire has been stretched, it is cut into three equal lengths and the pieces are connected in parallel with each other.

What is the ratio of the resistance of the original wire to the new resistance of the parallel combination?

A. $\dfrac{2}{3}$

B. $\dfrac{3}{4}$

C. $\dfrac{1}{2}$

D. $\dfrac{9}{16}$

(1 mark)