

# Current-Voltage Characteristics

## TOPIC QUESTIONS

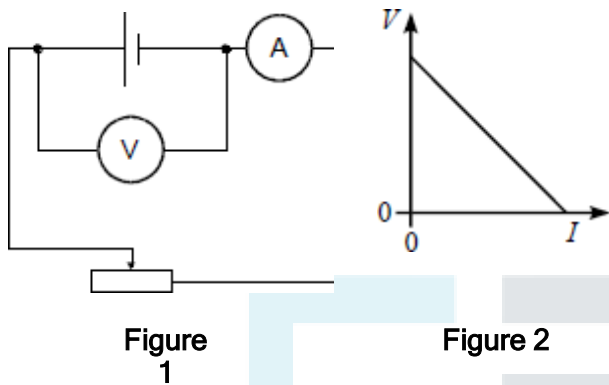
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|-------------------|------------------------|
| <b>Level</b>      | <b>A Level</b>         |
| <b>Subject</b>    | <b>Physics</b>         |
| <b>Exam Board</b> | <b>AQA</b>             |
| <b>Paper Type</b> | <b>Multiple Choice</b> |

Time Allowed : 30min

EXAM PAPERS PRACTICE

1. The resistance of a metallic conductor increases with temperature because, at highertemperatures,
  - A more electrons become available for conduction
  - B the conductor becomes a superconductor
  - C the amplitude of vibration of lattice ions increases
  - D the length and cross-sectional area of the conductor both increase
  
2. A 1.5 m length of wire has a cross-sectional area  $5.0 \times 10^{-8} \text{ m}^2$ . When the potential difference across its ends is 0.20 V, it carries a current of 0.40 A. The resistivity of the material from which the wire is made is
  - A  $6.0 \times 10^7 \Omega \text{ m}$
  - B  $1.7 \times 10^{-8} \Omega \text{ m}$
  - C  $1.1 \times 10^6 \Omega \text{ m}$
  - D  $9.4 \times 10^{-7} \Omega \text{ m}$

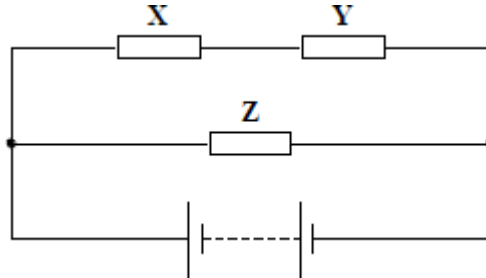
3. The circuit in **Figure 1** is used to investigate how the potential difference  $V$  between the terminals of a cell varies as the current  $I$  in the circuit changes. **Figure 2** shows the graph of the results.



Which one of the following can be deduced from the gradient of the graph?

- A The internal resistance of the cell
- B The e.m.f. of the cell
- C The power dissipated by the cell
- D The resistance of the variable resistor

4. Three identical resistors X, Y and Z are connected across a battery as shown.

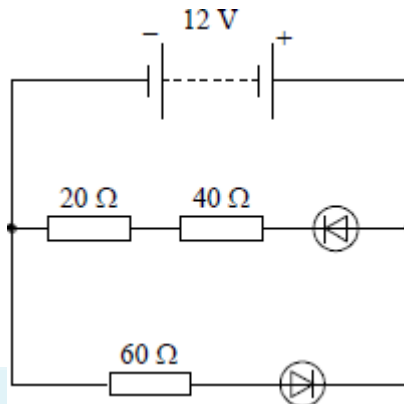


The ratio  $\frac{\text{power developed in X}}{\text{power developed in Z}}$  is

- A  $\frac{1}{4}$
- B  $\frac{1}{2}$
- C 1
- D 2



5. The 12 V battery in the circuit shown has negligible internal resistance. The diodes have 'ideal' characteristics.



The current through the battery is approximately

- A 0 A
  - B 0.10 A
  - C 0.20 A
  - D 0.40 A
6. The capacity of a portable charger is rated in ampere hours (A h). A charger of capacity 1 A h can provide 1 A for 1 hour at its working voltage.

One charger has a capacity of 1800 mA h at a working voltage of 3.7 V.

What is the energy stored in this charger?

- A 6.5 kJ
  - B 24 kJ
  - C 400 kJ
  - D 24 kJ
7. A filament lamp with resistance  $12\ \Omega$  is operated at a power of 36 W.
- A 26 C  
 B 1.6 kC  
 C 2.7 kC
- How much charge flows through the filament lamp during 15 minutes?

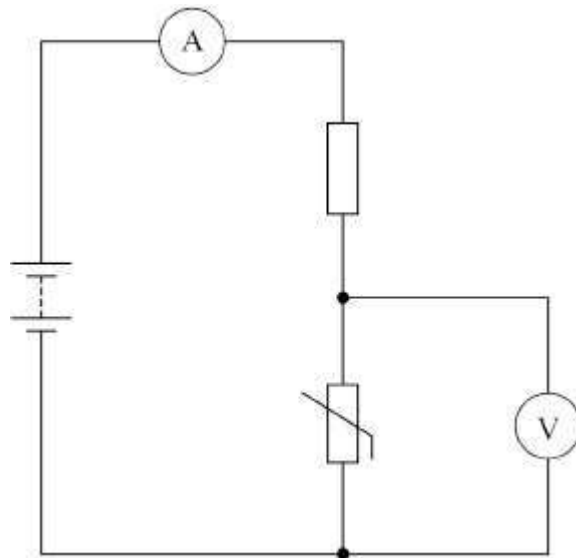
C

D 6.5 kC



EXAM PAPERS PRACTICE

8. The diagram shows a temperature-sensing circuit.

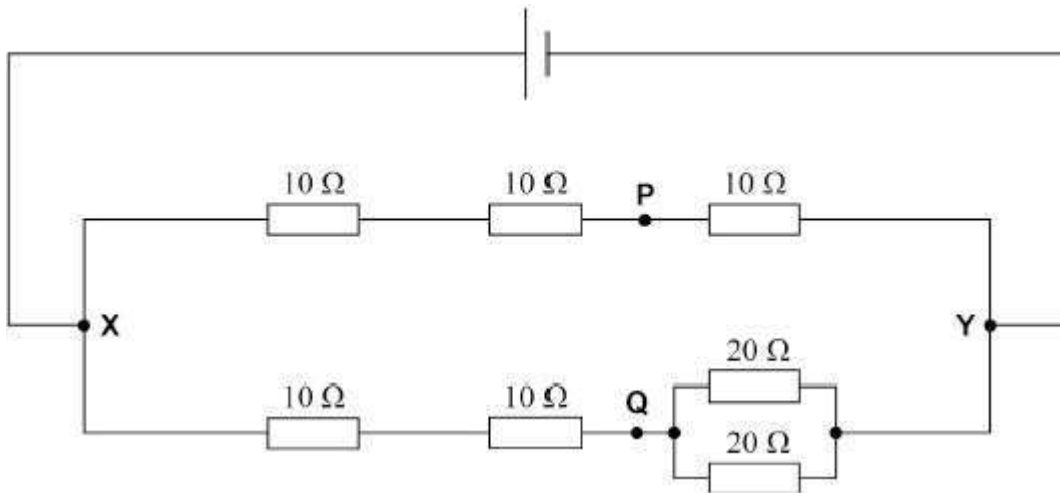


The temperature of the thermistor is decreased.

Which row shows the changes to the ammeter reading and the voltmeter reading?

|          | <b>Ammeter reading</b> | <b>Voltmeter reading</b> |
|----------|------------------------|--------------------------|
| <b>A</b> | increases              | increases                |
| <b>B</b> | increases              | decreases                |
| <b>C</b> | decreases              | decreases                |
| <b>D</b> | decreases              | increases                |

9. The potential difference between points X and Y is  $V$ .



What is the potential difference between P and Q?

A zero

A zero

B  $\frac{V}{3}$

C  $\frac{V}{2}$

D  $\frac{2V}{3}$

10. A resistor with resistance  $R$  is made from metal wire of resistivity  $\rho$ . The length of the wire is  $L$ . What is the diameter of the wire?



A

$$\sqrt{\frac{2\rho R}{\pi L}} \quad \text{B}$$

$$\sqrt{\frac{2\rho L}{\pi R}} \quad \text{C}$$

$$2\sqrt{\frac{\rho L}{\pi R}}$$

D  $2\sqrt{\frac{\rho R}{\pi L}}$

11. What is the definition of electric current?

- A. the rate of movement of electrons within a material that conducts electricity
- B. the rate of flow of negative charge carriers
- C. the rate of flow of positive charge carriers
- D. the movement of atoms in a material

12. What is the correct equation linking current, charge and time?

- A.  $Q = It$
- B.  $Q = EV$
- C.  $Q = \frac{I}{t}$
- D.  $Q = IV$

13. What happens when two oppositely charged conductors are connected together by a length of wire?

- A. Charge will jump between the two conductors
- B. Charge builds up on the surface of one of the conductors
- C. Charge cannot flow between the two conductors
- D. Charge will flow between the two conductors, causing a current

14. Which statement is true about the flow of electrons and conventional current in an electric circuit?

|   | Flow of Electrons  | Conventional Current  |
|---|--|---|
| A | In electrical wires the current is a flow of electrons                   | Conventional current is defined as the flow of negative charge                |
| B | Electrons flow away from the negative to the positive terminal of a cell | Conventional current flows in the same direction as electron flow             |
| C | Electrons are positively charged   | Conventional current is defined as the flow of positive charge                |
| D | Electrons flow away from the negative to the positive terminal of a cell | Conventional current flows in the opposite direction to electron current flow |

15. What is the equation linking potential difference, work done and charge?

A.  $V = QW$

B.  $Q = EV$

C.  $V = \frac{W}{Q}$

D.  $P = \frac{E}{t}$

16. What are the correct units for current, resistance and potential difference?

|   | Current ( <i>I</i> ) | Resistance ( <i>R</i> ) | Potential Difference ( <i>V</i> ) |
|---|----------------------|-------------------------|-----------------------------------|
| A | Amperes              | Ohms                    | Volts                             |
| B | Coulombs             | Joules                  | Amperes                           |
| C | Meters per second    | Coulombs                | Joules                            |
| D | Joules               | Resistivity             | Coulombs                          |

17. What is the correct equation for Ohm's Law?

A.  $V = IR$

B.  $Q = It$

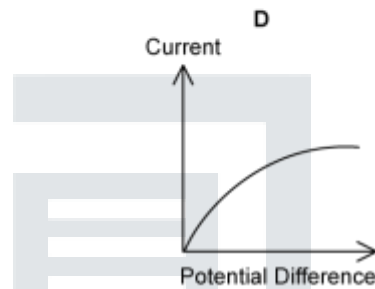
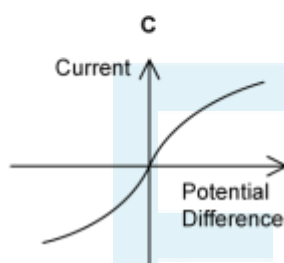
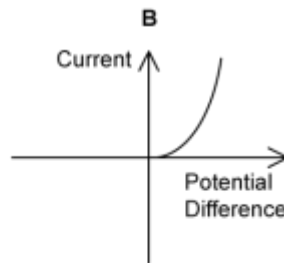
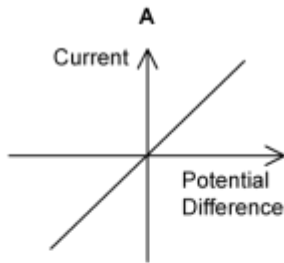
C.  $V = \frac{W}{Q}$

D.  $P = \frac{E}{t}$

18. What is the definition of Ohm's Law?

- A. The current through a conductor in a circuit is proportional to the potential difference across it
- B. For a conductor at a constant temperature, the current through it is proportional to the potential difference across it
- C. The resistance of a conductor is constant whilst the temperature remains constant
- D. An increase in temperature of an Ohmic conductor will create an increase in current across the component

19. Which graph represents the current-voltage characteristic of an ohmic conductor?



20. A diode allows current in a circuit to flow in only one specific direction.

Which statements correctly describe the current-potential difference graph for a semiconductor diode?

|   | Statement 1  | Statement 2  |
|---|--|--|
| A | When the current flows in the direction of the diode, there is a sharp increase in potential difference and current on the right side of the graph | When the diode is reversed, it conducts electricity and this is shown by a sharp increase in potential difference and current on the right side of the graph |
| B | When the current flows in the direction of the diode, then it does not conduct and this is shown by a zero on the right hand side of the graph     | When the diode is reversed, it does not conduct electricity and this is shown by a zero on the left hand side of the graph                                   |
| C | When the current flows in the direction of the diode, there is a sharp increase in potential difference and current on the right side of the graph | When the diode is reversed, it does not conduct electricity and this is shown by a zero on the left hand side of the graph                                   |
| D | When the current flows in the direction of the diode, then it does not conduct and this is shown by a zero on the right hand side of the graph     | When the diode is reversed, it does not conduct electricity and this is shown by a zero on the left hand side of the graph                                   |