Current-Voltage Characteristics

TOPIC QUESTIONS

Level	AS Level
Subject	Physics
Exam Board	AQA
Paper Type	Multiple Choice

Time Allowed : 30min

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 5.0×10^{-8} 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 6.0×10^{7} Ω m

   B 1.7×10^{-8} Ω m

   C 1.1×10^{6} Ω m

   D 9.4×10^{-7} Ω 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.

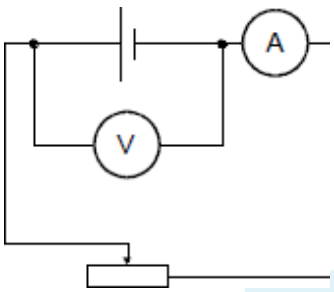


Figure 1

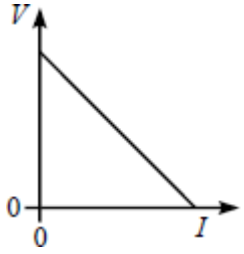


Figure 2

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

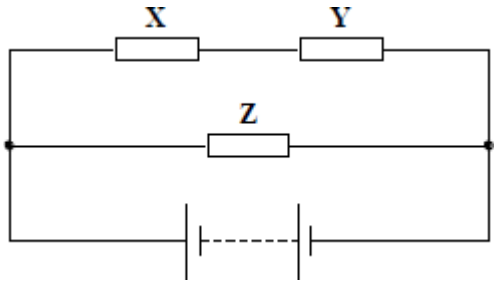
A The internal resistance of the cell

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

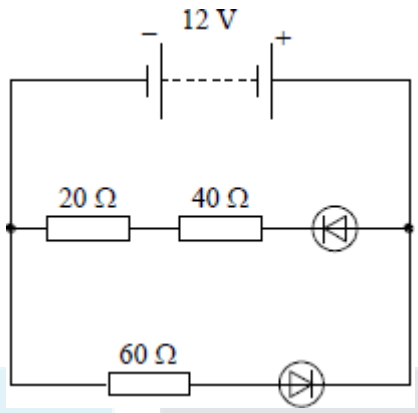
A $\frac{1}{4}$

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 hcan 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 Ω is operated at a power of 36 W.

How much charge flows through the filament lamp during 15 minutes?

A 26 C

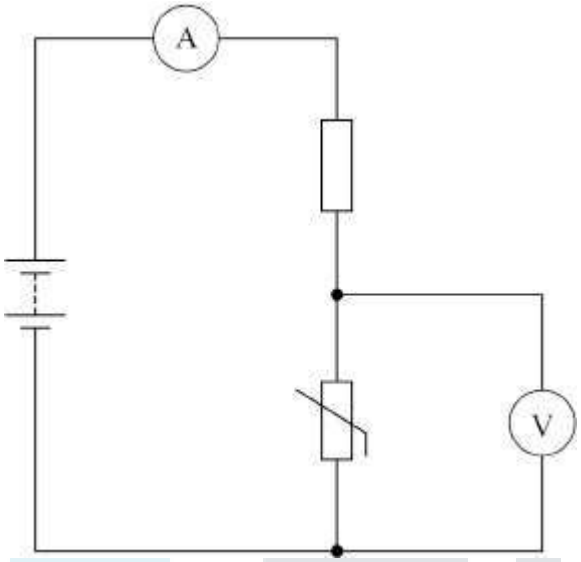
B 1.6 kC

C 2.7 Kc

C

D 6.5 kC

8. The diagram shows a temperature-sensing circuit.

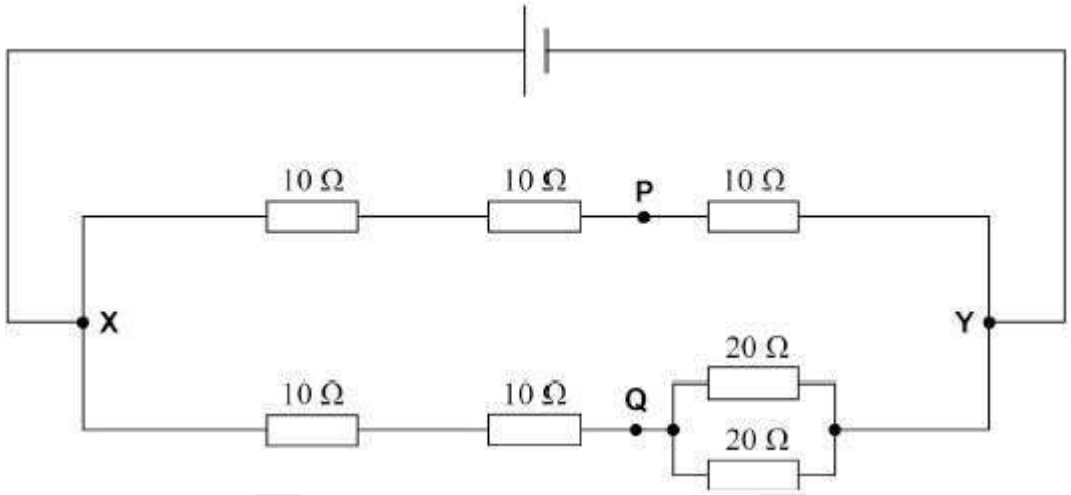


The temperature of the thermistor is decreased.

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

	Ammeter reading	**Voltmeter reading**
A	increases	increases
B	increases	decreases
C	decreases	decreases
D	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 ρ. The length of the wire is L.What is the diameter of the wire?

A

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

$\sqrt{\frac{2\rho L}{\pi R}}$ **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 thepositive 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*)	Resistance (*R*)	Potential Difference (*V*)
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?

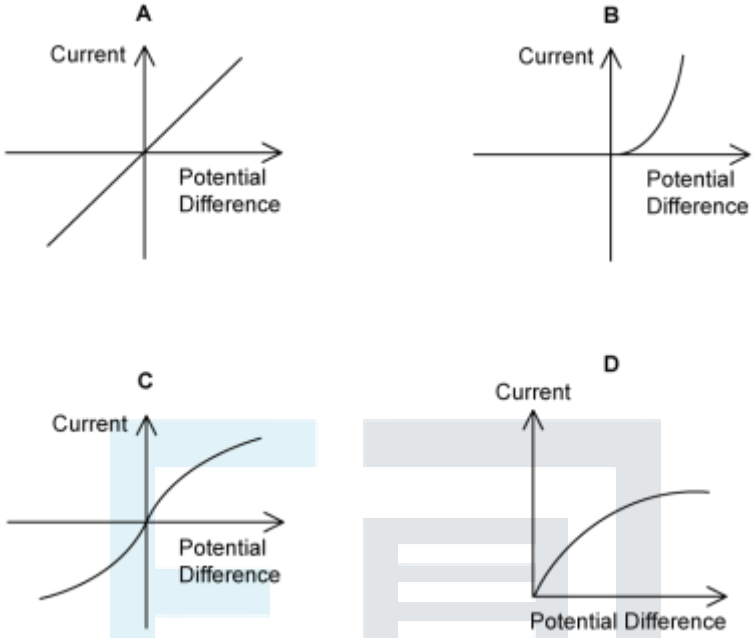
A. The current through a conductor in a circuit is proportional to the potential difference across it

B. For a conductor at a constant temperature, the current through it is proportional to the potential differenceacross 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 thegraph	When the diode is reversed, it conducts electricity andthis 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 shownby 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 handside 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 thegraph	When the diode is reversed, it does not conduct electricity and this is shown by a zero on the left handside of the graph
D	When the current flows in the direction of the diode, then it does not conduct and this is shownby 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 handside of the graph