































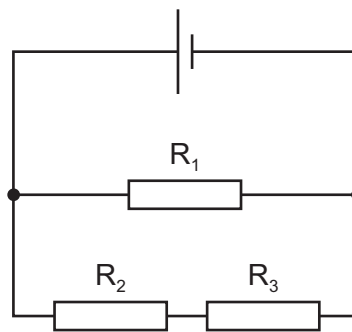


- 32 The current  $I$  in a metal wire is given by the equation

$$I = Anvq.$$

What does the symbol  $n$  represent?

- A the number of charge carriers in the wire
  - B the number of charge carriers per unit cross-sectional area of the wire
  - C the number of charge carriers per unit length of the wire
  - D the number of charge carriers per unit volume of the wire
- 33 A cell of negligible internal resistance is connected to resistors  $R_1$ ,  $R_2$  and  $R_3$ , as shown. The cell provides power to the circuit and power is dissipated in the resistors.

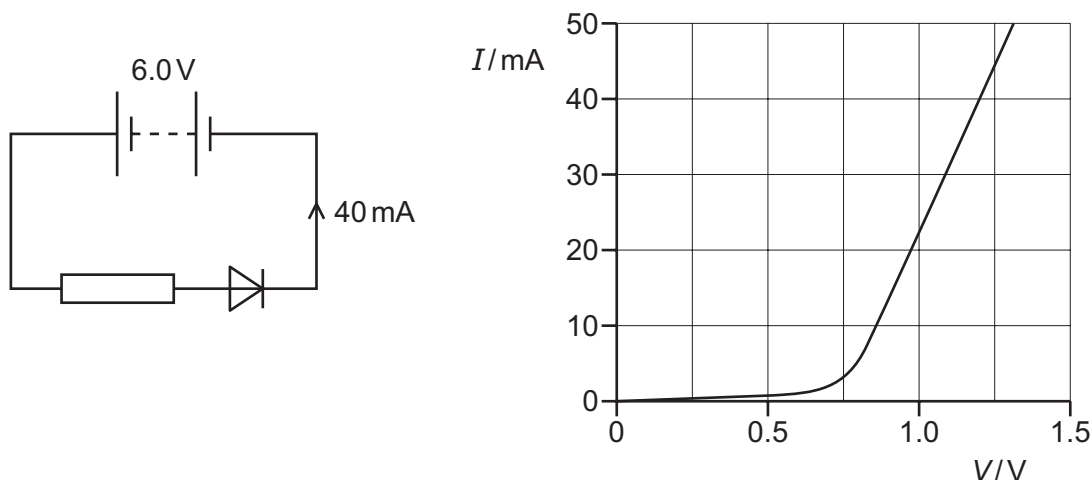


Which word equation **must** be correct?

- A power dissipated in  $R_1$  = power dissipated in  $R_2$  + power dissipated in  $R_3$
- B power dissipated in  $R_2$  = power dissipated in  $R_3$
- C power output of cell = power dissipated in  $R_1$  + power dissipated in  $R_2$  + power dissipated in  $R_3$
- D power output of cell = power dissipated in  $R_1$



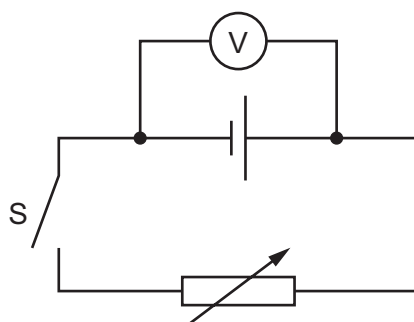
- 34 A fixed resistor and a diode are connected in series to a battery of electromotive force (e.m.f.) 6.0V and negligible internal resistance. The graph shows the variation with potential difference (p.d.)  $V$  of the current  $I$  for the diode.



The current in the diode is 40 mA.

What is the resistance of the fixed resistor?

- A**  $30\ \Omega$       **B**  $120\ \Omega$       **C**  $150\ \Omega$       **D**  $180\ \Omega$
- 35 An electrical cable consists of seven strands of copper wire, each of diameter 0.30 mm, connected in parallel.
- The resistivity of copper is  $1.72 \times 10^{-8}\ \Omega\text{ m}$ . The current in the cable is 13 A.
- What is the potential difference (p.d.) between two points on the cable a distance of 1.0 m apart?
- A** 0.0045 V      **B** 0.11 V      **C** 0.45 V      **D** 3.2 V
- 36 A cell that has internal resistance is connected to a switch S and a variable resistor. A voltmeter is connected between the terminals of the cell, as shown.

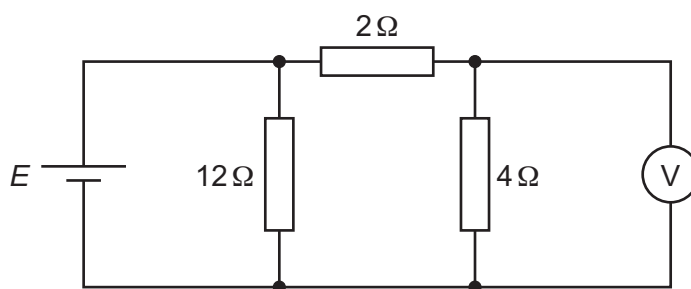


When switch S is open, the voltmeter reads 1.5 V. The switch is then closed and the variable resistor is adjusted to have a resistance of  $4.0\ \Omega$ . The voltmeter now reads 0.75 V.

What is the internal resistance of the cell?

- A**  $1.0\ \Omega$       **B**  $2.0\ \Omega$       **C**  $4.0\ \Omega$       **D**  $8.0\ \Omega$

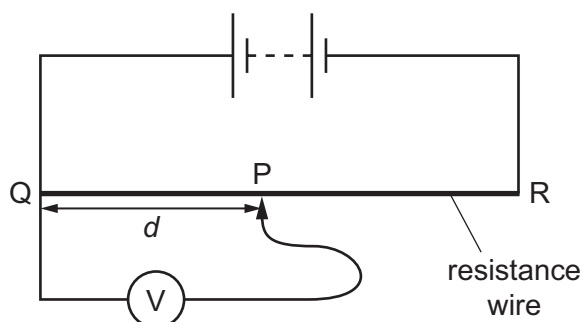
- 37 A cell of electromotive force (e.m.f.)  $E$  and negligible internal resistance is connected into a circuit, as shown.



The voltmeter has a very high resistance and reads a potential difference  $V_{\text{out}}$ .

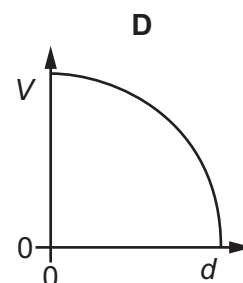
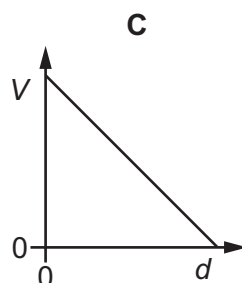
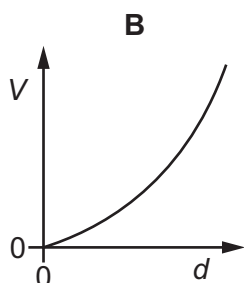
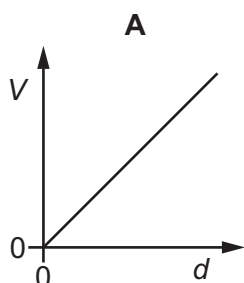
What is the ratio  $\frac{V_{\text{out}}}{E}$ ?

- A  $\frac{1}{6}$       B  $\frac{1}{3}$       C  $\frac{1}{2}$       D  $\frac{2}{3}$
- 38 A battery is connected to a potentiometer. The potentiometer consists of a uniform resistance wire and a sliding contact P.



The potential difference (p.d.)  $V$  between the sliding contact P and end Q of the wire is measured using a voltmeter. The sliding contact P is moved from end Q to end R of the wire. Sliding contact P is distance  $d$  from Q.

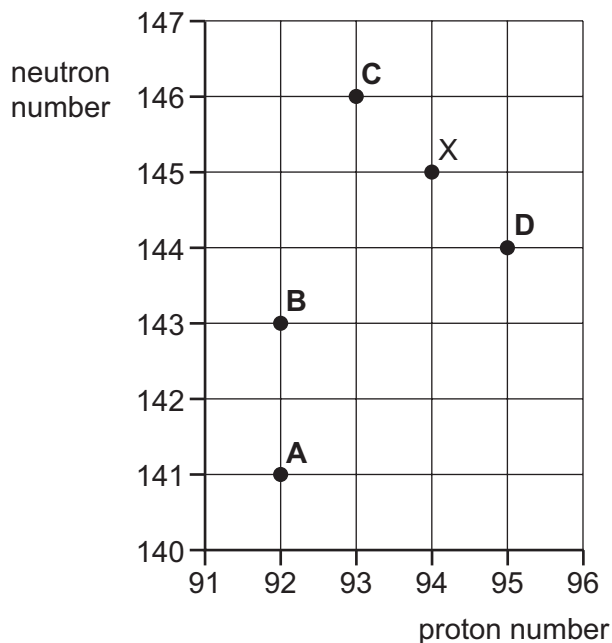
Which graph shows the variation with distance  $d$  of the p.d.  $V$ ?



- 39 The figure shows part of a chart of nuclides where neutron number is plotted against proton number.

An unstable nuclide X decays by emitting an  $\alpha$ -particle.

Which nuclide is formed by the decay of nuclide X?



- 40 The nuclei of common isotopes of hydrogen, helium, lithium and beryllium are shown.

Which nucleus contains equal numbers of up and down quarks?

- A  ${}^1_1\text{H}$       B  ${}^4_2\text{He}$       C  ${}^7_3\text{Li}$       D  ${}^9_4\text{Be}$

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