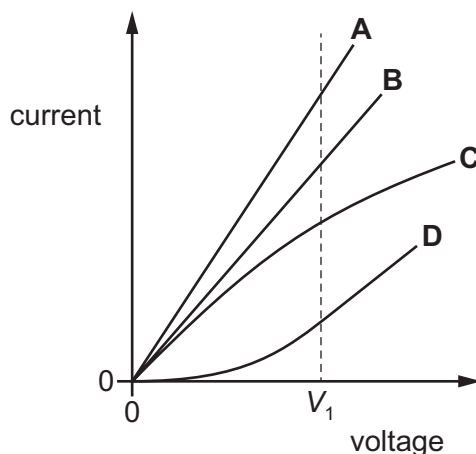


- 31 The  $I$ – $V$  characteristics for four components, **A**, **B**, **C** and **D**, are shown.

Which component has the greatest resistance when the potential difference across it is  $V_1$ ?



- 32 A cylindrical wire has cross-sectional area  $A$  and number density of free electrons  $n$ . The wire has current  $I$  and the free electrons have average drift speed  $v$ .

A second cylindrical wire has cross-sectional area  $0.5A$  and number density of free electrons  $2n$ . In this wire, the free electrons have average drift speed  $2v$ .

What is the current in the second wire?

- A**  $0.5I$                       **B**  $I$                       **C**  $2I$                       **D**  $4I$
- 33 An electric current is formed by moving charge carriers.

What is **not** a possible charge on a charge carrier?

- A**  $-4.8 \times 10^{-19} \text{ C}$   
**B**  $-2.4 \times 10^{-19} \text{ C}$   
**C**  $+1.6 \times 10^{-19} \text{ C}$   
**D**  $+3.2 \times 10^{-19} \text{ C}$
- 34 Which description of Kirchhoff's first law is correct?
- A** It considers the currents at a junction in a circuit and is a consequence of the conservation of charge.  
**B** It considers the currents at a junction in a circuit and is a consequence of the conservation of energy.  
**C** It considers the electromotive forces and potential differences in a circuit loop and is a consequence of the conservation of charge.  
**D** It considers the electromotive forces and potential differences in a circuit loop and is a consequence of the conservation of energy.