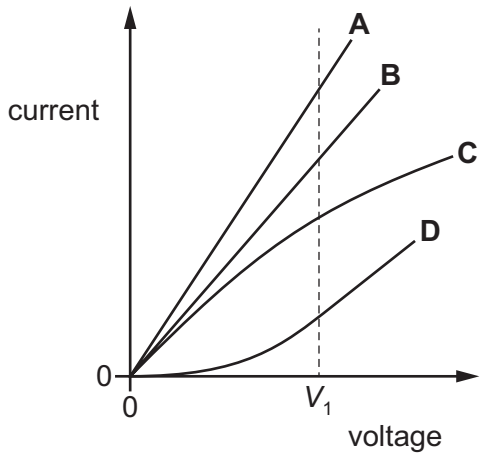
31 The I–V characteristics for four components, **A**, **B**, **C** and **D**, are shown.

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 -4.8×10^{-19} C

B -2.4×10^{-19} C

C $+1.6 \times 10^{-19}$ C

D $+3.2 \times 10^{-19}$ 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.