**30** The current I in a metal wire is given by the expression shown.

$$I = Anvq$$

What does the symbol n represent?

A   the number of atoms per unit volume of the metal

B   the number of free electrons per atom in the metal

C   the number of free electrons per unit volume of the metal

D   the total number of electrons per unit volume of the metal

31 The circuit diagrams show two lamps X and Y each connected to a cell. The current in lamp X is 0.50 A and its resistance is 9.6 Ω. The current in lamp Y is 3.0 A and its resistance is 1.2 Ω.
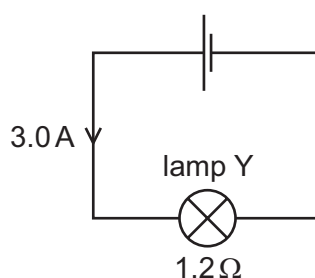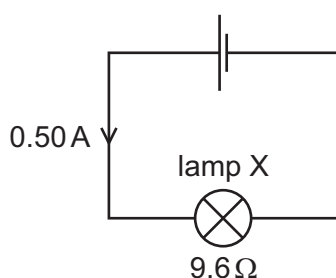
What is the ratio $\dfrac{\text{power in lamp X}}{\text{power in lamp Y}}$?

A   0.22   **B**   0.75   **C**   1.3   **D**   4.5

32 A cylindrical piece of a soft, electrically-conducting material has resistance R. It is rolled out so that its length is doubled but its volume stays constant.

What is its new resistance?

A $\dfrac{R}{2}$ **B** R **C** $2R$ **D** $4R$

33 The sum of the electrical currents into a point in a circuit is equal to the sum of the currents out of the point.

Which statement is correct?

A   This is Kirchhoff's first law, which results from the conservation of charge.

B   This is Kirchhoff's first law, which results from the conservation of energy.

C   This is Kirchhoff's second law, which results from the conservation of charge.

D   This is Kirchhoff's second law, which results from the conservation of energy.