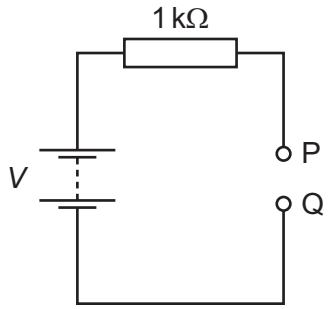
30 A battery of electromotive force (e.m.f.) V and negligible internal resistance is connected to a 1 kΩ resistor, as shown.



A student attempts to measure the potential difference (p.d.) between points P and Q using two voltmeters, one at a time. The first voltmeter has a resistance of 1 kΩ and the second voltmeter has a resistance of 1 MΩ.

What are the readings of the voltmeters?

	reading on voltmeter with 1 kΩ resistance	reading on voltmeter with 1 MΩ resistance
A	$\frac{V}{2}$	$\frac{V}{2}$
B	$\frac{V}{2}$	V
C	V	$\frac{V}{2}$
D	V	V

31 A copper wire is to be replaced by an aluminium alloy wire of the same length and resistance. Copper has half the resistivity of the alloy.

What is the ratio $\frac{\text{diameter of alloy wire}}{\text{diameter of copper wire}}$?

A $\sqrt{2}$ **B** 2 **C** $2\sqrt{2}$ **D** 4

Space for working