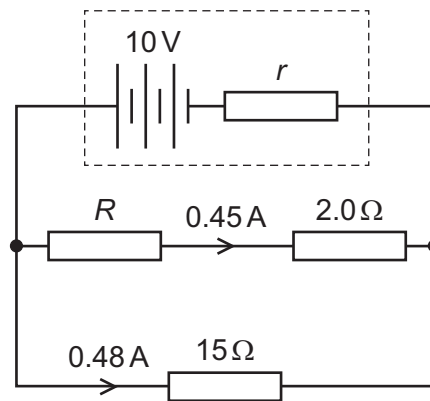


35 Kirchhoff's two laws for electric circuits can be derived by using conservation laws.

On which conservation laws do Kirchhoff's laws depend?

	Kirchhoff's first law	Kirchhoff's second law
A	charge	current
B	charge	energy
C	current	mass
D	energy	current

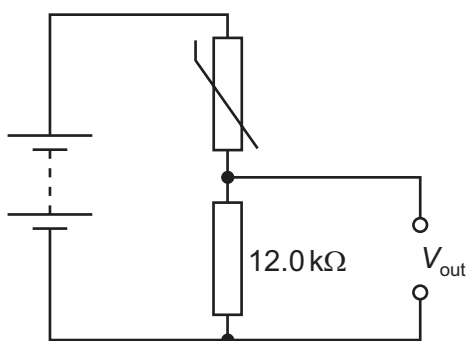
36 A battery of electromotive force (e.m.f.) 10V and internal resistance r is connected to three resistors of resistances R , 2.0Ω and 15Ω , as shown. A current of 0.45A is in the resistor of resistance 2.0Ω and a current of 0.48A is in the resistor of resistance 15Ω .



What are the values of r and R ?

	r/Ω	R/Ω
A	3.0	14
B	3.0	20
C	5.8	14
D	5.8	20

- 37 A battery of negligible internal resistance is connected in series with a thermistor and a fixed resistor of resistance $12.0\text{ k}\Omega$, as shown.



The table shows the resistance of the thermistor at two different temperatures.

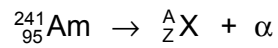
temperature / $^{\circ}\text{C}$	resistance of thermistor / $\text{k}\Omega$
20.0	12.0
50.0	5.00

The potential difference V_{out} across the fixed resistor is 4.50 V when the thermistor is at a temperature of 20.0°C .

What is V_{out} when the thermistor is at a temperature of 50.0°C ?

- A** 2.65 V **B** 3.18 V **C** 6.35 V **D** 10.8 V
- 38 What is a conclusion from the alpha-particle scattering experiment?
- A** Protons and electrons have equal but opposite charges.
B Protons have a much larger mass than electrons.
C The nucleus contains most of the mass of the atom.
D The nucleus of an atom contains protons and neutrons.

- 39 Americium-241 is a radioactive nuclide used in smoke detectors. It undergoes α -decay to form nuclide X. This decay may be represented by the equation shown.



What are the values of A and Z?

	A	Z
A	237	93
B	239	91
C	241	94
D	241	96

- 40 A top quark has a charge of $+\frac{2}{3}e$, where e is the elementary charge.

What is the charge of an anti top quark?

- A** $-\frac{2}{3}e$ **B** $-\frac{1}{3}e$ **C** $+\frac{1}{3}e$ **D** $+\frac{2}{3}e$



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