



















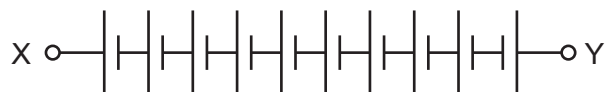






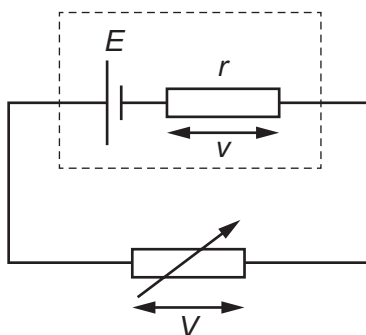


- 33 Ten cells, each of electromotive force (e.m.f.) 1.5 V, are connected together, as shown.



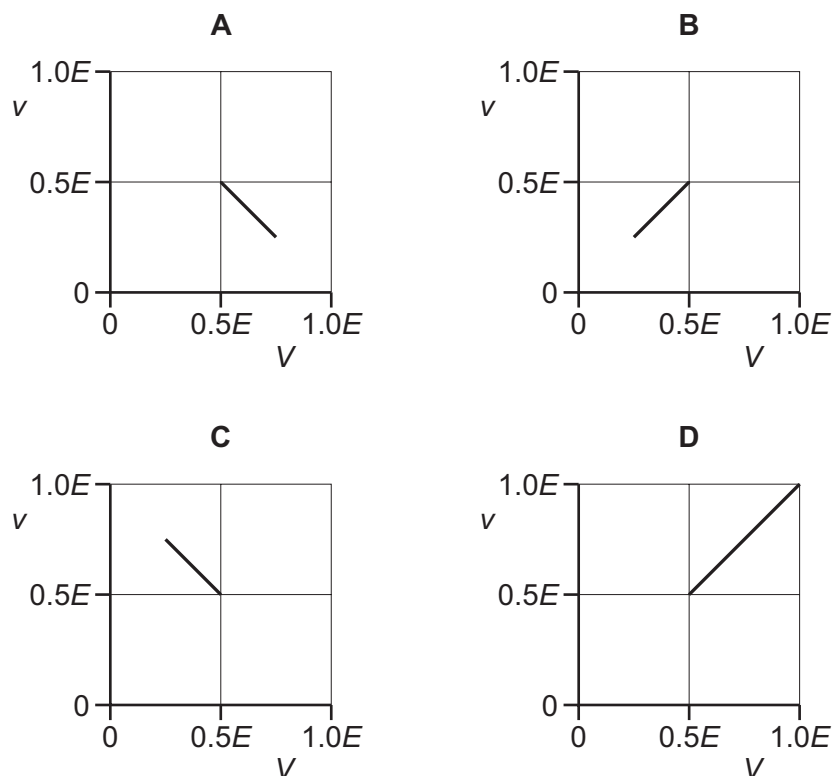
What is the combined e.m.f. between terminals X and Y?

- A 8 V                      B 9 V                      C 12 V                      D 15 V
- 34 A cell of electromotive force (e.m.f.)  $E$  and internal resistance  $r$  is connected to a variable resistor, as shown.



The resistance of the variable resistor is gradually increased from  $r$  to  $3r$ .

Which graph shows the variation of the potential difference (p.d.)  $v$  across the internal resistance with the p.d.  $V$  across the variable resistor?

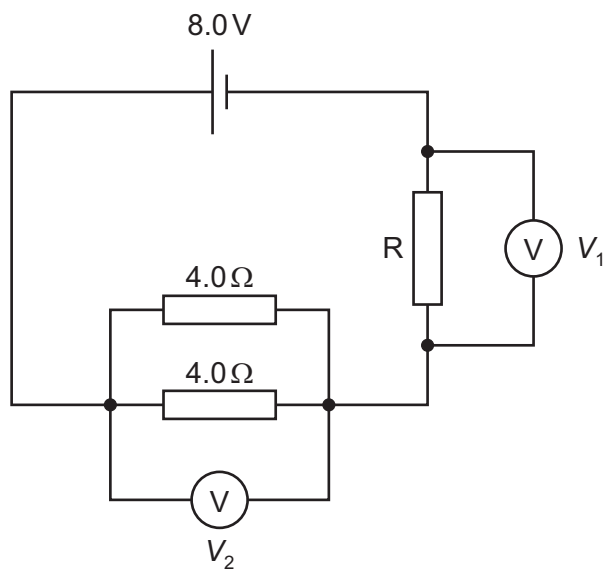


35 Each of Kirchhoff's two laws presumes that some quantity is conserved.

Which row states Kirchhoff's **first** law and names the quantity that is conserved?

|          | statement  | quantity |
|----------|--|----------|
| <b>A</b> | the algebraic sum of currents into a junction is zero  | charge   |
| <b>B</b> | the algebraic sum of currents into a junction is zero  | energy   |
| <b>C</b> | the e.m.f. in a loop is equal to the algebraic sum of the product of current and resistance round the loop | charge   |
| <b>D</b> | the e.m.f. in a loop is equal to the algebraic sum of the product of current and resistance round the loop | energy   |

36 A cell has an electromotive force (e.m.f.) of 8.0 V and negligible internal resistance. The cell forms part of a circuit, as shown.

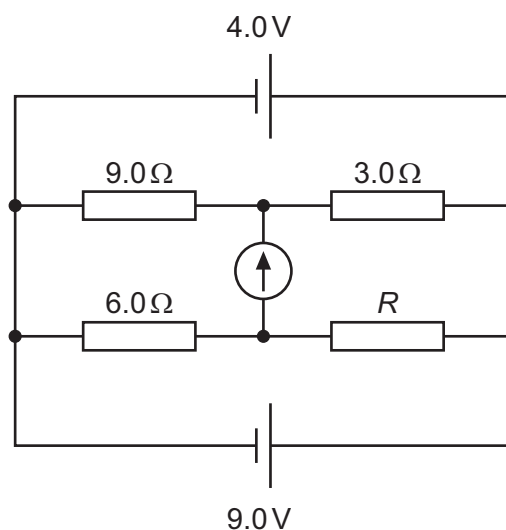


The reading  $V_1$  is 4.0 V and the reading  $V_2$  is also 4.0 V.

What is the resistance of resistor R?

- A** 0.50 Ω      **B** 2.0 Ω      **C** 4.0 Ω      **D** 8.0 Ω

- 37 In the circuit shown, the cells have negligible internal resistance and the reading on the galvanometer is zero.



What is the value of resistor  $R$ ?

- A**  $2.0\ \Omega$       **B**  $6.0\ \Omega$       **C**  $12\ \Omega$       **D**  $18\ \Omega$
- 38 When  $\alpha$ -particles are directed at gold leaf:

- 1 almost all  $\alpha$ -particles pass through without deflection
- 2 a few  $\alpha$ -particles are deviated through large angles.

What are the reasons for these effects?

|          | 1  | 2  |
|----------|--|--|
| <b>A</b> | most $\alpha$ -particles have enough energy to pass right through the gold leaf            | gold is very dense so a few low energy $\alpha$ -particles bounce back from the gold surface |
| <b>B</b> | most $\alpha$ -particles miss all gold atoms   | a few $\alpha$ -particles bounce off gold atoms  |
| <b>C</b> | the gold nucleus is very small so most $\alpha$ -particles miss all nuclei                 | occasionally the path of an $\alpha$ -particle is close to a nucleus                         |
| <b>D</b> | the positive charge in an atom is not concentrated enough to deflect an $\alpha$ -particle | occasionally an $\alpha$ -particle experiences many small deflections in the same direction  |

39 A nucleus X is radioactive and decays into a nucleus Y.

X and Y are isotopes of the same element.

Which combination of particles could have been emitted during the decay process?

- A 1  $\alpha$ -particle and 1  $\beta^-$  particle
- B 1  $\alpha$ -particle and 2  $\beta^-$  particles
- C 2  $\alpha$ -particles and 1  $\beta^-$  particle
- D 2  $\alpha$ -particles and 2  $\beta^-$  particles

40 A positively charged meson consists of a quark and an antiquark.

What could be the quark and antiquark?

- A charm and antiup
- B down and antitop
- C strange and antibottom
- D up and antistrange

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