

6: Electricity 2 – Topic questions

Paper 4

The questions in this document have been compiled from a number of past papers, as indicated in the table below.

Use these questions to formatively assess your learners' understanding of this topic.

Question	Year	Series	Paper number
9	2016	March	42
9	2016	November	42
11	2016	November	41

The mark scheme for each question is provided at the end of the document.

You can find the complete question papers and the complete mark schemes (with additional notes where available) on the School Support Hub at www.cambridgeinternational.org/support

- 9 (a) (i) State what is meant by the *direction* of an electric field.

.....
[1]

- (ii) Fig. 9.1 shows a pair of oppositely-charged horizontal metal plates with the top plate positive.

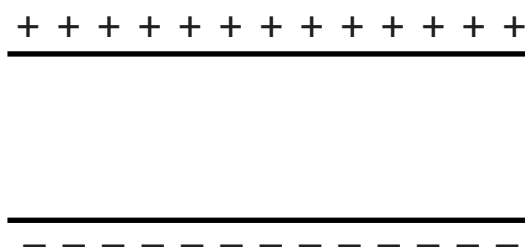


Fig. 9.1

The electric field between the plates in Fig. 9.1 is uniform.

Draw lines on Fig. 9.1 to represent this uniform field. Add arrows to these lines to show the direction of the field. [3]

- (b) Fig. 9.2 shows a very small negatively-charged oil drop in the air between a pair of oppositely charged horizontal metal plates. The oil drop does not move up or down.

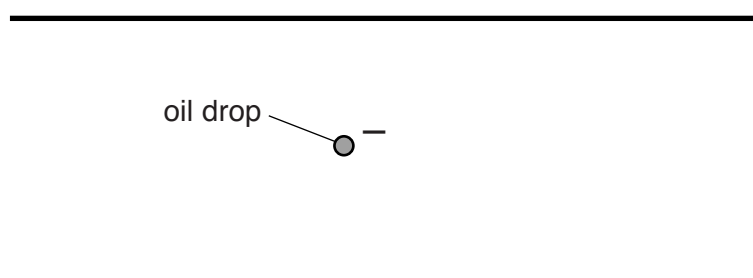


Fig. 9.2

- (i) Suggest, in terms of forces, why the oil drop does not move up or down.

.....
[2]

- (ii) Without losing any of its charge, the oil drop begins to evaporate.

State and explain what happens to the oil drop.

.....
[2]

[Total: 8]

- 9 Fig. 9.1 is a circuit diagram.

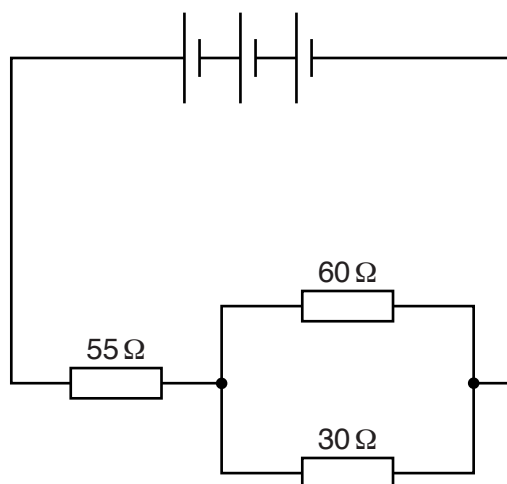


Fig. 9.1

The circuit consists of three resistors and three identical 1.5V cells.

- (a) State the total electromotive force (e.m.f.) of the three 1.5V cells in series.

total e.m.f. = [1]

- (b) Calculate

- (i) the combined resistance of the resistors in parallel,

resistance = [2]

- (ii) the total resistance of the circuit,

resistance = [1]

- (iii) the current in the 55Ω resistor.

current = [2]

(c) The currents in the $30\ \Omega$, the $55\ \Omega$ and the $60\ \Omega$ resistors are all different.

State the resistance of the resistor in which the current is

(i) the largest,

resistance = [1]

(ii) the smallest.

resistance = [1]

[Total: 8]

11 (a) State what is meant by

(i) an *electric field*,

.....
.....[1]

(ii) the direction of an electric field at a point.

.....
.....[1]

(b) Fig. 11.1 shows a positively charged sphere.

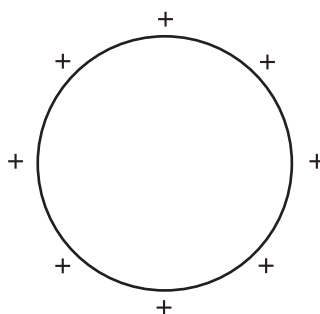


Fig. 11.1

On Fig. 11.1, draw the pattern of the electric field in the region around the positively charged sphere. Show the direction of the field with arrows. [2]

(c) The charge on the sphere in (b) is $+ 2.0 \times 10^{-5} \text{ C}$. A high resistance wire is now connected between the sphere and earth. It takes 20 minutes for the sphere to become completely discharged through the wire.

(i) Suggest why there is a current in the wire between the sphere and earth.

.....[1]

(ii) Calculate the average current in the wire between the sphere and earth.

average current =[2]

[Total: 7]

Question	Answer	Mark
9 (a) (i)	... direction of the force on a positive charge.	B1
9 (a) (ii)	straight parallel lines from upper to lower plate at least 3 lines drawn. All lines drawn equally spaced, approximately symmetrical with respect to plates arrows downwards	B1 B1 B1
9 (b) (i)	upward force (on drop) due to electric field / charge on plates = weight of drop upward force on drop = downward force on drop OR no resultant / net force on drop OR forces are balanced	B1 B1 (B1)
9 (b) (ii)	drop moves upwards weight / mass of drop decreases OR downward force decreases OR upward force (due to electric field) > weight of drop	B1 B1
		Total: 8
9 (a)	4.5 V	B1
9 (b) (i)	$1/R = 1/R_1 + 1/R_2$ OR $R_1 R_2 / (R_1 + R_2)$ ($R =$) 20 Ω	C1 A1
9 (b) (ii)	adds 55 to candidate's previous line	B1
9 (b) (iii)	$I = V/R$ in any form OR V/R ($I = 4.5/75 =$) 0.060 A	C1 A1
9 (c) (i)	reference to 55 Ω resistor	B1
9 (c) (ii)	reference to 60 Ω resistor	B1
		Total: 8
11 (a) (i)	(region) where a force acts on a charge	B1
11 (a) (ii)	direction of the force acting on a <u>positive</u> charge	B1
11 (b)	at least 4 radial equally spaced straight lines drawn from surface of sphere arrows on lines pointing away from sphere	B1 B1
11 (c) (i)	charges on sphere attract electrons (from earth) OR there is a p.d. between the sphere and the earth	B1
11 (c) (ii)	$I = Q/t$ in any form OR Q/t OR $20 \times 10^{-6} / (20 \times 60)$ 1.7×10^{-8} A OR $I = Q/t$ in any form OR Q/t OR $20 / (20 \times 60)$ 0.017 μ A	C1 A1 (C1) (A1)
		Total: 7

Notes about the mark scheme are available separately.