Unit 14 · Electricity and Magnetism

WORKSHEET

Full marks 44

Name _____ Class _____ Roll no. _____ Date _____ Marks _____ / 44

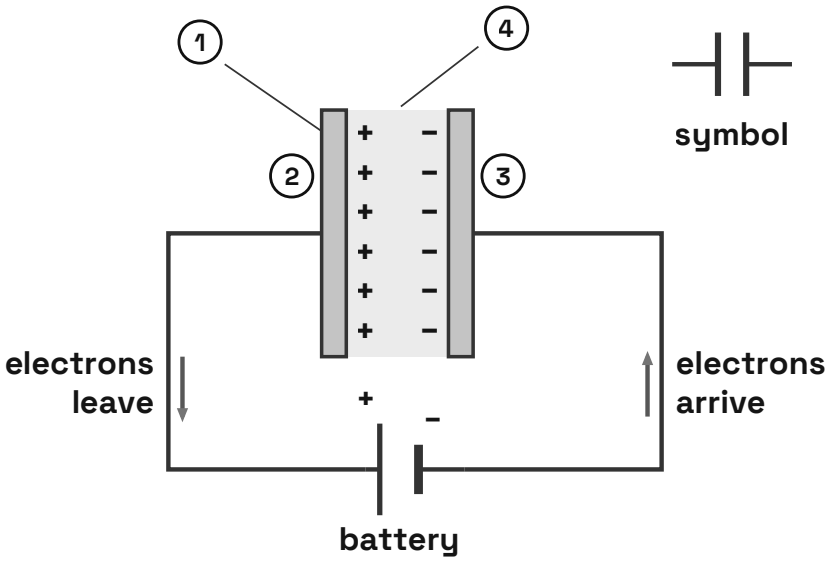
1 Key words [3]

Match each word in Column A with its description in Column B. Write the letter in the box. One description in Column B is not needed. Each match carries 0.5 mark.

Column A		Column B
1. test charge	☐	**a.** the force on a unit positive charge at a point
2. electric field intensity	☐	**b.** the insulator between the plates of a capacitor
3. capacitance	☐	**c.** the angle the Earth's field makes with the horizontal
4. dielectric	☐	**d.** a small positive charge used to find a field
5. neutral point	☐	**e.** the ratio of the charge on either plate to the potential difference between the plates
6. angle of declination	☐	**f.** a point where the resultant field is zero
		g. the angle between the geographic meridian and the magnetic meridian

2 Label the diagram [2]

The diagram shows a charged capacitor. Name the numbered parts. Each carries 0.5 mark.



1. _____ **2.** _____

3. _____ **4.** _____

3 Multiple choice [5]

Choose the correct option for each of the following questions.

i. Electric lines of force round an isolated positive point charge: [1]

a. point straight outward in all directions
b. point straight inward
c. form closed circles round the charge
d. run parallel to one another

ii. If the distance between two point charges is made three times as large, the force between them becomes: [1]

a. three times as large
b. one third
c. one ninth
d. nine times as large

iii. A 10 μF capacitor is connected to a 6 V battery. The charge on each plate is: [1]

a. 0.6 μC
b. 1.67 μC
c. 16 μC
d. 60 μC

iv. The pole of the Earth's magnet that lies near the geographic North Pole is: [1]

a. a north pole
b. a south pole
c. neither a north nor a south pole
d. a north pole in summer and a south pole in winter

v. The angle of dip at a place is measured with a: [1]

a. compass box
b. declinometer
c. dip circle
d. galvanometer

4 Very short answers [4]

Write very short answers to the following questions.

a. Where is the neutral point between two equal positive charges? [1]

b. A capacitor is marked "470 μF 25 V". What does the 25 V tell you? [1]

c. Why doesn't a phone's touchscreen respond to a plastic pen? [1]

d. What is the angle of dip at the magnetic equator? [1]

5 Short answers [8]

Write short answers to the following questions.

a. Electric lines of force never intersect each other. [2]

b. A capacitor can store charge, but it doesn't let a steady direct current flow through it. [2]

c. A compass placed at a neutral point doesn't point in any particular direction. [2]

d. A dip circle must be set in the magnetic meridian to measure the angle of dip. [2]

6 Long answers [8]

Write long answers to the following questions.

a. What is a neutral point? Draw the lines of force of a bar magnet placed with its N pole pointing (i) north, (ii) south, and mark the neutral points. [4]

b. Describe how the angle of dip is measured with a dip circle. **[4]**

7 Numerical problems **[11]**

Solve the following problems. Show your working.

a. Two point charges of +5 μC and −4 μC are 30 cm apart in air. Find the force between them. **[2]**

Answer: _____

b. Two equal charges repel each other with a force of 3.6 N when they are 5 cm apart in air. Find each charge. **[3]**

Answer: _____

c. Two small balls, each of mass 0.9 g and each carrying a charge of 0.1 μC, are 3 cm apart. Compare the electrostatic force between them with the weight of one ball ($g = 10\ m/s^2$). **[3]**

Answer: _____

d. A camera flash has a capacitor of 150 μF, charged to 300 V. (i) How much charge does it store? (ii) If the flash empties it in 1 ms, what is the average current through the flash tube? **[3]**

Answer: _____

8 Think **[3]**

A student sets up a dip circle in Pokhara and reads 70°. She is sure the instrument is level. What has she most probably done wrong, and how can she check? (The dip at Pokhara is about 45°.)

9 Activity: Finding the angle of dip (Practicals 27 and 29) (not marked)

With a dip circle, or a balanced magnetized needle of your own, set in the magnetic meridian. Away from iron, steel and electric cables, read the angle below the horizontal.

Position of the circle	One end of the needle	Other end of the needle
in the magnetic meridian		
turned through 180°		
turned through 90° from the meridian		

Mean of the four readings in the meridian: _____. What did the needle do when it swung east–west? Why?