Unit 14 · Electricity and Magnetism

WORKSHEET

Full marks 49

Name _____ Class _____ Roll no. _____ Date _____ Marks _____ / 49

1 Key words [4]

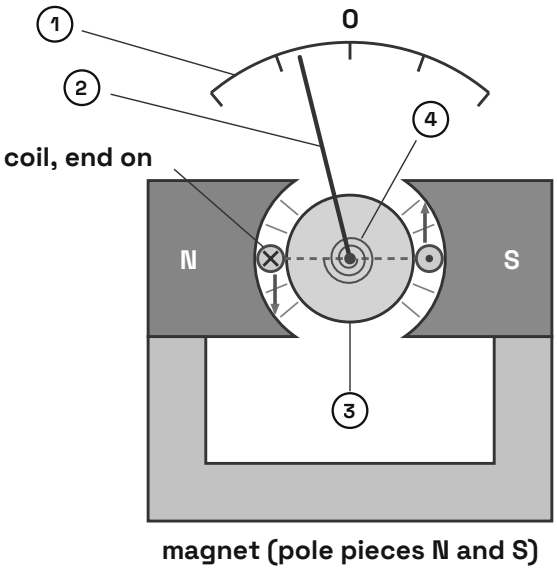
Fill in the blanks with words from the box. Two words in the box are not needed. Each blank carries 0.5 mark.

base	**diamagnetic**	**domains**	**doping**	**multiplier**	**paramagnetic**	**rectifier**	**secondary**	**semiconductor**	**shunt**

Substances that are weakly attracted by a magnet and keep no magnetism are _____. In a ferromagnetic material, the atomic magnets line up in regions called _____. A cell that can be charged again is a _____ cell. A low resistance joined in parallel with a galvanometer is called a _____, and a high resistance joined in series with it is a _____. A material that conducts between a conductor and an insulator is a _____. Adding a tiny amount of another element to silicon is called _____. The thin middle layer of a transistor is its _____.

2 Label the diagram [2]

The diagram shows a moving-coil galvanometer. Write the word that belongs in place of each number. Each carries 0.5 mark.



1. _____ 2. _____

3. _____ 4. _____

3 True or false [3]

Write ✓ for a true statement and ✗ for a false one. Each carries 0.5 mark.

i. A bigger lead-acid cell gives a higher voltage. ☐

ii. As a lead-acid cell discharges, the density of its acid falls. ☐

iii. A voltmeter must have a very low resistance. ☐

iv. A semiconductor conducts better as it gets hotter. ☐

v. Hard magnetic materials lose their magnetism as soon as the field is removed. ☐

vi. A reverse-biased diode acts like an open switch. ☐

4 Multiple choice [5]

Choose the correct option for each of the following questions.

i. When a paramagnetic material is taken out of a magnetic field, it: [1]

a. stays a strong magnet
b. becomes a weak magnet in the opposite direction
c. loses its magnetism completely
d. becomes ferromagnetic

ii. When a lead-acid cell is fully discharged, its plates are mostly: [1]

a. lead dioxide on both plates
b. spongy lead on both plates
c. lead sulphate on both plates
d. lead dioxide on the negative plate and lead on the positive plate

iii. The soft-iron core in a moving-coil galvanometer is used to: [1]

a. stop the coil from turning
b. carry the current into the coil
c. make the magnetic field strong and radial
d. act as a permanent magnet

iv. A p-type semiconductor is made by adding to pure silicon a small amount of: [1]

a. phosphorus
b. arsenic
c. boron
d. germanium

v. Which device turns an alternating current into a direct current? [1]

a. a transistor used as an amplifier
b. a transformer
c. a diode
d. a galvanometer

5 Very short answers [3]

Write very short answers to the following questions.

a. How many cells are joined in series in a 12 V lead-acid car battery? [1]

b. For about how long can a 7 Ah battery give a current of 0.5 A? **[1]**

c. About what voltage does a silicon diode need across it to start conducting? **[1]**

6 Short answers **[10]**

Write short answers to the following questions.

a. Give a reason: a ferromagnetic material is attracted far more strongly than a paramagnetic material. **[2]**

b. Give a reason: a lead-acid battery should be charged in an open, airy place away from flames. **[2]**

c. Give a reason: an ammeter should have a very low resistance and a voltmeter a very high one. **[2]**

d. Write any two differences between a primary cell and a secondary cell. **[2]**

e. Write two differences between p-type and n-type semiconductors. **[2]**

7 Long answers [8]

Write long answers to the following questions.

a. Write the chemical reactions at each plate of a lead-acid cell while it is discharging. What happens to them during charging? [4]

b. What is a transistor? How can it be used as a switch and as an amplifier? [4]

8 Numerical problems [11]

Solve the following problems. Show your working.

a. A galvanometer of resistance 50 Ω gives full-scale deflection for 10 mA. Find the shunt needed to make it an ammeter of range 0–2 A, and the resistance of the whole ammeter. [3]

Answer:

b. A galvanometer of resistance 40 Ω gives full-scale deflection for 2 mA. A shunt of 0.04 Ω is connected across it. What is the largest current the ammeter can now read? [3]

Answer:

c. A shop in Bhaktapur keeps four 10 W LED lights and a 60 W fan running during power cuts, on an inverter with a 12 V battery. The longest power cut is 3 hours. Ignoring losses in the inverter, find (i) the energy needed, in watt-hours, (ii) the charge needed, in ampere-hours, and (iii) the smallest battery capacity if no more than half of its charge is to be used. **[3]**

Answer: _____

d. A red LED works with 2 V across it and a current of 20 mA. What resistance must be put in series with it to run it from a 5 V phone charger? **[2]**

Answer: _____

9 Think **[3]**

An automatic night light has a 10 kΩ resistor between +6 V and a transistor's base, and an LDR between the base and 0 V. What would happen if the LDR and the resistor were swapped? (LDR: about 1 kΩ in daylight, about 100 kΩ in the dark.)

10 Activity: Find the resistance of a resistor (not marked)

Join one to three 1.5 V cells, a switch, an ammeter and a 10 Ω resistor in one loop, and connect a voltmeter across the resistor only (+ towards the cells' + side). Read both meters, then open the switch.

Cells	Voltmeter (V)	Ammeter (A)	V ÷ I (Ω)
1			
2			
3			