PRACTICE PAPER (2026–27)

Chapter 11: Electricity

CLASS: X **SUBJECT: SCIENCE** **DURATION: 1½ hrs** **MAX. MARKS: 40**

General Instructions:

1. All questions are compulsory.
2. This question paper contains 20 questions divided into five Sections: **A**, **B**, **C**, **D**, and **E**.
3. **Section A** comprises 10 Multiple Choice Questions (including Assertion-Reason) of 1 mark each.
4. **Section B** comprises 4 questions of 2 marks each.
5. **Section C** comprises 3 questions of 3 marks each.
6. **Section D** comprises 1 question of 5 marks (with internal choice).
7. **Section E** comprises 2 Case Study Based Questions of 4 marks each.
8. Use of calculators is strictly prohibited.

SECTION – A

Questions 1 to 10 carry 1 mark each.

1. A cylindrical conductor of length L and uniform area of cross-section A has resistance R. Another conductor of length $2L$ and resistance R of the same material has an area of cross-section:

   (a) $A/2$ (b) $3A/2$

   (c) $2A$ (d) $3A$

2. A current of 1 A is drawn by a filament of an electric bulb for 16 seconds. The number of electrons passing through a cross-section of the filament in this time is:

   (a) 10^{20} (b) 10^{19}

   (c) 10^{18} (d) 1.6×10^{19}

3. A piece of wire of resistance R is cut into five equal parts. These parts are then connected in parallel. If the equivalent resistance of this parallel combination is R', then the ratio R/R' is:

   (a) 1/25 (b) 1/5

   (c) 5 (d) 25

4. Two conducting wires of the same material and of equal lengths and equal diameters are first connected in series and then in parallel in a circuit across the same potential difference. The ratio of heat produced in series and parallel combinations would be:

   (a) 1 : 2 (b) 2 : 1

   (c) 1 : 4 (d) 4 : 1

5. Which of the following terms does not represent electrical power in an electrical circuit?

   (a) I^2R (b) IR^2

   (c) VI (d) V^2/R

6. An electric bulb is rated 220 V and 100 W. When it is operated on 110 V, the power consumed will be:

   (a) 100 W (b) 75 W

   (c) 50 W (d) 25 W

7. The resistivity of a given metallic wire depends upon:

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(a) Its length
(b) Its thickness
(c) Its shape
(d) Nature of the material

8. To determine the equivalent resistance of two resistors connected in series, the ammeter and the voltmeter should be connected as:
   (a) Ammeter in series, voltmeter in parallel
   (b) Ammeter in parallel, voltmeter in series
   (c) Both in series
   (d) Both in parallel

Directions for Q9 and Q10: In each question, a statement of **Assertion (A)** is followed by a statement of **Reason (R)**. Mark the correct choice as:
(a) Both (A) and (R) are true and (R) is the correct explanation of (A).
(b) Both (A) and (R) are true but (R) is NOT the correct explanation of (A).
(c) (A) is true but (R) is false.
(d) (A) is false but (R) is true.

9. **Assertion (A):** Alloys such as Nichrome are commonly used in heating elements of appliances like electric toasters and irons.
   Reason (R): Alloys have higher resistivity than their constituent metals and do not oxidise (burn) easily at high temperatures.

10. **Assertion (A):** In domestic electrical wiring, appliances are connected in series.
    Reason (R): In a series circuit, if one appliance fails or is switched off, all other appliances continue to operate normally.

SECTION – B

Questions 11 to 14 carry 2 marks each.

11. Define the SI unit of electric potential difference (1 Volt). How much work is done in moving a charge of 4 C across two points having a potential difference of 12 V?

12. State Ohm's law. Draw the circuit diagram used to verify Ohm's law in the laboratory, including a battery, key, ammeter, voltmeter, rheostat, and an unknown resistor.

13. Why are copper and aluminium wires usually employed for electricity transmission, while tungsten is almost exclusively used for incandescent lamp filaments?

14. An electric iron consumes energy at a rate of 840 W when heating is at the maximum rate, and 360 W when the heating is at the minimum. The voltage is 220 V. Calculate the current in each case.

SECTION – C

Questions 15 to 17 carry 3 marks each.

15. A wire of length l, cross-sectional area A, and resistivity ρ has a resistance R.
    a. Write the mathematical expression connecting R, l, A, and ρ. State the SI unit of electrical resistivity.
    b. If the wire is stretched to double its original length without changing its mass or density, what will be its new resistance in terms of R?

16. State Joule's law of heating. Derive the mathematical expression for heat produced in a resistor of resistance R when a steady current I flows through it for time t.

17. Three resistors of resistances $R_1 = 4\ \Omega$, $R_2 = 6\ \Omega$, and $R_3 = 12\ \Omega$ are given.
    a. How can they be connected to give an equivalent resistance of:
       (i) 8 Ω (ii) 2 Ω?
    b. Show your circuit combination along with calculated proof for both cases.

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SECTION – D

Question 18 carries 5 marks.

18. a. Deduce the expression for the equivalent resistance of three resistors R_1, R_2, and R_3 connected in parallel across a potential source V. Draw a neat circuit diagram.

b. State three advantages of connecting electrical appliances in parallel rather than in series in household circuits.

c. An electric lamp of resistance 20 Ω and a conductor of 4 Ω resistance are connected in series to a 6 V battery. Calculate:
(i) Total resistance of the circuit.
(ii) Total current flowing through the circuit.

OR

a. Define electric power. Express electric power in three different mathematical formulas involving V, I, and R.

b. What is meant by the commercial unit of electric energy? Express 1 kilowatt-hour (1 kWh) in Joules.

c. An electric refrigerator rated 400 W operates 8 hours/day and an electric television rated 100 W operates 6 hours/day. Calculate the total cost of electricity bill for the month of June (30 days) if the rate of energy is Rs. 4.50 per kWh.

SECTION – E (Case Study Based Questions)

Questions 19 and 20 carry 4 marks each.

19. **Read the passage given below and answer the questions that follow:**

> *When an electric current flows through a purely resistive conductor, the electrical energy delivered by the power source is dissipated entirely in the form of heat. This phenomenon is known as the heating effect of electric current. While this heat generation is undesirable in computers, transformers, and electric motors—where it causes waste of energy and wear of insulation—it is deliberately harnessed in practical heating appliances such as geysers, room heaters, electric kettles, and safety fuses. A fuse is a crucial safety device containing a thin wire made of a metal or alloy having an appropriate low melting point, which protects circuits from overloads and short circuits.*

a. On which physical principle does an electric fuse wire operate? **[1 Mark]**

b. Why is a fuse wire always placed in the live wire and in series with the appliance? **[1 Mark]**

c. An electric kettle rated 2 kW is operated on a 220 V supply.
(i) What current is drawn by the kettle?
(ii) Which of the standard commercial fuses (1 A, 2 A, 5 A, or 10 A) should be used for this kettle? Justify. **[2 Marks]**

OR

c. Why does the connecting cord of an electric heater not glow hot, while its heating element glows red hot when connected to the mains? **[2 Marks]**

20. **Read the passage given below and answer the questions that follow:**

> *The resistance of a uniform metallic conductor depends on its physical dimensions (length and area of cross-section), the nature of the material, and the temperature. A student conducts an experiment with Nichrome wires of different lengths and thicknesses to observe the dependence of resistance on physical parameters using a standard V-I circuit. The data gathered indicates that doubling the length of the conductor doubles the resistance, whereas doubling the diameter reduces the resistance to one-fourth.*

a. How does the resistance of a conductor change if its radius is halved while keeping length constant? **[1 Mark]**

b. What happens to the electrical resistivity of a metallic wire when it is cut into two equal halves? **[1 Mark]**

c. A cylindrical copper wire has a length of 2 m, cross-sectional area of 1.7×10^{-6} m^2, and resistivity of 1.7×10^{-8} Ω·m.

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(i) Calculate the resistance of this wire.

(ii) If the temperature of this copper wire is raised, how will its resistance change? **[2 Marks]**

OR

c. Between a thick wire and a thin wire of the same material and same length, which one offers more resistance to current flow? Explain the relationship. **[2 Marks]**

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