

Electricity, Magnetism, Energy and Environment

Science · Class 10 · Topic-wise Practice Worksheet

TIME 45 minutes	QUESTIONS 18	TOTAL MARKS 24	MAX. SCORE ___ / 24
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Name: _____ Class/Sec: _____ Date: _____

INSTRUCTIONS

- There are **18 questions** in this worksheet. All questions are compulsory.
- Each question has four options (A), (B), (C) and (D). Exactly **one** option is correct.
- Questions 1–15 carry **1 mark** each. Questions 16–18 (Achievers Section) carry **3 marks** each.
- There is no negative marking. Study every circuit diagram and table carefully.

Section A — Scientific Reasoning

Q1–Q8 · 1 mark each

1. Ohm's law is expressed as _____.

(A) $V = \frac{I}{R}$

(B) $V = IR$

(C) $I = VR$

(D) $R = VI$

2. The SI unit of electrical resistance is the _____.

(A) Volt

(B) Ampere

(C) Ohm

(D) Watt

3. When several resistors are joined in series, the total resistance is _____.

(A) The sum of the individual resistances

(B) Less than the smallest resistance

(C) Equal to the largest resistance

(D) Always $1\ \Omega$

4. Electric power is given by _____.

(A) $P = \frac{V}{I}$

(B) $P = VI$

(C) $P = \frac{I}{V}$

(D) $P = V + I$

5. Outside a bar magnet, the magnetic field lines run from _____.

(A) Both poles towards the middle

(B) South pole to north pole

(C) North pole to south pole

(D) The middle towards both poles

6. The direction of the magnetic field produced around a straight current-carrying wire is given by _____.

(A) Faraday's law

(B) Ohm's law

(C) Fleming's left-hand rule

(D) The right-hand thumb rule

7. Fleming's left-hand rule is used to find the direction of _____.

(A) The force on a current-carrying conductor in a magnetic field

(B) The induced current in a generator

(C) The magnetic field of a solenoid

(D) The current in a resistor

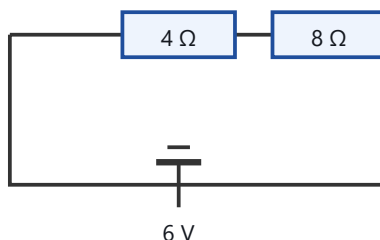
8. Which of the following is a renewable source of energy?

- (A) Coal (B) Wind
(C) Petroleum (D) Natural gas

Section B — Applying What You Know

Q9–Q15 · 1 mark each

9. In the circuit shown, two resistors of $4\ \Omega$ and $8\ \Omega$ are joined in series across a $6\ \text{V}$ battery. The current in the circuit is _____.



Two resistors in series across a $6\ \text{V}$ battery

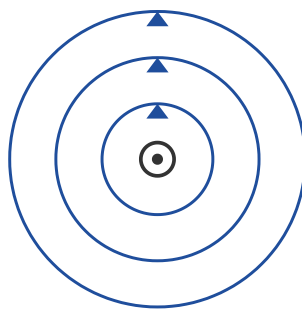
- (A) $2\ \text{A}$ (B) $1.5\ \text{A}$
(C) $0.5\ \text{A}$ (D) $12\ \text{A}$
10. Two resistors of $6\ \Omega$ each are connected in parallel. Their combined resistance is _____.
- (A) $\frac{1}{3}\ \Omega$ (B) $6\ \Omega$
(C) $12\ \Omega$ (D) $3\ \Omega$
11. The wire used in an electric fuse is chosen because it has _____.
- (A) A low melting point and high resistance (B) A high melting point and low resistance
(C) No resistance at all (D) A very large thickness
12. One row of the table below is **incorrectly** matched. Which row is it?

Row	Device	Energy conversion
(A)	Electric motor	Electrical energy to mechanical energy
(B)	Electric generator	Mechanical energy to electrical energy
(C)	Electric bulb	Electrical energy to light and heat
(D)	Solar cell	Chemical energy to electrical energy

Table 6.1 — Devices and the energy changes in them

- (A) (A) (B) (B)
(C) (C) (D) (D)

13. The figure shows the magnetic field around a long straight wire carrying current out of the page. The field lines are _____.



current flowing out of the page

Magnetic field lines around a straight current-carrying wire

- (A) Straight lines parallel to the wire
(B) Concentric circles around the wire, getting weaker farther away
(C) Circles that get stronger farther from the wire
(D) Absent, since a straight wire produces no field
14. An electric motor converts _____.
(A) Heat energy into light energy
(B) Mechanical energy into electrical energy
(C) Electrical energy into mechanical energy
(D) Chemical energy into heat energy
15. Which of the following wastes is **biodegradable**?
(A) Glass bottles
(B) Plastic bags
(C) Aluminium cans
(D) Vegetable peels

Achievers Section

Q16–Q18 · 3 marks each

16. **Assertion (A):** A bird perched on a single high-voltage wire is not harmed.
Reason (R): No appreciable current flows through the bird because there is almost no potential difference between its two feet.
(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
17. A 100 W bulb is used for 10 hours a day for 30 days. If electricity costs ₹5 per kilowatt hour, the monthly cost of running it is _____.
(A) ₹150
(B) ₹50
(C) ₹15
(D) ₹300
18. In a food chain grass → deer → tiger, 10 000 J of energy is available in the grass. According to the ten per cent law, the energy available to the tiger is about _____.
(A) 1000 J
(B) 100 J
(C) 10 J
(D) 10 000 J

Answer Key

1	B	2	C	3	A	4	B	5	C
6	D	7	A	8	B	9	C	10	D
11	A	12	D	13	B	14	C	15	D
16	A	17	A	18	B				

Solutions

1. Answer: (B) $V = IR$

At constant temperature the current through a conductor is proportional to the potential difference across it, which gives **$V = IR$** .

2. Answer: (C) Ohm

Resistance is measured in **ohms** (Ω): one ohm is the resistance through which a potential difference of 1 V drives a current of 1 A.

3. Answer: (A) The sum of the individual resistances

In series the same current passes through each resistor and the potential differences add, so the resistances add too: $R = R_1 + R_2 + \dots$. Joining them in *parallel* instead gives a total smaller than the smallest one.

4. Answer: (B) $P = VI$

Power is the rate at which electrical energy is used: **$P = VI$** , which can also be written as I^2R or $\frac{V^2}{R}$. It is measured in watts.

5. Answer: (C) North pole to south pole

Outside the magnet the field lines emerge at the north pole and run to the south pole; inside the magnet they run from south to north, so every line forms a closed loop.

6. Answer: (D) The right-hand thumb rule

Grasp the wire in the right hand with the thumb pointing along the current, and the curled fingers show the direction of the circular field lines — the **right-hand thumb rule**. Fleming's left-hand rule gives the force on a conductor instead.

7. Answer: (A) The force on a current-carrying conductor in a magnetic field

With the first finger along the field and the second along the current, the thumb points along the **force on the conductor**. This is the principle of the electric motor; the right-hand rule applies to the generator.

8. Answer: (B) Wind

Wind is replenished continuously by the sun's uneven heating of the earth, so it will not run out. Coal, petroleum and natural gas are fossil fuels and are non-renewable.

9. Answer: (C) 0.5 A

In series the resistances add: $R = 4 + 8 = 12 \Omega$. By Ohm's law, $I = \frac{V}{R} = \frac{6}{12} = \mathbf{0.5 \text{ A}}$, and the same current flows through both resistors.

10. Answer: (D) 3 Ω

For a parallel pair, $\frac{1}{R} = \frac{1}{6} + \frac{1}{6} = \frac{2}{6}$, so $R = \mathbf{3 \Omega}$. Identical resistors in parallel always give half the individual resistance.

11. Answer: (A) A low melting point and high resistance

A fuse must melt before the wiring is damaged, so its wire has a **low melting point and a relatively high resistance**. An excessive current heats it quickly, it melts, and the circuit breaks.

12. Answer: (D) (D)

A solar cell converts *light* energy into electrical energy; chemical energy to electrical energy describes a cell or battery. So row **(D)** is wrong; the other three conversions are correctly stated.

13. Answer: (B) Concentric circles around the wire, getting weaker farther away

The field lines form **concentric circles centred on the wire**, and they are drawn farther apart as the distance grows because the field weakens. The right-hand thumb rule gives the anticlockwise sense shown here for current coming out of the page.

14. Answer: (C) Electrical energy into mechanical energy

A current-carrying coil placed in a magnetic field experiences a force that turns it, so a motor converts **electrical energy into mechanical energy**. A generator performs the reverse conversion.

15. Answer: (D) Vegetable peels

Vegetable peels are broken down by bacteria and fungi into simpler substances that return to the soil. Plastic, aluminium and glass resist such decomposition and persist in the environment for a very long time.

16. Answer: (A) Both A and R are true and R is the correct explanation of A

Current needs a potential difference to drive it. The bird's feet touch the same wire a few centimetres apart, so the potential difference between them is tiny and almost no current passes through its body. Both statements are true and the second is exactly **why** the bird is safe — touching a second wire or the ground would be fatal.

17. Answer: (A) ₹150

The bulb uses $0.1 \text{ kW} \times 10 \text{ h} = 1 \text{ kWh}$ a day, so in 30 days it consumes 30 kWh. At ₹5 per unit the cost is $30 \times 5 =$ **₹150**.

18. Answer: (B) 100 J

Only about a tenth of the energy passes to the next trophic level, the rest being lost as heat and used in life processes. So the deer receive about 1000 J and the tiger about **100 J**. This steep loss is why food chains rarely have more than four or five links.