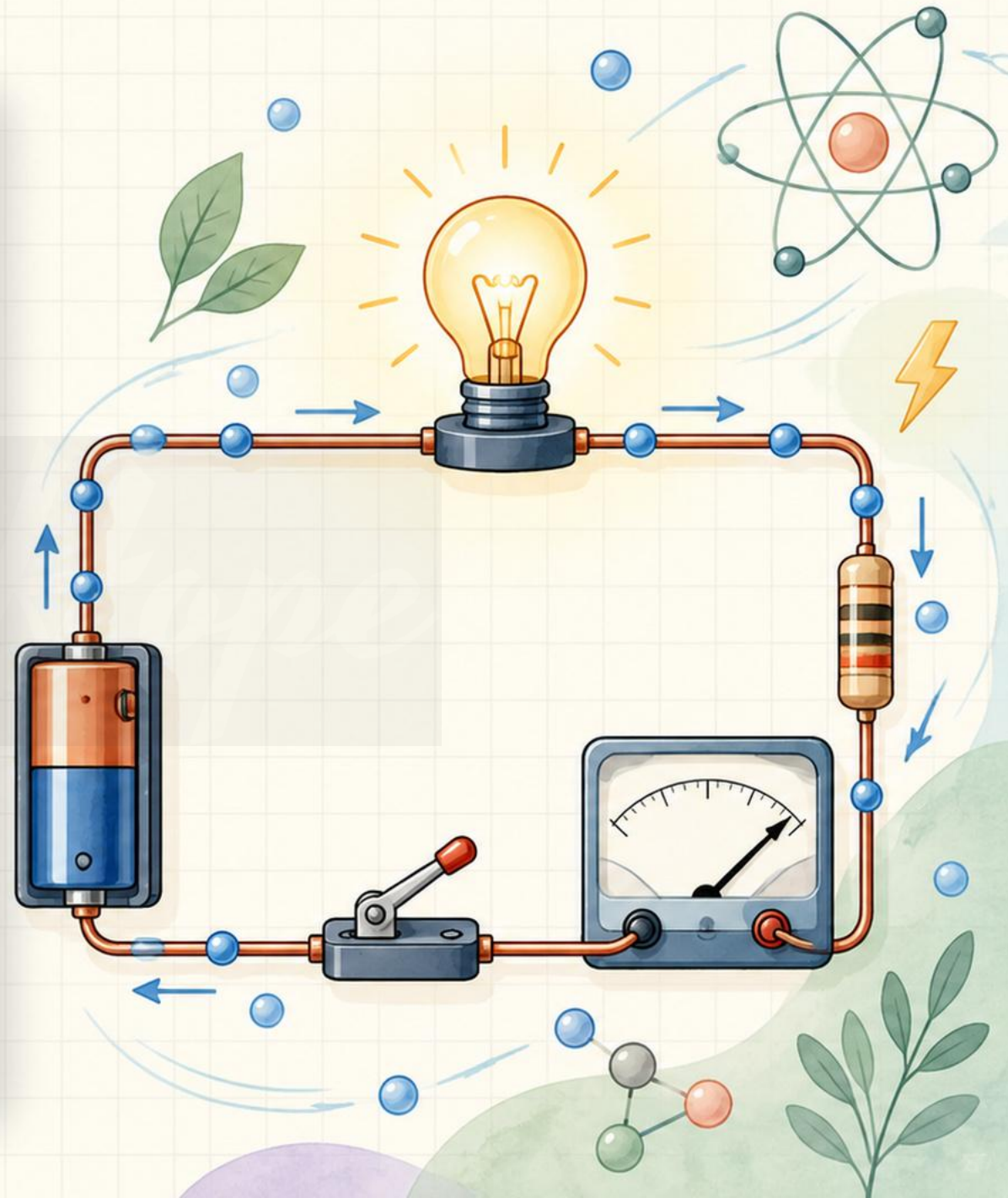


SCIENCE • CLASS 10

CHAPTER 11

Electricity

NCERT SOLUTIONS



CUT WIRE IN PARALLEL

Exercise 1

A wire is cut into five equal parts, which are connected in parallel. Find the ratio of the original resistance to the new resistance.

Original resistance: R ; new resistance: R'

Required ratio: R/R'

(a) $1/25$

(b) $1/5$

(c) 5

(d) 25

Resistance is proportional to length for the same material and cross-section.

Resistance of each piece = $R/5$

For five identical pieces in parallel:

$$1/R' = 5/(R/5) = 25/R$$

$$R' = R/25$$

$$R/R' = 25$$

Answer: (d) 25.

POWER EXPRESSIONS AND VOLTMETER

Exercise 2 — Which expression does not represent electrical power?

(a) $I^2 R$

(b) IR^2

(c) VI

(d) V^2/R

$$P = VI = I^2 R = V^2/R$$

Answer: (b) IR^2 .

Exercise 5 — How is a voltmeter connected to measure the potential difference between two points?

Answer: In parallel across the two points.

Its positive terminal is connected towards the higher potential and its negative terminal towards the lower potential.

BULB AT HALF VOLTAGE

Exercise 3 — What power does the bulb described below consume at the new voltage?

Bulb rating: 220 V, 100 W

New voltage: 110 V

(a) 100 W (b) 75 W (c) 50 W (d) 25 W

Using the textbook assumption that resistance stays constant:

$$R = V^2/P = 220^2/100 = 484 \, \Omega$$

At 110 V:

$$P' = V'^2/R = 110^2/484 = 25 \, \text{W}$$

Answer: (d) 25 W.

A real incandescent filament's resistance changes with temperature;
this calculation uses the stated model.

HEAT IN SERIES AND PARALLEL

Exercise 4 — Two wires have the same material, length and diameter. Compare heat produced in series and parallel across the same voltage for the same time.

(a) 1 : 2

(b) 2 : 1

(c) 1 : 4

(d) 4 : 1

Solution: Let each wire have resistance r .

$$R_s = 2r; \quad R_p = \frac{r}{2}$$

We know that heat produced, $H = \frac{V^2 t}{R}$

$$\text{Therefore, } \frac{H_s}{H_p} = \frac{R_p}{R_s} = \frac{(r/2)}{2r} = \frac{1}{4}$$

Answer: (c) 1 : 4.

At fixed voltage and time, the lower-resistance parallel arrangement produces more heat.



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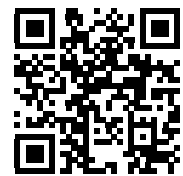


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