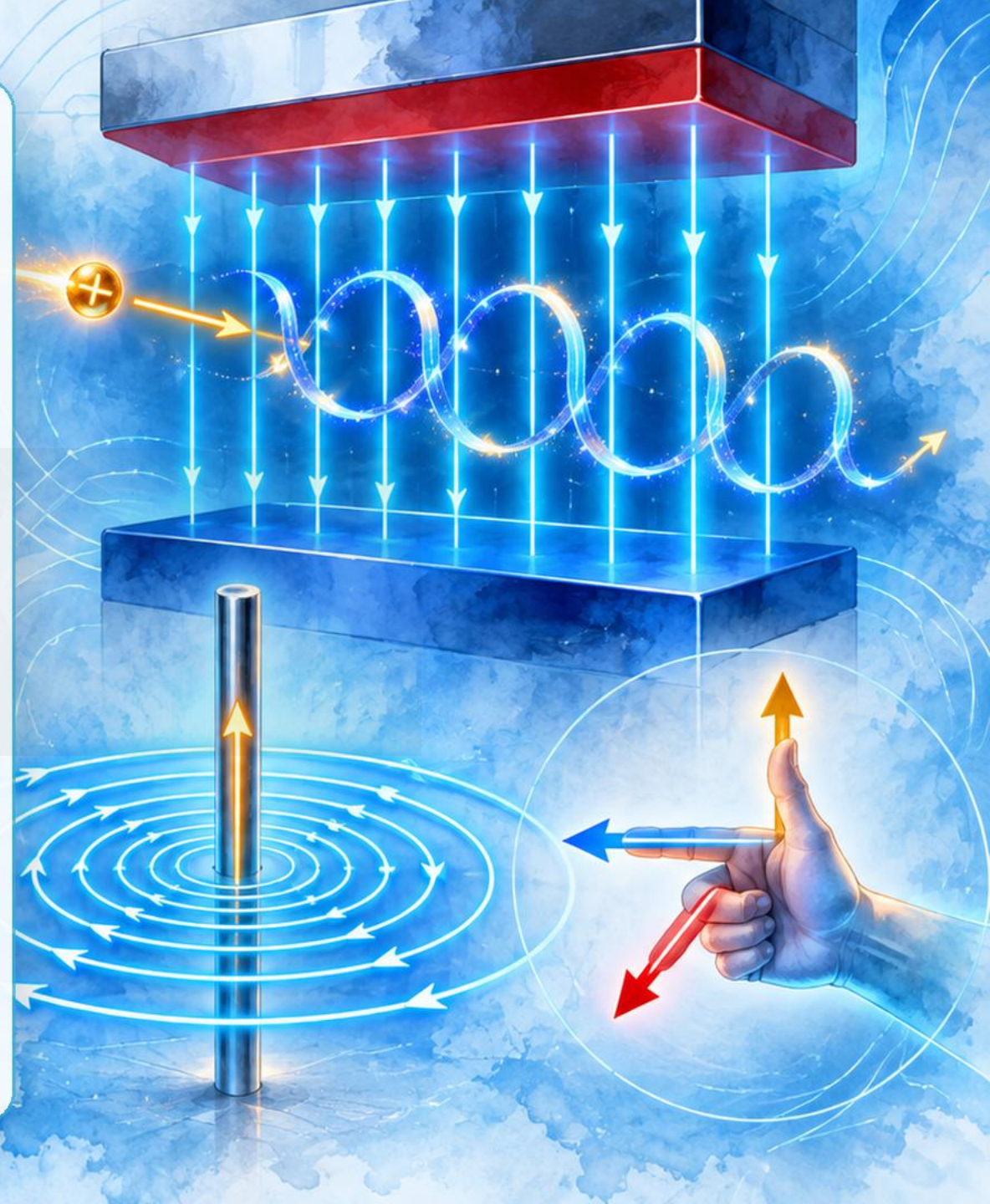


PHYSICS • CLASS 12

CHAPTER 4

# Moving Charges and Magnetism

NCERT SOLUTIONS



## FIELD AT A COIL CENTRE — EXERCISE 4.1

Q. A circular coil has 100 turns, each of radius 8.0 cm, and carries 0.40 A. Find the magnitude of the magnetic field at its centre.

Answer: The magnetic fields of all the turns add at the centre.

$$N = 100$$

$$r = 0.080 \text{ m}$$

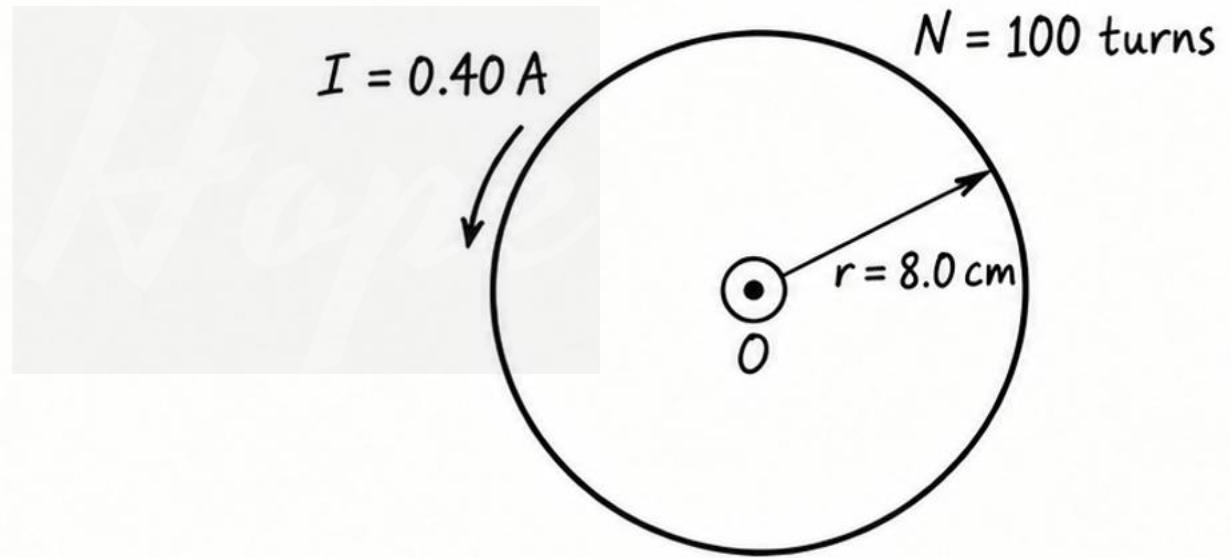
$$I = 0.40 \text{ A}$$

$$\mu_0 = 4\pi \times 10^{-7} \text{ T m A}^{-1}$$

$$B = \frac{\mu_0 NI}{2r}$$

$$B = \frac{(4\pi \times 10^{-7})(100)(0.40)}{2(0.080)}$$

$$B = \pi \times 10^{-4} \text{ T} \approx 3.14 \times 10^{-4} \text{ T}.$$



The field is perpendicular to the plane of the coil. Direction shown is for the chosen anticlockwise current.

## FIELD OF A STRAIGHT WIRE — EXERCISE 4.2

Q. A long straight wire carries 35 A. Find the magnitude of the magnetic field at a point 20 cm from the wire.

Answer: Use the perpendicular distance from the wire.

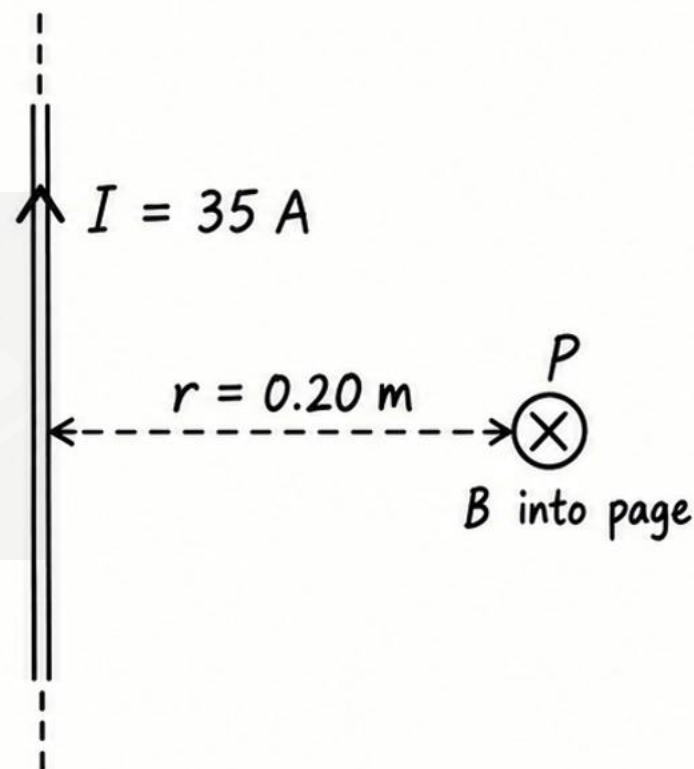
$$I = 35 \text{ A}$$

$$r = 20 \text{ cm} = 0.20 \text{ m}$$

$$B = \frac{\mu_0 I}{2\pi r}$$

$$B = \frac{(4\pi \times 10^{-7})(35)}{2\pi(0.20)}$$

$$B = 3.5 \times 10^{-5} \text{ T} = 35 \mu\text{T}$$



The right-hand thumb rule gives the field direction; its magnitude is the value calculated above.

## FIELD EAST OF A WIRE – EXERCISE 4.3

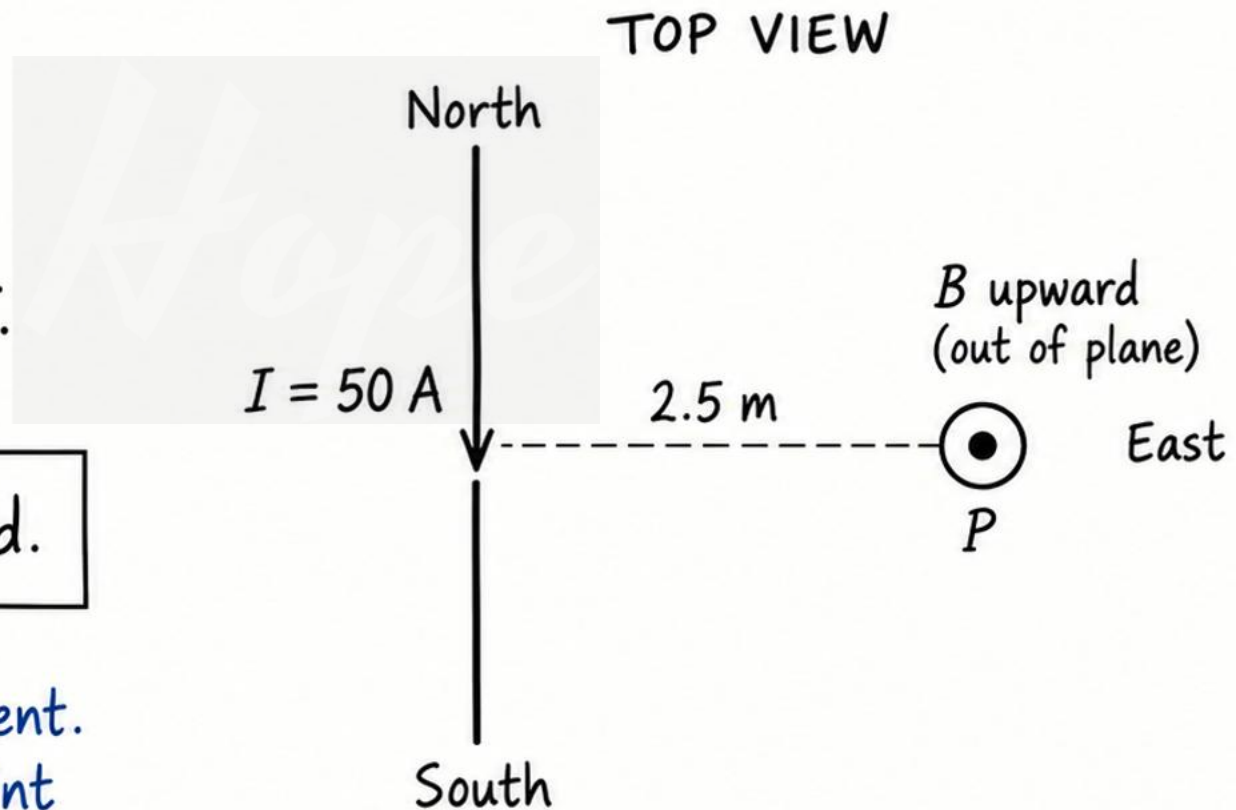
**Q.** A long straight horizontal wire carries 50 A from north to south. Find the magnitude and direction of the magnetic field at a point 2.5 m east of the wire.

Answer:  $B = \frac{\mu_0 I}{2\pi r}$ .

$$B = \frac{(4\pi \times 10^{-7})(50)}{2\pi(2.5)} = 4.0 \times 10^{-6} \text{ T.}$$

$B = 4.0 \times 10^{-6} \text{ T, vertically upward.}$

Point the right thumb south, along the current. At the eastern point, the curled fingers point vertically upward.



## FIELD BELOW A POWER LINE – EXERCISE 4.4

Q. A horizontal overhead power line carries 90 A from east to west. Find the magnitude and direction of its magnetic field 1.5 m below the line.

Answer:

$$I = 90 \text{ A}$$

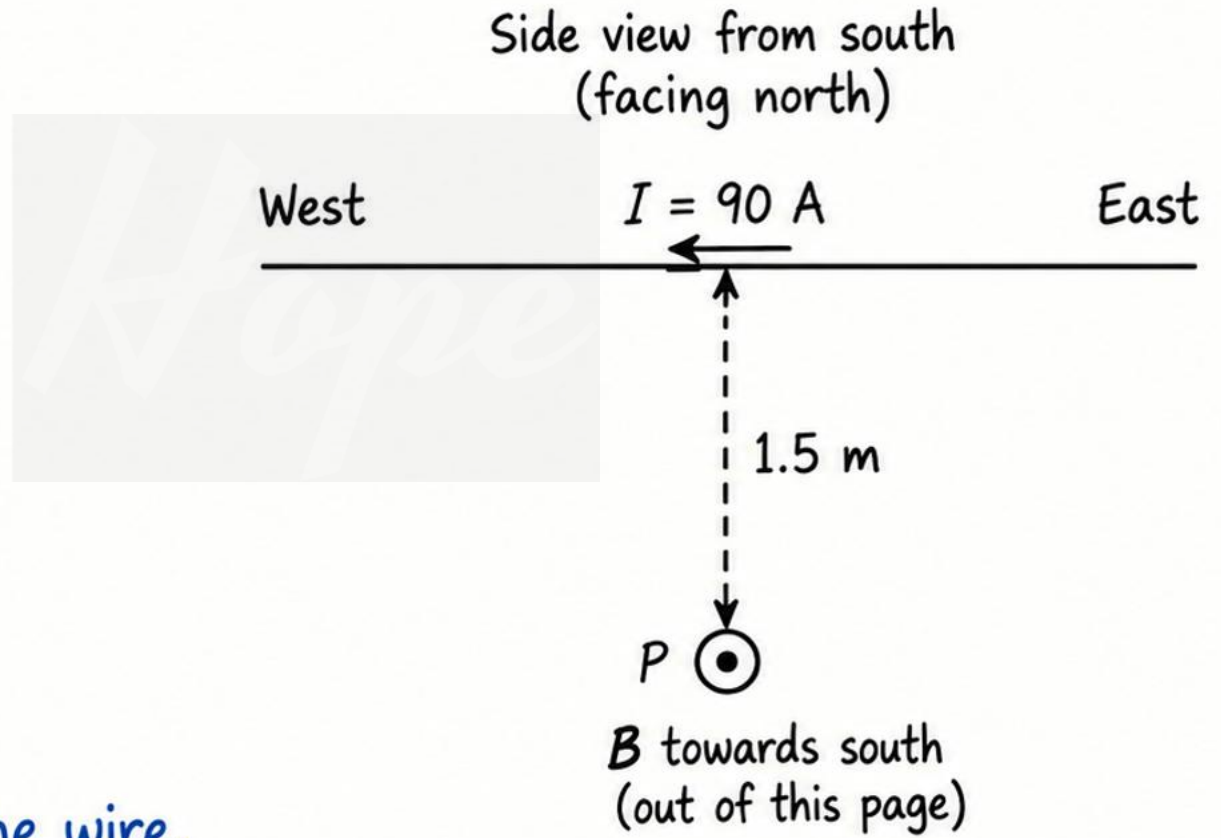
$$r = 1.5 \text{ m}$$

$$B = \frac{\mu_0 I}{2\pi r} = \frac{(4\pi \times 10^{-7})(90)}{2\pi(1.5)}.$$

$$B = 1.2 \times 10^{-5} \text{ T}.$$

$B = 1.2 \times 10^{-5} \text{ T, towards south.}$

Point the right thumb west. Directly below the wire, the curled fingers point south.



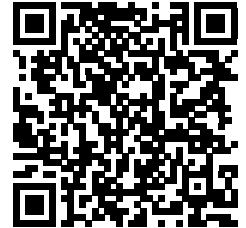


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