

Chapter 8 — Magnetism

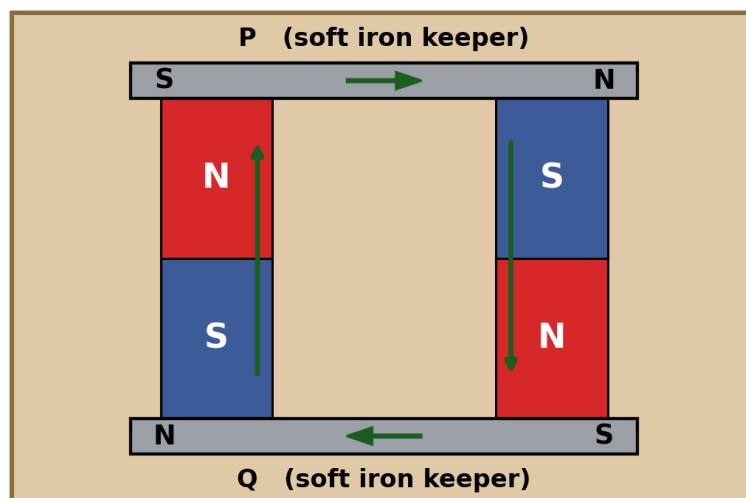
Constructed Response Questions (with Answers)

Class 9 Physics (New Syllabus) — Board Level

Q 8.1. Two bar magnets are stored in a wooden box. Label the poles of the magnets and identify P and Q objects.

Ans: The magnets are stored with unlike poles side by side: the left magnet has N at the top and S at the bottom, and the right magnet has S at the top and N at the bottom. P and Q are soft iron bars called keepers. Magnetism is induced in them, so a closed magnetic path is completed and the magnets do not weaken while stored.

Q 8.1 Two bar magnets stored in a wooden box



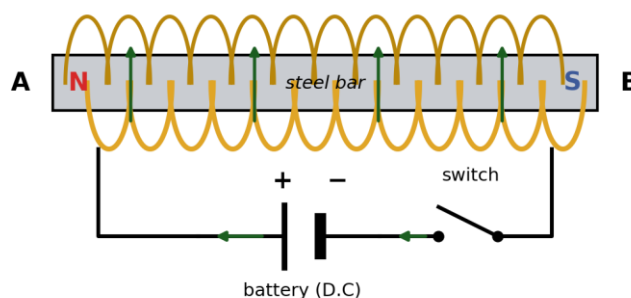
Unlike poles are placed side by side and the keepers complete a closed magnetic path, so the magnets do not weaken themselves while stored.

Q 8.2. A steel bar has to be magnetised by placing it inside a solenoid such that end A becomes N-pole and end B becomes S-pole. Draw circuit diagram of solenoid showing steel bar inside it.

Ans: The steel bar is placed inside a solenoid of several hundred turns and direct current is passed through it from a battery. By the right hand grip rule, the current must be sent so that the curled fingers give the thumb pointing towards A. End A then becomes the N-pole and B the S-pole. A.C must not be used, as it would demagnetise the bar.

Q 8.2 Magnetising a steel bar inside a solenoid (A = N-pole, B = S-pole)

on the near side of the turns the current flows UPWARD

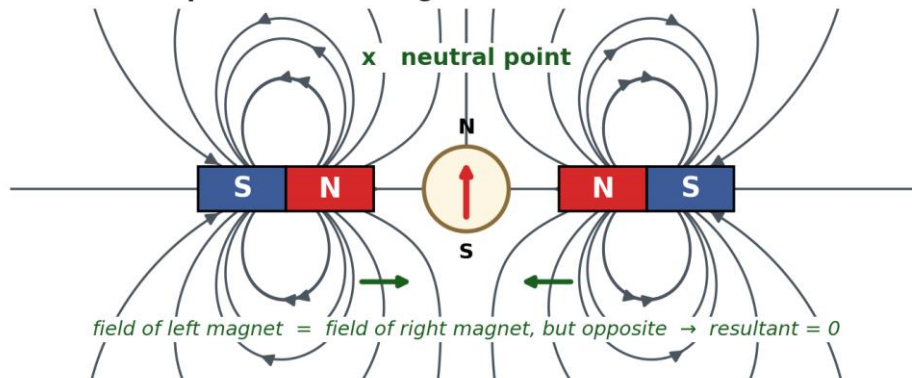


Right hand grip rule: fingers curl along the current, thumb points towards A → end A becomes the N-pole

Q 8.3. Two bar magnets are lying as shown in the figure. A compass is placed at the middle of the gap. Its needle settles in the north-south direction. Label N and S poles of the magnets. Justify your answer by drawing field lines.

Ans: The needle settles north-south, which means the resultant field of the two magnets at that point is zero. Such a point is a neutral point, and it can occur only when like poles face the gap. So both inner ends are N-poles and both outer ends are S-poles. The field of one magnet at the mid-point is equal and opposite to that of the other, so they cancel.

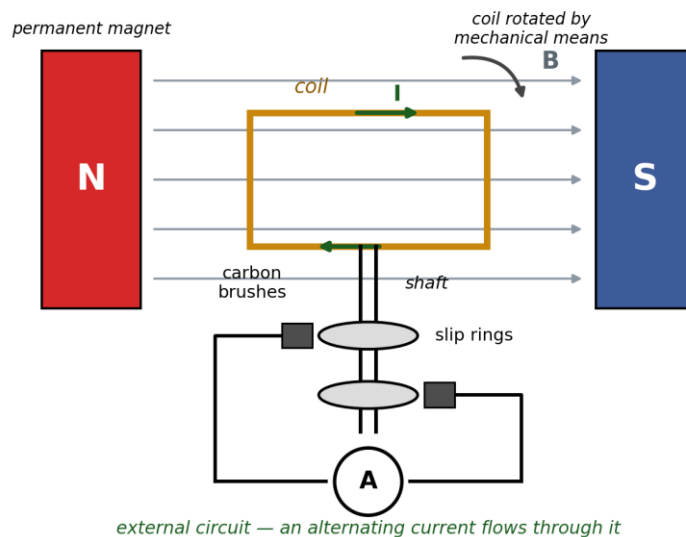
Q 8.3 Like poles face the gap → the mid-point is a neutral point, so the compass settles along the earth's north-south direction



Q 8.4. Electric current or motion of electrons produce magnetic field. Is the reverse process true, that is the magnetic field gives rise to electric current? If yes, give an example and describe it briefly.

Ans: Yes, a changing magnetic field produces an electric current. The example is the A.C generator, in which a coil is rotated between the poles of a permanent magnet. As the coil turns, the magnetic field through it keeps changing and an emf is induced across its ends. When these ends are joined to an external circuit through slip rings and brushes, an alternating current flows.

Q 8.4 A.C generator — the changing magnetic field through the rotating coil induces an emf, so a magnetic field gives rise to an electric current



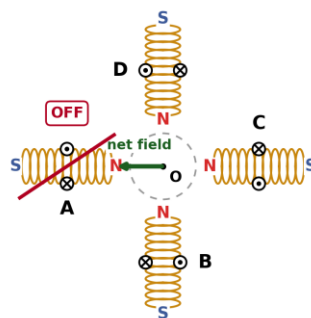
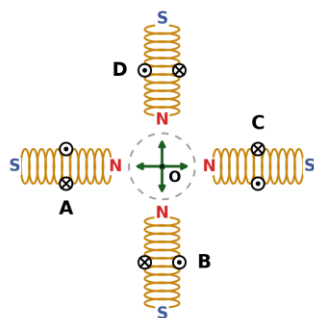
Q 8.5. Four similar solenoids are placed in a circle. Show by diagram, the direction of current in each solenoid such that when current in any one solenoid is switched OFF, the net magnetic field at the centre O is directed towards that solenoid. Explain your answer.

Ans: The current in each solenoid is sent so that, by the right hand grip rule, the thumb points towards O; that is, every solenoid has its N-pole facing O. The field each one produces at O then points away from itself, so A cancels C and B cancels D, and the net field at O is zero. When A is switched OFF, nothing is left to cancel its share, so the resultant points towards A.

Q 8.5 Four similar solenoids placed in a circle

All four ON — every solenoid has its N-pole facing O,
so the four fields at O cancel: net field = 0

A switched OFF — nothing is left to cancel A's share,
so the resultant at O points TOWARDS A



⊙ current out of the page ⊗ current into the page. In every solenoid the current is sent so that, by the right hand grip rule, the thumb points towards O.