



2025 Sec 4 Physics Assignment 17 Magnetism - Answers

Problem solving approach

- Consider the nature of the **materials** used: permanent magnet or magnetic material.
- Consider **processes** of magnetisation, magnetic induction, magnetic screening (or shielding).
- Apply **law** of magnetism where relevant.

1(a) No.

At least one piece must be a permanent magnet and the other could be a magnet or could be made of a magnetic material such as soft iron. A magnet always induces an unlike pole in the magnetic material such that only attraction can occur.

(b) Yes.

They must have like poles facing each other for repulsion. Since only magnets have permanent poles, both pieces of metal must be permanent magnets.

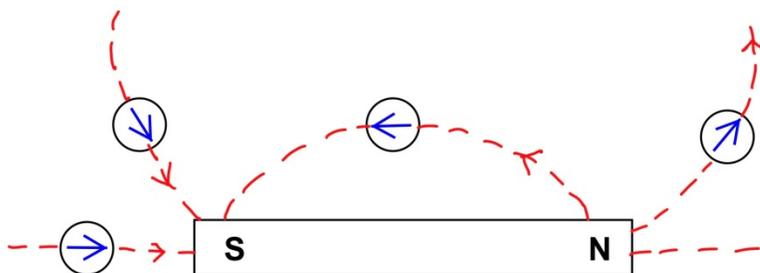
2(a) The ring must be made of a magnetic material.

When the bar magnet is brought near to the ring, an unlike pole is induced on the left side of the ring, which would be a south pole. Since unlike poles attract, the ring is attracted to the bar magnet.

(b) A possible material is (soft) iron.

Since the ring is attracted, an unlike pole is induced on the right side of the ring, which would be a south pole. Since the poles have changed, the magnetic material does not retain magnetism.

3 **Approach:** *trace the direction of the magnetic field lines around the bar magnet to pass through each compass.*



4(a) Arctic: magnetic south pole; Antarctic: magnetic north pole

(b) Although the earth is a giant magnet, the strength of its magnetic field is very weak. The magnetic force is much smaller than the gravitational force, hence the net force is towards the ground.

Note:

- *The magnetic field of the earth is only about 1/2000 of that between the poles of a horseshoe magnet. Therefore, objects on the earth are attracted more strongly by the gravitational force as compared to the magnetic force.]*

5(a) Electromagnet.

(b) Any one of the advantages below.

- Since the magnetism of an electromagnet can be switched on and off, the position to collect and release the iron objects can be varied.
- Identification of iron objects is accurate and fast since only iron objects are automatically attracted.

(c) Any one of the following:

- Any modification to increase the current in the coil
 - Increase the voltage of the power supply to increase the current in the coil
 - Use a coil of lower resistance/use thicker wire to make the coil, to increase the current in the coil
- Use a coil with more turns (or more loops).