



## 2024 Sec 4 Physics Assignment 18 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 opposite pole in the magnetic material such that only attraction can occur.

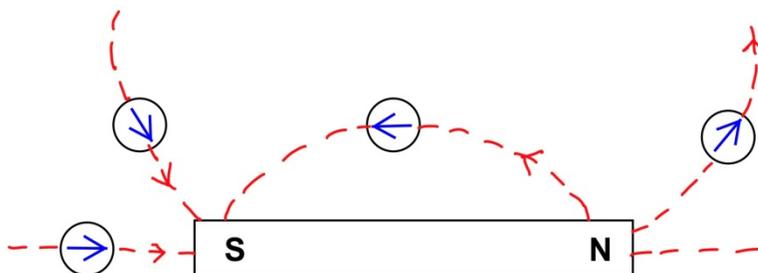
(b) Yes.

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

2. When the bar magnet is brought near to the iron ring, the left side of the iron ring develops an induced South pole.

Since unlike poles attract, the iron ring will be attracted to the bar magnet.

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, (so the magnetic force is much smaller than the gravitational force/ frictional force on such objects).

### **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) an electromagnet.

(b)

- It is because the magnetism of an electromagnet can be switched on and off.
- When the electromagnet is switched on, it will pick up iron objects. When the electromagnet is switched off, iron objects fall from the electromagnet. This makes disposal of iron objects easy.

(c) Any one of the following:

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