Chapter 4: Exploring Magnets

Exercises — Let Us Enhance Our Learning

Q1 Fill in the blanks: (i) Unlike poles of two magnets _____ each other, whereas like poles _____ each other. (ii) The materials that are attracted towards a magnet are called _____. (iii) The needle of a magnetic compass rests along the _____ direction. (iv) A magnet always has _____ poles.

SOLUTION

(i) Unlike poles attract each other; like poles repel each other.
The chapter states: 'unlike poles of two magnets attract each other' and 'like poles repel each other.'

(ii) Magnetic materials.
The chapter defines: 'The materials which are attracted towards a magnet are called magnetic materials.'

(iii) North-south direction.
The chapter states: 'A freely suspended magnet comes to rest along the north-south direction,' and 'The needle of a magnetic compass indicates the north-south direction.'

(iv) Two poles (North and South).
The chapter states: 'North and South poles always exist in pairs' and 'A single North pole or a South pole cannot exist.'

Answer: (i) attract; repel. (ii) Magnetic materials. (iii) North-south. (iv) Two (North and South).

Q2 State whether the following statements are True (T) or False (F). (i) A magnet can be broken into pieces to obtain a single pole. (ii) Similar poles of a magnet repel each other. (iii) Iron filings mostly stick in the middle of a bar magnet when it is brought near them. (iv) A freely suspended bar magnet always aligns with the north-south direction.

SOLUTION

(i) False.
The chapter states: 'If a magnet is broken into smaller pieces, North and South poles always exist in pairs even in the smallest piece of the magnet. A single North pole or a South pole cannot exist.'

(ii) True.
The chapter states: 'like poles, that is, either the North poles or the South poles of both magnets, repel each other.'

(iii) False.
The chapter states: 'maximum iron filings stick near the ends of the bar magnet, while a very few iron filings stick at the remaining part of the magnet.' The ends (poles) attract most, not the middle.

(iv) True.
The chapter states: 'A freely suspended magnet comes to rest along the north-south direction.'

Answer: (i) False. (ii) True. (iii) False. (iv) True.

Q3 Column I shows different positions in which one pole of a magnet is placed near that of the other. Column II indicates the resulting interaction. Fill in the blanks. Column I: N–N, N–?, S–N, ?–S. Column II: (blank), Attraction, (blank), Repulsion.

SOLUTION

Rule from the chapter: Like poles repel; unlike poles attract.

N–N → Repulsion (like poles).
N–? → Attraction, so the missing pole must be S (unlike poles attract); fill: N–S.
S–N → Attraction (unlike poles).
?–S → Repulsion, so the missing pole must be S (like poles repel); fill: S–S.

Answer: N–N: Repulsion. N–S: Attraction. S–N: Attraction. S–S: Repulsion.

Q4 Atharv rolled a bar magnet over a heap of steel U-clips (Fig. 4.15). The positions A, B, and C are along the magnet. Which option from Table 4.3 (number of pins at each position) is likely to be his observation? Options: (i) A=10, B=2, C=10; (ii) A=10, B=10, C=2; (iii) A=2, B=10, C=10; (iv) A=10, B=10, C=10.

SOLUTION

The chapter states: 'maximum iron filings stick near the ends of the bar magnet, while a very few iron filings stick at the remaining part of the magnet.'
Positions A and C are the two ends (poles) of the bar magnet; position B is the middle.
Therefore, the poles at A and C attract the most clips (10 each), while the middle

B attracts very few (2).

This matches option (i): A=10, B=2, C=10.

Answer: Option (i): A = 10, B = 2, C = 10. The poles at both ends attract the most clips; the middle attracts very few.

Q5 Reshma bought three identical metal bars. Two are magnets and one is just a piece of iron. How will she identify which two are magnets (without using any other material)?

SOLUTION

The chapter states: 'a magnet can be identified by its property of repulsion.'

Method:

Step 1: Pick any two bars — call them X and Y. Bring one end of X near each end of Y.

Step 2: If they repel at some position, both X and Y are magnets (repulsion only happens between two magnets).

Step 3: If X and Y attract at both ends but never repel, one of them is the iron bar. Then test X against the third bar Z. If X and Z repel, X and Z are the two magnets.

Key principle: An iron bar is attracted to both poles of a magnet but never causes repulsion. Two magnets will repel when like poles face each other.

By testing pairs until repulsion is observed, the two magnets are identified.

Answer: Test pairs for repulsion. Two bars that repel each other (when like poles face) are both magnets. The iron bar attracts to magnets but never repels them.

Q6 You are given a magnet which does not have the poles marked. How can you find its poles with the help of another magnet which has its poles marked?

SOLUTION

Use the known magnet (with N and S marked) to test each end of the unknown magnet.

Step 1: Bring the N pole of the known magnet near one end of the unknown magnet.

Step 2: If the unknown magnet's end is attracted, that end is the South pole (unlike poles attract).

Step 3: If the unknown magnet's end repels, that end is the North pole (like poles repel).

Step 4: The other end is the opposite pole.

This works because repulsion is the definitive test for like poles between two magnets.

Answer: Bring the marked N pole near each end of the unknown magnet. The end that repels is the North pole; the end that attracts is the South pole.

Q7 A bar magnet has no markings to indicate its poles. How would you find out near which end its North pole is located without using another magnet?

SOLUTION

The chapter states: 'A freely suspended magnet comes to rest along the north-south direction. The end of the magnet that points towards north direction is called the North pole.'

Method:
Step 1: Tie a thread to the middle of the bar magnet and suspend it freely so it can rotate horizontally.
Step 2: Allow it to come to rest on its own.
Step 3: Using the direction where the Sun rises (East) or sets (West) as a reference, identify the North direction.
Step 4: The end of the freely suspended magnet pointing toward the North is its North pole.

Answer: Suspend the magnet freely by a thread. When it comes to rest, the end pointing toward geographic North is the North pole.

Q8 If the earth is itself a magnet, can you guess the poles of earth's magnet by looking at the direction of the magnetic compass?

SOLUTION

The chapter states: 'A freely suspended magnet rests along the north-south direction because our Earth itself behaves like a giant magnet.'
The North pole of a compass needle points toward geographic North.

Since unlike poles attract, the geographic North of Earth must have the South pole of Earth's magnet (it attracts the North pole of the compass needle).
Similarly, the geographic South of Earth must have the North pole of Earth's magnet.

So: Earth's magnetic South pole is near geographic North, and Earth's magnetic North pole is near geographic South.

Answer: Yes. Since the compass needle's North pole points toward geographic North, Earth's magnetic South pole lies near geographic North, and Earth's magnetic North pole lies near geographic South (unlike poles attract).

Q9 While a mechanic was repairing a gadget using a screwdriver, the steel screws kept falling down. Suggest a way to solve the problem of the mechanic on the basis of what you have learnt in this chapter.

SOLUTION

Steel is a magnetic material (contains iron) — it is attracted to magnets.
The mechanic can magnetise the screwdriver by stroking it with a bar magnet repeatedly in one direction (as described in Activity 4.4 for making an iron needle a magnet).
Once magnetised, the screwdriver tip will attract and hold the steel screws, preventing them from falling.

This applies the chapter's learning: iron/steel objects can be made into magnets, and magnetic materials are attracted to magnets.

Answer: Magnetise the screwdriver by stroking it with a bar magnet. The magnetised tip will attract and hold steel screws so they do not fall.

Q10 Two ring magnets X and Y are arranged as shown in Fig. 4.16. It is observed that magnet X does not move down further. What could be the possible reason? Suggest a way to bring magnet X in contact with magnet Y, without pushing either of the magnets.

SOLUTION

Reason: The facing surfaces (poles) of X and Y are like poles (both N or both S).
The chapter states: 'like poles repel each other.'
This repulsion force balances gravity and keeps X floating above Y without touching it.

To bring X in contact with Y without pushing either magnet:
Flip magnet X (or magnet Y) so that its other pole faces Y. The facing poles will now be unlike (one N, one S), which attract each other. X will move down and

come into contact with Y.

Answer: X floats because like poles of X and Y face each other, causing repulsion. Flip one magnet so unlike poles face — they will attract and X will come into contact with Y.

Q11 Three magnets are arranged on a table in the form of a shape shown in Fig. 4.17. What is the polarity (N or S) at ends 1, 2, 3, 4, and 6 of the magnets? The polarity of end 5 is given as N.

SOLUTION

Rule: The two ends of one bar magnet are always opposite poles. Where two magnets touch, the touching ends must be unlike poles (so they attract and stay together).

Given end 5 = N.
End 6 is the other end of the same magnet as 5, so end 6 = S.
End 4 touches end 5 (N), so end 4 = S. End 3 is the other end of that magnet, so end 3 = N.
End 2 touches end 3 (N), so end 2 = S. End 1 is the other end of that magnet, so end 1 = N.

Answer: 1 = N, 2 = S, 3 = N, 4 = S, 5 = N (given), 6 = S.