Practice Challenge - Objective

Subject: Phy

Topic : Magnetic effects of electric current - Exam Prep 1

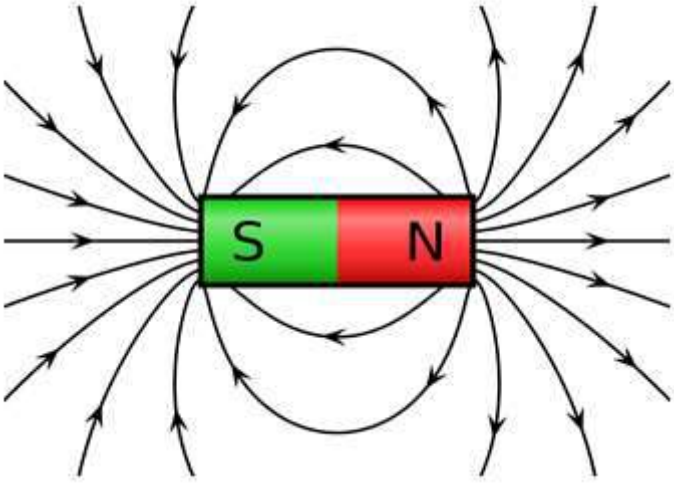
Class: X

Time: 00:20 hrs

1. Consider the following statements and choose the correct option.
1. Magnetic field lines form closed loops.
2. No two field lines intersect

- ✗ **A.** Only 1 is true
- ✗ **B.** Only 2 is true
- ✓ **C.** Both 1 and 2 are true
- ✗ **D.** Both 1 and 2 are false

Magnetic field lines originate from the north pole of a magnet and go to the south pole of the magnet. This is inferred by taking a compass and marking the direction where the compass points at different places around the magnet. When we join the points, the line originates from the north pole and ends in the south pole. Inside the magnet, the magnetic field lines go from south pole to the north pole. Hence, they form closed loops.



Also, as we see, no two magnetic field lines intersect.

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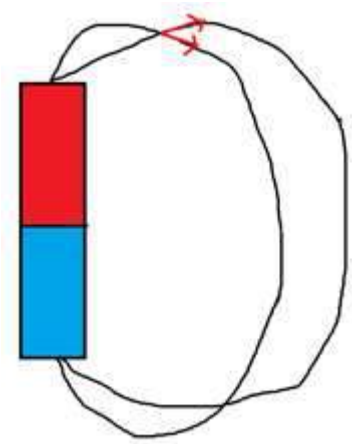

The figure above shows two intersecting field lines. The direction of the field at any point is given by the direction of the tangent drawn on the field line passing through the point. At the point of intersection of two magnetic field lines, two tangents are possible, one on each field line. This would mean that the compass will point at two possible directions at the point of intersection. This is not possible since we know that at a point near the magnet, the compass will point in one direction only. Hence, magnetic field lines don't intersect.

2. Choose the incorrect statement from the following regarding magnetic field lines.

- ✗ **A.** The direction of magnetic field is tangent to the magnetic field line at any point.
- ✗ **B.** Magnetic field lines form closed loops.
- ✓ **C.** If magnetic field lines are parallel, it represents zero field strength.
- ✗ **D.** Magnetic field lines do not intersect each other

Magnetic field lines form closed loops and they do not intersect each other. The direction of magnetic field is tangent to the magnetic field line at any point. If the magnetic field lines are parallel and equidistant, they represent a uniform magnetic field and not a zero field strength.

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3. A compass needle deflects when kept next to an electric wire. The reason for the deflection is:

- ✗ **A.** the charges force the needle into deflecting
- ✓ **B.** the flow of charges have an associated magnetic field
- ✗ **C.** the flow of charges have an associated gravitational field
- ✗ **D.** friction offered by flowing charges

A static charge has an electric field associated with it. A moving charge has a magnetic field associated with it.
Flowing charges constitute an electric current. Now, we know that a current flowing through a conductor has a magnetic field associated with it.
Hence, due to the influence of that magnetic field, the needle of the compass deflects.

4. The spacing between the magnetic field lines _____ as we move away from the current carrying conductor.

- ✓ **A.** Increases
- ✗ **B.** Decreases
- ✗ **C.** Remains unaffected
- ✗ **D.** Increases or decreases depending on the conductor

5. Outside a magnet, the magnetic field lines originate at_____and ends at_____.

- ✓ **A.** north pole, south pole
- ✗ **B.** south pole, north pole
- ✗ **C.** north pole, east pole
- ✗ **D.** north pole, west pole

Magnetic field lines represent the strength of the magnetic field and its direction. Magnetic field lines originate at the north pole and ends at the south pole.

6. The compass is circled around a bar magnet. State at which point around the bar magnet, the compass will show the maximum deflection?

- ✓ **A.** Near the poles
- ✗ **B.** Halfway between south pole and north pole
- ✗ **C.** Near the north pole only
- ✗ **D.** Near the south pole only

The magnetic field is stronger near the poles. So, the compass will deflect the most near the poles: north and south.

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7. In which direction does the magnetic field lines run inside a bar magnet?

- ✗ **A.** From north to south
- ✓ **B.** From south to north
- ✗ **C.** There are no magnetic field lines inside a bar magnet
- ✗ **D.** The field lines runs perpendicular to the north-south direction.

Outside a bar magnet the magnetic field lines run from north to south pole and as they form a closed loop so inside they run from south to north pole.

8. The direction of magnetic lines of force produced by passing a direct current in a straight conductor are :

- ✗ **A.** Perpendicular to the conductor & coming outwards
- ✗ **B.** Parallel to conductor
- ✓ **C.** Surrounding the conductor and of circular nature
- ✗ **D.** Perpendicular to the conductor & coming inwards

The magnetic filed lines due to a wire are produced along a plane parallel to it. They form a closed circular loop with the current-carrying wire along the axis of the loop.

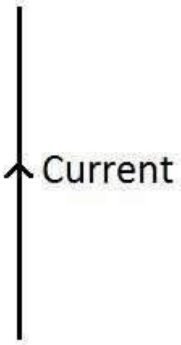
9. On which of the following factor, the direction of deflection of a magnetic needle of a compass depends when the compass is kept near a current carrying wire?

- ✔ **A.** Direction of current flowing.
- ✘ **B.** Magnitude of current flowing.
- ✘ **C.** Size of magnetic needle.
- ✘ **D.** Size of the battery.

When a current flows through a wire, magnetic field will be produced around it. So, when a compass is kept near the wire, the magnetic needle of the compass gets deflected.

Now, the direction in which the needle deflects depend on the direction of current in the wire. The direction of deflection can be verified using the right hand thumb rule.

10. There is a straight wire carrying current as shown in the figure. What is the direction of the magnetic field around the wire when the reference point is above the wire?



- ✗ **A.** Clockwise direction along the circle encircling the wire.
- ✓ **B.** Anti-clockwise direction along the circle encircling the wire.
- ✗ **C.** In the direction of the current.
- ✗ **D.** Opposite to the direction of the current.

The direction of the magnetic field can be determined by right-hand thumb rule - "When the thumb points in direction of the current, the direction of curling of fingers will give the direction of magnetic field."

So, in the current situation, the direction of the magnetic field is in anti-clockwise direction as observed from the reference point that lies above.