

Magnetism and Matter

Assertion & Reason Type Questions

Directions: In the following questions, a statement of Assertion (A) is followed by a statement of Reason (R). Mark the correct choice as:

- a. Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).
- b. Both Assertion (A) and Reason (R) are true but Reason (R) is not the correct explanation of Assertion (A).
- c. Assertion (A) is true but Reason (R) is false.
- d. Both Assertion (A) and Reason (R) are false.

Q1. Assertion (A): Gauss's law of magnetism is different from that for electrostatics.

Reason (R): Isolated magnetic poles are not known to exist.

Answer : (a) Gauss's law of magnetism is different from that for electrostatics because electric charges do not necessarily exist in pairs but magnetic monopoles do not exist.

Q2. Assertion (A): The poles of magnet cannot be separated by breaking into two pieces.

Reason (R): The magnetic moment will be reduced to half when a magnet is broken into two equal pieces.

Answer : (b) As we know every atom of a magnet acts as a dipole. So, poles cannot be separated. When magnet is broken into two equal pieces, magnetic moment of each part will be half of the original magnet.

Q3. Assertion (A): In water, value of magnetic field decreases.

Reason (R): Water is a diamagnetic substance.

Answer : (a) Water is a diamagnetic substance. The relative permeability of water is less than 1.

Therefore, the magnetic field intensity decreases in water.

Q4. Assertion (A): The ability of a material to permit the passage of magnetic lines of force through it is called magnetic permeability.



Reason (R): For a perfect diamagnetic substance, permeability is always one.

Answer : (c) For a perfectly diamagnetic substance,

$$B = \mu_0 (H + I) = 0 \quad \therefore I = -H$$

Therefore, $\chi_m = \frac{I}{H} = -1$

Therefore relative permeability,

$$\mu_r = 1 + \chi_m = 1 - 1 = 0$$

$\therefore \mu = \mu_0 \mu_r = \text{zero}$

i.e., for a perfect diamagnetic material, permeability is zero.

Q5. Assertion: We cannot think of a magnetic field configuration with three poles

Reason: A bar magnet does exert a torque on itself due to its own field.

Q6. Assertion: In high latitudes one sees colourful curtains of light hanging down from high altitudes

Reason: The high energy charged particles from the sun are deflected to polar regions by the magnetic field of the earth.

Q7. Assertion: The true geographic north direction is found by using a compass needle.

Reason: The magnetic meridian of the earth is along the axis of rotation of the earth.

Q8. Assertion: A disc-shaped magnet is deviated above a superconducting material that has been cooled by liquid nitrogen.

Reason: Superconductors repel a magnet.

Q9. Assertion: Magnetic Resonance Imaging (MRI) is a useful diagnostic tool for producing images of various parts of human body.

Reason: Protons of various tissues of the human body play a role in MRI.

Q10. Assertion: Diamagnetic materials can exhibit magnetism.

Reason: Diamagnetic materials have permanent magnetic dipole moment.

Q11. Assertion: Ferro-magnetic substances become paramagnetic above Curie temp.

Reason: Domains are destroyed at high temperature.

Q12. Assertion: If a compass needle be kept at magnetic north pole of the earth the compass needle may stay in any direction.

Reason: Dip needle will stay vertical at the north pole of earth



Q13. Assertion: The ferromagnetic substance do not obey Curie's law.

Reason: At Curie point a ferromagnetic substance start behaving as a paramagnetic substance.

Q14. Assertion: The ferromagnetic substance do not obey Curie's law.

Reason: At Curie point a ferromagnetic substance start behaving as a paramagnetic substance.

Q15. Assertion: A paramagnetic sample display greater magnetisation (for the same magnetic field) when cooled.

Reason: The magnetisation does not depend on temperature.

Q16. Assertion: Electromagnetic are made of soft iron.

Reason: Coercivity of soft iron is small.

Q17. Assertion: The sensitivity of a moving coil galvanometer is increased by placing a suitable magnetic material as a core inside the coil.

Reason: Soft iron has high magnetic permeability and cannot be easily magnetized or demagnetized.

Q18. Assertion: The poles of magnet can not be separated by breaking into two pieces.

Reason: The magnetic moment will be reduced to half when a magnet is broken into two equal pieces.

ANSWER KEY 5 to 18

Q5 : (d)

Q6 : (a)

Q7 : (d)

Q8 : (a)

Q9 : (a)

Q10 : (c)

Q11 : (a)

Q12 : (b)

Q13 : (b)

Q14 : (c)

Q15 : (d)

Q16 : (b)

Q17 : (c)

Q18 : (b)

