Solution

MAGNETISM AND MATTER

Class 12 - Physics

1. **(a)** Copper
   Explanation:
   as Copper is diamagnetic substance.
2. **(d)** Nickel
   Explanation:
   as Nickel is ferromagnetic substance.
3. **(b)** spin motion of electrons
   Explanation:
   spin motion of electrons
4. **(b)** potential is zero at all points on the right bisector
   Explanation:
   The magnetic potential at any point is the amount of work done in bringing a unit north pole from infinity to that point. At any point on the right bisector, the potentials due to the two poles are equal and opposite.
5. **(c)** 0.6 J/T
   Explanation:
   m = NIA = $800 \times 3 \times 2.5 \times 10^{-4}$ = 0.6 J/T
6. Yes. The magnetisation of a paramagnetic salt decreases with temperature. This is because the tendency to disrupt the alignment of atomic dipoles arising from the thermal random motion increases with the increase in temperature.
7. There will be only one neutral point on the horizontal board. This is because the field of the earth is from south to north; and the field of the pole on the board is radially outwards. At any point towards the south of the magnetic pole, a field of earth and field of the pole will cancel out to give a neutral point.
8. The induced dipole moment in a diamagnetic sample is always opposite to the magnetising field, no matter what the internal motion of the atom.
9. Torque, τ = mB sin θ
10. For diamagnetic substances, μ_r < 1
    For paramagnetic substances, μ_r > 1
    For ferromagnetic substances, μ_r >> 1
11. **(c)** Assertion is correct statement but reason is wrong statement.
    Explanation:
    Assertion is correct statement but reason is wrong statement.
12. **(a)** Both A and R are true and R is the correct explanation of A.
    Explanation:
    In case of the electric field of an electric dipole, the electric lines of force originate from positive charge and end at negative charge. Since isolated magnetic lines are closed continuous loops extending through out the body of the magnet.
13. **(a)** Both A and R are true and R is the correct explanation of A.
    Explanation:

Let us consider an electric dipole. The electric lines of force exist outside only and not inside the dipole.
Let us take a magnetic dipole. The magnetic lines of force exist outside as well as inside the dipole.
So, it can be said that magnetic lines of force are continuous and electric lines of force are discontinuous.
So, assertion and reason both are true and reason explains the assertion too.

14. **(a)** Both A and R are true and R is the correct explanation of A.
Explanation:
Assertion is true since, poles of bar magnet cannot be separated.
The reason is also true since, the magnetic monopoles do not exist. The reason explains the assertions properly.

15.
(d) If both assertion and reason are false.
Explanation:
Magnetic resonance imaging is based on resonance on the nuclear magnetic resonance of protons. Therefore, both assertion and reason are correct.

16. State True or False:

(i) **(a)** True
Explanation: {
True

(ii) **(a)** True
Explanation: {
True

(iii) **(a)** True
Explanation: {
True

(iv) **(a)** True
Explanation: {
True

(v) **(a)** True
Explanation: {
True

17. Fill in the blanks:

(i) 1. Maximum
(ii) 1. Coercive
(iii) 1. Ampere metre
(iv) 1. Paramagnetic
(v) 1. Coercivity

18. **Read the text carefully and answer the questions:**
The field of a hollow wire with a constant current is homogeneous. Curves in the graph shown give, as functions of radius distance r, the magnitude B of the magnetic field inside and outside four long wires a, b, c and d, carrying currents that are uniformly distributed across the cross-sections of the wires. Overlapping portions of the plots are indicated by double labels.

(i) **(c)** a
Explanation:
It can be seen that slop of curve for wire a is greater than wire c.

(ii) **(a)** less than in wire c

Explanation:

Inside the wire

B(r) = $\frac{\mu_0}{2\pi}\frac{I}{R^2}r \Rightarrow \frac{dB}{dr} = \frac{\mu_0}{2\pi}\frac{I}{R^2}r$

i.e., slope $\propto \frac{I}{\pi R^2} \propto$ Current density

(iii) **(b)** c

Explanation:

Wire c has the greatest radius.

(iv) **(d)** zero at any point inside the pipe

Explanation:

zero at any point inside the pipe

(v) **(a)** outside the cable

Explanation:

outside the cable