PHYSICS GURUKUL

DPP - Daily Practice Problems

Chapter-wise Sheets

Date :

Start Time :

End Time :

PHYSICS

CP19

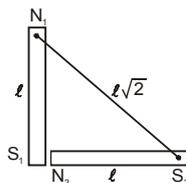**SYLLABUS :** Magnetism and Matter

Max. Marks : 180   **Marking Scheme :** (+4) for correct & (–1) for incorrect answer   **Time : 60 min.**

INSTRUCTIONS : This Daily Practice Problem Sheet contains 45 MCQs. For each question only one option is correct. Darken the correct circle/ bubble in the Response Grid provided on each page.

1. Two identical magnetic dipoles of magnetic moments 1.0 A-m^2 each, placed at a separation of 2 m with their axis perpendicular to each other. The resultant magnetic field at point midway between the dipole is
   (a) 5×10^{-7} T
   (b) $\sqrt{5} \times 10^{-7}$ T
   (c) 10^{-7} T
   (d) 2×10^{-7} T

2. Two identical thin bar magnets each of length ℓ and pole strength m are placed at right angles to each other, with north pole of one touching south pole of the other, then the magnetic moment of the system is
   (a) $1\, m\ell$
   (b) $2\, m\ell$
   (c) $\sqrt{2}\, m\ell$
   (d) $m\ell/2$

3. The magnetic lines of force inside a bar magnet
   (a) are from north-pole to south-pole of the magnet
   (b) do not exist
   (c) depend upon the area of cross-section of the bar magnet
   (d) are from south-pole to north-pole of the magnet

4. Relative permittivity and permeability of a material ε_r and μ_r, respectively. Which of the following values of these quantities are allowed for a diamagnetic material?
   (a) $\varepsilon_r = 0.5$, $\mu_r = 1.5$
   (b) $\varepsilon_r = 1.5$, $\mu_r = 0.5$
   (c) $\varepsilon_r = 0.5$, $\mu_r = 0.5$
   (d) $\varepsilon_r = 1.5$, $\mu_r = 1.5$

5. If the period of oscillation of freely suspended bar magnet in earth's horizontal field H is 4 sec. When another magnet is brought near it, the period of oscillation is reduced to 2s. The magnetic field of second bar magnet is
   (a) 4 H
   (b) 3 H
   (c) 2 H
   (d) $\sqrt{3}$ H

6. Three identical bars A, B and C are made of different magnetic materials. When kept in a uniform magnetic field, the field lines around them look as follows:
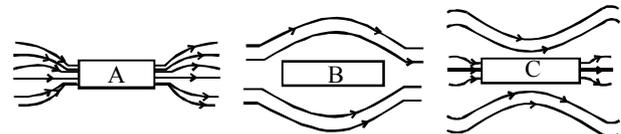
Make the correspondence of these bars with their material being diamagnetic (D), ferromagnetic (F) and paramagnetic (P):
   (a) $A \leftrightarrow D$, $B \leftrightarrow P$, $C \leftrightarrow F$
   (b) $A \leftrightarrow F$, $B \leftrightarrow D$, $C \leftrightarrow P$
   (c) $A \leftrightarrow P$, $B \leftrightarrow F$, $C \leftrightarrow D$
   (d) $A \leftrightarrow F$, $B \leftrightarrow P$, $C \leftrightarrow D$

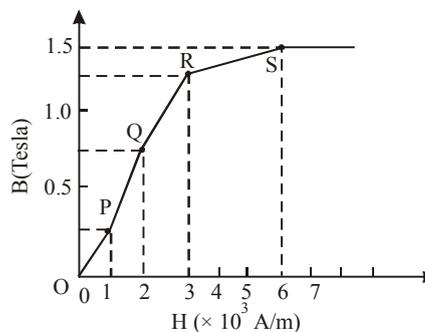| RESPONSE GRID	1. ⓐⓑⓒⓓ	2. ⓐⓑⓒⓓ	3. ⓐⓑⓒⓓ	4. ⓐⓑⓒⓓ	5. ⓐⓑⓒⓓ
	6. ⓐⓑⓒⓓ				

Space for Rough Work

7. Curie temperature is the temperature above which
   (a) a ferromagnetic material becomes paramagnetic
   (b) a paramagnetic material becomes diamagnetic
   (c) a ferromagnetic material becomes diamagnetic
   (d) a paramagnetic material becomes ferromagnetic

8. A watch glass containing some powdered substance is placed between the pole pieces of a magnet. Deep concavity is observed at the centre. The substance in the watch glass is
   (a) iron   (b) chromium   (c) carbon   (d) wood

9. A coil in the shape of an equilateral triangle of side l is suspended between the pole pieces of a permanent magnet such that $\vec{B}$ is in the plane of the coil. If due to a current i in the triangle a torque τ acts on it, the side l of the triangle is

   (a) $\dfrac{2}{\sqrt{3}}\left(\dfrac{\tau}{B.i}\right)^{\frac{1}{2}}$ (b) $2\left(\dfrac{\tau}{\sqrt{3}B.i}\right)^{\frac{1}{2}}$

   (c) $\dfrac{2}{\sqrt{3}}\left(\dfrac{\tau}{B.i}\right)$ (d) $\dfrac{1}{\sqrt{3}}\dfrac{\tau}{B.i}$

10. A compass needle whose magnetic moment is 60 Am², is directed towards geographical north at any place experiencing moment of force of 1.2×10^{-3} Nm. At that place the horizontal component of earth field is 40 micro W/m². What is the value of dip angle at that place?
   (a) 30°   (b) 60°   (c) 45°   (d) 15°

11. The materials suitable for making electromagnets should have
   (a) high retentivity and low coercivity
   (b) low retentivity and low coercivity
   (c) high retentivity and high coercivity
   (d) low retentivity and high coercivity

12. The length of a magnet is large compared to its width and breadth. The time period of its oscillation in a vibration magnetometer is 2s. The magnet is cut along its length into three equal parts and these parts are then placed on each other with their like poles together. The time period of this combination will be

   (a) $2\sqrt{3}$ s   (b) $\dfrac{2}{3}$ s   (c) 2 s   (d) $\dfrac{2}{\sqrt{3}}$ s

13. Hysteresis loops for two magnetic materials A and B are given below :

(A)   (B)
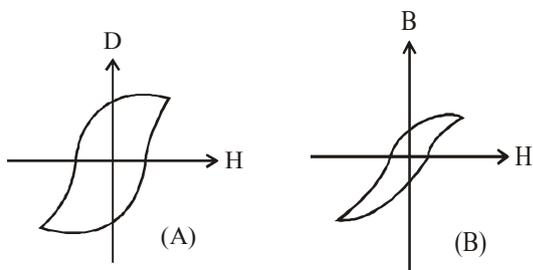
These materials are used to make magnets for elecric generators, transformer core and electromagnet core. Then it is proper to use :
   (a) A for transformers and B for electric generators.
   (b) B for electromagnets and transformers.
   (c) A for electric generators and trasformers.
   (d) A for electromagnets and B for electric generators.

14. Which of the following is responsible for the earth's magnetic field?
   (a) Convective currents in earth's core.
   (b) Diversive current in earth's core.
   (c) Rotational motion of earth.
   (d) Translational motion of earth.

15. In a vibration megnetometer, the time period of a bar magnet oscillating in horizontal component of earth's magnetic field is 2 sec. When a magnet is brought near and parallel to it, the time period reduces to 1 sec. The ratio H/F of the horizontal component H and the field F due to magnet will be
   (a) 3   (b) 1/3   (c) $\sqrt{3}$ (d) $1/\sqrt{3}$

16. Let V and H be the vertical and horizontal components of earth's magnetic field at any point on earth. Near the north pole
   (a) $V \gg H$ (b) $V \ll H$ (c) $V=H$ (d) $V=H=0$

17. A thin circular wire carrying a current I has a magnetic moment M. The shape of the wire is changed to a square and it carries the same current. It will have a magnetic moment

   (a) M (b) $\dfrac{4}{\pi^2}M$ (c) $\dfrac{4}{\pi}M$ (d) $\dfrac{\pi}{4}M$

18. A bar magnet of magnetic moment M is placed at right angles to a magnetic induction B. If a force F is experienced by each pole of the magnet, the length of the magnet will be
   (a) F/MB (b) MB/F (c) BF/M (d) MF/B

19. If the susceptibility of dia, para and ferro magnetic materials are χ_d, χ_p, χ_f respectively, then
   (a) $\chi_d < \chi_p < \chi_f$ (b) $\chi_d < \chi_f < \chi_p$
   (c) $\chi_f < \chi_d < \chi_p$ (d) $\chi_f < \chi_p < \chi_d$

20. The basic magnetization curve for a ferromagnetic material is shown in figure. Then, the value of relative permeability is highest for the point

H ($\times 10^3$ A/m)

   (a) P   (b) Q   (c) R   (d) S

RESPONSE GRID	7. ⓐⓑⓒⓓ	8. ⓐⓑⓒⓓ	9. ⓐⓑⓒⓓ	10. ⓐⓑⓒⓓ	11. ⓐⓑⓒⓓ
	12. ⓐⓑⓒⓓ	13. ⓐⓑⓒⓓ	14. ⓐⓑⓒⓓ	15. ⓐⓑⓒⓓ	16. ⓐⓑⓒⓓ
	17. ⓐⓑⓒⓓ	18. ⓐⓑⓒⓓ	19. ⓐⓑⓒⓓ	20. ⓐⓑⓒⓓ	

**21.** A magnetic needle suspended by a silk thread is vibrating in the earth's magnetic field. if the temperature of the needle is increased by 700°C, then
(a) time period decreases
(b) time period increases
(c) time period remains unchanged
(d) the needle stops vibrating

22. Torques τ_1 and τ_2 are required for a magnetic needle to remain perpendicular to the magnetic fields at two different places. The magnetic fields at those places are B_1 and B_2 respectively; then ratio $\dfrac{B_1}{B_2}$ is

(a) $\dfrac{\tau_2}{\tau_1}$
(b) $\dfrac{\tau_1}{\tau_2}$

(c) $\dfrac{\tau_1 + \tau_2}{\tau_1 - \tau_2}$
(d) $\dfrac{\tau_1 - \tau_2}{\tau_1 + \tau_2}$

23. A bar magnet has a length 8 cm. The magnetic field at a point at a distance 3 cm from the centre in the broad side-on position is found to be 4×10^{-6} T. The pole strength of the magnet is.
(a) 6×10^{-5} Am
(b) 5×10^{-5} Am
(c) 2×10^{-4} Am
(d) 3×10^{-4} Am

24. A vibration magnetometer consists of two identical bar magnets placed one over the other such that they are perpendicular and bisect each other. The time period of oscillation in a horizontal magnetic field is $2^{5/4}$ seconds. One of the magnets is removed and if the other magnet oscillates in the same field, then the time period in seconds is
(a) $2^{1/4}$
(b) $2^{1/2}$
(c) 2
(d) $2^{3/4}$

25. A magnetic needle is kept in a non-uniform magnetic field. It experiences
(a) neither a force nor a torque
(b) a torque but not a force
(c) a force but not a torque
(d) a force and a torque

26. The angle of dip at a place is 37° and the vertical component of the earth's magnetic field is 6×10^{-5}T. The earth's magnetic field at this place is (tan 37° = 3/4)
(a) 7×10^{-5} T
(b) 6×10^{-5} T
(c) 5×10^{-5} T
(d) 10^{-4} T

27. Needles N_1, N_2 and N_3 are made of a ferromagnetic, a paramagnetic and a diamagnetic substance respectively. A magnet when brought close to them will
(a) attract N_1 and N_2 strongly but repel N_3
(b) attract N_1 strongly, N_2 weakly and repel N_3 weakly
(c) attract N_1 strongly, but repel N_2 and N_3 weakly
(d) attract all three of them

28. The figure shows the various positions (labelled by subscripts) of small magnetised needles P and Q. The arrows show the direction of their magnetic moment. Which

configuration corresponds to the lowest potential energy among all the configurations shown ?

(a) PQ_3
(b) PQ_4
(c) PQ_5
(d) PQ_6
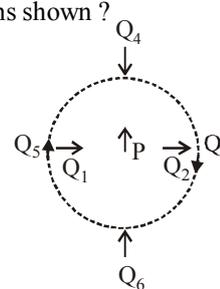
29. A dip needle lies initially in the magnetic meridian when it shows an angle of dip θ at a place. The dip circle is rotated through an angle x in the horizontal plane and then it shows an angle of dip θ′.

Then $\dfrac{\tan\theta'}{\tan\theta}$ is

(a) $\dfrac{1}{\cos x}$
(b) $\dfrac{1}{\sin x}$
(c) $\dfrac{1}{\tan x}$
(d) $\cos x$

30. Two tangent galvanometers having coils of the same radius are connected in series. A current flowing in them produces deflections of 60° and 45° respectively. The ratio of the number of turns in the coils is
(a) 4/3
(b) $\dfrac{\sqrt{3}+1}{1}$
(c) $\dfrac{\sqrt{3}+1}{\sqrt{3}-1}$
(d) $\dfrac{\sqrt{3}}{1}$

31. Following figures show the arrangement of bar magnets in different configurations. Each magnet has magnet ic dipole moment $\vec{m}$. Which configuration has highest net magnetic dipole moment?
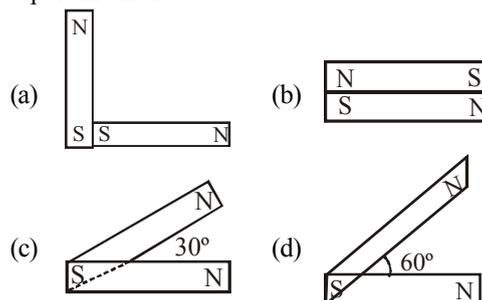

32. A compass needle which is allowed to move in a horizontal plane is taken to a geomagnetic pole. It :
(a) will become rigid showing no movement
(b) will stay in any position
(c) will stay in north-south direction only
(d) will stay in east-west direction only

33. If a magnetic dipole of moment M situated in the direction of a magnetic field B is rotated by 180°, then the amount of work done is
(a) MB
(b) $2MB$
(c) $\dfrac{MB}{\sqrt{2}}$
(d) 0

RESPONSE GRID	21. ⓐⓑⓒⓓ	22. ⓐⓑⓒⓓ	23. ⓐⓑⓒⓓ	24. ⓐⓑⓒⓓ	25. ⓐⓑⓒⓓ
	26. ⓐⓑⓒⓓ	27. ⓐⓑⓒⓓ	28. ⓐⓑⓒⓓ	29. ⓐⓑⓒⓓ	30. ⓐⓑⓒⓓ
	31. ⓐⓑⓒⓓ	32. ⓐⓑⓒⓓ	33. ⓐⓑⓒⓓ		

34. A bar magnet is oscillating in the earth's magnetic field with a period T. What happens to its period of motion, if its mass is quadrupled
(a) motion remains simple harmonic with new period = T/2
(b) motion remains simple harmonic with new period = 2 T
(c) motion remains simple harmonic with new period = 4T
(d) motion remains simple harmonic and the period stays nearly constant

35. The magnetic field of earth at the equator is approximately 4 × 10^{-5} T. The radius of earth is $6.4 × 10^6$ m. Then the dipole moment of the earth will be nearly of the order of:
(a) 10^{23} A m^2 (b) 10^{20} A m^2 (c) 10^{16} A m^2 (d) 10^{10} A m^2

36. The relative permeability of a medium is 0.075. What is its magnetic susceptibility?
(a) 0.925 (b) −0.925 (c) 1.075 (d) −1.075

37. A dip circle is so set that its needle moves freely in the magnetic meridian. In this position, the angle of dip is 40°. Now the dip circle is rotated so that the plane in which the needle moves makes an angle of 30° with the magnetic meridian. In this position, the needle will dip by an angle
(a) 40° (b) 30° (c) more than 40° (d) less than 40°

38. The mid points of two small magnetic dipoles of length d in end-on positions, are separated by a distance x, (x >> d). The force between them is proportional to x^{-n} where n is:
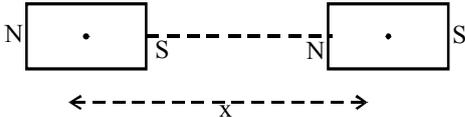
(a) 1 (b) 2 (c) 3 (d) 4

39. At a temperatur of 30°C, the susceptibility of a ferromagnetic material is found to be χ. Its susceptibility at 333°C is
(a) χ (b) 0.5χ (c) 2χ (d) 11.1χ

40. The susceptibility of annealed iron at saturation is 5500. Find the permeability of annealed iron at saturation.
(a) $6.9 × 10^{-3}$ (b) $5.1 × 10^{-2}$ (c) $5 × 10^2$ (d) $3.2 × 10^{-5}$

41. A short magnet oscillates in an oscillation magnetometer with a time period of 0.10s where the earth's horizontal magnetic field is 24 μT. A downward current of 18 A is established in a vertical wire placed 20 cm east of the magnet. Find the new time period.
(a) 0.076 s (b) 0.5 s (c) 0.1 s (d) 0.2 s

42. A permanent magnet in the shape of a thin cylinder of length 10 cm has magnetisation (M) = 10^6 A m^{-1}. Its magnetization current I_M is
(a) 10^5 A (b) 10^6 A (c) 10^7 A (d) 10^8 A

43. The earth's magnetic field lines resemble that of a dipole at the centre of the earth. If the magnetic moment of this dipole is close to $8 × 10^{22}$ A m^2, the value of earth's magnetic field near the equator is close to (radius of the earth = $6.4 × 10^6$ m)
(a) 0.6 Gauss (b) 1.2 Gauss
(c) 1.8 Gauss (d) 0.32 Gauss

44. The coercivity of a small magnet where the ferromagnet gets demagnetized is $3 × 10^3$ A m^{-1}. The current required to be passed in a solenoid of length 10 cm and number of turns 100, so that the magnet gets demagnetized when inside the solenoid, is:
(a) 30 mA (b) 60 mA (c) 3 A (d) 6 A

45. A thin bar magnet of length 2 ℓ and breadth 2 b pole strength m and magnetic moment M is divided into four equal parts with length and breadth of each part being half of original magnet.
Then, the magnetic moment of each part is
(a) M/4 (b) M (c) M/2 (d) 2 M

RESPONSE GRID	34. ⓐⓑⓒⓓ	35. ⓐⓑⓒⓓ	36. ⓐⓑⓒⓓ	37. ⓐⓑⓒⓓ	38. ⓐⓑⓒⓓ
	39. ⓐⓑⓒⓓ	40. ⓐⓑⓒⓓ	41. ⓐⓑⓒⓓ	42. ⓐⓑⓒⓓ	43. ⓐⓑⓒⓓ
	44. ⓐⓑⓒⓓ	45. ⓐⓑⓒⓓ			

DAILY PRACTICE PROBLEM DPP CHAPTERWISE CP19 - PHYSICS

Total Questions	45	Total Marks	180
Attempted		Correct	
Incorrect		Net Score	
Cut-off Score	50	Qualifying Score	70
Success Gap = Net Score – Qualifying Score			
Net Score = (Correct × 4) – (Incorrect × 1)			

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