

DPP - Daily Practice Problems

Name :

Date :

Start Time :

End Time :

PHYSICS

43

SYLLABUS : MAGNETISM & MATTER-2 (Para, dia and ferro-magnetic substances, magnetic susceptibility and permeability, Hysteresis, Electromagnets and permanent magnets.)

Max. Marks : 120

Time : 60 min.

GENERAL INSTRUCTIONS

- The Daily Practice Problem Sheet contains 30 MCQ's. For each question only one option is correct. Darken the correct circle/ bubble in the Response Grid provided on each page.
- You have to evaluate your Response Grids yourself with the help of solution booklet.
- Each correct answer will get you 4 marks and 1 mark shall be deducted for each incorrect answer. No mark will be given/ deducted if no bubble is filled. Keep a timer in front of you and stop immediately at the end of 60 min.
- The sheet follows a particular syllabus. Do not attempt the sheet before you have completed your preparation for that syllabus. Refer syllabus sheet in the starting of the book for the syllabus of all the DPP sheets.
- After completing the sheet check your answers with the solution booklet and complete the Result Grid. Finally spend time to analyse your performance and revise the areas which emerge out as weak in your evaluation.

DIRECTIONS (Q.1-Q.24) : There are 24 multiple choice questions. Each question has 4 choices (a), (b), (c) and (d), out of which **ONLY ONE** choice is correct.

- Q.1** Susceptibility of ferromagnetic substance is
(a) > 1 (b) < 1 (c) 0 (d) 1
- Q.2** Among the following properties describing diamagnetism identify the property that is wrongly stated.
(a) Diamagnetic material do not have permanent magnetic moment
(b) Diamagnetism is explained in terms of electromagnetic induction.
(c) Diamagnetic materials have a small positive susceptibility
(d) The magnetic moment of individual electrons neutralize each other

Q.3 If the magnetic dipole moment of an atom of diamagnetic material, paramagnetic material and ferromagnetic material denoted by μ_d, μ_p, μ_f respectively then

- (a) $\mu_d \neq 0$ and $\mu_f \neq 0$ (b) $\mu_p = 0$ and $\mu_f \neq 0$
(c) $\mu_d = 0$ and $\mu_p \neq 0$ (d) $\mu_d \neq 0$ and $\mu_p = 0$

Q.4 When a piece of a ferromagnetic substance is put in a uniform magnetic field, the flux density inside it is four times the flux density away from the piece. The magnetic permeability of the material is

- (a) 1 (b) 2
(c) 3 (d) 4

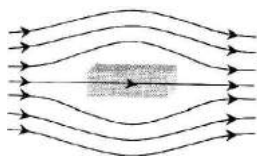
RESPONSE GRID

1. (a)(b)(c)(d) 2. (a)(b)(c)(d) 3. (a)(b)(c)(d) 4. (a)(b)(c)(d)

Space for Rough Work

Q.5 The given figure represents a material which is

- (a) Paramagnetic
(b) Diamagnetic
(c) Ferromagnetic
(d) None of these



Q.6 Liquid oxygen remains suspended between two pole faces of a magnet because it is

- (a) diamagnetic (b) paramagnetic
(c) ferromagnetic (d) antiferromagnetic

Q.7 A superconductor exhibits perfect

- (a) ferrimagnetism (b) ferromagnetism
(c) paramagnetism (d) diamagnetism

Q.8 Which of the following is the most suitable for the core of electromagnets?

- (a) Soft iron (b) Steel
(c) Copper-nickel alloy (d) Air

Q.9 The universal property of all substances is

- (a) diamagnetism (b) ferromagnetism
(c) paramagnetism (d) all of these

Q.10 If a magnetic substance is kept in a magnetic field, then which of the following substance is thrown out ?

- (a) Paramagnetic (b) Ferromagnetic
(c) Diamagnetic (d) Antiferromagnetic

Q.11 In the hysteresis cycle, the value of H needed to make the intensity of magnetisation zero is called

- (a) Retentivity (b) Coercive force
(c) Lorentz force (d) None of these

Q.12 If a diamagnetic solution is poured into a U-tube and one arm of this U-tube placed between the poles of a strong magnet with the meniscus in a line with field, then the level of the solution will

- (a) rise (b) fall
(c) oscillate slowly (d) remain as such

Q.13 The relative permeability is represented by μ_r and the susceptibility is denoted by χ for a magnetic substance.

Then for a paramagnetic substance

- (a) $\mu_r < 1, \chi < 0$ (b) $\mu_r < 1, \chi > 0$
(c) $\mu_r > 1, \chi < 0$ (d) $\mu_r > 1, \chi > 0$

Q.14 The use of study of hysteresis curve for a given material is to estimate the

- (a) voltage loss (b) hysteresis loss
(c) current loss (d) all of these

Q.15 The magnetic moment of atomic neon is

- (a) zero (b) $\mu_B/2$
(c) μ_B (d) $3\mu_B/2$

Q.16 A ferromagnetic material is heated above its Curie temperature, then which one is a correct statement ?

- (a) Ferromagnetic domains are perfectly arranged
(b) Ferromagnetic domains becomes random
(c) Ferromagnetic domains are not influenced
(d) Ferromagnetic material changes itself into diamagnetic material

Q.17 If a diamagnetic substance is brought near north or south pole of a bar magnet, it is

- (a) attracted by the poles
(b) repelled by the poles
(c) repelled by the north pole and attracted by the south pole
(d) attracted by the north pole and repelled by the south pole

Q.18 The material of permanent magnet has

- (a) high retentivity, low coercivity
(b) low retentivity, high coercivity
(c) low retentivity, low coercivity
(d) high retentivity, high coercivity

Q.19 Diamagnetic substances are

- (a) feebly attracted by magnets
(b) strongly attracted by magnets
(c) feebly repelled by magnets
(d) strongly repelled by magnets

RESPONSE
GRID

5. (a)(b)(c)(d) 6. (a)(b)(c)(d) 7. (a)(b)(c)(d) 8. (a)(b)(c)(d) 9. (a)(b)(c)(d)
10. (a)(b)(c)(d) 11. (a)(b)(c)(d) 12. (a)(b)(c)(d) 13. (a)(b)(c)(d) 14. (a)(b)(c)(d)
15. (a)(b)(c)(d) 16. (a)(b)(c)(d) 17. (a)(b)(c)(d) 18. (a)(b)(c)(d) 19. (a)(b)(c)(d)

Space for Rough Work

Q.20 For an isotropic medium B , μ , H and M are related as (where B , μ_0 , H and M have their usual meaning in the context of magnetic material)

- (a) $(B - M) = \mu_0 H$ (b) $M = \mu_0(H + M)$
 (c) $H = \mu_0(H + M)$ (d) $B = \mu_0(H + M)$

Q.21 Relative permeability of iron is 5500, then its magnetic susceptibility will be

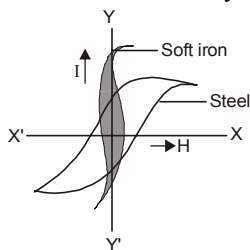
- (a) 5500×10^7 (b) 5500×10^{-7}
 (c) 5501 (d) 5499

Q.22 A magnetising field of 2×10^3 amp/m produces a magnetic flux density of 8π Tesla in an iron rod. The relative permeability of the rod will be

- (a) 10^2 (b) 10^0 (c) 10^4 (d) 10^1

Q.23 The mass of a specimen of a ferromagnetic material is 0.6 kg. and its density is 7.8×10^3 kg/m³. If the area of hysteresis loop of alternating magnetising field of frequency 50Hz is 0.722 MKS units then the hysteresis loss per second will be

- (a) 277.7×10^{-5} Joule
 (b) 277.7×10^{-6} Joule
 (c) 277.7×10^{-4} Joule
 (d) 27.77×10^{-4} Joule



Q.24 A diamagnetic material in a magnetic field moves

- (a) from weaker to the stronger parts of the field
 (b) perpendicular to the field
 (c) from stronger to the weaker parts of the field
 (d) None of these

DIRECTIONS (Q.25-Q.27) : In the following questions, more than one of the answers given are correct. Select the correct answers and mark it according to the following codes:

Codes :

- (a) 1, 2 and 3 are correct (b) 1 and 2 are correct
 (c) 2 and 4 are correct (d) 1 and 3 are correct

Q.25 A magnetising field of 1600 Am^{-1} produces a magnetic flux of 2.4×10^{-5} weber in a bar of iron of area of cross-section 0.2 cm^2 . Then,

- (1) the magnetic permeability of the bar is $7.5 \times 10^{-4} \text{ TA}^{-1}\text{m}$
 (2) the susceptibility of the bar is 596.1
 (3) the magnetic permeability of the bar is 4.1 Wbm^{-2}
 (4) the susceptibility of the bar is 496.1

Q.26 Which of the following statements are correct about hysteresis?

- (1) This effect is common to all ferromagnetic substances
 (2) The hysteresis loop area is proportional to the thermal energy developed per unit volume of the material
 (3) The shape of the hysteresis loop is characteristic of the material
 (4) The hysteresis loop area is independent of the thermal energy developed per unit volume of the material

Q.27 Which of the following statements are false about the magnetic susceptibility χ_m of paramagnetic substance?

- (1) Value of χ_m is directly proportional to the absolute temperature of the sample
 (2) χ_m is negative at all temperature
 (3) χ_m does not depend on the temperature of the sample
 (4) χ_m is positive at all temperature

DIRECTIONS (Q. 28-Q.30) : Each of these questions contains two statements: Statement-1 (Assertion) and Statement-2 (Reason). Each of these questions has four alternative choices, only one of which is the correct answer. You have to select the correct choice.

- (a) Statement-1 is True, Statement-2 is True; Statement-2 is a correct explanation for Statement-1.
 (b) Statement-1 is True, Statement-2 is True; Statement-2 is NOT a correct explanation for Statement-1.
 (c) Statement -1 is False, Statement-2 is True.
 (d) Statement -1 is True, Statement-2 is False.

RESPONSE GRID	20. (a)(b)(c)(d)	21. (a)(b)(c)(d)	22. (a)(b)(c)(d)	23. (a)(b)(c)(d)	24. (a)(b)(c)(d)
	25. (a)(b)(c)(d)	26. (a)(b)(c)(d)	27. (a)(b)(c)(d)		

Space for Rough Work

Q.28 Statement-1 : The ferromagnetic substance do not obey Curie's law.

Statement-2 : At Curie point a ferromagnetic substance start behaving as a paramagnetic substance.

Q.29 Statement-1 : A paramagnetic sample displays greater magnetisation (for the same magnetising field) when cooled.

Statement-2 : The magnetisation does not depend on temperature.

Q.30 Statement-1 : The permeability of a ferromagnetic material dependent on the magnetic field.

Statement-2 : Permeability of a material is a constant quantity.

RESPONSE GRID

28. (a) (b) (c) (d) 29. (a) (b) (c) (d) 30. (a) (b) (c) (d)

DAILY PRACTICE PROBLEM SHEET 43 - PHYSICS

Total Questions	30	Total Marks	120
Attempted		Correct	
Incorrect		Net Score	
Cut-off Score	28	Qualifying Score	46
Success Gap = Net Score – Qualifying Score			
Net Score = (Correct × 4) – (Incorrect × 1)			

Space for Rough Work



**DAILY PRACTICE
PROBLEMS**
**PHYSICS
SOLUTIONS**
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1. (a) Susceptibility of ferromagnetic substance is greater than 1.
2. (c) Susceptibility of diamagnetic substance is negative and it does not change with temperature.
3. (c) $\mu_d = 0$ and $\mu_p \neq 0$
4. (d) $\mu_r = \frac{B}{B_0} = 4$
5. (b) Diamagnetic
6. (b) Paramagnetic
7. (d) A super conductor exhibits perfect diamagnetism.
8. (a) Soft iron is highly ferromagnetic.
9. (a) Diamagnetism is the universal property of all substances.
10. (c) Diamagnetic substances are repelled by magnetic field.
11. (b) Coercive force
12. (b) Because, diamagnetic substance, moves from stronger magnetic field to weaker field.
13. (d) $\mu_r > 1, \chi > 0$
14. (b) Hysteresis curve for a given material estimates hysteresis loss.
15. (a) Neon atom is diamagnetic, hence it's net magnetic moment is zero.
16. (b) On heating, different domains have net magnetisation in them which are randomly distributes. Thus the net magnetisation of the substance due to various domains decreases to minimum.
17. (b) Repelled due to induction of similar poles.
18. (d) From the characteristic of $B-H$ curve.
19. (c) Diamagnetic substances are feebly repelled by magnets.
20. (d) Net magnetic induction $B = B_0 + B_m = \mu_0 H + \mu_0 M$
21. (d) $\chi_m = (\mu_r - 1) \Rightarrow \chi_m = (5500 - 1) = 5499$
22. (c) $\therefore \mu_r = \frac{\mu}{\mu_0} = \frac{B}{H\mu_0}$

$$\text{or } \mu_r = \frac{8\pi}{2 \times 10^3 \times 4\pi \times 10^{-7}} = 10^4$$
23. (a) $W_H = VAft = \frac{m}{d} Aft$

$$\text{or } W_H = \frac{0.6}{7.8 \times 10^3} \times 0.722 \times 50$$

$$= 277.7 \times 10^{-5} \text{ Joule}$$
24. (c)
25. (b) Given that : $H = 1600 \text{ Am}^{-1}$, $\phi = 2.4 \times 10^{-5} \text{ Wb}$,
 $A = 0.2 \text{ cm}^2 = 0.2 \times 10^{-4} \text{ m}^2$.
 $B =$ magnetic flux per unit cross - sectional area

$$= \frac{\phi}{A} = \frac{2.4 \times 10^{-5}}{0.2 \times 10^{-4}} = 1.2 \text{ Wbm}^{-2}$$

Magnetic permeability :

$$\mu = \frac{B}{H} = \frac{1.2 \text{ Wbm}^{-2} \text{ or T}}{1600 \text{ Am}^{-1}} = 7.5 \times 10^{-4} \text{ T A}^{-1} \text{ m}$$

As $\mu = \mu_0 (1 + x_m)$

$$\therefore x_m = \frac{\mu}{\mu_0} - 1 = \frac{7.5 \times 10^{-4}}{4 \times 3.14 \times 10^{-7}}$$

$$= 597.1 - 1 = 596.1.$$
26. (a) The energy lost per unit volume of a substance in a complete cycle of magnetisation is equal to the area of the hysteresis loop.
27. (a) Statement (4) is the only true statement among the given choices.
28. (b) The susceptibility of ferromagnetic substance decreases with the rise of temperature in a complicated manner. After Curie's point the susceptibility of ferromagnetic substance varies inversely with its absolute temperature. Ferromagnetic substance obey's Curies law only above its Curie point.
29. (d) A paramagnetic sample display greater magnetisation when cooled, this is because at lower temperature, the tendency to disrupt the alignment of dipoles (due to magnetising field) decreases on account of reduced random thermal motion.
30. (d) The permeability of a ferromagnetic material dependent on magnetic field, $\bar{B} = K_m \bar{B}_0$, where B_0 is applied field. The total magnetic field \bar{B} inside a ferromagnet may be 10^3 or 10^4 times the applied field B_0 . The permeability K_m of a ferromagnetic material is not constant, neither the field \bar{B} nor the magnetization \bar{M} increases linearly with \bar{B} even at small value of B_0 . From the hysteresis curve, magnetic permeability is greater for lower field.

