PHYSICS

BOOKS - MHTCET PREVIOUS YEAR PAPERS AND PRACTICE PAPERS

MAGNETISM-II

Example

1. A planar loop of irregular shape encloses an area of $7 \cdot 5 \times 10^{-4} m^2$, and carries a current

of $12A$. The sense of flow of current appears to be clockwise to an observer. What is the magnitude and direction of the magnetic moment vector associated with the current loop?

A. $9 \times 10^{-3} A - m^2$

B. $4.5 \times 10^{-4} A - m^2$

C. $1.8 \times 10^{-4} A - m^2$

D. $9 \times 10^{-4} A - m^2$

Answer: A

2. The electron in hydrogen atom moves with a speed of $2.2 \times 10^6 m/s$ in an orbit of radius $5.3 \times 10^{-11} cm$. Find the magnetic moment of the orbiting electron.

    A. $8.3 \times 10^{-23} A - m^2$

    B. $9.3 \times 10^{-24} A - m^2$

    C. $7.2 \times 10^{-24} A - m^2$

    D. $6 \times 10^{-24} A - m^2$

Answer: B

3. The space inside a toroid is filled with tungsten whose susceptibility is 6.8×10^{-5} . The percentage increase in the magnetic field will be

    A. $0.0068\,\%$

    B. $0.068\,\%$

    C. $0.68\,\%$

D. None of these

Answer: A

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4. Relative permeability of iron is 4000. What is its magnetic susceptibility ?

A. 4001

B. 3999

C. 4000×10^{-2}

D. 4000×10^2

Answer: B

5. An iron rod of $0 \cdot 2cm^2$ cross-sectional area is subjected to a magnetising field of $1200 Am^{-1}$. The suscaptibility of iron is 599. Find the permeability and the magnetic flux produced.

A. $7.9 \times 10^5 TmA^{-1}$

B. $8.0 \times 10^{22} TmA^{-1}$

C. $7.5 \times 10^{-4} TmA^{-1}$

D. $7.8 \times 10^{-5} TmA^{-1}$

Answer: C

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6. A solenoid of 600 turns per metre is carrying a current of 4 A . Its core is made of iron with relative permeability of 5000.

Calculate the intensity of magnetisation and magnetic field inside the core .

A. $1.2 \times 10^7 \, Am^{-1}$ and $15T$

B. $2.3 \times 10^9 \, Am^{-1}$ and $13T$

C. $2.7 \times 10^{11} \, Am^{-1}$ and $16T$

D. $1.8 \times 10^6 \, Am^{-1}$ and $14T$

Answer: A

7. A domain in ferromagnetic iron is in the form of a cube of side length $10^{-4}m$. Estimate the number of iron atoms in the domain and the maximum possible dipole moment and magnetisation of the domain. The molecular mass of iron is $55g/$mole, and its density is $7 \cdot 9g/cm^3$. Assume that each iron atom has a dipole moment of $9 \cdot 27 \times 10^{-24}Am^2$.

A. $8 \times 10^5 A - m^{-2}$

B. $4 \times 10^5 A - m^{-1}$

C. $8 \times 10^{-13} A - m^2$

D. $8 \times 10^{13} A - m^2$

Answer: C

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8. The susceptibility of a magnetism at 300 K is 1.4×10^{-5}. The material is heated and at a particular temperature is susceptibility increased to 2.1×10^{-5}. What is the change in temperature of the material ?

A. 200K

B. 300K

C. 400K

D. 100K

Answer: D

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Exercise 1

1. The magnetic moment produced in a substance of $1 gmis 6 \times 10^{-7}$ampere, metre^2.

If its density is $5gm/cm^3$, then the intensity of magnetisation in A/m will be

A. 8.3×10^6

B. 3.0

C. 1.2×10^{-7}

D. 3×10^{-6}

Answer: B

2. Which of the following expression represents the relation between orbital magnetic moment and orbital angular momentum of an electron?

A. $\mu_{orb} = -\dfrac{2m_e}{e} L_{orb}$

B. $\mu_{orb} = -2m_e L_{orb}$

C. $\mu_{orb} = -\dfrac{3}{2m_e} L_{orb}$

D. $\mu_{orb} = \dfrac{e}{2m_3} L_{orb}$

Answer: C

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3. A particle of charge q and mass m moves in a circular orbit of radius r with angular speed ω. The ratio of the magnitude of its magnetic moment to that of its angular momentum depends on

A. $\dfrac{q}{2m}$

B. $\dfrac{q\omega r^2}{2}$

C. $\dfrac{q\omega}{2mr^2}$

D. $\dfrac{q\omega r^2}{2m}$

Answer: A

4. The magnetic moment of a current (i) carrying circular coil of radius (r) and number of turns (n) varies as

    A. $1/r^2$

    B. $1/r$

    C. r

    D. r^2

Answer: D

5. A closely wound solenoid of 800 turns and area of cross section $2 \cdot 5 \times 10^{-4} m^2$ carries a current of $3 \cdot 0A$. Explain the sense in which the solenoid acts like a bar magnet. What is its associated magnetic moment?

A. $6JT^{-1}$

B. $0.9JT^{-1}$

C. JT^{-1}

D. $0.6JT^{-1}$

Answer: D

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6. The elementary magnetic moment of revolving electron is also known as

A. Rutherford Magneton

B. Bohr Magneton

C. Planck's Magneton

D. earth's Magneton

Answer: B

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7. The correct value of Bohr magneton is

A. $9.27 \times 10^{-27} Am^2$

B. $9.27 \times 10^{-23} Am^2$

C. $2.97 \times 10^{-24} Am^2$

D. $2.92 \times 10^{-27} Am^2$

Answer: B

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8. A current I flows in a conducting wire of lenth L. If we bent it in a circular form, then calculate its magnetic dipole moment.

A. $\dfrac{lL^2}{4\pi} Am^2$

B. $\dfrac{l^2 L}{4\pi} Am^2$

C. $\dfrac{lL^2}{2\pi}Am^2$

D. $\dfrac{l^2L}{2\pi}Am^2$

Answer: A

9. The electron in hydrogen atom moves with a speed of $2.2 \times 10^6 m/s$ in an orbit of radius $5.3 \times 10^{-11}cm$. Find the magnetic moment of the orbiting electron.

A. $8.27 \times 10^{-26} Am^2$

B. $9.27 \times 10^{-27} Am^2$

C. $9.3 \times 10^{-26} Am^2$

D. $8.8 \times 10^{-27} Am^2$

Answer: C

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10. A susceptibility of a certain magnetic material is 400. What is the class of the magnetic material?

A. Diamagnetic

B. Paramagnetic

C. Ferromagnetic

D. Ferroelectric

Answer: C

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11. If the magnetic susceptibility of a material is large and positive. The material is

A. Diamagnetic

B. ferromagnetic

C. paramagnetic

D. perfect diamagnetic

Answer: B

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12. Resultant force acting on a diamagentic material in a magnetic field is in direction

A. from stronger to the weaker part of the

   magnetic field

B. from weaker to the strogner part of the

   magnetic field

C. perpendicular to the magnetic field

D. in the direction making $60°$ to the

   magnetic field

Answer: A

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13. There are four light-weight-rod sample A, B, C, D separately suspended by threads. A bar magnet is slowly brought near each sample and the following observations are noted

(i) A is feebly repelled

(ii) B is feebly attracted

(iii) C is strongly attracted

(iv) D remains unaffected

Which one of the following is true?

A. C is of a diamagnetic material

B. D is of a ferromagnetic material

C. A is of a non-magnetic material

D. B is of a paramagnetic material

Answer: D

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14. A domain in ferromagnetic iron in the form of cube shaving 5×10^{10} atoms. If the side length of this domain is 1.5μ and each atom has a dipole moment of $8 \times 10^{-24} Am^2$, then magnetisation of domain is

A. $7.2 \times 10^5 \, Am^{-1}$

B. $7.2 \times 10^3 \, Am^{-1}$

C. $7.2 \times 10^9 \, Am^{-1}$

D. $7.2 \times 10^{12} \, Am^{-1}$

Answer: A

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15. The intensity of magnetisation of a bar magnet is $5 \times 10^4 A - m^{-1}$. The magnetic length and the area of cross section of the

magnet are 12cm and $1cm^{-2}$ respectivley. The magnitude of magnetic moment of this bar magnet (in SI unit) is.

A. 0.6

B. 1.3

C. 1.24

D. 2.4

Answer: A

16. Name the SI unit of intensity of magnetisation.

A. Am^{-1}

B. $A - m^2$

C. $A - m$

D. Wm^{-1}

Answer: A

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17. Domain formation is the necessary feature of

A. ferromagnetism

B. paramagnetism

C. diamagnetism

D. All of these

Answer: A

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18. The material of permanent magnet has

A. high-high

B. low-low

C. low-high

D. high-low

Answer: A

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19. At Curie point, a ferromagnetic material transforms into:

A. non-magnetic

B. diamagnetic

C. paramagnetic

D. strong ferromagnetic

Answer: C

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20. 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

Answer: C

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21. Magnetic susceptibility for a paramagnetic and diamagnetic materials is respectively,

A. copper, aluminium , iron

B. aluminium , copper , iron

C. copper , iron , aluminium

D. aluminium , iron , copper

Answer: A

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22. A paramagnetic sample shows a net magnetisation of $0.8A - m^{-1}$ when plced in an external mgnetic field of 0.8T at a temperature of 5K. Whent the same sample is

placed in an external magnetic field of 0.4T at temperature of 20K, the magnetisation will be

A. $0.8 Am^{-1}$

B. $0.8 Am^{-2}$

C. $0.1 Am$

D. $0.1 Am^{-1}$

Answer: D

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23. The relative permeability of a substance X is slightly less than unity and that of substance Y is slightly more than unity then –

A. X is paramagnetic and Y is ferromagnetic

B. X is diamagnetic and Y is ferromagnetic

C. X and Y both are paramagnetic .

D. X is diamagnetic and Y is paramagnetic

Answer: B

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24. The magnetic moment of atomic neon is

A. zero

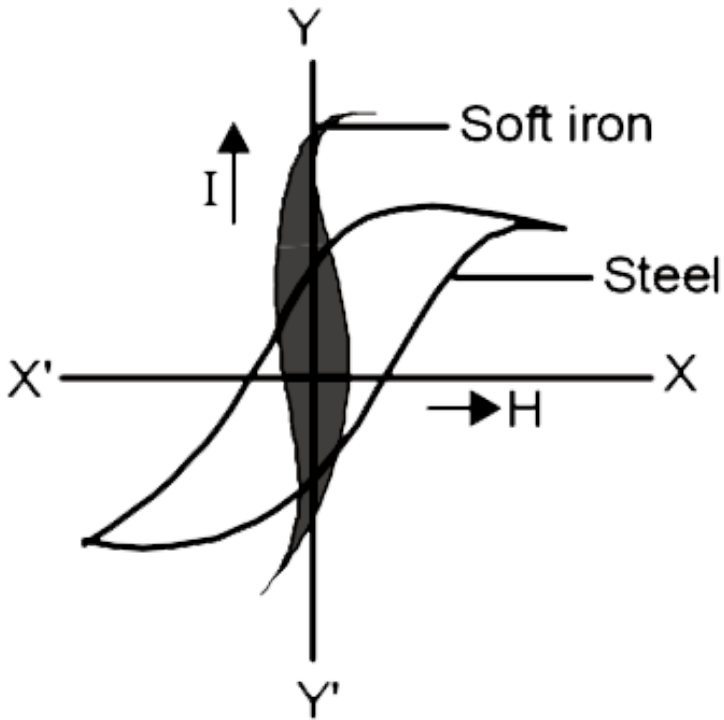B. $\mu B/2$

C. μB

D. $3\mu B/2$

Answer: A

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Exercise 2

1. The mass of a specimen of a ferromagnetic material is 0.6 kg. and its density is $7.8 \times 10^3 kg/m3$. 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. $27.77 \times 10^{-5}J$

B. $2.777 \times 10^{-5}J$

C. $27.77 \times 10^{-4}J$

D. $27.77 \times 10^{-6}J$

Answer: C

2. The magnetic susceptibility of a metrial of a rod is 299. Permeatbility of vaccum μ_0 find the permeatibility?

    A. $3777 \times 10^{-7} Hm^{-1}$

    B. $3771 \times 10^{-5} Hm^{-1}$

    C. $3770 \times 10^{-6} Hm^{-1}$

    D. $3771 \times 10^{-8} Hm^{-1}$

Answer: A

3. Substance in which the magnetic moment of

a single atom is not zero, is know as

    A. diamagnetism

    B. ferrimagnetism

    C. paramagnetism

    D. ferromagnetism

Answer: C

4. Curie-Weiss law is obeyed by iron at a temperature....

A. at Curie temeprature only

B. at all temperature

C. below Curie temperature

D. above Curie temperature

Answer: D

5. Susceptibility of ferromagnetic substance is

A. > 1

B. < 1

C. zero

D. 1

Answer: A

6. 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 .

Answer: B

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7. Ferro magnetic materials used in

transformer must have

A. low permeability and high hysterisis loss

B. high permeability and low hysterisis loss

C. high permeability and high hysterisis

    loss

D. low permeability and low hysterisis loss

Answer: B

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8. A superconducting material is

A. ferromagnetic

B. ferroelectic

C. diamagnetic

D. paramagnetic

Answer: C

9. The coercitivity of a small magnet where the ferromagnet gets demagnetized is $3 \times 10^3 Am^{-1}$. The current required to be passed in a solenoid of length $10cm$ and

number of turns 100, so that the magnet gets

demagnetized when inside the solenoid , is :

A. 30mA

B. 60mA

C. 3A

D. 6A

Answer: C

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10. The area enclosed by a hysteresis loop is a measure of

A. Permeability

B. Retentivity

C. Heat energy lost per unit volume in the sample

D. Susceptibility

Answer: C

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11. The susceptibility of magnesium at $300K$ is 1.2×10^{-5}. At what temperature will the susceptibility increase to 1.8×10^{-5}?

A. 150K

B. 200K

C. 250K

D. 20K

Answer: B

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12. Which one of the following characteristics is not associated with a ferromagnetic

A. It is strongly attracted by a magnet

B. It tends to move from a region of low magnetic field to a region of high magnetic field

C. Above the curie temperature , it exhibits paramagnetic properties

D. Its origin is the spin of electrons

Answer: B

Mht Cet Corner

1. The magnetic field (B) inside a long solenoid having n turns per unit length and carrying current / when iron core is kept in it is (μ_o = permeability of vacuum, χ = magnetic susceptibility)

A. $\mu_0 nl(1-x)$

B. $\mu_0 nl\chi$

C. $\mu_0 nl^2(1+\chi)$

D. $\mu_0 nl(1+x)$

Answer: D

2. An iron rod is placed parallel to magnetic field of intensity $2000 Am^{-1}$. The magnetic flux through the rod is 6×10^{-1} Wb and its

cross-sectional area is $3cm^2$. The magnetic permeability of the rod in Wb $A^{-1}m^{-1}$ is

A. 10^{-1}

B. 10^{-2}

C. 10^{-3}

D. 10^{-4}

Answer: C

3. Magnetic susceptibility of a diamagnetic substances

A. small and negative

B. small and positive

C. large and negative

D. large and positive

Answer: A

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4. On applying an external magnetic field , to a ferromagnetic substance domains

    A. align in the direction of magnetic field

    B. align in the direction opposite to magnetic field

    C. remain unaffected

    D. None of the above

Answer: A

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5. Nickel shows ferromagnetic property at room temperature. If the temperature is increased beyond curie temperature, then it will show

    A. paramagnetism

    B. anti-ferromagnetism

    C. no magnetic property

    D. diamagnetism

Answer: A

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

    A. Paramagnetic

    B. ferromagnetic

    C. Diamagnetic

    D. Anti-ferromagnetic

Answer: C

7. The magnetism of a bar magnet is due to

A. the earth

B. cosmic rays

C. the spin motion of electrons

D. pressure of big magnet inside the earth

Answer: C

8. Magnetic permeability is maximum for

A. ferromagnetic substances

B. diamagnetic substance

C. paramagnetic substances

D. All of the above

Answer: A

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