PrepWiser.

PHYSICS · JEE MAIN

Magnetism & Matter

Chapter-wise previous year questions, with answer key

44	2020–2025	4
PYQS	PAPERS	TOPICS

Magnetic Properties of Materials · Bar Magnet and Magnetic Dipole · Earth's Magnetism · Hysteresis

1. Attempt each question on paper first — they're grouped by topic, newest papers first.
2. Check yourself against the answer key at the end.
3. Got one wrong? Tap “Step-by-step solution” under it for the full working.

Stuck on a question?

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Magnetic Properties of Materials · 23 PYQs

Q1 JEE Main 2025 · 7 Apr · Shift 1

The percentage increase in magnetic field (B) when space within a current carrying solenoid is filled with magnesium (magnetic susceptibility $\chi_{\mathrm{Mg}} = 1.2 \times 10^{-5}$) is :

(A) $\frac{5}{3} \times 10^{-5}\%$

(B) $\frac{5}{6} \times 10^{-4}\%$

(C) $\frac{5}{6} \times 10^{-5}\%$

(D) $\frac{6}{5} \times 10^{-3}\%$

Step-by-step solution ▸ prepwiser.in/questions/hRUGAyKuj3

Q2 JEE Main 2025 · 2 Apr · Shift 1

The relationship between the magnetic susceptibility (x) and the magnetic permeability (μ) is given by : (μ_0 is the permeability of free space and μ_T is relative permeability)

(A) $X = \frac{\mu}{\mu_0} - 1$

(B) $X = \frac{\mu_r}{\mu_0} + 1$

(C) $\chi = \mu_r + 1$

(D) $X = 1 - \frac{\mu}{\mu_0}$

Step-by-step solution ▸ prepwiser.in/questions/RoxiQkIhKP

Q3 JEE Main 2025 · 29 Jan · Shift 2

Match List - I with List - II.

List - I	List - II
(A) Magnetic induction	(I) Ampere meter^2
(B) Magnetic intensity	(II) Weber
(C) Magnetic flux	(III) Gauss
(D) Magnetic moment	(IV) Ampere meter

Choose the correct answer from the options given below:

(A) (A)-(III), (B)-(IV), (C)-(II), (D)-(I)

(B) (A)-(III), (B)-(II), (C)-(I), (D)-(IV)

(C) (A)-(III), (B)-(IV), (C)-(I), (D)-(II)

(D) (A)-(I), (B)-(II), (C)-(III), (D)-(IV)

Step-by-step solution ▸ prepwiser.in/questions/3duXyX6g4N

Q4 JEE Main 2024 · 8 Apr · Shift 1

Paramagnetic substances:

A. align themselves along the directions of external magnetic field.

B. attract strongly towards external magnetic field.

C. has susceptibility little more than zero.

D. move from a region of strong magnetic field to weak magnetic field.

Choose the most appropriate answer from the options given below:

(A) A, B, C Only

(B) A, C Only

(C) A, B, C, D

(D) B, D Only

Step-by-step solution ▸ prepwiser.in/questions/nBDS_H_hiP

Q5 JEE Main 2023 · 12 Apr · Shift 1

Given below are two statements:

Statement I : The diamagnetic property depends on temperature.

Statement II : The induced magnetic dipole moment in a diamagnetic sample is always opposite to the magnetizing field.

In the light of given statements, choose the correct answer from the options given below.

(A) Statement I is incorrect but Statement II is true.

(B) Statement I is correct but Statement II is false.

(C) Both Statement I and Statement II are False.

(D) Both Statement I and Statement II are true.

Step-by-step solution ▸ prepwiser.in/questions/2EzOY3z5ZI

Q6 JEE Main 2023 · 11 Apr · Shift 1

The free space inside a current carrying toroid is filled with a material of susceptibility 2×10^{-2}. The percentage increase in the value of magnetic field inside the toroid will be

(A) 0.1%

(B) 1%

(C) 2%

(D) 0.2%

Step-by-step solution ▸ prepwiser.in/questions/2LPw4bg-oi

Q7 JEE Main 2023 · 10 Apr · Shift 2

Given below are two statements:

Statement I : For diamagnetic substance, $-1 \leq \chi < 0$, where χ is the magnetic susceptibility.

Statement II : Diamagnetic substances when placed in an external magnetic field, tend to move from stronger to weaker part of the field.

In the light of the above statements, choose the correct answer from the options given below

(A) Both Statement I and Statement II are true

(B) Statement I is correct but Statement II is false

(C) Both Statement I and Statement II are False

(D) Statement I is incorrect but Statement II is true.

Step-by-step solution ▸ prepwiser.in/questions/9Yp5GgFjCx

Q8 JEE Main 2023 · 10 Apr · Shift 1

The current required to be passed through a solenoid of 15 cm length and 60 turns in order of demagnetise a bar magnet of magnetic intensity $2.4 \times 10^3 Am^{-1}$ is _____ A.

Numerical answer — enter the value.

Step-by-step solution ▸ prepwiser.in/questions/UOFfkqnQ1W

Q9 JEE Main 2023 · 8 Apr · Shift 2

Given below are two statements: one is labelled as Assertion $\mathbf{A}$ and the other is labelled as Reason $\mathbf{R}$

Assertion A : Electromagnets are made of soft iron.

Reason R : Soft iron has high permeability and low retentivity.

In the light of above, statements, choose the most appropriate answer from the options given below.

(A) Both A and R are correct and R is the correct explanation of A

(B) A is not correct but R is correct

(C) A is correct but R is not correct

(D) Both A and R are correct but R is NOT the correct explanation of A

Step-by-step solution ▸ prepwiser.in/questions/tMH40oW40q

Q10 JEE Main 2023 · 31 Jan · Shift 1

A rod with circular cross-section area $2\mathrm{cm}^2$ and length $40\mathrm{cm}$ is wound uniformly with 400 turns of an insulated wire. If a current of $0.4\mathrm{A}$ flows in the wire windings, the total magnetic flux produced inside windings is $4\pi \times 10^{-6}\mathrm{Wb}$. The relative permeability of the rod is

(Given : Permeability of vacuum $\mu_0 = 4\pi \times 10^{-7}\mathrm{NA}^{-2}$)

(A) $\frac{5}{16}$

(B) 125

(C) $\frac{32}{5}$

(D) 12.5

Step-by-step solution ▸ prepwiser.in/questions/e9p42c0fFc

Q11 JEE Main 2022 · 28 Jun · Shift 2

The space inside a straight current carrying solenoid is filled with a magnetic material having magnetic susceptibility equal to 1.2×10^{-5}. What is fractional increase in the magnetic field inside solenoid with respect to air as medium inside the solenoid?

(A) 1.2×10^{-5}

(B) 1.2×10^{-3}

(C) 1.8×10^{-3}

(D) 2.4×10^{-5}

Step-by-step solution ▸ prepwiser.in/questions/X0ZJwImdAW

Q12 JEE Main 2022 · 27 Jun · Shift 1

The susceptibility of a paramagnetic material is 99. The permeability of the material in Wb/A-m, is :

[Permeability of free space $\mu_0 = 4\pi \times 10^{-7}$ Wb/A-m]

(A) $4\pi \times 10^{-7}$

(B) $4\pi \times 10^{-4}$

(C) $4\pi \times 10^{-5}$

(D) $4\pi \times 10^{-6}$

Step-by-step solution ▸ prepwiser.in/questions/O0tdpRrlt1

Q13 JEE Main 2022 · 25 Jun · Shift 2

Given below are two statements :

Statement I : Susceptibilities of paramagnetic and ferromagnetic substances increase with decrease in temperature.

Statement II : Diamagnetism is a result of orbital motions of electrons developing magnetic moments opposite to the applied magnetic field.

Choose the correct answer from the options given below :

(A) Both Statement I and Statement II are true.

(B) Both Statement I and Statement II are false.

(C) Statement I is true but Statement II is false.

(D) Statement I is false but Statement II is true.

Step-by-step solution ▸ prepwiser.in/questions/8Sq8QqsdT6

Q14 JEE Main 2022 · 24 Jun · Shift 2

The soft-iron is a suitable material for making an electromagnet. This is because soft-iron has

(A) low coercivity and high retentivity.

(B) low coercivity and low permeability.

(C) high permeability and low retentivity.

(D) high permeability and high retentivity.

Step-by-step solution ▸ prepwiser.in/questions/cEl5AGeujg

Q15 JEE Main 2021 · 31 Aug · Shift 2

A long solenoid with 1000 turns/m has a core material with relative permeability 500 and volume 10^3 cm^3. If the core material is replaced by another material having relative permeability of 750 with same volume maintaining same current of 0.75 A in the solenoid, the fractional change in the magnetic moment of the core would be approximately $\left(\frac{x}{499}\right)$. Find the value of x.

Numerical answer — enter the value.

Step-by-step solution ▸ prepwiser.in/questions/_rePYTdM4P

Q16 JEE Main 2021 · 25 Jul · Shift 1

The value of aluminium susceptibility is 2.2×10^{-5}. The percentage increase in the magnetic field if space within a current carrying toroid is filled with aluminium is $\frac{x}{10^4}$. Then the value of x is _____.

Numerical answer — enter the value.

Step-by-step solution ▸ prepwiser.in/questions/ys8ei18EXA

Q17 JEE Main 2021 · 22 Jul · Shift 2

Statement I : The ferromagnetic property depends on temperature. At high temperature, ferromagnet becomes paramagnet.

Statement II : At high temperature, the domain wall area of a ferromagnetic substance increases.

In the light of the above statements, choose the most appropriate answer from the options given below :

(A) Statement I is false but Statement II is true

(B) Statement I is true but Statement II is false

(C) Both Statement I and Statement II are false

(D) Both Statement I and Statement II are true

Step-by-step solution ▸ prepwiser.in/questions/7Px408u1TF

Q18 JEE Main 2021 · 20 Jul · Shift 2

The magnetic susceptibility of a material of a rod is 499. Permeability in vacuum is $4\pi \times 10^{-7}$ H/m. Absolute permeability of the material of the rod is :

(A) $4\pi \times 10^{-4}$ H/m

(B) $2\pi \times 10^{-4}$ H/m

(C) $3\pi \times 10^{-4}$ H/m

(D) $\pi \times 10^{-4}$ H/m

Step-by-step solution ▸ prepwiser.in/questions/gjvQna8Vph

Q19 JEE Main 2021 · 18 Mar · Shift 2

Which of the following statements are correct?

(A) Electric monopoles do not exist whereas magnetic monopoles exist.

(B) Magnetic field lines due to a solenoid at its ends and outside cannot be completely straight and confined.

(C) Magnetic field lines are completely confined within a toroid.

(D) Magnetic field lines inside a bar magnet are not parallel.

(E) $\chi = -1$ is the condition for a perfect diamagnetic material, where x is its magnetic susceptibility.

Choose the correct answer from the options given below :

(A) (A) and (B) only

(B) (B) and (C) only

(C) (C) and (E) only

(D) (B) and (D) only

Step-by-step solution ▸ prepwiser.in/questions/TN447EMaNL

Q20 JEE Main 2021 · 25 Feb · Shift 2

In a ferromagnetic material, below the curie temperature, a domain is defined as :

(A) a macroscopic region with zero magnetization.

(B) a macroscopic region with saturation magnetization.

(C) a macroscopic region with randomly oriented magnetic dipoles.

(D) a macroscopic region with consecutive magnetic dipoles oriented in opposite direction.

Step-by-step solution ▸ prepwiser.in/questions/7W2TaYbaFc

Q21 JEE Main 2021 · 24 Feb · Shift 2

A soft ferromagnetic material is placed in an external magnetic field. The magnetic domains :

(A) may increase or decrease in size and change its orientation.

(B) increase in size but no change in orientation.

(C) decrease in size and changes orientation.

(D) have no relation with external magnetic field.

Step-by-step solution ▸ prepwiser.in/questions/Y7oqdCgF8a

Q22 JEE Main 2020 · 5 Sep · Shift 2

An iron rod of volume 10^{-3} m^3 and relative permeability 1000 is placed as core in a solenoid with 10 turns/cm. If a current of 0.5 A is passed through the solenoid, then the magnetic moment of the rod will be :

(A) 5×10^2 Am^2

(B) 0.5×10^2 Am^2

(C) 500×10^2 Am^2

(D) 50×10^2 Am^2

Step-by-step solution ▸ prepwiser.in/questions/kcJ5_CKZU

Q23 JEE Main 2020 · 4 Sep · Shift 2

A paramagnetic sample shows a net magnetisation of 6 A/m when it is placed in an external magnetic field of 0.4 T at a temperature of 4 K. When the sample is placed in an external magnetic field of 0.3 T at a temperature of 24 K, then the magnetisation will be:

(A) 4 A/m

(B) 1 A/m

(C) 0.75 A/m

(D) 2.25 A/m

Step-by-step solution ▸ prepwiser.in/questions/DNdw45bigD

Bar Magnet and Magnetic Dipole · 14 PYQs

Q24 JEE Main 2025 · 7 Apr · Shift 2

Given below are two statements : one is labelled as **Assertion (A)** and the other is labelled as **Reason (R).**

Assertion (A): Magnetic monopoles do not exist.

Reason (R): Magnetic field lines are continuous and form closed loops.

In the light of the above statements, choose the **most appropriate answer** from the options given below:

(A) Both (A) and (R) are correct and (R) is the correct explanation of (A)

(B) (A) is not correct but (R) is correct

(C) (A) is correct but (R) is not correct

(D) Both (A) and (R) are correct but (R) is **not** the correct explanation of (A)

Step-by-step solution ▸ prepwiser.in/questions/d9jGGjNL9V

Q25 JEE Main 2025 · 3 Apr · Shift 2

A magnetic dipole experiences a torque of $80\sqrt{3}\mathrm{Nm}$ when placed in uniform magnetic field in such a way that dipole moment makes angle of 60° with magnetic field. The potential energy of the dipole is :

(A) $-40\sqrt{3}\mathrm{J}$

(B) -80 J

(C) 80 J

(D) -60 J

Step-by-step solution ▸ prepwiser.in/questions/v7cYaI1sIk

Q26 JEE Main 2024 · 9 Apr · Shift 2

A straight magnetic strip has a magnetic moment of $44\mathrm{Am}^2$. If the strip is bent in a semicircular shape, its magnetic moment will be _____ Am^2.

(given $\pi = \frac{22}{7}$)

Numerical answer — enter the value.

Step-by-step solution ▸ prepwiser.in/questions/CtBGciIWp8

Q27 JEE Main 2024 · 6 Apr · Shift 2

A coil having 100 turns, area of $5 \times 10^{-3}\mathrm{m}^2$, carrying current of $1\mathrm{mA}$ is placed in uniform magnetic field of $0.20\mathrm{T}$ such a way that plane of coil is perpendicular to the magnetic field. The work done in turning the coil through 90° is _____ $\mu\mathrm{J}$.

Numerical answer — enter the value.

Step-by-step solution ▸ prepwiser.in/questions/8jNV4HhZYf

Q28 JEE Main 2024 · 6 Apr · Shift 1

A circular coil having 200 turns, $2.5 \times 10^{-4}\mathrm{m}^2$ area and carrying $100\mu\mathrm{A}$ current is placed in a uniform magnetic field of $1\mathrm{T}$. Initially the magnetic dipole moment $(\vec{M})$ was directed along $\vec{B}$. Amount of work, required to rotate the coil through 90° from its initial orientation such that $\vec{M}$ becomes perpendicular to $\vec{B}$, is _____ μJ.

Numerical answer — enter the value.

Step-by-step solution ▸ prepwiser.in/questions/ZYeOjMm4Bc

Q29 JEE Main 2024 · 4 Apr · Shift 2

The magnetic moment of a bar magnet is $0.5\mathrm{Am}^2$. It is suspended in a uniform magnetic field of $8 \times 10^{-2}\mathrm{T}$. The work done in rotating it from its most stable to most unstable position is:

(A) $4 \times 10^{-2}\mathrm{J}$

(B) $16 \times 10^{-2}\mathrm{J}$

(C) $8 \times 10^{-2}\mathrm{J}$

(D) Zero

Step-by-step solution ▸ prepwiser.in/questions/km_XpqQCgj

Q30 JEE Main 2024 · 29 Jan · Shift 1

The magnetic potential due to a magnetic dipole at a point on its axis situated at a distance of $20\mathrm{cm}$ from its center is $1.5 \times 10^{-5}\mathrm{Tm}$. The magnetic moment of the dipole is _____ $A\mathrm{m}^2$. (Given : $\frac{\mu_o}{4\pi} = 10^{-7}\mathrm{Tm}A^{-1}$)

Numerical answer — enter the value.

Step-by-step solution ▸ prepwiser.in/questions/Y-bXFNXZo-

Q31 JEE Main 2023 · 31 Jan · Shift 1

A bar magnet with a magnetic moment $5.0\mathrm{Am}^2$ is placed in parallel position relative to a magnetic field of $0.4\mathrm{T}$. The amount of required work done in turning the magnet from parallel to antiparallel position relative to the field direction is _____.

(A) zero

(B) 1 J

(C) 2 J

(D) 4 J

Step-by-step solution ▸ prepwiser.in/questions/R9vLIYKGho

Q32 JEE Main 2023 · 30 Jan · Shift 1

The magnetic moments associated with two closely wound circular coils A and B of radius $\mathrm{r_A} = 10\ \mathrm{cm}$ and $\mathrm{r_B} = 20\mathrm{cm}$ respectively are equal if : (Where $\mathrm{N_A}, \mathrm{I_A}$ and $\mathrm{N_B}, \mathrm{I_B}$ are number of turn and current of A and B respectively)

(A) $4\mathrm{N_A I_A} = \mathrm{N_B I_B}$

(B) $2\mathrm{N_A I_A} = \mathrm{N_B I_B}$

(C) $\mathrm{N_A} = 2\mathrm{N_B}$

(D) $\mathrm{N_A I_A} = 4\mathrm{N_B I_B}$

Step-by-step solution ▸ prepwiser.in/questions/yqfkUVLwzK

Q33 JEE Main 2022 · 27 Jul · Shift 1

Two bar magnets oscillate in a horizontal plane in earth's magnetic field with time periods of $3\mathrm{s}$ and $4\mathrm{s}$ respectively. If their moments of inertia are in the ratio of $3 : 2$, then the ratio of their magnetic moments will be:

(A) 2 : 1

(B) 8 : 3

(C) 1 : 3

(D) 27 : 16

Step-by-step solution ▸ prepwiser.in/questions/bNvOpa40XM

Q34 JEE Main 2022 · 26 Jun · Shift 2

A bar magnet having a magnetic moment of 2.0×10^5 JT^{-1}, is placed along the direction of uniform magnetic field of magnitude B = 14×10^{-5} T. The work done in rotating the magnet slowly through 60° from the direction of field is :

(A) 14 J

(B) 8.4 J

(C) 4 J

(D) 1.4 J

Step-by-step solution ▸ prepwiser.in/questions/o0VmFNYLvc

Q35 JEE Main 2021 · 27 Jul · Shift 1

In a uniform magnetic field, the magnetic needle has a magnetic moment 9.85×10^{-2} A/m^2 and moment of inertia 5×10^{-6} kg m^2. If it performs 10 complete oscillations in 5 seconds then the magnitude of the magnetic field is _____ mT. [Take π^2 as 9.85]

Numerical answer — enter the value.

Step-by-step solution ▸ prepwiser.in/questions/vqR4CbROcD

Q36 JEE Main 2020 · 4 Sep · Shift 1

A small bar magnet placed with its axis at 30^o with an external field of 0.06 T experiences a torque of 0.018 Nm. The minimum work required to rotate it from its stable to unstable equilibrium position is :

(A) 6.4×10^{-2} J

(B) 9.2×10^{-3} J

(C) 7.2×10^{-2} J

(D) 11.7×10^{-3} J

Step-by-step solution ▸ prepwiser.in/questions/01WODrhdf2

Q37 JEE Main 2020 · 9 Jan · Shift 2

A small circular loop of conducting wire has radius a and carries current I. It is placed in a uniform magnetic field B perpendicular to its plane such that when rotated slightly about its diameter and released, it starts performing simple harmonic motion of time period T. If the mass of the loop is m then :

(A) $T = \sqrt{\frac{2m}{IB}}$

(B) $T = \sqrt{\frac{\pi m}{IB}}$

(C) $T = \sqrt{\frac{\pi m}{2IB}}$

(D) $T = \sqrt{\frac{2\pi m}{IB}}$

Step-by-step solution ▸ prepwiser.in/questions/3M-5Z4xSd7

Earth's Magnetism · 5 PYQs

Q38 JEE Main 2023 · 12 Apr · Shift 1

A compass needle oscillates 20 times per minute at a place where the dip is 30° and 30 times per minute where the dip is 60°. The ratio of total magnetic field due to the earth at two places respectively is $\frac{4}{\sqrt{x}}$. The value of x is

Numerical answer — enter the value.

Step-by-step solution ▸ prepwiser.in/questions/aOqY87uk7Y

Q39 JEE Main 2022 · 27 Jul · Shift 1

A magnet hung at 45° with magnetic meridian makes an angle of 60° with the horizontal. The actual value of the angle of dip is -

(A) $\tan^{-1}\left(\sqrt{\frac{3}{2}}\right)$

(B) $\tan^{-1}(\sqrt{6})$

(C) $\tan^{-1}\left(\sqrt{\frac{2}{3}}\right)$

(D) $\tan^{-1}\left(\sqrt{\frac{1}{2}}\right)$

Step-by-step solution ▸ prepwiser.in/questions/Z5tTJEmUd8

Q40 JEE Main 2022 · 27 Jul · Shift 2

A compass needle of oscillation magnetometer oscillates 20 times per minute at a place P of dip 30°. The number of oscillations per minute become 10 at another place Q of 60° dip. The ratio of the total magnetic field at the two places $(B_Q : B_P)$ is :

(A) $\sqrt{3} : 4$

(B) $4 : \sqrt{3}$

(C) $\sqrt{3} : 2$

(D) $2 : \sqrt{3}$

Step-by-step solution ▸ prepwiser.in/questions/g8J8-LZHZP

Q41 JEE Main 2022 · 29 Jun · Shift 1

At a certain place the angle of dip is 30° and the horizontal component of earth's magnetic field is 0.5 G. The earth's total magnetic field (in G), at that certain place, is :

(A) $\frac{1}{\sqrt{3}}$

(B) $\frac{1}{2}$

(C) $\sqrt{3}$

(D) 1

Step-by-step solution ▸ prepwiser.in/questions/7wbUsWiazw

Q42 JEE Main 2021 · 20 Jul · Shift 2

At an angle of 30° to the magnetic meridian, the apparent dip is 45°. Find the true dip :

(A) $\tan^{-1}\sqrt{3}$

(B) $\tan^{-1}\frac{1}{\sqrt{3}}$

(C) $\tan^{-1}\frac{2}{\sqrt{3}}$

(D) $\tan^{-1}\frac{\sqrt{3}}{2}$

Step-by-step solution ▸ prepwiser.in/questions/GjAkOVJejU

Hysteresis · 2 PYQs

Q43 JEE Main 2024 · 8 Apr · Shift 2

The coercivity of a magnet is $5 \times 10^3 \mathrm{A/m}$. The amount of current required to be passed in a solenoid of length $30\mathrm{cm}$ and the number of turns 150, so that the magnet gets demagnetised when inside the solenoid is _____ A.

Numerical answer — enter the value.

Step-by-step solution ▸ prepwiser.in/questions/n0gO7K01oR

Q44 JEE Main 2020 · 2 Sep · Shift 1

Magnetic materials used for making permanent magnets (P) and magnets in a transformer (T) have different properties of the following, which property best matches for the type of magnet required?

(A) T : Large retentivity, small coercivity

(B) P : Large retentivity, large coercivity

(C) P : Small retentivity, large coercivity

(D) T : Large retentivity, large coercivity

Step-by-step solution ▸ prepwiser.in/questions/ifhnKUi9DS

Answer key — Magnetism & Matter

Numbers match the question numbers above. For full working, open the solution link under each question.

1 **D**	2 **A**	3 **A**	4 **B**	5 **A**	6 **C**	7 **A**	8 **6**
9 **A**	10 **A**	11 **A**	12 **C**	13 **A**	14 **C**	15 **250**	16 **22**
17 **B**	18 **B**	19 **C**	20 **B**	21 **A**	22 **A**	23 **C**	24 **A**
25 **B**	26 **28**	27 **100**	28 **5**	29 **C**	30 **6**	31 **D**	32 **D**
33 **B**	34 **A**	35 **8**	36 **C**	37 **D**	38 **243**	39 **A**	40 **A**
41 **A**	42 **D**	43 **10**	44 **B**				