

JEE Main 2025 April 3 Shift 2 Physics Question Paper

Time Allowed :3 Hours	Maximum Marks :300	Total Questions :75
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General Instructions

Read the following instructions very carefully and strictly follow them:

1. Multiple choice questions (MCQs)
2. Questions with numerical values as answers.
3. There are three sections: **Mathematics, Physics, Chemistry.**
4. **Mathematics:** 25 (20+5) 10 Questions with answers as a numerical value. Out of 10 questions, 5 questions are compulsory.
5. **Physics:** 25 (20+5) 10 Questions with answers as a numerical value. Out of 10 questions, 5 questions are compulsory..
6. **Chemistry:** 25 (20+5) 10 Questions with answers as a numerical value. Out of 10 questions, 5 questions are compulsory.
7. Total: 75 Questions (25 questions each).
8. 300 Marks (100 marks for each section).
9. **MCQs:** Four marks will be awarded for each correct answer and there will be a negative marking of one mark on each wrong answer.
10. **Questions with numerical value answers:** Candidates will be given four marks for each correct answer and there will be a negative marking of 1 mark for each wrong answer.

Physics

Section - A

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

- (A) 80 J
- (B) $-40\sqrt{3}$ J
- (C) -60 J
- (D) -80 J

27. In a resonance experiment, two air columns (closed at one end) of 100 cm and 120 cm long, give 15 beats per second when each one is sounding in the respective fundamental modes. The velocity of sound in the air column is :

- (A) 335 m/s
 - (B) 370 m/s
 - (C) 340 m/s
 - (D) 360 m/s
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28. Two cylindrical vessels of equal cross-sectional area of 2 m^2 contain water up to heights 10 m and 6 m, respectively. If the vessels are connected at their bottom, then the work done by the force of gravity is: (Density of water is 10^3 kg/m^3 and $g = 10\text{ m/s}^2$)

- (A) $1 \times 10^5\text{ J}$
 - (B) $4 \times 10^4\text{ J}$
 - (C) $6 \times 10^4\text{ J}$
 - (D) $8 \times 10^4\text{ J}$
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29. Width of one of the two slits in a Young's double slit interference experiment is half of the other slit. The ratio of the maximum to the minimum intensity in the interference pattern is :

- (A) $(2\sqrt{2} + 1) : (2\sqrt{2} - 1)$
 - (B) $(3 + 2\sqrt{2}) : (3 - 2\sqrt{2})$
 - (C) 9 : 1
 - (D) 3 : 1
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30. An ideal gas exists in a state with pressure P_0 , volume V_0 . It is isothermally expanded to 4 times of its initial volume (V_0), then isobarically compressed to its original volume. Finally the system is heated isochorically to bring it to its initial state. The amount of heat exchanged in this process is :

- (A) $P_0V_0(2\ln 2 - 0.75)$
 - (B) $P_0V_0(\ln 2 - 0.75)$
 - (C) $P_0V_0(\ln 2 - 0.25)$
 - (D) $P_0V_0(2\ln 2 - 0.25)$
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31. Two monochromatic light beams have intensities in the ratio 1:9. An interference pattern is obtained by these beams. The ratio of the intensities of maximum to minimum is

- (A) 8 : 1
- (B) 9 : 1
- (C) 3 : 1
- (D) 4 : 1

32. Given below are two statements : one is labelled as Assertion A and the other is labelled as Reason R. Assertion A : The Bohr model is applicable to hydrogen and hydrogen-like atoms only. Reason R : The formulation of Bohr model does not include repulsive force between electrons. In the light of the above statements, choose the correct answer from the options given below :

- (1) Both A and R are true but R is NOT the correct explanation of A.
- (2) A is false but R is true.
- (3) Both A and R are true and R is the correct explanation of A.
- (4) A is true but R is false.

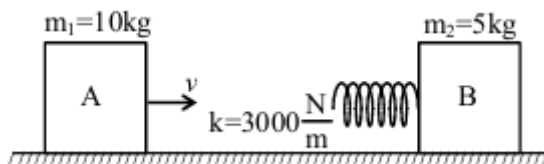
33. Using a battery, a 100 pF capacitor is charged to 60 V and then the battery is removed. After that, a second uncharged capacitor is connected to the first capacitor in parallel. If the final voltage across the second capacitor is 20 V, its capacitance is : (in pF)

- (1) 600
- (2) 200
- (3) 400
- (4) 100

34. A monochromatic light of frequency 5×10^{14} Hz travelling through air, is incident on a medium of refractive index '2'. Wavelength of the refracted light will be :

- (1) 300 nm
- (2) 600 nm
- (3) 400 nm
- (4) 500 nm

35.



Consider two blocks A and B of masses $m_1 = 10$ kg and $m_2 = 5$ kg that are placed on a frictionless table. The block A moves with a constant speed $v = 3$ m/s towards the block B kept at rest. A spring with spring constant $k = 3000$ N/m is attached with the block B as shown in the figure. After the collision, suppose that the blocks A and B, along with the spring in constant compression state, move together, then the compression in the spring is, (Neglect the mass of the spring)

- (1) 0.2 m
- (2) 0.4 m
- (3) 0.1 m
- (4) 0.3 m

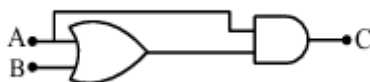
36. A particle is projected with velocity u so that its horizontal range is three times the maximum height attained by it. The horizontal range of the projectile is given as $\frac{nu^2}{25g}$, where value of n is : (Given 'g' is the acceleration due to gravity).

- (1) 6
- (2) 18
- (3) 12
- (4) 24

37. A solid steel ball of diameter 3.6 mm acquired terminal velocity 2.45×10^{-2} m/s while falling under gravity through an oil of density 925 kg m^{-3} . Take density of steel as 7825 kg m^{-3} and g as 9.8 m/s^2 . The viscosity of the oil in SI unit is

- (1) 2.18
- (2) 2.38
- (3) 1.68
- (4) 1.99

38. The truth table corresponding to the circuit given below is



- (1)

A	B	C
0	0	0
1	0	0
0	1	0
1	1	1

(2)

A	B	C
0	0	0
0	1	0
1	0	1
1	1	1

(3)

A	B	C
0	0	1
1	0	0
0	1	0
1	1	0

(4)

A	B	C
0	0	1
0	1	0
1	0	0
1	1	0

39. A particle moves along the x-axis and has its displacement x varying with time t according to the equation $x = c_0(t^2 - 2) + c(t - 2)^2$ where c_0 and c are constants of appropriate dimensions. Then, which of the following statements is correct?

- (1) the acceleration of the particle is $2c_0$
 - (2) the acceleration of the particle is $2c$
 - (3) the initial velocity of the particle is $4c$
 - (4) the acceleration of the particle is $2(c + c_0)$
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40. An electric bulb rated as 100 W-220 V is connected to an ac source of rms voltage 220 V. The peak value of current through the bulb is :

- (1) 0.64 A
- (2) 0.45 A
- (3) 2.2 A
- (4) 0.32 A

41. Match the LIST-I with LIST-II

LIST-I		LIST-II	
A.	Boltzmann constant	I.	ML^2T^{-1}
B.	Coefficient of viscosity	II.	$\text{MLT}^{-3}\text{K}^{-1}$
C.	Planck's constant	III.	$\text{ML}^2\text{T}^{-2}\text{K}^{-1}$
D.	Thermal conductivity	IV.	$\text{ML}^{-1}\text{T}^{-1}$

Choose the correct answer from the options given below :

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

42. Pressure of an ideal gas, contained in a closed vessel, is increased by 0.4

- (1) 25°C
- (2) 2500 K
- (3) 250 K
- (4) 250°C

43. A motor operating on 100 V draws a current of 1 A. If the efficiency of the motor is 91.6

- (1) 4
- (2) 8.4
- (3) 2
- (4) 6.2

44. A block of mass 1 kg, moving along x with speed $v_i = 10$ m/s enters a rough region ranging from $x = 0.1$ m to $x = 1.9$ m. The retarding force acting on the block in this range is $F_r = -kx$ N, with $k = 10$ N/m. Then the final speed of the block as it crosses this rough region is

- (1) 10 m/s
- (2) 4 m/s
- (3) 6 m/s
- (4) 8 m/s

45. Given below are two statements : one is labelled as Assertion A and the other is labelled as Reason R. Assertion A : If oxygen ion (O^{-2}) and Hydrogen ion (H^{+}) enter normal to the magnetic field with equal momentum, then the path of O^{-2} ion has a smaller curvature than that of H^{+} . Reason R : A proton with same linear momentum as an electron will form a path of smaller radius of curvature on entering a uniform magnetic field perpendicularly. In the light of the above statements, choose the correct answer from the options given below

- (1) A is true but R is false
- (2) Both A and R are true but R is NOT the correct explanation of A
- (3) A is false but R is true
- (4) Both A and R are true and R is the correct explanation of A

46. Light from a point source in air falls on a spherical glass surface (refractive index, $\mu = 1.5$ and radius of curvature $R = 50$ cm). The image is formed at a distance of 200 cm from the glass surface inside the glass. The magnitude of distance of the light source from the glass surface is _____ m.

47. The excess pressure inside a soap bubble A in air is half the excess pressure inside another soap bubble B in air. If the volume of the bubble A is n times the volume of the bubble B, then, the value of n is _____ .

48. Two cells of emf 1V and 2V and internal resistance $2\ \Omega$ and $1\ \Omega$, respectively, are connected in series with an external resistance of $6\ \Omega$. The total current in the circuit is I_1 . Now the same two cells in parallel configuration are connected to the same external resistance. In this case, the total current drawn is I_2 . The value of $\left(\frac{I_1}{I_2}\right)$ is $\frac{x}{3}$. The value of x is _____ .

49. An electron in the hydrogen atom initially in the fourth excited state makes a transition to n^{th} energy state by emitting a photon of energy 2.86 eV. The integer value of n will be _____ .

50. A physical quantity C is related to four other quantities p, q, r and s as follows

$$C = \frac{pq^2}{r^3\sqrt{s}}$$

The percentage errors in the measurement of p, q, r and s are 1%, 2%, 3% and 2% respectively. The percentage error in the measurement of C will be ----- %.
