

JEE Main 2025 April 4 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 radioactive material P first decays into Q and then Q decays to non-radioactive material R. Which of the following figure represents time dependent mass of P, Q and R?

27.

There are 'n' number of identical electric bulbs, each is designed to draw a power p independently from the mains supply. They are now joined in series across the main supply. The total power drawn by the combination is:

- (1) np
 - (2) $\frac{p}{n^2}$
 - (3) $\frac{p}{n}$
 - (4) p
-

28.

Consider a rectangular sheet of solid material of length $\ell = 9$ cm and width $d = 4$ cm. The coefficient of linear expansion is $\alpha = 3.1 \times 10^{-5} \text{ K}^{-1}$ at room temperature and one atmospheric pressure. The mass of the sheet is $m = 0.1$ kg and the specific heat capacity $C_v = 900 \text{ J kg}^{-1}\text{K}^{-1}$. If the amount of heat supplied to the material is $8.1 \times 10^2 \text{ J}$, then the change in area of the rectangular sheet is:

- (1) $2.0 \times 10^{-6} \text{ m}^2$
 - (2) $3.0 \times 10^{-7} \text{ m}^2$
 - (3) $6.0 \times 10^{-7} \text{ m}^2$
 - (4) $4.0 \times 10^{-7} \text{ m}^2$
-

29.

Given below are two statements:

Statement (I) : The dimensions of Planck's constant and angular momentum are same.

Statement (II) : In Bohr's model, electron revolves around the nucleus in those orbits for which angular momentum is an integral multiple of Planck's constant.

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

- (1) Both Statement I and Statement II are correct
 - (2) Statement I is incorrect but Statement II is correct
 - (3) Statement I is correct but Statement II is incorrect
 - (4) Both Statement I and Statement II are incorrect
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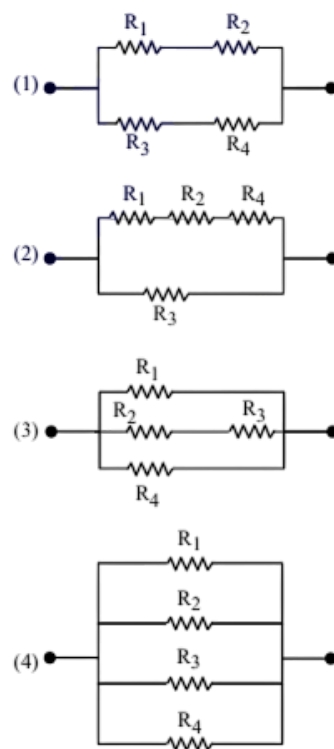
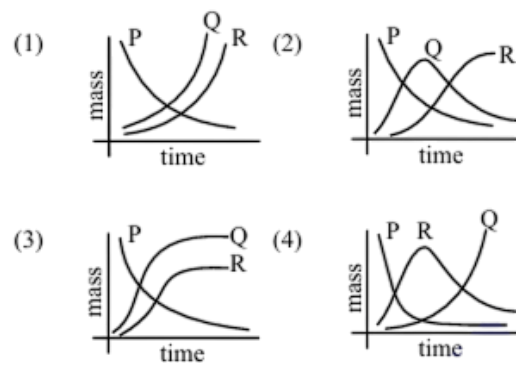
30.

A cylindrical rod of length 1 m and radius 4 cm is mounted vertically. It is subjected to a shear force of 10^5 N at the top. Considering infinitesimally small displacement in the upper edge, the angular displacement θ of the rod axis from its original position would be: (shear moduli $G = 10^{10} \text{ N/m}^2$)

- (1) $\frac{1}{160\pi}$
 - (2) $\frac{1}{4\pi}$
 - (3) $\frac{1}{40\pi}$
 - (4) $\frac{1}{2\pi}$
-

31.

From the combination of resistors with resistance values $R_1 = R_2 = R_3 = 5 \Omega$ and $R_4 = 10 \Omega$, which of the following combination is the best circuit to get an equivalent resistance of 6Ω ?



32.

A metallic ring is uniformly charged as shown in the figure. AC and BD are two mutually perpendicular diameters. Electric field due to arc AB to O is 'E' magnitude. What would be the magnitude of electric field at 'O' due to arc ABC?

- (1) $2E$
 - (2) $\sqrt{2}E$
 - (3) $E/2$
 - (4) Zero
-

33.

There are two vessels filled with an ideal gas where volume of one is double the volume of the other. The large vessel contains the gas at 8 kPa at 1000 K while the smaller vessel contains the gas at 7 kPa at 500 K. If the vessels are connected to each other by a thin tube allowing the gas to flow and the temperature of both vessels is maintained at 600 K, at steady state the pressure in the vessels will be (in kPa).

- (1) 4.4
 - (2) 6
 - (3) 24
 - (4) 18
-

34.

An object is kept at rest at a distance of $3R$ above the earth's surface where R is earth's radius. The minimum speed with which it must be projected so that it does not return to earth is: (Assume M = mass of earth, G = Universal gravitational constant)

- (1) $\sqrt{\frac{GM}{2R}}$
 - (2) $\sqrt{\frac{GM}{R}}$
 - (3) $\sqrt{\frac{3GM}{R}}$
 - (4) $\sqrt{\frac{2GM}{R}}$
-

35.

Three parallel plate capacitors C_1 , C_2 , and C_3 each of capacitance $5 \mu\text{F}$ are connected as shown in the figure. The effective capacitance between points A and B, when the space between the parallel plates of C_1 capacitor is filled with a dielectric medium having dielectric constant of 4, is:

- (1) $22.5 \mu\text{F}$
- (2) $7.5 \mu\text{F}$
- (3) $9 \mu\text{F}$

(4) 30 μF

36.

The displacement x versus time graph is shown below.

The displacement x is plotted against time t . Choose the correct answer from the options given below:

- (A) The average velocity during 0 to 3 s is 10 m/s
- (B) The average velocity during 3 to 5 s is 0 m/s
- (C) The instantaneous velocity at $t = 2$ s is 5 m/s
- (D) The average velocity during 5 to 7 s is the same as instantaneous velocity at $t = 6.5$ s
- (E) The average velocity from $t = 0$ to $t = 9$ s is zero

Choose the correct answer from the options given below:

- (1) (A), (D), (E) only
 - (2) (B), (C), (D) only
 - (3) (B), (D), (E) only
 - (4) (B), (C), (E) only
-

37.

A wheel is rolling on a plane surface. The speed of a particle on the highest point of the rim is 8 m/s. The speed of the particle on the rim of the wheel at the same level as the center of the wheel, will be:

- (1) $4\sqrt{2}$ m/s
 - (2) 8 m/s
 - (3) 4 m/s
 - (4) $8\sqrt{2}$ m/s
-

38.

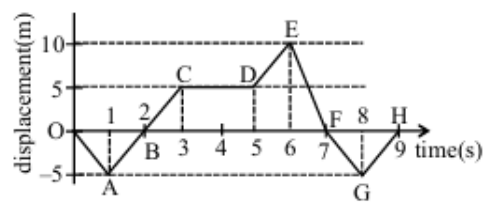
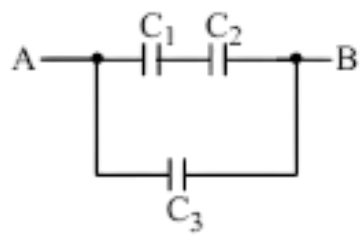
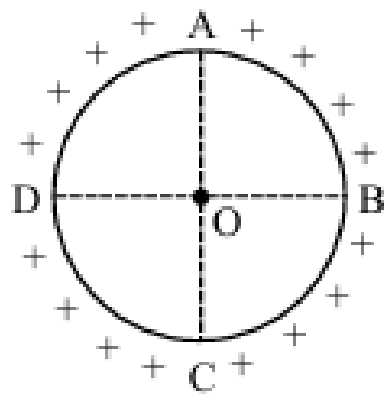
For the determination of refractive index of glass slab, a travelling microscope is used whose main scale contains 300 equal divisions equals to 15 cm. The vernier scale attached to the microscope has 25 divisions equals to 24 divisions of main scale. The least count (LC) of the travelling microscope is (in cm):

- (1) 0.001
 - (2) 0.002
 - (3) 0.0005
 - (4) 0.0025
-

39.

A block of mass 25 kg is pulled along a horizontal surface by a force at an angle 45° with the horizontal. The friction coefficient between the block and the surface is 0.25. The displacement of 5 m of the block is:

- (1) 970 J



- (2) 735 J
 - (3) 245 J
 - (4) 490 J
-

40.

Two polarisers P_1 and P_2 are placed in such a way that the intensity of the transmitted light will be zero. A third polariser P_3 is inserted in between P_1 and P_2 , at the particular angle between P_1 and P_2 . The transmitted intensity of the light passing through all three polarisers is maximum. The angle between the polarisers P_2 and P_3 is:

- (1) $\frac{\pi}{4}$
 - (2) $\frac{\pi}{6}$
 - (3) $\frac{\pi}{8}$
 - (4) $\frac{\pi}{3}$
-

41.

Consider a n-type semiconductor in which n_e and n_h are the number of electrons and holes, respectively.

- (A) Holes are minority carriers
- (B) The dopant is a pentavalent atom
- (C) $n_e n_h = n_i^2$ for intrinsic semiconductor
- (D) $n_e \gg n_h$ for extrinsic semiconductor

The correct answer from the options given below is:

- (1) (A) and (C) only
 - (2) (B) and (D) only
 - (3) (A), (B) and (C) only
 - (4) (A), (C) and (D) only
-

42.

Match List-I with List-II.

- | | |
|----------------|--|
| (A) Isobaric | (I) $\Delta Q = \Delta W$ |
| (B) Isochoric | (II) $\Delta Q = \Delta U$ |
| (C) Adiabatic | (III) $\Delta Q = 0$ |
| (D) Isothermal | (IV) $\Delta Q = \Delta U + P\Delta V$ |

Choose the correct answer from the options given below:

- (1) (A)-(IV), (B)-(III), (C)-(II), (D)-(I)
 - (2) (A)-(IV), (B)-(I), (C)-(III), (D)-(II)
 - (3) (A)-(IV), (B)-(II), (C)-(III), (D)-(I)
 - (4) (A)-(I), (B)-(II), (C)-(IV), (D)-(III)
-

43.

Displacement of a wave is expressed as

$$x(t) = 5 \cos \left(628t + \frac{\pi}{2} \right) \text{ m.}$$

The wavelength of the wave when its velocity is 300 m/s is:

- (1) 5 m
 - (2) 0.5 m
 - (3) 0.33 m
 - (4) 0.33 m
-

44.

A finite size object is placed normal to the principal axis at a distance of 30 cm from a convex mirror of focal length 30 cm. A plane mirror is now placed in such a way that the image produced by both the mirrors coincide with each other.

The distance between the two mirrors is:

- (1) 45 cm
 - (2) 7.5 cm
 - (3) 22.5 cm
 - (4) 15 cm
-

45.

In an electromagnetic system, a quantity defined as the ratio of electric dipole moment and magnetic dipole moment has dimensions of $[ML^2T^{-3}A^{-1}]$. The value of P and Q are:

- (1) 1, 0
 - (2) 1, -1
 - (3) 1, 1
 - (4) 0, -1
-

Section - B

46.

A particle of charge $1.6 \mu\text{C}$ and mass $16 \mu\text{g}$ is present in a strong magnetic field of 6.28 T. The particle is then fired perpendicular to magnetic field. The time required for the particle to return to original location for the first time is _____ s. (Take $\pi = 3.14$)

47.

A solid sphere with uniform density and radius R is rotating initially with constant angular velocity (ω_1) about its diameter. After some time during the

rotation, it starts losing mass at a uniform rate, with no change in its shape. The angular velocity of the sphere when its radius becomes $\frac{R}{2}$ is ω_2 . The value of x is -----.

48.

If an optical medium possesses a relative permeability of $\frac{10}{\pi}$ and relative permittivity of $\frac{1}{0.0885}$, then the velocity of light is greater in vacuum than in that medium by ----- times.

$$(\mu_0 = 4\pi \times 10^{-7} \text{ H/m}, \quad \epsilon_0 = 8.85 \times 10^{-12} \text{ F/m}, \quad c = 3 \times 10^8 \text{ m/s})$$

49.

In a Young's double slit experiment, two slits are located 1.5 m apart. The distance of screen from slits is 2 m and the wavelength of the source is 400 nm. If the 20 maxima of the double slit pattern are contained within the centre maximum of the single slit diffraction pattern, then the width of each slit is $x \times 10^{-3}$ cm, where x-value is:

50.

An inductor of self inductance 1 H connected in series with a resistor of 100 Ω and an AC supply of 10 V, 50 Hz. Maximum current flowing in the circuit is:
(1) 1 A
