



# TECHNO INDIA GROUP PUBLIC SCHOOLS

Dt. 13-12-2025

## JEE (Main)-XI Monthly Mock Test - 6 (December-2025)

Time Allowed: **3 hours**

Maximum Marks: **300**

### General Instructions:

1. There are three subjects in the question paper consisting of Physics (Q. no. 1 to 25), Chemistry (Q. no. 26 to 50), and Mathematics (Q. no. 51 to 75).
2. Each subject is divided into two sections. Section A consists of 20 multiple-choice questions & Section B consists of 5 numerical value-type questions.
3. There will be only one correct choice in the given four choices in Section A. For each question for Section A, 4 marks will be awarded for correct choice, 1 mark will be deducted for incorrect choice questions and zero marks will be awarded for not attempted questions.
4. For Section B questions, 4 marks will be awarded for correct choice, 1 mark will be deducted for incorrect choice questions and zero marks will be awarded for not attempted questions.
5. Any textual, printed, or written material, mobile phones, calculator etc. is not allowed for the students appearing for the test.
6. All calculations/written work should be done in the rough sheet, provided with the Question Paper.

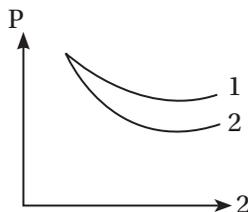
**Space For Rough Works**



## PHYSICS

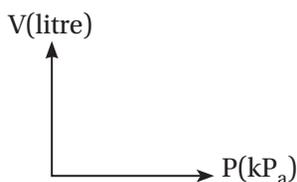
### Section—A (Single Option Correct Type)

1. Potential energy of a particle of unit mass moving in a one dimension conservative force field is given by  $U = x^2 - 4x + 3$ . The time period is
  - ①  $\sqrt{2\pi}$  sec
  - ②  $2\pi$  sec
  - ③  $\frac{1}{\sqrt{2}}$  sec
  - ④  $\frac{\pi}{2}$  sec
2. A ring of mass  $m$  and radius  $r$  suspended through a point on its periphery, time period of small oscillations is
  - ①  $2\pi\sqrt{\frac{r}{g}}$
  - ②  $2\pi\sqrt{\frac{2r}{g}}$
  - ③  $2\pi\sqrt{\frac{r}{2g}}$
  - ④  $2\pi\sqrt{\frac{g}{2r}}$
3. The amplitude of a damped oscillator is  $A_0$ , It becomes  $\frac{A_0}{3}$  in 2 minutes, the amplitude of oscillations after 6 min. will be
  - ①  $\frac{A_0}{6}$
  - ②  $\frac{A_0}{9}$
  - ③  $\frac{A_0}{27}$
  - ④  $\frac{A_0}{81}$
4. If the absolute temperature of a black body is double the percentage increase in the rate of loss of heat by radiation is
  - ① 15%
  - ② 16%
  - ③ 1650%
  - ④ 1500%
5. If distance between the gas molecules is doubled at constant temperature, then pressure
  - ①  $\frac{P}{16}$
  - ②  $\frac{P}{8}$
  - ③  $\frac{P}{4}$
  - ④  $\frac{P}{2}$
6. At a pressure of  $24 \times 10^5$  dyne./c.m<sup>2</sup>, the volume of O<sub>2</sub> is 10 litre and mass is 20 gm. The r.m.s velocity will be
  - ① 800 m/sec.
  - ② 400 m/s
  - ③ 600 m/s
  - ④ 1000 m/s
7. Internal energy of  $n_1$  mole of hydrogens of temperature  $T$  is equal to the internal energy of  $n_2$  mole of helium at temperature  $2T$ , the ratio  $\frac{n_1}{n_2}$  is
  - ①  $\frac{2}{5}$
  - ②  $\frac{2}{3}$
  - ③  $\frac{6}{5}$
  - ④  $\frac{3}{7}$
8. P-V graph for two gasses during diabatic process are shown in figure, Plots 1 and 2 should correspond to



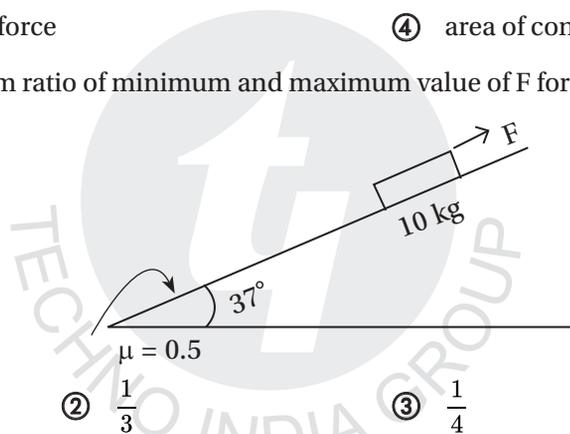
- ① He and O<sub>2</sub>
- ② O<sub>2</sub> and He
- ③ He and Ar
- ④ O<sub>2</sub> and N<sub>2</sub>

9. Heat energy absorbed by a system is going through a cyclic process shown in figure is  $V$ (litre)

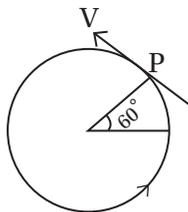


- ①  $10^7 \pi$  j
- ②  $10^4 \pi$  j
- ③  $10^2 \pi$  j
- ④  $10^{-3} \pi$  j

10. 80 g of water at  $0^{\circ}\text{C}$  are poured on a large block of ice, the mass of ice that melts is  
 ① 80 g                                      ② 30 g                                      ③ 12 g                                      ④ zero
11. If  $\vec{P} + \vec{Q} = \vec{R}$  and when value of P becomes double, resultant becomes perpendicular with Q find value of 'R'  
 ①  $\sqrt{P^2 + Q^2}$                               ② Q                                      ③ P                                      ④  $(P + Q)^2$
12. If  $\hat{a}$ ,  $\hat{b}$  and  $\hat{c}$  are the three unit vectors, and  $\hat{a} + \hat{b} + \hat{c} = 0$ , find  $|\hat{a} + \hat{b} - \hat{c}| =$   
 ① 2                                      ②  $\sqrt{3}$                                       ③  $2\sqrt{3}$                                       ④ zero
13. If  $a_1\hat{i} + a_2\hat{j}$  is a unit vector and perpendicular to  $4\hat{i} - 3\hat{j}$  if  
 ①  $a_1 = \frac{3}{5}$ ;  $a_2 = \frac{4}{5}$                               ②  $a_1 = \frac{4}{5}$ ;  $a_2 = \frac{3}{5}$                               ③  $a_1 = 1$ ;  $a_2 = 1$                               ④  $a_1 = 0$ ;  $a_2 = 1$
14. Static friction force depends on -  
 ① nature of contact surface                              ② normal reaction force  
 ③ resulting applied force                              ④ area of contact.
15. According to the diagram ratio of minimum and maximum value of F for the block is at rest ( $\mu = 0.5$ )



- ①  $\frac{1}{2}$                                       ②  $\frac{1}{3}$                                       ③  $\frac{1}{4}$                                       ④  $\frac{1}{5}$
16. A 5 Kg block is placed on a horizontal surface ( $\mu = 0.6$ ). Find minimum force require to move the block.  
 ① 30 N                                      ② 26 N                                      ③ 22 N                                      ④ 38 N
17. A particle rotate in a circular path of radius 2m. Its acceleration is  $36 \text{ ms}^{-2}$  at point P. Find its velocity at point 'P'.



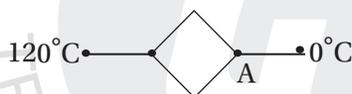
- ①  $6 \text{ ms}^{-2}$                                       ②  $8 \text{ ms}^{-2}$   
 ③  $10 \text{ ms}^{-2}$                                       ④  $4 \text{ ms}^{-2}$
18. A particle rotate in a circular path such that its  $\vec{v} \cdot \vec{a} > 0$  then  
 ① rotate with same speed                              ② rotate with increasing speed  
 ③ rotate with decreasing speed                              ④ none of the above

19. Two bodies of masses  $m$  and  $4m$  at a distance  $r$ , find the gravitational potential at a point where field is zero.
- ① zero                      ②  $-\frac{4Gm}{r}$                       ③  $-\frac{6Gm}{r}$                       ④  $-\frac{9Gm}{r}$
20. The force  $7\hat{i} + 3\hat{j} - 5\hat{k}$  acts on a particle whose position vector is  $\hat{i} - \hat{j} + \hat{k}$ . What is the torque of a given force about the origin?
- ①  $2\hat{i} + 12\hat{j} + 10\hat{k}$                       ②  $2\hat{i} + 10\hat{j} + 12\hat{k}$                       ③  $2\hat{i} + 10\hat{j} + 10\hat{k}$                       ④  $10\hat{i} + 2\hat{j} + \hat{k}$

### SECTION-B

#### Integer Type Questions (Q.21 - Q.25)

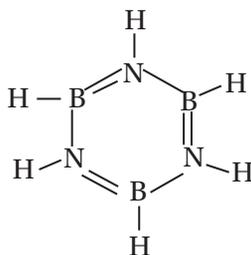
21. A soap bubble of radius 3 cm is formed inside another soap bubble of radius 6 cm. The radius of an equivalent soap bubble which has the same excess pressure as inside the smaller bubble with respect to the atmospheric pressure is \_\_\_\_\_ cm.
22. The excess pressure inside a liquid drop is  $500 \text{ Nm}^{-2}$ . If the radius of the drop is 2mm, the surface tension of liquid is  $x \times 10^{-3} \text{ Nm}^{-1}$ . The value of  $x$  is \_\_\_\_\_.
23. When a rubber ball is taken to a depth of \_\_\_ m in deep sea, its volume decreases by 0.5%  
(Bulk modulus =  $9.8 \times 10^8 \text{ Nm}^{-2}$ , density of sea water =  $10^3 \text{ kg m}^{-3}$ )
24. A particle executing SHM of equation  $x = 5 (\sin wt + \sqrt{3} \cos wt)$ , its amplitude will be \_\_\_\_\_.
25. Consider the 6 identical rods as shown in figure, the temperature at A in  $^{\circ}\text{C}$  will be \_\_\_\_\_.



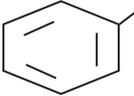
### CHEMISTRY

#### Section—A (Single Option Correct Type)

26. The sequence that correctly describes the relative bond strengths pertaining to oxygen molecule and its cations or anion is :
- ①  $\text{O}_2^{2-} > \text{O}_2^- > \text{O}_2 > \text{O}_2^+$                       ②  $\text{O}_2 > \text{O}_2^+ > \text{O}_2^- > \text{O}_2^{2-}$   
 ③  $\text{O}_2^+ > \text{O}_2 > \text{O}_2^{2-} > \text{O}_2^-$                       ④  $\text{O}_2^+ > \text{O}_2 > \text{O}_2^- > \text{O}_2^{2-}$
27. What are the formal charges on 'B' and 'N' respectively in the given structure ?



- ① -1, +1                      ② +1, 0                      ③ -2, 2                      ④ 0, 0

28. The number of stereoisomers obtained by bromination of trans-2-butene is :  
 ① 1                                      ② 2                                      ③ 3                                      ④ 4
29. Among the following which one of the following is the highest acidic in nature ?  
 ①  $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_3$  ②  ③  ④ 
30. The potential energy of electron present in the ground state of  $\text{Li}^{2+}$  ion is represented by :  
 ①  $\frac{+3e^2}{4\pi \epsilon_0 r}$                               ②  $\frac{-3e}{4\pi \epsilon_0 r}$                               ③  $\frac{-3e^2}{4\pi \epsilon_0 r^2}$                               ④  $\frac{-3e^2}{4\pi \epsilon_0 r}$
31. If the radius of first orbit of H-atom is  $a_0$ . Hence de-Broglie wave-length of electron on 4<sup>th</sup> orbit is :  
 ①  $8\pi a_0$                                       ②  $\frac{a_0}{4}$                                       ③  $16 a_0$                                       ④  $2\pi a_0$
32. A compound made up of two elements 'A' and 'B' is formed to contain 25% 'A' (atomic mass = 12.5) and 75% 'B' (atomic mass = 37.5). The simplest formula of the compound is :  
 ① AB                                      ②  $\text{AB}_2$                                       ③  $\text{AB}_3$                                       ④  $\text{A}_3\text{B}$
33. Calculate the degree of dissociation of  $\text{PCl}_5$ , the density at  $230^\circ\text{C}$  is 70.  
 ① 97.8%                                      ② 49.9%                                      ③ 4.89%                                      ④ 24.49%
34. Calculate the pH of 0.5(M) aqueous solution of NaCN, the  $\text{pK}_b$  of  $\text{CN}^-$  is 4.70  
 ① 4.70                                      ② 11.5                                      ③ 7                                      ④ 6.5
35. The bond dissociation energies of gaseous  $\text{H}_2$ ,  $\text{Cl}_2$  and HCl are 104, 58 and 103 KCal respectively. The enthalpy of formation of HCl gas would be :  
 ① -44 KCal                                      ② 44 KCal                                      ③ -22 KCal                                      ④ +22 KCal
36. For a spontaneous reaction the  $\Delta G$ ; equilibrium constant (K) and  $E^\circ_{\text{cell}}$  will be respectively :  
 ① -ve, > 1, -ve                              ② -ve, < 1, -ve                              ③ +ve, > 1, > -ve                              ④ -ve, > 1, +ve
37. The density of 3(M) solution of sodium chloride is  $1.252 \text{ g(ml)}^{-1}$ . The molality of the solution will be [Molar mass of all =  $58.5 \text{ g(ml)}^{-1}$ ].  
 ① 2.60 m                                      ② 2.18 m                                      ③ 2.79 m                                      ④ 3.00 m
38. Indicate in which of the following processes, the nitrogen is reduced ?  
 ①  $\text{NO}_3^- \longrightarrow \text{NO}$                               ②  $\text{NO}_2 \longrightarrow \text{NO}_2^-$                               ③  $\text{NO}_3^- \longrightarrow \text{NH}_4^+$                               ④ All of these
39. In the reaction :  
 $\text{VO} + \text{Fe}_2\text{O}_3 \longrightarrow \text{FeO} + \text{V}_2\text{O}_5$   
 What is the n-factor for  $\text{V}_2\text{O}_5$  ?  
 ① +2                                      ② +4                                      ③ +6                                      ④ +8
40. The normality of a solution obtained by mixing 100 ml of 0.2(M)  $\text{H}_2\text{SO}_4$  with 100 ml of 0.2(M) NaOH is  
 ① 0.1                                      ② 0.2                                      ③ 0.5                                      ④ 0.3
41. Mole fraction of urea in its aqueous solution is 0.2, then molality of the solution will be :  
 ① 1.38                                      ② 8.31                                      ③ 3.81                                      ④ 13.8

42. The species having bond order difference from that is CO is  
 ①  $\text{NO}^-$                       ②  $\text{NO}^+$                       ③  $\text{CN}^-$                       ④  $\text{N}_2$
43. The shape of  $\text{XeO}_2\text{F}_2$  molecule is  
 ① Trigonal bipyramidal    ② Square planar                      ③ Tetrahedral                      ④ See-Saw
44. Calculate the pH of the following solutions, when 50 ml of 0.1(M)  $\text{CH}_3\text{COOH}$  mixed with 100 ml of 0.1(M)  $\text{NaOH}$ . [ $\text{p}K_a = 4.75$ ]  
 ① 4.75                      ② 8.72                      ③ 9.25                      ④ 12.52
45. Calculate the solubility of  $\text{AgCl}$  in 0.1(M)  $\text{AgNO}_3$  solution. (Given  $(K_{sp})_{\text{AgCl}}$  at  $25^\circ\text{C} = 2.3 \times 10^{-10}$ )  
 ①  $2.8 \times 10^{-10}$  mol/L    ②  $2.8 \times 10^{-9}$  mol/L                      ③  $2.8 \times 10^{-12}$  mol/[(2) $^{-1}$ ]    ④ None

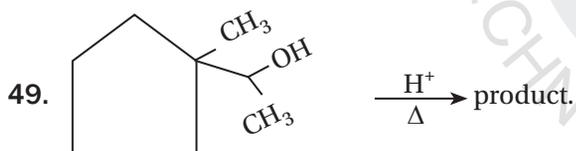
### Section—B (Numerical Answer Type)

46. Let the wave function  $\psi$  for 2S orbital is given by :

$$\psi_{2s} = \frac{1}{\sqrt{y\pi}} \left[ \frac{x}{a_0} \right]^{\frac{3}{2}} \left[ 2 - \frac{r}{3a_0} \right] e^{-\frac{r}{2a_0}}$$

Where 'x' and 'y' are constant. If at  $r = r_0$  radial node is formed, and value of  $r_0$  in terms of  $a_0$  is  $na_0$ . What is the value of 'n' ? \_\_\_\_\_ .

47. Number of moles of electrons are needed to convert one mole of nitrate ion into hydrazine are \_\_\_\_\_ .
48. If total number of monochloro derivative of  $\text{C}_4\text{H}_8$  is x.  $x - 5 = -?$



What will be the sum of number of atoms involved in ring (ie x membered ring) and number of  $\pi$ -bond (y).  $x + y = -?$

50. Total number of stereoisomers possible for the compound :  
 $\text{CH}_3 - \text{CH} = \text{CH} - \text{CH} = \text{CH} - \text{CH} - \text{CH} = \text{CH} - \text{Cl}$  is

## MATHEMATICS

### Section—A (Single Option Correct Type)

51. If  $y = \frac{x^4 + x^2 + 1}{x^2 + x + 1}$  and  $\frac{dy}{dx} = (ax + b)$  then  
 ①  $a = 2, b = 1$                       ②  $a = -2, b = 1$                       ③  $a = 2, b = -1$                       ④  $a = -2, b = -1$
52. If  $f(x) = \cos x \cdot \cos 2x \cdot \cos 4x \cdot \cos 8x \cdot \cos 16x$  then  $f'\left(\frac{\pi}{4}\right)$  then  
 ①  $\sqrt{2}$                       ②  $\frac{1}{\sqrt{2}}$                       ③ 1                      ④ none of these

53. If  $y = \frac{\tan x + \sec x - 1}{\tan x - \sec x + 1}$  then  $\frac{dy}{dx} = ?$
- ①  $(\sec x + \tan x)$       ②  $\sec x(\sec x + \tan x)$       ③  $\sec x(\sec x - \tan x)$       ④ none of these
54. If  $f(x) = 1 + \frac{x}{1!} + \frac{x^2}{2!} + \frac{x^3}{3!} + \dots \infty$  then  $f'(x) = ?$
- ①  $f(x)$       ②  $f(0)$       ③  $-f(x)$       ④ none of these
55. If  $n \in N$ , and  $[x]$  denotes the greatest integer less than or equal to  $x$ , then  $\lim_{x \rightarrow n} (-1)^{[x]}$  is equal to
- ① 1      ② -1      ③ 0      ④ none of these
56. If the reflection of the ellipse  $\frac{(x-4)^2}{16} + \frac{(y-3)^2}{9} = 1$  in the mirror line  $x - y - 2 = 0$  is  $k_1x^2 + k_2y - 160x - 36y + 292 = 0$  then  $a$  is equal to
- ① 4      ② 5      ③ 6      ④ 7
57. Locus of the point of intersection of the perpendicular tangents of the curve  $y^2 + 4y - 6x - 2 = 0$
- ①  $2x - 1 = 0$       ②  $2x + 3 = 0$       ③  $2y + 3 = 0$       ④  $2x + 5 = 0$
58. The length of chord of contact of the tangents drawn from the point  $(2, 5)$  to the parabola  $y^2 = 8x$ , is
- ①  $\frac{\sqrt{41}}{2}$       ②  $\sqrt{41}$       ③  $\frac{3\sqrt{41}}{2}$       ④  $2\sqrt{41}$
59. The curve represented by the equation  $\sqrt{ax} + \sqrt{by} = 1$  where  $a, b > 0$  is
- ① a circle      ② a parabola      ③ an ellipse      ④ a hyperbola
60. Let a circle  $S$  whose centre is  $(h, k)$ , touches a pair of lines  $4xy - 3y^2 + 16x - 12y = 0$  at  $A$  and  $B$ . If ' $r$ ' is the radius of the circle " $S$ " then  $(h + k)$  is equal to
- ① 6      ② -7      ③ 24      ④ 48
61. The number of ways of distributing 8 identical balls in 3 distinct boxes, so that none of the boxes is empty, is
- ① 5      ② 21      ③  $3^8$       ④  ${}^8C_3$
62. If the letters of the word "SACHIN" are arranged in all possible ways and these words are written out as in dictionary, then the word "SACHIN" appears at serial number
- ① 602      ② 603      ③ 600      ④ 601
63. At an election, a voter may vote for any number of candidates, not greater than the number to be elected. There are 10 candidates and 4 are to be elected. If a voter votes for at least one candidate, then the number of ways in which he can vote is
- ① 5040      ② 6210      ③ 385      ④ 1110
64. There are 10 points in a plane, out of these 6 are collinear. If  $N$  is the number of triangles formed by joining these points. Then
- ①  $N \leq 100$       ②  $100 < N \leq 140$       ③  $140 < N \leq 190$       ④  $N > 190$

65. Assuming the balls to be identical except for difference in colours, the number of ways in which one or more balls can be selected from 10 white, 9 green and 7 black balls is
- ① 880                      ② 629                      ③ 630                      ④ 879
66. Let  $z$  be a complex number such that the imaginary part of  $z$  is non-zero and  $a = z^2 + z + 1$  is real. Then  $a$  cannot take the value
- ① -1                      ②  $\frac{1}{2}$                       ③  $\frac{1}{3}$                       ④  $\frac{3}{4}$
67. If  $|z| = 1$  and  $z \neq \pm 1$ , then all the values of  $\frac{z}{1-z^2}$  lie on
- ① a line not passing through the origin                      ②  $|z| = \sqrt{2}$   
 ③ the  $x$ -axis                      ④ the  $y$ -axis
68.  $a, b, c$  are integers, not all simultaneously equal and  $\omega$  is cube root of unity ( $\omega \neq 1$ ), then minimum value of  $|a + b\omega + c\omega^2|$  is
- ① 0                      ② 1                      ③  $\frac{\sqrt{3}}{2}$                       ④  $\frac{1}{2}$
69. For all complex numbers  $z_1, z_2$  satisfying  $|z_1| = 12$  and  $|z_2 - 3 - 4i| = 5$ , the minimum value of  $|z_1 - z_2|$  is
- ① 0                      ② 2                      ③ 7                      ④ 17
70. For the equation  $3x^2 + px + 3 = 0, p > 0$  if one of the roots is square of the other, then  $p$  is equal to
- ①  $\frac{1}{3}$                       ② 1                      ③ 3                      ④  $\frac{2}{3}$

## Section-B

## (Numerical Answer Type)

71. Each  $X_r$  contains 5 elements and each set  $Y_r$  contain 2 elements and  $\bigcup_{r=1}^{20} X_r = S = \bigcup_{r=1}^n Y_r$ . If each element of  $S$  belong to exactly 10 of  $X_r$ 'S and to exactly 4 of  $Y_r$ 'S, then  $n$  is
72. The value of  $-16 \cos \frac{\pi}{5} \cdot \cos \frac{2\pi}{5} \cdot \frac{\cos 4\pi}{5} \cos \frac{8\pi}{5}$  is
73. The number of terms in the expansion of  $(a + b + c)^{10}$  is
74. If  $\alpha$  and  $\beta$  are the roots of the equation  $x^2 + x - 3 = 0$ . Find the value of  $\alpha^3 - 4\beta^2 + 19$ .
75. We call 'P' a good number if the inequality  $\frac{2x^2 + 2x + 3}{x^2 + x + 1} \leq P$  is satisfied for any real  $x$ . Find the smallest integral good number.