TECHNO INDIA GROUP PUBLIC SCHOOLS

Dt. 21-01-2026

JEE (Main)-XI

Monthly Mock Test - 7 (JANUARY-2026)

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)

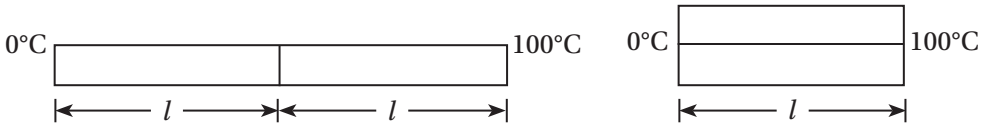
1. A train has to negotiate a curve of radius 2000 m. By how much should the outer rail be raised with respect to inner rail for a speed 72 km/hr? The distance between the rails is 1 m.

① 2 cm ② 5 cm ③ 3.5 cm ④ 7.5 cm

2. A particle of mass 120 g has a velocity $\vec{v} = \left(2\ \text{ms}^{-1}\right)\hat{i} + \left(5\ \text{ms}^{-1}\right)\hat{j}$. Its kinetic energy is

① 3 J ② 4 J ③ 5 J ④ 1.74 J

3. Two identical rectangular rods are welded end to end as shown in figure (a), 20 calories of heat flows through it in 4 minutes. If the rods are welded as shown in figure (b), the same amount of heat will flow through the rods in



① 1 min ② 2 min ③ 4 min ④ 16 min

4. A bullet of mass 10 g moving horizontally with a speed of 400 ms^{-1} strikes a block of mass 390 g and remains in it. The block slides 10 m on rough horizontal surface coming to rest. The friction coefficient is

① $\frac{1}{4}$ ② $\frac{1}{2}$ ③ $\frac{3}{4}$ ④ 1

5. N divisions on the main scale of vernier calipers coincide with $(N+1)$ divisions on the vernier scale. If each division on the main scale is of a units, determine the least count of the instrument

① $\frac{a}{N+1}$ ② $\frac{3a}{4(N+1)}$ ③ $\frac{a}{N}$ ④ $\frac{a}{N-1}$

6. Water is flowing in a river at 2 ms^{-1}. The river is 50 m wide and has an average depth of 5 m. The power available from the current in the river is

① 0.5 MW ② 1 MW ③ 1.5 MW ④ 2 MW

7. How many times does a diatomic gas should be expanded adiabatically so as to reduce the rms velocity to half?

① 64 ② 32 ③ 16 ④ 8

8. In simple harmonic motion, the time period of variation of potential energy is T_1 and time period of variation of position is T_2, then relation between T_1 and T_2 is

① $T_1 = T_2$ ② $T_1 = 2T_2$ ③ $2T_1 = T_2$ ④ $3T_1 = T_2$

9. If $\widehat{a_1}$, $\widehat{a_2}$ and $\widehat{a_3}$ are unit vectors such that $\widehat{a_1} + \widehat{a_2} + \widehat{a_3} = 0$. Find the value of $\left|\widehat{a_1} - \widehat{a_2} - \widehat{a_3}\right|$ is

① 1 ② 2 ③ $\sqrt{3}$ ④ $\sqrt{3}+1$

10. A stone is dropped from a height h. Simultaneously another stone is thrown vertically upward from the ground which reaches a height $4h$. The two stones cross each other after time

① $\sqrt{\frac{h}{8g}}$ ② $\sqrt{8gh}$ ③ $\sqrt{2gh}$ ④ $\sqrt{\frac{h}{2g}}$

Cont.. 4

11. The escape velocity from the earth's surface is 11 km/s. The escape velocity from a planet having twice the radius and same mean density as that of earth is

① 5.5 km/s ② 11 km/s ③ 22 km/s ④ 44 km/s

12. A square formed with four thin rods each of mass 4 g and length 3 cm, is rotating about one of its diagonals with angular speed 2 rad/s. The kinetic energy of the square is

① 48 erg ② 24 erg ③ 36 erg ④ 6 erg

13. At a depth x and at height x from the surface of earth, values of g are equal. Then $\frac{x}{R}$ is (R = Radius of earth)

① $\frac{1}{2}$ ② $\frac{2}{3}$ ③ $\frac{\sqrt{3}+1}{2}$ ④ $\frac{\sqrt{5}-1}{2}$

14. An ideal gas expands from volume V_1 to volume V_2 in three different thermodynamic following process

(i) isothermally (work done = W_1)

(ii) adiabatically (work done = W_2)

(iii) isobarically (work done = W_3)

① $W_1 = W_2 = W_3$ ② $W_3 > W_1 > W_3$ ③ $W_1 > W_2 > W_3$ ④ $W_2 > W_1 > W_3$

15. Find the ratio of kinetic energy of a hydrogen molecule to the helium molecule at same temperature.

① 1 : 1 ② 1 : 2 ③ 5 : 3 ④ 1 : 4

16. If $\vec{P}+\vec{Q}=\vec{R}$ and P becomes double then $\vec{R}$ is perpendicular with Q, then value of R is

① $|P+Q|$ ② $\sqrt{P^2+Q^2}$ ③ Q ④ $2Q$

17. The latent heat of vaporisation of water is 2240 J/g. If the work done in the process of vaporisation of 1 g is 168 J, then the increase in internal energy is

① 2408 J ② 2240 J ③ 2072 J ④ 1904 J

18. Average momentum of an ideal gas depends upon

① temperature ② mass ③ volume ④ none of these

19. The Poisson's ratio of a material is 0.1. If the longitudinal strain of a rod of this material is 10^{-3}, then the percentage change in the volume of the rod will be

① 0.008% ② 0.08% ③ 0.8% ④ 8%

20. A car of mass m is moving with momentum ρ. If μ be the coefficient of friction between the tyres and the road, what will be stopping distance due to friction alone.

① $\frac{\rho^2}{2\mu g}$ ② $\frac{\rho^2}{2m\mu g}$ ③ $\frac{\rho^2}{2m^2\mu g}$ ④ $\frac{\rho^2}{2mg}$

Section—B
(Numerical Answer Type)

21. A body project from the centre of earth its escape velocity is $\sqrt{xgR}$, value of x is _____.

22. If the equation for the angular displacement of a particle moving on a circle is given by $\theta = 2t^2 + 0.5$ where θ is in radian and t is in second, angular velocity (rad/sec) of the particle at $t = 2$ s is _____.

23. A hammer weighing 3 kg strikes the head of a nail with a speed of 2 ms^{-1} and drives by 1 cm into the wall. The impulse (in N-S) imparted to the wall is _____.

24. A mass of 4 kg suspended from a spring of force constant 800 Nm^{-1} executes SHM. If the total energy is 4 J, the maximum acceleration (in ms^{-2}) is _____.

25. When two progressive waves $y_1 = 4\sin(2x-6t)$ and $y_2 = 3\sin\left(2x-6t-\frac{\pi}{2}\right)$ are superimposed, the amplitude of the resultant wave is _____.

CHEMISTRY

Section—A
(Single Option Correct Type)

26. The density (in g mL^{-1}) of a 3.60 M sulphuric acid solution that is 29% H_2SO_4 (molar mass = 98 mol^{-1}) by mass will be

① 1.45 ② 1.64 ③ 1.88 ④ 1.22

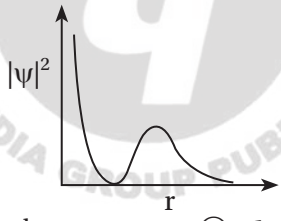
27. To neutralise completely 20 mL of 0.1 M aqueous solution of phosphorous acid (H_3PO_3), the value of 0.1 M aqueous KOH solution required is

① 40 mL ② 20 mL ③ 10 mL ④ 60 mL

28. What volume of hydrogen gas, at 273 K and 1 atm. pressure will be consumed in obtaining 21.6 g of elemental boron (atomic mass = 10.8) from the reduction of boron trichloride by hydrogen ?

① 67.2 L ② 44.8 L ③ 22.4 L ④ 89.6 L

29. The graph between $|\psi|^2$ and r (radial distance) is shown below. This represents :



① 3s orbital ② 2s orbital ③ 1s orbital ④ 2p orbital

30. The isoelectronic set of ions is

① N^{3-}, O^{2-}, F^- and Na^+ ② N^{3-}, Li^+, Mg^{2+} and O^{2-}

③ F^-, Li^+, Na^+ and Mg^{2+} ④ Li^+, Na^+, O^{2-} and F^-

31. The correct set of four quantum numbers for the valence electrons of rubidium atom (Z = 37) is :

① 5,0,0, $+\frac{1}{2}$ ② 5,1,0, $+\frac{1}{2}$ ③ 5,1,1, $+\frac{1}{2}$ ④ 5,0,1, $+\frac{1}{2}$

32. The electrons identified by quantum numbers n and l :

(A) $n = 4, l = 1$ (B) $n = 4, l = 0$ (C) $n = 3, l = 2$ (D) $n = 3, l = 1$

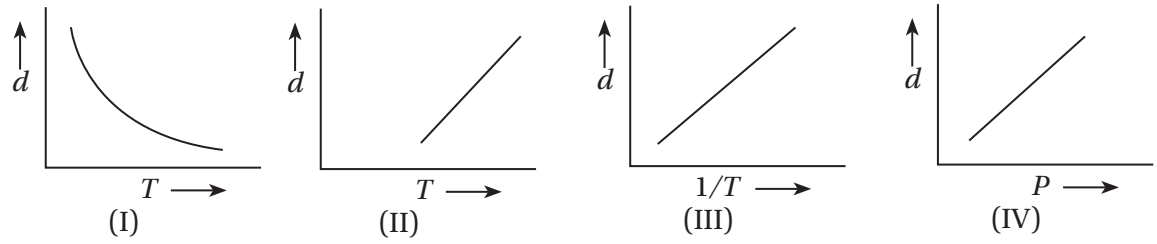
Can be placed in order of increasing energy as:

① C < D < B < A ② D < B < C < A ③ B < D < A < C ④ A < C < B < D

33. A mixture of one mole each of H_2, He and O_2 each are enclosed in a cylinder of volume V at temperature T. If the partial pressure of H_2 is 2 atm, the total pressure of the gases in the cylinder is:

① 6 atm ② 38 atm ③ 14 atm ④ 22 atm

34. Which one of the following graphs is not correct for ideal gas ?



d = Density, P = Pressure, T = Temperature

① I ② II ③ IV ④ III

35. The element having greatest difference between its first and second ionization energies, is :

① Ca ② Sc ③ Ba ④ K

36. The correct order of the atomic radii of C, Cs, Al, and S is :

① C < S < Al < Cs ② S < C < Cs < Al ③ S < C < Al < Cs ④ C < S < Cs < Al

37. If an endothermic reaction is non-spontaneous at freezing point of water and becomes feasible at its boiling point.

① ΔH is –ve, ΔS is +ve ② ΔH and ΔS both are +ve
③ ΔH and ΔS both are –ve ④ ΔH is +ve, ΔS is –ve

38. For the reactions,

$C + O_2 \rightarrow CO_2$; $\Delta H = -393$ J

$2Zn + O_2 \rightarrow 2ZnO$; $\Delta H = -412$ J

① carbon can oxidise Zn ② oxidation of carbon is not feasible
③ oxidation of Zn is not feasible ④ Zn can oxidise carbon

39. Solubility product of silver bromide is 5.0×10^{-13}. The quantity of potassium bromide (molar mass taken as 120 g mol^{-1}) to be added to 1 litre of 0.05 M solution of silver nitrate to start the precipitation of AgBr is

① 1.2×10^{-10} g ② 1.2×10^{-9} g ③ 6.2×10^{-5} g ④ 5.0×10^{-8} g

40. At 25°C, the solubility product of $Mg(OH)_2$ is 1.0×10^{-11}. At which pH, will Mg^{2+} ions start precipitating in the form of $Mg(OH)_2$ from a solution of 0.001 M Mg^{2+} ions?

① 9 ② 10 ③ 11 ④ 8

41. in a saturated solution of the sparingly soluble strong electrolyte $AgIO_3$ (molecular mass = 283) the equilibrium which sets in is $AgIO_3(s) = Ag+(aq) + IO_3^-$ (aq). If the solubility product constant K_{sp} of $AgIO_3$ at a given temperature is 1.0×10^{-8}, what is the mass of $AgIO_3$ contained in 100 mL of its saturated solution ?

① 1.0×10^{-4} g ② 28.3×10^{-2} g ③ 2.83×10^{-3} g ④ 1.0×10^{-7} g

42. Given that $E^\circ_{O2/H2O} = +1.23$ V;

$E^\circ_{s_2O_4^{2-}} = 2.05$ V ; $E^\circ_{Br_2/Br^-} = +1.09$ V

$E^\circ_{Au^{3+}/Au} = +1.4$ V ;

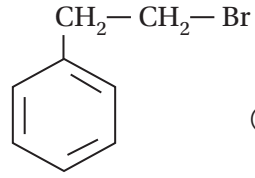
the strongest oxidising agent is :

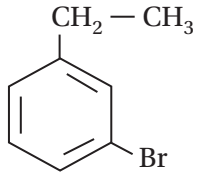
① Au^{3+} ② O_2 ③ $S_2O_8^{2-}$ ④ Br_2

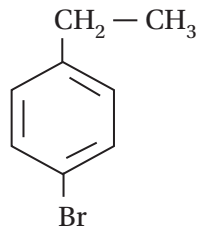
43. In the reaction of oxalate with permanganate in acidic medium, the number of electrons involved in producing one molecule of CO_2 is :

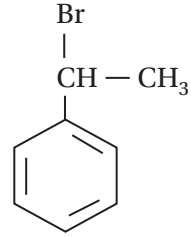
① 1 ② 10 ③ 2 ④ 5

44. The product of the reaction between ethyl benzene and N-bromosuccinamide is

① 

② 

③ 

④ 

45. Toluene is nitrated and the resulting product is reduced with tin and hydrochloric acid. The product so obtained is diazotised and then heated with cuprous bromide. The reaction mixture so formed contains

① mixture of *0*–and *p*–bromotoluenes
② mixture of *0*–and *p*–dibromobenzenes
③ mixture of *0*–and *p*–bromoanilines
④ mixture of *0*–and *m*–bromotoluenes

Section—B (Numerical Answer Type)

46. Consider the following chemical reaction.

$$CH \equiv CH \xrightarrow[2.\ CO,\ HCl,\ AlCl_3]{1.\ \text{Red hot Fe tube, 873K}} \text{Product}$$

The number of sp^2 hybridized carbon atom(s) present in he product is _____ .

47. The number of sp^3 hybridised carbons in an acyclic neutral compound with molecular formula C_4H_5N is _____ .

48. The separation of two coloured substances was done by paper chromatography. The distances travelled by solvent front, substance A and substance B from the base line are 3.25 cm, 2.08 cm and 1.05 cm respectively. The ratio of R_f values of A to B is _____ .

49. 25.0 mL of 0.050 M $(Ba(NO_3)_2$ is mixed with 25.0 mL of 0.020 M NaF. K of BaF_2 is 0.5×10^{-6} at 298 K. The ratio of $[Ba^{2+}]\ [F^-]^2$ and K_{sp} is _____ (Nearest integer).

50. The solubility product of $BaSO_4$ is 1×10^{-10} at 298 K. The solubility of $BaSO_4$ in 0.1 M K_2SO_4(aq) solution is _____ $\times 10^{-9}$ g L–1 (nearest integer).

Given : Molar mass of $BaSO_4$ is 233 g mol^{-1}.

MATHEMATICS

Section—A

(Single Option Correct Type)

51. The middle term in the expansion of $\left(\frac{10}{x} + \frac{x}{10}\right)^{10}$

① $^{10}C_5$ ② $^{10}C_5 . \frac{1}{x^{10}}$ ③ $^{10}C_5 x^{10}$ ④ $^{10}C_6$

52. If $\sum_{r=0}^{n}\left(\frac{r+2}{r+1}\right){}^{n}C_{r} = \frac{2^8-1}{6}$, then n = ?

① 8 ② 6 ③ 4 ④ 5

53. What is the sum of coefficients in the expansion of $(1+x)^n$?

① 2^n ② $2^n - 1$ ③ $2^n + 1$ ④ $n+1$

54. If a die is thrown twice, then the probability of getting 1 in the first throw only is

① $\frac{1}{36}$ ② $\frac{3}{36}$ ③ $\frac{5}{36}$ ④ $\frac{1}{6}$

55. If A and B are mutually exclusive events and if $P(B) = \frac{1}{3}$ $P(A \cup B) = \frac{2}{3}$; then P(A) is equal to,

① 0 ② 1 ③ $\frac{1}{3}$ ④ $\frac{2}{3}$

56. If $\lim_{x\to\frac{\pi}{4}} \frac{4\sqrt{2} - \left(\cos x + \sin x\right)^5}{(1-\sin 2x)}$, then

① $\sqrt{2}$ ② $3\sqrt{2}$ ③ $5\sqrt{2}$ ④ None

57. $\lim_{x\to 0} (\cos x)^{\cot^2 x}$ equals

① e ② e^2 ③ $e^{-\frac{1}{2}}$ ④ 1

58. If $f(x) = x^{\frac{1}{x}}$, then $f''(e)$ is equal to,

① $e^{1/e}$ ② $e^{\frac{1}{e}-2}$ ③ $2^{\frac{1}{e-3}}$ ④ $-e^{\left(\frac{1}{e}\right)-3}$

59. Let, f(x+y) = f(x) . f(y) for all x, y where $f(0) \neq 0$. If f(5) = 2 and $f'(0) = 3$, then f'(5) is equal to,

① 6 ② 0 ③ 1 ④ None

60. Let z_1 and z_2 be two roots of the equation $z^2 + az + b = 0$, being complex, further assume that the origin, z_1 and z_2 form an equilateral triangle. Then

① $a^2 = b$ ② $a^2 = 2b$ ③ $a^2 = 3b$ ④ $a^2 = 4b$

61. If z_1, z_2, z_3 are 3 distinct complex numbers such that $\frac{3}{|z_2 - z_1|} = \frac{4}{|z_3 - z_1|} = \frac{5}{|z_1 - z_2|}$, then the value of $\frac{9}{z_2 - z_1} + \frac{16}{z_3 - z_1} + \frac{9}{z_1 - z_2}$ equals

① 4 ② 0 ③ 1 ④ 6

62. If α and B are the roots of equation $x^2 - x - 1 = 0$, then the equation whose roots are $\frac{\alpha}{\beta}$ and $\frac{\beta}{\alpha}$ is

① $x^2 + 3x - 1 = 0$ ② $x^2 + x - 1 = 0$ ③ $x^2 - x + 1 = 0$ ④ $x^2 + 3x + 1 = 0$

63. If a , b and c are real numbers then the roots of the equation (x – a) (x – b) + (x – b) (x – c) + (x – c) (x – a) = 0 are always

① real ② imaginary ③ positive ④ negative

64. If x is real, then $\frac{x}{x^2 - 5x + 9}$ must lie between

① $\frac{1}{11}$ and 1 ② –1 and $\frac{1}{11}$ ③ –11 and 1 ④ $-\frac{1}{11}$ and 1

65. If $\sin\theta = -\frac{1}{2}$ and $\tan\theta = \frac{1}{\sqrt{3}}$ then θ =

① $2n\pi + \frac{\pi}{6}$ ② $2n\pi + \frac{11\pi}{6}$ ③ $2n\pi + \frac{7\pi}{6}$ ④ $2n\pi + \frac{\pi}{4}$

66. The value of cot 70° + 4 cos 70° is

① $\frac{1}{\sqrt{3}}$ ② $\sqrt{3}$ ③ $2\sqrt{3}$ ④ $\frac{1}{2}$

67. The inequality $n! > 2^{n-1}$ is true for

① $n > 2$ ② $n \in N$ ③ $n \in 3$ ④ None

68. What is the distance between the straight lines 3x + 4y = 9 and 6x + 8y = 15 ?

① $\frac{3}{2}$ ② $\frac{3}{10}$ ③ 6 ④ 5

69. The focus of the curve $y^2 + 4x - 6y + 13 = 0$ is

① (2, 3) ② (–2, 3) ③ (2, –3) ④ (–2, –3)

70. The locus of the point of intersection of the lines

$x = a\left(\frac{1 - t^2}{1 + t^2}\right)$ and $y = \frac{2at}{1 + t^2}$; represent (t being a parameter)

① circle ② parabola ③ ellipse ④ hyperbola

Section—B (Numerical Answer Type)

71. If ${}^{20}C_r = {}^{20}C_{r-10}$ then ${}^{18}C_r$ is equal to

72. In how many ways can 5 prizes be distributed among 4 boys when every boy can take one or more prizes ?

73. Number of words from the letters of the words BHARAT in which B and H will never come together is

74. A = {1, 2, 3, 4, 5}, then the number of proper subses of A is

75. Find the mean deviation about the mean for the data 4,7, 8, 9, 10, 12, 13, 17