GEAR UP FOR JEE MAIN 2019

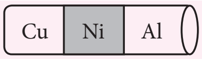
JEE MAIN Exam Date

8th, 9th, 10th & 12th April

Full Length Practice Paper for JEE Main

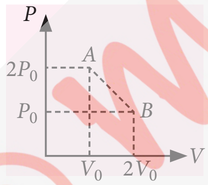
PHYSICS

1. A composite metallic bar of uniform cross-section is made up of length 25 cm of copper, 10 cm of nickel and 15 cm of aluminium, each part being in perfect thermal contact with the adjoining part. The copper end of the composite rod is maintained at 100°C and the aluminium end at 0°C. The whole rod is covered with belt so that there is no heat loss at sides. If $K_{Cu} = 2\,K_{Al}$ and $K_{Al} = 3\,K_{Ni}$, then what will be the temperatures of Cu–Ni and Ni–Al junctions, respectively?



(a) 23.33°C and 78.8°C (b) 83.33°C and 20°C
(c) 50°C and 30°C (d) 30°C and 50°C

2. n mole of an ideal gas undergoes a process $A \to B$ as shown in the given figure. Maximum temperature of the gas during process is



(a) $\dfrac{3P_0V_0}{2nR}$ (b) $\dfrac{9P_0V_0}{4nR}$ (c) $\dfrac{9P_0V_0}{2nR}$ (d) $\dfrac{9P_0V_0}{nR}$

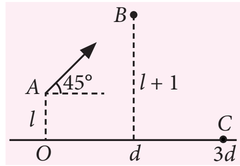
3. A particle of mass m moves in a one-dimensional potential energy $U(x) = -ax^2 + bx^4$, where a and b are positive constants. The angular frequency of small oscillations about the minima of the potential energy is equal to

(a) $\pi\sqrt{\dfrac{a}{2b}}$ (b) $2\sqrt{\dfrac{a}{m}}$ (c) $\sqrt{\dfrac{2a}{m}}$ (d) $\sqrt{\dfrac{a}{2m}}$

4. A car emitting sound of frequency 500 Hz speeds towards a fixed wall at 4 m s^{-1}. An observer in the car hears both the source frequency as well as the frequency of sound reflected from the wall. If he hears 10 beats per second between the two sounds, the velocity of sound (in m s^{-1}) in air will be

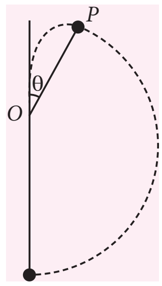
(a) 330 (b) 387 (c) 404 (d) 340

5. A projectile is launched at time $t = 0$ from point A which is at height 1 m above the floor with speed v m s^{-1} and at an angle $\theta = 45°$ with the floor. It passes through a hoop at B which is 1 m above A and B is the highest point of the trajectory. The horizontal distance between A and B is d meters. The projectile then falls into a basket, hitting the floor at C a horizontal distance $3d$ meters from A. Find l (in m).



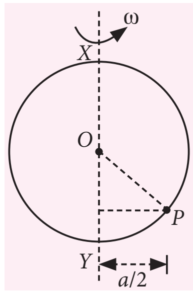
(a) 3.90 (b) 0.46 (c) 1.76 (d) 3.00

6. A point mass m connected to one end of inextensible string of length l and other end of string is fixed at peg. String is free to rotate in vertical plane. Find the minimum velocity given to the mass in horizontal direction so that it hits the peg in its subsequent motion.



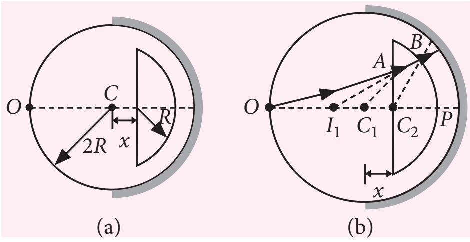
(a) $[(2+\sqrt{3})gl]$ (b) $[(2+\sqrt{3})gl]^{3/2}$
(c) $[(2+\sqrt{3})gl]^{1/2}$ (d) $[(2+\sqrt{3})gl]^{5/2}$

7. A small ring P is threaded on a smooth wire bent in the form of a circle of radius a and center O. The wire is rotating with constant angular speed ω about a vertical diameter XY, while the ring remains at rest relative to the wire at a distance $\dfrac{a}{2}$ from XY. Then ω^2 is equal to



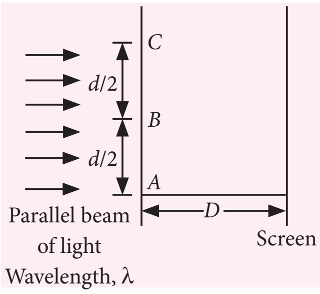
(a) $\dfrac{2g}{a}$ (b) $\dfrac{g}{2a}$ (c) $\dfrac{2g}{a\sqrt{3}}$ (d) $\dfrac{g\sqrt{3}}{2a}$

8. Consider figure shown a hemispherical cavity of radius R is curved out from a sphere ($\mu = 1.5$) of radius $2R$ such that the principal axis of the cavity coincides with that of the sphere. One side of the sphere is silvered as shown. Find the value of x for which the image of an object at O is formed at O itself.



(a) $\frac{4}{3}R$ (b) $\frac{3}{4}R$ (c) $\frac{5}{4}R$ (d) $\frac{4}{5}R$

9. For the situation shown in figure below $BP - AP = \frac{\lambda}{3}$ and $D >> d$. The slits are of equal widths, having intensity I_0. The intensity at P would be

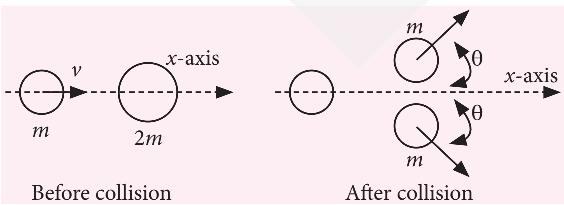


(a) $4I_0$ (b) $2I_0$ (c) $3I_0$ (d) $\frac{7}{2}I_0$

10. Surfaces of a thin equi-convex glass lens (μ = 1.5) have radius of curvature R. Paraxial rays are incident on it. If the final image is formed at a distance $\frac{R}{13}$ from pole of the lens after n internal reflection. Then n is

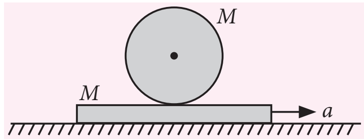
(a) 2 (b) 3 (c) 4 (d) infinity

11. A particle of mas m is moving along the x-axis with speed v when it collides with a particle of mass $2m$ initially at rest. After the collision, the first particle has come to rest and the second particle has split into two equal-mass pieces that are shown in figure. Which of the following statements correctly describes the speeds of the two places? ($\theta > 0$)



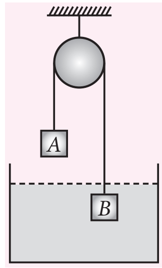
(a) Each piece moves with speed v.
(b) Each piece moves with speed $v/2$.
(c) One of the pieces moves with speed $v/2$, the other moves with speed greater than $v/2$.
(d) Each piece moves with speed greater than $v/2$.

12. A uniform cylinder (mass M) of radius R is kept on an accelerating platform (mass M) as shown in figure. If the cylinder rolls without slipping on the platform, assuming the coefficient of friction μ = 0.40, determine the maximum acceleration (in m s^{-1}) the platform may have without slip between the cylinder and the platform.



(a) 10 (b) 12 (c) 14 (d) 16

13. In the arrangement as shown, $m_B = 3m$, density of liquid is ρ and density of block B is 2ρ. The system is released from rest so that block B moves up when in liquid and moves down when out of liquid with the same acceleration. Find the mass of block A.



(a) $\frac{7}{4}m$ (b) $2m$ (c) $\frac{9}{2}m$ (d) $\frac{9}{4}m$

14. The rubber cord of catapult has a cross-sectional area 1 mm^2 and total unstretched length 10.0 cm. It is stretched to 12.0 cm and then released to project a missile of mass 5.0 g. Taking Young's modulus Y for rubber as 5.0×10^8 N m^{-2}, total elastic energy of catapult is converted into kinetic energy of missile without any heat loss. Calculate the velocity of projection (in m s^{-1}).

(a) 20 (b) 22 (c) 24 (d) 26

15. A satellite is revolving in a circular equatorial orbit of radius $R = 2 \times 10^4$ km from east to west. Calculate the interval after which it will appear at the same equatorial town. Given that the radius of the earth = 6400 km and g (acceleration due to gravity) = 10 m s^{-2}.

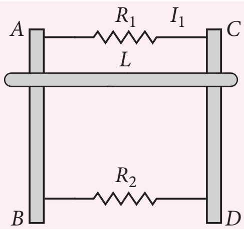
(a) 5 h 30 min (b) 5 h 48 min
(c) 5 h 37 min (d) 4 h 30 min

16. There is a constant homogeneous electric field of 100 V m^{-1} within the region $x = 0$ and $x = 0.167$ m pointing in x-direction. There is a constant homogeneous magnetic field B within the region $x = 0.167$ m and $x = 0.334$ m pointing in the z-direction. A proton at rest at the origin is released in positive x-direction. Find the minimum strength of the magnetic field B (in T), so that the proton is detected back at $x = 0$, $y = 0.167$ m.

(mass of proton = 1.67×10^{-27} kg)

(a) 3.34×10^{-9} (b) 1.25×10^{-8}
(c) 7.07×10^{-3} (d) 9.11×10^{-5}

17. Two parallel vertical metallic rails AB and CD are separated by 1 m. They are connected at two ends by resistances R_1 and R_2 as shown in figure. A horizontal metallic bar L of mass 0.2 kg slides without friction vertically down the rails under the action of gravity. There is a uniform horizontal magnetic field of 0.6 T perpendicular to the plane of the rails. It is observed that when the terminal velocity is attained, the power dissipated in R_1 and R_2 are 0.76 and 1.2 W, respectively. Find the the values of $R_1 : R_2$.



(a) 30:19 (b) 19:30 (c) 9:19 (d) 19:9

18. A simple LR circuit is connected to a battery at time $t = 0$. The energy stored in the inductor reaches half its maximum value at time

(a) $\frac{R}{L}\ln\left[\frac{\sqrt{2}}{\sqrt{2}-1}\right]$ (b) $\frac{L}{R}\ln\left[\frac{\sqrt{2}-1}{\sqrt{2}}\right]$

(c) $\frac{L}{R}\ln\left[\frac{\sqrt{2}}{\sqrt{2}-1}\right]$ (d) $\frac{R}{L}\ln\left[\frac{\sqrt{2}-1}{\sqrt{2}}\right]$

19. An inductive circuit draws a power 550 W from a 220 V–50 Hz source. The power factor of the circuit is 0.8. The current in the circuit lags behind the voltage. To bring its power factor to unity the capacitor connected in the circuit must have capacitance

(a) $\frac{1}{8448\pi}$ F (b) 4224π F

(c) 8448π F (d) $\frac{1}{4224\pi}$ F

20. A neutron of energy 1 MeV and mass 1.6×10^{-27} kg passes a proton at such a distance that the angular momentum of neutron relative to proton approximately equals 10^{-33} J s. The distance of closest approach neglecting the interaction between particles is

(a) 0.44 mm (b) 0.44 nm

(c) 0.44 A (d) 0.44 fm

21. A large insulating thick sheet of thickness $2d$ carries a uniform charge per unit volume ρ. A particle of mass m, carrying a charge q having a sign opposite to that of the sheet is released from the surface of the sheet. The sheet does not offer any mechanical resistance to the motion of the particle. Find the oscillation frequency υ of the particle inside the sheet.

(a) $\frac{1}{2\pi}\sqrt{\frac{q\rho}{m\varepsilon_0}}$ (b) $\frac{1}{2\pi}\sqrt{\frac{2q\rho}{m\varepsilon_0}}$

(c) $\frac{1}{4\pi}\sqrt{\frac{q\rho}{m\varepsilon_0}}$ (d) $\frac{1}{4\pi}\sqrt{\frac{2q\rho}{m\varepsilon_0}}$

22. An n-p-n transistor in a common-emitter mode is used as a simple voltage-amplifier with a collector-current of 4 mA. The terminals of a 8 V battery is connected to the collector through a load-resistance R_L and to the base through a resistance R_B. The collector-emitter voltage V_{CE} = 4 V, the base-emitter voltage V_{BE} = 0.6 V and the current amplification factor β_{dc} = 100. Then

(a) R_L = 1 kΩ, R_B = 185 kΩ

(b) R_L = 2 kΩ = R_B

(c) R_L = 2 kΩ, R_B = 15 kΩ

(d) R_L = 185 kΩ, R_B = 1 kΩ

23. A galvanometer shows a reading of 0.65 mA. When a galvanometer is shunted with a 4 Ω resistance, the deflection is reduced to 0.13 mA. If the galvanometer is further shunted with a 2 Ω wire, the new reading (in mA) will be (the main current remains the same)

(a) 0.60 (b) 0.08 (c) 0.12 (d) 0.05

24. A capacitor of capacitance C_0 is charged to a potential V_0 and isolated. A small capacitor C is then charged from C_0, discharged and charged again and the process being repeated n times. Due to this, potential of the larger capacitor is decreased to V, find the value of C.

(a) $C_0\left[\frac{V_0}{V}\right]^{1/n}$ (b) $C_0\left[\left(\frac{V_0}{V}\right)^{1/n}-1\right]$

(c) $C_0\left[\left(\frac{V_0}{V}\right)-1\right]^n$ (d) $C_0\left[\left(\frac{V_0}{V}\right)^n-1\right]$

25. When both jaws touch to each other, but zero mark of vernier scale is right to zero mark of main scale. Further 4th mark of vernier scale coincides with a certain mark of main scale. While measuring the side of a cube, it gives 10 divisions on main scale and 6th division of vernier scale coincide with main scale division. Find the side length of cube.

(a) 10.6 mm (b) 11.0 mm

(c) 10.2 mm (d) 10.4 mm

26. The resistance is $R = \frac{V}{I}$, where $V = 100 \pm 5$ volts and $I = 10 \pm 0.2$ amperes. What is the total error in R ?

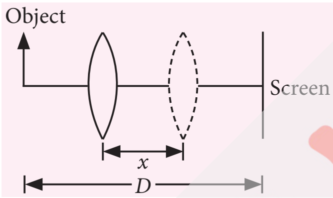
(a) 5 % (b) 7 % (c) 5.2 % (d) $\left(\frac{5}{2}\right)$ %

27. Students X_1, X_2, X_3, X_4 perform an experiment for measuring the acceleration due to gravity (g) using a simple pendulum. They use different lengths of the pendulum and record time for different number of oscillations. The observations are shown in the table. Least count for length = 0.1 cm,
Least count for time = 1 s

Students	Length of pendulum (cm)	No. of oscillations (n)	Time period of pendulum (s)
X_1	100.0	20	20
X_2	400.0	10	40
X_3	100.0	10	20
X_4	400.0	20	40

If P_1, P_2, P_3 and P_4 are the % error in g for students X_1, X_2, X_3 and X_4 respectively then
(a) $P_1 = P_3$ (b) P_3 is maximum
(c) P_1 is minimum (d) $P_2 = P_4$

28. Displacement method is applicable to determine the focal length of convex lens. In this method, the applicable formula is $f = \frac{D^2 - x^2}{4D}$.

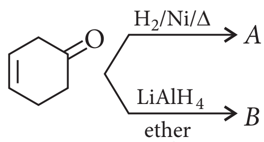


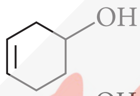
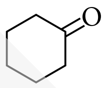
Here, D = distance between object plane and screen on which image is formed, f = focal length of lens, x = distance between two position of lens.
To determine focal length of lens, the measure values of D and x are 90.0 cm and 30.0 cm respectively. If percentage error in measurement of focal length is $n \times 10^{-1}$%. Find the value of n.
(a) 1 (b) 2 (c) 3 (d) 4

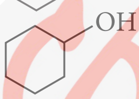
29. During measurement of Young's modulus of elasticity by Searle's method, the percentage error in measurement of load, length of wire, extension in wire and diameter of wire are 1%, 2%, 1% and 1%, respectively. The percentage error in measurement of Young's modulus of elasticity is
(a) 5 % (b) 6 % (c) 5.5 % (d) 4.5 %

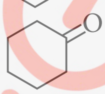
30. To determine surface tension of water by experiment, capillary tube method is used. In this method, $T = \frac{\rho r g h}{2}$ relation is used.
Here, T = surface tension, ρ = density of water, g = acceleration due to gravity, h = rise of water in capillary tube, r = radius of capillary tube.
The percentage error in the measurement of ρ, r, g and h are 1%, 2%, 1% and 2%, respectively, error in the measurement of surface tension is n%. Find the value of n.
(a) 6 % (b) 6.1 % (c) 0.5 % (d) 5.1 %

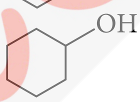
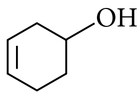
CHEMISTRY

31. 

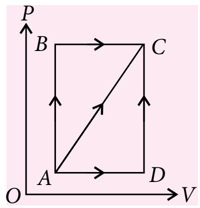
Here, A and B respectively are
(a)  and 

(b)  in both cases

(c)  in both cases

(d)  and 

32. A thermodynamic process is shown in the given figure. The pressures and volumes corresponding to some points in the figure are
$P_A = 3 \times 10^4$ Pa, $P_B = 8 \times 10^4$ Pa,
$V_A = 2 \times 10^{-3}$ m^3, $V_D = 5 \times 10^{-3}$ m^3
In the process AB, 600 J of heat is added to the system and in BC, 200 J of heat is added to the system. The change in internal energy of the system in the process AC would be



(a) 560 J (b) 800 J (c) 600 J (d) 640 J

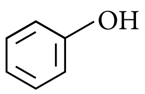
33. Which of the following increasing orders is not correct as per the property indicated against it?
(a) $CsCl < RbCl < KCl < NaCl < LiCl$ (Lattice energy)
(b) $LiOH < NaOH < KOH$ (Solubility in water)
(c) $Li^+ < Na^+ < K^+ < Rb^+ < Cs^+$ (Size of hydrated ion)
(d) $NaI < NaBr < NaCl < NaF$ (Lattice energy)

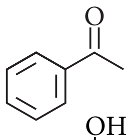
34. The reaction, $2AB_{(g)} + 2C_{(g)} \longrightarrow A_{2(g)} + 2BC_{(g)}$, proceeds according to the mechanism :
(I) $2AB \rightleftharpoons A_2B_2$ (fast)
(II) $A_2B_2 + C \longrightarrow A_2B + BC$ (slow)
(III) $A_2B + C \longrightarrow A_2 + BC$ (fast)

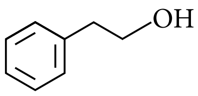
What will be the initial rate taking $[AB] = 0.2$ M and $[C] = 0.5$ M? The K_c for the step I is 10^2 M^{-1} and rate constant for the step II is 3.0×10^{-3} mol^{-1} L min^{-1}.
(a) 0.0716 M min^{-1} (b) 0.0891 M min^{-1}
(c) 0.006 M min^{-1} (d) 0.0257 M min^{-}

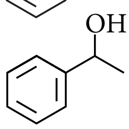
35. $H(Me)(Ph)C{-}CO_2H \xrightarrow[\Delta]{NH_3} A \xrightarrow{Br_2 + KOH} B \xrightarrow{HONO} C$

The end product C is

(a) 

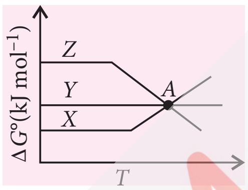
(b) 

(c) 

(d) 

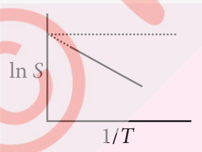
36. An oxide of nitrogen has vapour density 46. Find the total number of electrons in its 92 g.
(a) 46 N_A (b) $\frac{N_A}{46}$ (c) 92 N_A (d) $\frac{N_A}{92}$

37. In the following Ellingham diagram, X, Y and Z represent graphs for metal oxides. Select the correct option before point A.



(a) Y will reduce oxide of Z.
(b) Y will reduce oxide of X.
(c) Z will reduce oxide of X.
(d) Z will reduce oxide of Y.

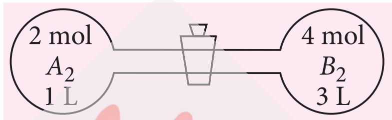
38. The solubility of a solute in water varies with temperature as given by : $S = A\,e^{-\Delta H/RT}$, ΔH being the enthalpy of solution. For a given solute, variation of ln S with temperature is as shown in the figure. The solute is expected to be



(a) CaO (b) $CuSO_4$
(c) $MgSO_4$ (d) $CuSO_4 . 5H_2O$

39. $[Ni(NH_3)_2]^{2+} \xrightarrow{\text{Conc. HCl}}$ 'A' + 'B'
The molecular formula of both 'A' and 'B' is same. 'A' can be converted to 'B' by boiling in dil. HCl. 'A' on reaction with oxalic acid yields a complex having the formula $Ni(NH_3)_2(C_2O_4)$ but 'B' does not.
From the above information we can say that
(a) 'A' is square planar but 'B' is tetrahedral
(b) 'A' and 'B' both are tetrahedral, 'A' is optically active compound whereas 'B' is optically inactive
(c) both 'A' and 'B' are square planar, 'A' is *trans*-isomer and 'B' is *cis*-isomer
(d) both 'A' and 'B' are square planar, 'A' is *cis*-isomer and 'B' is *trans*-isomer.

40. Aniline is reacted with bromine water and the resulting product is treated with an aqueous solution of sodium nitrite in presence of dilute hydrochloric acid. The compound so formed is converted into a tetrafluoroborate which is subsequently heated dry. The final product is
(a) *p*-bromoaniline
(b) *p*-bromofluorobenzene
(c) 1, 3, 5-tribromobenzene
(d) 2, 4, 6-tribromofluorobenzene.

41. 

When A_2 and B_2 are allowed to react, the equilibrium constant of the reaction at 27 °C is found ($K_c = 4$).

$$A_{2(g)} + B_{2(g)} \rightleftharpoons 2AB_{(g)}$$

What will be the equilibrium concentration of AB?
(a) 1.33 M (b) 2.66 M (c) 0.66 M (d) 0.33 M

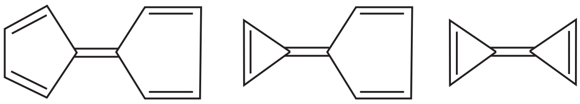
42. Consider the following statements :
1. Atomic hydrogen is obtained by passing hydrogen through an electric arc.
2. Hydrogen gas will not reduce heated aluminium oxide.
3. Finely divided palladium absorbs large volume of hydrogen gas.
4. Pure nascent hydrogen is best obtained by reacting Na with C_2H_5OH.

Which of the given statements is/are correct?
(a) 1 only (b) 2 only
(c) 1, 2 and 3 (d) 2, 3 and 4

43. The longest wavelength doublet absorption transition is observed at 589 and 589.6 nm. Energy difference between two excited states is
(a) 3.31×10^{-22} kJ (b) 3.31×10^{-22} J
(c) 2.98×10^{-21} J (d) 3.0×10^{-21} kJ

44. The freezing point depression of 0.1 molal solution of acetic acid in benzene is 0.256 K, K_f for benzene is 5.12 K kg mol^{-1}. What conclusion can you draw about the molecular state of acetic acid in benzene?
(a) Acetic acid is doubly associated.
(b) Benzene is doubly associated.
(c) Both are equally associated.
(d) None of the above.

45. Consider the following compounds :

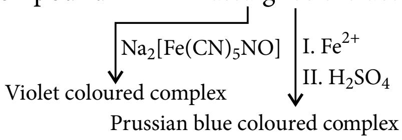


(I) (II) (III)

Which compound possesses highest dipole moment?

(a) I (b) II
(c) Both I and II (d) III

46. Organic compound '*A*' ⟶ Lassaigne's extract



The above Lassaigne's extract on treatment with Fe^{2+} does not give blood red colour because of the

(a) absence of S in the organic compound
(b) presence of halogen in the organic compound
(c) dissociation of NaSCN into Na_2S and NaCN
(d) conversion of NaSCN into HSCN.

47. An alkyl halide with molecular formula $C_6H_{13}Br$ on dehydrohalogenation gives two isomeric alkenes *X* and *Y* with molecular formula C_6H_{12}. On reductive ozonolysis *X* and *Y* gave four compounds CH_3COCH_3, CH_3CHO, CH_3CH_2CHO and $(CH_3)_2CHCHO$. The alkyl halide is

(a) 4-bromo-2-methylpentane
(b) 3-bromo-2-methylpentane
(c) 2-bromo-2, 3-dimethylbutane
(d) 2, 2-dimethyl-1-bromobutane

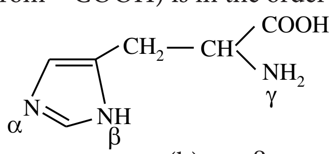
48. The electronic configuration of four elements are

(i) $[Xe]5s^1$ (ii) $[Xe]4f^{14}5d^16s^2$
(iii) $[Ar]3d^{10}4s^24p^5$ (iv) $[Ar]3d^74s^2$

Select the incorrect match about these elements.

(a) (i) – a strong reducing agent
(b) (ii) – a *d*-block element
(c) (iii) – high magnitude of $\Delta_{eg}H$
(d) (iv) – exhibits variable oxidation states

49. When the imidazole ring of Histidine is protonated, tendency of nitrogen to be protonated (proton migrates from – COOH) is in the order



(a) β > γ > α (b) γ > β > α
(c) γ > α > β (d) β > α > γ

50. A mixture of salts (Na_2SO_3 + $K_2Cr_2O_7$) in a test tube is treated with dil. H_2SO_4 and resulting gas is passed through lime water. Which of the following observations is correct about this test?

(a) Solution in test tube becomes green and lime water turns milky.
(b) Solution in test tube is colourless and lime water turns milky.
(c) Solution in test tube becomes green and lime water remains clear.
(d) Solution in test tube remains clear and lime water also remain clear.

51. Pick up the incorrect statement from the following.

(a) Glucose exists in two different crystalline forms, α-*D*-glucose and β-*D*-glucose.
(b) Cyclic structure of α-*D*-glucose and β-*D*-glucose is called pyranose structure.
(c) α-*D*-glucose and β-*D*-glucose are enantiomers.
(d) Cellulose is a straight chain polysaccharide made up of only β-glucose units.

52. What is the pH at which $Mg(OH)_2$ begins to precipitate from a solution containing 0.1 M Mg^{2+} ions? [K_{sp} for $Mg(OH)_2 = 1.0 \times 10^{-11}$]

(a) 4 (b) 6 (c) 9 (d) 7

53. Peroxide ion

(i) has five completely filled antibonding molecular orbitals.
(ii) is diamagnetic. (iii) has bond order one.
(iv) is isoelectronic with neon.

Which of these are correct?

(a) (ii) and (iii) only (b) (i), (ii) and (iv) only
(c) (i), (ii) and (iii) only (d) (i) and (iv) only

54. In a solid *AB* having rock-salt structure, *B* atoms occupy the corners of the cubic unit cell. If all the face centred atoms along one of the axis are removed, then the stoichiometry of the resultant structure will be

(a) A_2B_3 (b) A_2B (c) A_4B_3 (d) A_3B_4

55. A test tube containing nitrate and another containing bromide and MnO_2 are treated with conc. H_2SO_4. The brown fumes evolved are passed in water. The water will be coloured by

(a) the nitrate (b) the bromide
(c) both of these (d) none of these.

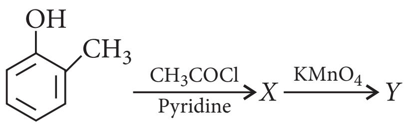
56. N_2 is passed through overheated CaC_2. Which of the following statements are correct for the product formed?

I. State of hybridisation of C is *sp*.
II. Urea is an intermediate formed during hydrolysis of the above product.
III. Anion present in the product is not a pseudohalide ion.
IV. Hydrolysis of the product gives rise to NH_3 gas slowly.

(a) I, II and III (b) III and IV
(c) I, II and IV (d) None of these.

57. A 2 L vessel is filled with air at 50 °C and a pressure of 3 atm. The temperature is now raised to 200 °C. A valve is now opened so that the pressure inside drops to one atm. What will be the fraction of the total number of moles, inside escaped on opening the valve? (Assume no change in the volume of the container).
(a) 7.7 (b) 9.9
(c) 8.9 (d) 0.77

58. The number of structural and configurational isomers of a bromo compound, C_5H_9Br, formed by the addition of HBr to 2-pentyne respectively are
(a) 1 and 2 (b) 2 and 4
(c) 4 and 2 (d) 2 and 1

59. 

The final product Y is a medicine. Which of the following is incorrect regarding Y?
(a) It has analgesic as well as antipyretic properties.
(b) It helps to prevent heart attack.
(c) It has anti-blood clotting action.
(d) It suppresses the gastric anomalies.

60. A hydrogen electrode placed in a buffer solution of CH_3COONa and acetic acid in the ratio's $x : y$ and $y : x$ has electrode potential values E_1 and E_2 volt respectively at 25 °C. The pK_a values of acetic acid is (E_1 and E_2 are oxidation potential) :
(a) $\frac{E_1+E_2}{0.118}$ (b) $\frac{E_2-E_1}{0.118}$
(c) $-\frac{E_1+E_2}{0.118}$ (d) $\frac{E_1-E_2}{0.118}$

MATHEMATICS

61. If $y+x\frac{dy}{dx}=x\frac{\phi(xy)}{\phi'(xy)}$, then $\phi(xy)$ is equal to
(a) $ke^{x^2/2}$ (b) $ke^{y^2/2}$ (c) $ke^{xy/2}$ (d) ke^{xy}

62. If $xy^2 = 4$ and $\log_3(\log_2 x) + \log_{1/3}(\log_{1/2} y) = 1$, then x equals
(a) 4 (b) 8 (c) 16 (d) 64

63. If the function $f : [1, \infty) \to [1, \infty)$ is defined by $f(x) = 2^{x(x-1)}$, then $f^{-1}(x)$ is
(a) $\left(\frac{1}{2}\right)^{x(x-1)}$ (b) $\frac{1}{2}(1+\sqrt{1+4\log_2 x})$
(c) $\frac{1}{2}(1-\sqrt{1+4\log_2 x})$ (d) not defined

64. n biscuits are distributed among N beggars at random. The probability that a particular beggar gets $r(<n)$ biscuits, is
(a) ${}^nC_r\left(\frac{1}{N}\right)^r\left(\frac{N-1}{N}\right)^{n-r}$ (b) $\frac{{}^nC_r}{N^r}$
(c) ${}^nC_r$ (d) $\frac{r}{n}$

65. If sum of x terms of a series is $S_x = \frac{1}{(2x+3)(2x+1)}$ whose r^{th} term is T_r. Then, $\sum_{r=1}^{n}\frac{1}{T_r}$ is equal to
(a) $\frac{1}{4}\sum(2r+1)(2r-1)(2r+3)$
(b) $-\frac{1}{4}\sum(2r+1)(2r-1)(2r+3)$
(c) $\sum(2r+1)(2r-1)(2r+3)$
(d) none of these.

66. If $A = [a_{ij}]_{n\times n}$, where $a_{ij} = i^{100} + j^{100}$, then $\lim_{n\to\infty}\left(\frac{\sum_{i=1}^{n}a_{ii}}{n^{101}}\right)$ equals
(a) $\frac{1}{50}$ (b) $\frac{1}{101}$ (c) $\frac{2}{101}$ (d) $\frac{3}{101}$

67. If the line $x - 1 = 0$ is the directrix of the parabola $y^2 - kx + 8 = 0$, then one of the value of k, is
(a) 1/8 (b) 8 (c) 4 (d) 1/4

68. The complete solution set of the inequality $[\cot^{-1}x]^2 - 6[\cot^{-1}x] + 9 \le 0$, where $[\cdot]$ denotes the greatest integer function, is
(a) $(-\infty, \cot 3]$ (b) $[\cot 3, \cot 2)$
(c) $(\cot 3, \infty)$ (d) none of these

69. If $(1 + x)^n = a_0 + a_1x + a_2x^2 + ... + a_nx^n$, then $\left(1+\frac{a_1}{a_0}\right)\left(1+\frac{a_2}{a_1}\right)\left(1+\frac{a_3}{a_2}\right)...\left(1+\frac{a_n}{a_{n-1}}\right)$ is equal to
(a) $\frac{n^n}{n!}$ (b) $\frac{(n+1)^n}{n!}$
(c) $\frac{n^{n+1}}{(n+1)!}$ (d) none of these

70. If $|z_1| = 2$, $|z_2| = 3$, $|z_3| = 4$ and $|2z_1 + 3z_2 + 4z_3| = 4$, then absolute value of $8z_2z_3 + 27z_3z_1 + 64z_1z_2$ equals
(a) 24 (b) 48 (c) 72 (d) 96

71. The number of times the digit 3 will be written when listing the integers from 1 to 1000 is
(a) 269 (b) 300 (c) 271 (d) 302

72. If $I = \int \frac{\sqrt{x^2+1}}{x^4}dx$, then I equals
(a) $-\frac{1}{3}\frac{(x^2+1)^{3/2}}{x^3}+C$ (b) $x^3\,(x^2+1)^{-1/2}+C$
(c) $\frac{\sqrt{x^2+1}}{x^2}+C$ (d) $-\frac{1}{3}\frac{(x^2+1)^{3/2}}{x^2}+C$

73. If θ_1 and θ_2 be the angles which the lines $(x^2 + y^2)(\cos^2\theta\sin^2\alpha + \sin^2\theta) = (x\tan\alpha - y\sin\theta)^2$ make with the axis of x, then if $\theta = \pi/6$, $\tan\theta_1 + \tan\theta_2$ is equal to
(a) $(-8/3)\sin^2\alpha$ (b) $(-8/3)\operatorname{cosec} 2\alpha$
(c) $-8\sqrt{3}\operatorname{cosec} 2\alpha$ (d) $-4\operatorname{cosec} 2\alpha$

74. Let $\vec{a} = \hat{i}+\hat{j}+\hat{k}, \vec{c} = \hat{j}-\hat{k}$. If $\vec{b}$ is a vector satisfying $\vec{a}\times\vec{b} = \vec{c}$ and $\vec{a}\cdot\vec{b} = 3$, then $\vec{b}$ is
(a) $\frac{1}{3}(5\hat{i}+2\hat{j}+2\hat{k})$ (b) $\frac{1}{3}(5\hat{i}-2\hat{j}-2\hat{k})$
(c) $3\hat{i}-\hat{j}-\hat{k}$ (d) none of these

75. The value of $\lim_{x\to-\infty}\left\{\frac{x^4\sin\left(\frac{1}{x}\right)+x^2}{1+|x^3|}\right\}$ is
(a) 1 (b) –1 (c) 0 (d) ∞

76. If $f(x) = x^n$, n being a non-negative integer, then the values of n for which $f'(\alpha+\beta) = f'(\alpha) + f'(\beta)$, for all $\alpha, \beta > 0$, are
(a) 1, 2 (b) 0, 2
(c) 0, 1 (d) none of these

77. If the tangent to the curve $xy + ax + by = 0$ at (1, 1) makes an angle $\tan^{-1} 2$ with x-axis, then $\frac{a+b}{ab} =$
(a) 0 (b) 1/2
(c) –1/2 (d) none of these

78. If $[\cdot]$ stands for the greatest integer function, then $\int_1^2 [3x]dx$ is equal to
(a) 3 (b) 4 (c) 5 (d) 6

79. If $x = \cos\alpha + \cos\beta - \cos(\alpha+\beta)$ and $y = 4\sin\frac{\alpha}{2}\sin\frac{\beta}{2}\cos\left(\frac{\alpha+\beta}{2}\right)$, then $(x - y)$ equals
(a) 0 (b) 1 (c) –1 (d) –2

80. Maximum length of chord of the ellipse $\frac{x^2}{8}+\frac{y^2}{4}=1$, such that eccentric angles of its extremities differ by $\frac{\pi}{2}$, is
(a) 4 (b) $2\sqrt{2}$ (c) 16 (d) 8

81. If $f(x) = \begin{vmatrix} \sin x & \cos x & \tan x \\ x^3 & x^2 & x \\ 2x & 1 & x \end{vmatrix}$, then $\lim_{x\to\infty}\frac{f(x)}{x^2} =$
(a) 0 (b) 3 (c) 2 (d) 1

82. Let $f(x) = \frac{x^2-3x+2}{x^2+2x+1}$ for $x \neq -1$ and $f(-1) = 0$. If m is the number points at which $f(x)$ has a local minimum then $m =$
(a) 0 (b) 1 (c) 2 (d) 3

83. Area bounded by the curve $y = x^6(1-x)^7$ and x-axis is
(a) $\frac{7!7!}{14!}$ (b) $\frac{6!7!}{14!}$ (c) $\frac{6!7!}{13!}$ (d) $\frac{6!6!}{13!}$

84. If $f(x) = \begin{cases} (\cos x)^{1/\sin x} & \text{for } x \neq 0 \\ k & \text{for } x = 0, \end{cases}$ then the value of k, so that f is continuous at $x = 0$ is
(a) 0 (b) 1
(c) 1/2 (d) none of these

85. The abscissaes of two points A and B are the roots of the equation $x^2 + 2ax - b^2 = 0$ and their ordinates are the roots of the equation $x^2 + 2px - q^2 = 0$. The radius of the circle with AB as diameter is :
(a) $\sqrt{(a^2+b^2+p^2+q^2)}$ (b) $\sqrt{(a^2+p^2)}$
(c) $\sqrt{(b^2+q^2)}$ (d) none of these

86. If α, β be the roots of $x^2 - x - 1 = 0$ and $A_n = \alpha^n + \beta^n$, then A.M. of A_{n-1} and A_n is
(a) $2A_{n+1}$ (b) $(1/2)\,A_{n+1}$
(c) $2A_{n-2}$ (d) none of these

87. The intersection of all the intervals having the form $\left[1+\frac{1}{n}, 6-\frac{2}{n}\right]$, where n is a positive integer is
(a) [1, 6] (b) (1, 6) (c) [2, 4] (d) [3/2, 5]

88. For $n \in N$, $3^{2n+2} - 2^3 n - 9$ is divisible by
(a) 3 (b) 9 (c) 64 (d) 81

89. If the foci of the ellipse $\frac{x^2}{16}+\frac{y^2}{b^2}=1$ coincide with the foci of the hyperbola $\frac{x^2}{144}-\frac{y^2}{81}=\frac{1}{25}$, then b^2 is equal to
(a) 7 (b) 8 (c) 10 (d) 9

90. The equation $2x^2 - 3xy - py^2 + x + qy - 1 = 0$ represents two mutually perpendicular lines if
(a) $p = 3, q = 2$ (b) $p = 2, q = 3$
(c) $p = -2, q = 3$ (d) $p = 2, q = 9/2$

ANSWER KEY

1.	(b)	**2.**	(b)	**3.**	(b)	**4.**	(c)	**5.**	(d)	**6.**	(c)	**7.**	(c)	**8.**	(b)	**9.**	(c)	**10.**	(c)
11.	(d)	**12**	(b)	**13.**	(d)	**14.**	(a)	**15.**	(b)	**16.**	(c)	**17.**	(a)	**18.**	(c)	**19.**	(d)	**20.**	(d)
21.	(a)	**22.**	(a)	**23.**	(d)	**24.**	(b)	**25.**	(c)	**26.**	(b)	**27.**	(b)	**28.**	(d)	**29.**	(b)	**30.**	(a)
31.	(d)	**32.**	(a)	**33.**	(c)	**34.**	(c)	**35.**	(d)	**36.**	(a)	**37.**	(a)	**38.**	(d)	**39.**	(d)	**40.**	(d)
41.	(c)	**42.**	(c)	**43.**	(b)	**44.**	(a)	**45.**	(b)	**46.**	(c)	**47.**	(b)	**48.**	(b)	**49.**	(c)	**50.**	(c)
51.	(c)	**52.**	(c)	**53.**	(a)	**54.**	(c)	**55.**	(b)	**56.**	(c)	**57.**	(d)	**58.**	(b)	**59.**	(d)	**60.**	(a)
61.	(a)	**62.**	(d)	**63.**	(b)	**64.**	(a)	**65.**	(b)	**66.**	(c)	**67.**	(c)	**68.**	(a)	**69.**	(b)	**70.**	(d)
71.	(b)	**72.**	(a)	**73.**	(b)	**74.**	(a)	**75.**	(b)	**76.**	(b)	**77.**	(b)	**78.**	(b)	**79.**	(b)	**80.**	(a)
81.	(d)	**82.**	(c)	**83.**	(b)	**84.**	(b)	**85.**	(a)	**86.**	(b)	**87.**	(c)	**88.**	(c)	**89.**	(a)	**90.**	(b)