JEE (MAINS) MODEL GRAND TEST

No. of Questions: 90 **Marks: 360** **Time: 3 Hrs.**

PHYSICS

1. Statement-1: In simple harmonic motion, the velocity is maximum when the acceleration is minimum.

Statement-2: Displacement and velocity of a particle executing simple harmonic motion differ in phase by $\frac{\pi}{2}$

A) Statement-1 is True, Statement-2 is True; Statement-2 is a correct explanation for Statement-1.

B) Statement-1 is True, Statement-2 is True; Statement-2 is NOT a correct explanation for Statement-1.

C) Statement-1 is True, Statement-2 is False.

D) Statement-1 is False, Statement-2 is True.

2. The position of a particle moving along x – axis is given by $x = 3t^2 - t^3$ where x is in m and t is in s. Consider the following statements:

i) Displacement of the particle after 4 s is 16 m.

ii) Distance travelled by the particle upto 4 s is 24 m.

iii) Displacement of the particle after 4 s is –16 m.

iv) Distance covered by the particle upto 4 s is 22 m.

Select the correct alternative.

A) statements (i) and (ii) only are correct. B) statements (ii) and (iii) only are correct.

C) statements (i) and (iii) only are correct. D) None of these

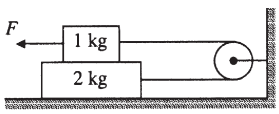
3. Two particles positioned at A(5, 3) and B(7, 3) are moving with constant velocity $2\hat{i} + 3\hat{j}$ and $x\hat{i} + y\hat{j}$ respectively. After 2 s they collide, then the values of x and y are respectively

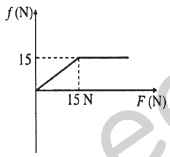
A) 2, 2 B) 1, 3 C) 3, 2 D) 1, 1

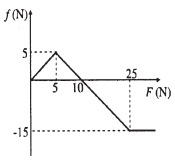
4. If the frequency of K_α , X – ray emitted by the element with atomic number 41 be f, then the frequency of K_α , X – ray emitted from the element with atomic number 61 would be .....

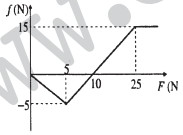
A) $\frac{1681}{3721}$f B) $\frac{3721}{1681}$f C) $\frac{9}{4}$f D) $\frac{4}{9}$f

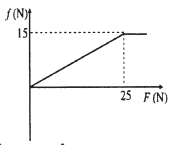
5. For the arrangement shown in figure the coefficient of friction between any two surfaces is 0.5. Which of the following graphs shows correct variation of frictional force 'f' between the 2 kg block and floor with the applied force F? (Take leftward direction of f as positive.)



A) 

B) 

C) 

D) 

6. A particle is acted upon by a conservative force $\vec{F} = (7\hat{i} - 6\hat{j})$ N (no other force is acting on the particle). Under the influence of this force particle moves from (0, 0) to (–3 m, 4 m), then

A) work done by the force is 3 J B) work done by the force is –45 J

C) at (0, 0) speed of the particle must be zero D) None of these

7. A rocket of initial mass 5000 kg ejects gas at a constant rate of 60 kg/s with a relative speed of 2050 m/s. Acceleration of the rocket 15 second after it is blasted off from the surface of earth will be ($g = 10\ m/s^2$). Assume negligible change in g during the given time.

A) $10\ m/s^2$ B) $20\ m/s^2$ C) $30\ m/s^2$ D) $40\ m/s^2$

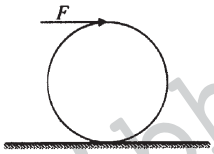
8. A ring of mass M is kept on a horizontal rough surface. A force *F* is applied tangentially at its rim as shown. The coefficient of friction between the ring and the surface is μ. Then

A) friction will act in the forward direction

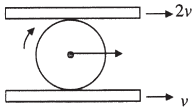
B) friction will act in the backward direction

C) frictional force will not act

D) frictional force will be μMg.



9. A solid sphere of mass M rolls without slipping between two horizontal planks moving with velocities 2 v and v respectively as shown in the figure. The total kinetic energy of the sphere will be



A) $\frac{27\ Mv^2}{20}$ B) $\frac{9\ Mv^2}{2}$ C) $\frac{9\ Mv^2}{8}$ D) $\frac{47\ Mv^2}{40}$

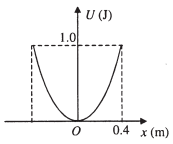
10. The deformation of a wire under its own weight compared to the deformation of same wire subjected to a load equal to weight of the wire is

A) same B) one third C) half D) one fourth

11. There is a hole at the bottom of a large open vessel. If water is filled up to a height h, its flow rate is v. If water is filled to a height 4 h, its flow rate will be

A) 4 v B) 3 v C) 2 v D) v

12. A particle of mass 2 kg moves in simple harmonic motion and its potential energy U varies with position x as shown. The period of oscillation of the particle is



A) $\frac{2\pi}{5}$ s B) $\frac{2\sqrt{2\pi}}{5}$ s C) $\frac{\sqrt{2\pi}}{5}$ s D) $\frac{4\pi}{5}$ s

13. Two soap bubbles of radius 3 cm and 4 cm coalesce to form a simple bubble under isothermal conditions. Then the radius of bigger bubble is

A) 7 cm B) 1 cm C) 12 cm D) 5 cm

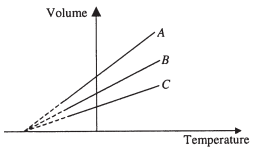
14. Two sound waves of slightly different frequencies have amplitude ratio $\frac{11}{9}$. What is the difference of sound levels in decibels of maximum and minimum intensities heard at a point?

A) 100 B) 10 C) 16 D) 20

15. A rod of length 40 cm has the coefficient of linear expansion $\alpha_1 = 6 \times 10^{-6}$ /°C. Another rod of length *l* has the coefficient of linear expansion $\alpha_2 = 4 \times 10^{-6}$ /°C. If the difference in length of the two rods always remain same at all temperatures, then the value of *l* is

A) 26 cm B) 60 cm C) 80 cm D) 32 cm

16. The expansion of an ideal gas of mass m at a constant pressure *P* is given by the straight line B. Then the expansion of the same ideal gas of mass 2 m at a pressure 2P is given by the straight line



A) C B) A

C) B D) None of these

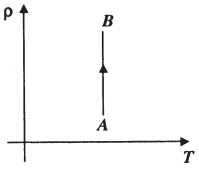
17. The density (r) of an ideal gas varies with temperature T as shown in figure. Then which of the following statement is incorrect?

A) The product of P & V at A is equal to the product of P & V at B

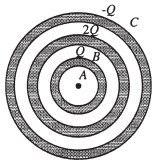
B) Pressure at B is smaller than the pressure at A

C) Work done by the gas during the process AB is negative

D) The change in internal energy from A to B is zero



18. Charges Q, 2Q and −Q are given to three concentric conducting spherical shells A, B and C respectively as shown in figure. The ratio of charges on the inner and outer surfaces of shell C will be



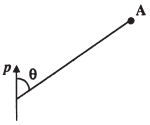
A) $+\frac{3}{4}$ B) $\frac{-3}{4}$ C) $\frac{3}{2}$ D) $\frac{-3}{2}$

19. A uniform electric field exists in x – y plane. The potential of points A (2m, 2m), B (– 2 m, 2 m) and C (2 m, 4 m) are 4 V, 16 V and 12 V respectively. The electric field is

A) $(4\hat{i} + 5\hat{j})$ V/m B) $(3\hat{i} + 4\hat{j})$ V/m

C) $-(3\hat{i} + 4\hat{j})$ V/m D) $(3\hat{i} - 4\hat{j})$ V/m

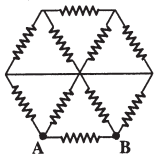
20. The electric field at A due to dipole p is perpendicular to p. The angle θ is



A) 0° B) 90°

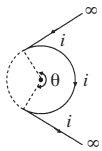
C) $\tan^{-1} 2$ D) $\tan^{-1}\sqrt{2}$

21. In the network shown in figure, each resistance is R. The equivalent resistance between A and B is



A) $\frac{20}{11}R$ B) $\frac{19}{20}R$ C) $\frac{8}{15}R$ D) $\frac{R}{2}$

22. A wire carrying a current i has the configuration as shown in the figure. Two semi-infinite straight sections both tangents to the same circle are connected by a circular arc of central angle θ, along the circumference of circle, with all sections lying in the same plane. If the magnetic field at center of the circle is zero, then θ is equal to

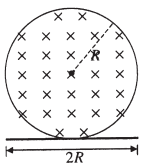


A) $\frac{\pi}{2}$ rad B) π rad C) 1 rad D) 2 rad

23. A particle of charge q and mass m starts moving from the origin under the action of an electric field $\vec{E} = E^\circ \hat{i}$ and magnetic field $\vec{B} = B^\circ \hat{k}$. Its velocity at (x, 3, 0) is $(4\hat{i} + 3\hat{j})$. The value of x is

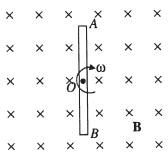
A) $\frac{36\,E^\circ B^\circ}{qm}$ B) $\frac{25\text{ m}}{2qE^\circ}$ C) $\frac{10\text{ m}}{qE^\circ}$ D) $\frac{25\,E^\circ B^\circ}{m}$

24. A uniform but time varying magnetic field is present in a circular region of radius *R*. The magnetic field is perpendicular and into the plane of the loop and the magnitude of field is increasing at a constant rate α. There is a straight conducting rod of length 2R placed as shown in figure. The magnitude of induced emf across the rod is

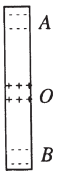


A) $\pi R^2\alpha$ B) $\frac{\pi R^2\alpha}{2}$ C) $\frac{R^2\alpha}{\sqrt{2}}$ D) $\frac{\pi R^2\alpha}{4}$

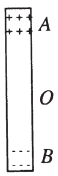
25. A rod is rotating with a constant angular velocity w about point O (its center) in a magnetic field B as shown. Which of the following figure correctly shows the distribution of charge inside the rod?



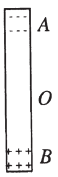
A)



B)

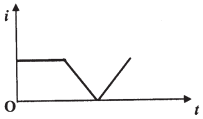


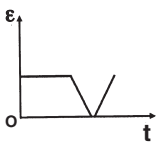
C)

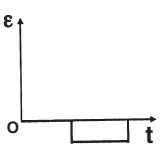


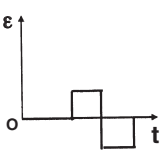
D)

26. The current 'i' in an induction coil varies with time 't' according to the graph shown in the figure. Which of the following graphs shows the induced emf (ε) in the coil with time?



A) 

B) 

C) 

D) 

27. A L–R 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) $\frac{R}{L}\ln\left[\frac{\sqrt{2}-1}{\sqrt{2}}\right]$

28. When the object is at distances u_1 and u_2 from the optical center of a convex lens, a real and a virtual image of the same magnification is obtained. The focal length of the lens is

A) $\frac{u_1 - u_2}{2}$ B) $2u_1$ C) $2u_2$ D) $\frac{u_1 + u_2}{2}$

29. A stationary hydrogen atom emits photon corresponding to the first line of Lymann series. If R is the Rydberg's constant and M is the mass of the atom, then the velocity acquired by the atom is

A) $\frac{3Rh}{4M}$ B) $\frac{Rh}{4M}$ C) $\frac{Rh}{2M}$ D) $\frac{Rh}{M}$

30. Statement–1: A thin stainless steel needle can lay floating on a still water surface.

Statement-2: Any object floats in a liquid when the buoyant force balances the weight of the object.

A) Statement-1 is True, Statement-2 is True; Statement-2 is a correct explanation for Statement-1.

B) Statement-1 is True, Statement-2 is True; Statement-2 is NOT a correct explanation for Statement-1.

C) Statement-1 is True, Statement-2 is False.

D) Statement-1 is False, Statement-2 is True.

MATHEMATICS

31. A particle P starts from the point $z_0 = 1 + 2i$, where $i = \sqrt{-1}$. It moves first horizontally away from origin by 5 units and then vertically away from origin by 3 units to reach a point z_1. From z_1 the particle moves $\sqrt{2}$ units in the direction of the vector $\hat{i} + \hat{j}$ and, then it moves through an angle $\frac{\pi}{2}$ in anti clockwise direction on a circle with centre at origin, to reach a point z_2. The point z_2 is given by

A) 6 + 7i B) –7 + 6i C) 7 + 6i D) –6 + 7i

32. If the sum of first n terms of an A.P. is cn^2, then the sum of squares of these n terms, is

A) $\frac{n(4n^2-1)c^2}{6}$ B) $\frac{n(4n^2+1)c^2}{3}$ C) $\frac{n(4n^2-1)c^2}{3}$ D) $\frac{n(4n^2+1)c^2}{6}$

33. Let a, b, c be real. If $ax^2 + bx + c = 0$ has two real roots α and β, where $\alpha < -1$ and $\beta > 1$, then $1 + \frac{c}{a} + \left|\frac{b}{a}\right|$ is

A) < 0 B) > 0 C) ≤ 0 D) None

34. 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 atleast one candidate, then the number of ways in which he can vote, is

A) 6210 B) 385 C) 1110 D) 5040

35. For r = 0, 1, ...,10, let A_r, B_r and C_r denote, respectively, the coefficient of x^r in the expansions of $(1 + x)^{10}$, $(1 + x)^{20}$ and $(1 + x)^{30}$

Then $\sum_{r=1}^{10} A_r \left(B_{10} B_r - C_{10} A_r\right)$ is equal to

A) $B_{10} - C_{10}$ B) $A_{10}\left(B_{10}^2 - C_{10} A_{10}\right)$

C) 0 D) $C_{10} - B_{10}$

36. The number of A in T_p such that A is either symmetric or skew-symmetric or both, and det (A) is divisible by p is

A) $(p-1)^2$ B) $2(p-1)$ C) $(p-1)^2+1$ D) $2p-1$

37. The number of matrices A in A for which the system of linear equations $A\begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 1 \\ 0 \\ 0 \end{bmatrix}$ is inconsistent, is

A) 0 B) more than 2 C) 2 D) 1

38. Let ω be a complex cube root of unity with $\omega \neq 1$. A fair die is thrown three times. If r_1, r_2 and r_3 are the numbers obtained on the die, then the probability that $\omega^{r1} + \omega^{r2} + \omega^{r3} = 0$ is

A) $\frac{1}{18}$ B) $\frac{1}{9}$ C) $\frac{2}{9}$ D) $\frac{1}{36}$

39. If $P(u_i) \propto i$, where i = 1, 2, 3, ..., n, then $\lim\limits_{n\to\infty} P(w)$ is equal to

A) 1 B) $\frac{2}{3}$ C) $\frac{1}{4}$ D) $\frac{3}{4}$

40. Let $\theta \in \left(0, \frac{\pi}{4}\right)$ and $t_1 = (\tan\theta)^{\tan\theta}$, $t_2 = (\tan\theta)^{\cot\theta}$, $t_3 = (\cot\theta)^{\tan\theta}$ and $t_4 = (\cot\theta)^{\cot\theta}$, then

A) $t_1 > t_2 > t_3 > t_4$ B) $t_4 > t_3 > t_1 > t_2$ C) $t_3 > t_1 > t_2 > t_4$ D) $t_2 > t_3 > t_1 > t_4$

41. In a ΔABC, a, c, A are given and b_1, b_2 are two values, if the third side b such that $b_2 = 2b_1$, then sin A is equal to

A) $\frac{\sqrt{9a^2 - c^2}}{8a^2}$ B) $\sqrt{\frac{9a^2 - c^2}{8c^2}}$ C) $\frac{\sqrt{9a^2 + c^2}}{8a^2}$ D) None of these

42. For two data sets, each of size 5, the variances are given to be 4 and 5 and the corresponding means are given to be 2 and 4, respectively. The variance of the combined data set is

A) $\frac{5}{2}$ B) $\frac{11}{2}$ C) 6 D) $\frac{13}{2}$

43. The locus of the orthocenter of the triangle formed by the lines $(1+p)x - py + p(1+p) = 0$, $(1+q)x - qy + q(1+q) = 0$, and $y = 0$ where $p \neq q$ is

A) hyperbola B) a parabola C) an ellipse D) a straight line

44. A circle C of radius 1 is inscribed in an equilateral Δ PQR. The points of contact of C with sides PQ, QR, RP are D, E, F respectively. The line PQ is given by the equation $\sqrt{3}x + y - 6 = 0$ and the point D is $\left(\frac{3\sqrt{3}}{2}, \frac{3}{2}\right)$. Further, it is given that the origin and the centre of C are on the same side of the line PQ. The equation of circle C is

A) $(x - 2\sqrt{3})^2 + (y-1)^2 = 1$ B) $(x - 2\sqrt{3})^2 + \left(y + \frac{1}{2}\right)^2 = 1$

C) $(x - \sqrt{3})^2 + (y+1)^2 = 1$ D) $(x - \sqrt{3})^2 + (y-1)^2 = 1$

45. If two chords having lengths $a^2 - 1$ and $3(a+1)$ where a is a constant of a circle bisect each other, then the radius of the circle is

A) 6 B) $\frac{15}{2}$ C) 8 D) $\frac{19}{2}$

46. Consider the two curves $C_1 : y^2 = 4x$ and $C_2 : x^2 + y^2 - 6x + 1 = 0$, then

A) C_1 and C_2 touch each other only at one point

B) C_1 and C_2 touch each other exactly at two points

C) C_1 and C_2 intersect (but do not touch) at exactly two points

D) C_1 and C_2 neither intersect nor touch each other.

47. Let $P(x_1, y_1)$ and $Q(x_2, y_2)$, $y_1 < 0, y_2 < 0$, be the end points of the latusrectum of the ellipse $x^2 + 4y^2 = 4$. The equations of parabolas with latusrectum PQ are

A) $x^2 + 2\sqrt{3}y = 3 + \sqrt{3}$ B) $x^2 - 2\sqrt{3}y = 3 + \sqrt{3}$

C) $x^2 + 2\sqrt{3}y = 3 - \sqrt{3}$ D) $x^2 - 2\sqrt{3}y = 3 - \sqrt{3}$

48. An ellipse intersects the hyperbola $2x^2 - 2y^2 = 1$ orthogonally. The eccentricity of the ellipse is reciprocal to that of the hyperbola. If the axes of the ellipse are along the coordinates axes, then

A) Equation of ellipse is $x^2 + 2y^2 = 2$ B) The foci of ellipse are $(\pm 2, 0)$

C) Equation of ellipse is $x^2 + 2y^2 = 4$ D) The foci of ellipse are $(\pm\sqrt{2}, 0)$

49. Let f be a real-valued function defined on the interval $(-1, 1)$ such that $e^{-x} f(x) = 2 + \int_0^x \sqrt{t^4 + 1}\, dt$, for all $x \in (-1, 1)$ and let f^{-1} be the inverse function of f. Then, $(f^{-1})'(2)$ is equal to

A) 1 B) $\frac{1}{3}$ C) $\frac{1}{2}$ D) $\frac{1}{e}$

50. If $f(x) = \min\{1, x^2, x^3\}$, then

A) f (x) is not continuous every where

B) f (x) is continuous and differentiable every where

C) f (x) is not differentiable at two points

D) f (x) is not differentiable at one point

51. The total number of local maxima and local minima of the function

$$f(x) = \begin{cases} (2 + x)^3, & -3 < x \le -1 \\ x^{\frac{2}{3}}, & -1 < x < 2 \end{cases}$$ is

A) 0 B) 1 C) 2 D) 3

52. For any real number x, let [x] denotes the largest integer less than or equal to x. Let f be a real valued function defined on the interval [−10, 10] by

$$f(x) = \begin{cases} x - [x], & \text{if } [x] \text{ is odd} \\ 1 + [x] - x, & \text{if } [x] \text{ is even} \end{cases}$$, then the value of $\frac{\pi^2}{10}\int_{-10}^{10} f(x)\cos \pi x\, dx$ is

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

53. If $I_n = \int_{-\pi}^{\pi} \frac{\sin nx}{(1 + \pi^x)\sin x}\, dx$, $n = 0, 1, 2, \ldots$, then, which of the following is not correct?

A) $I_n = I_{n+2}$ B) $\sum_{m=1}^{10} I_{2m+1} = 10\pi$

C) $\sum_{m=1}^{10} I_{2m} = 0$ D) $I_n = I_{n+1}$

54. The area of the region between the curves $y = \sqrt{\frac{1 + \sin x}{\cos x}}$ and $y = \sqrt{\frac{1 - \sin x}{\cos x}}$ bounded by the lines $x = 0$ and $x = \frac{\pi}{4}$ is

A) $\int_0^{\sqrt{2}-1} \frac{t}{(1 + t^2)\sqrt{1 - t^2}}\, dt$ B) $\int_0^{\sqrt{2}-1} \frac{4t}{(1 + t^2)\sqrt{1 - t^2}}\, dt$

C) $\int_0^{\sqrt{2}+1} \frac{4t}{(1 + t^2)\sqrt{1 - t^2}}\, dt$ D) $\int_0^{\sqrt{2}+1} \frac{t}{(1 + t^2)\sqrt{1 - t^2}}\, dt$

55. Tangent is drawn at any point P of a curve which passes through (1, 1) cutting x–axis and y–axis at A and B respectively.

If AP : BP = 3 : 1, then

A) Differential equation of the curve is $3x\frac{dy}{dx} + y = 0$

B) Differential equation of the curve is $3x\frac{dy}{dx} - y = 0$

C) Curve is passing through $\left(\frac{1}{8}, 2\right)$

D) Normal at (1, 1) is $x + 3y = 4$

56. Let two non–collinear unit vectors $\hat{a}$ and $\hat{b}$ form an acute angle. A point P moves so that at any time t the position vector $\overline{OP}$ (where O is the origin) is given by $\hat{a}\cos t + \hat{b}\sin t$. When P is farthest from origin O, let M be the length of $\overline{OP}$ and $\hat{u}$ be the unit vector along $\overline{OP}$. Then,

A) $\hat{u} = \frac{\hat{a}+\hat{b}}{|\hat{a}+\hat{b}|}$ and $M = \left(1 + \hat{a}.\hat{b}\right)^{\frac{1}{2}}$

B) $\hat{u} = \frac{\hat{a}-\hat{b}}{|\hat{a}-\hat{b}|}$ and $M = \left(1 + \hat{a}.\hat{b}\right)^{\frac{1}{2}}$

C) $\hat{u} = \frac{\hat{a}+\hat{b}}{|\hat{a}+\hat{b}|}$ and $M = \left(1 + 2\,\hat{a}.\hat{b}\right)^{\frac{1}{2}}$

D) $\hat{u} = \frac{\hat{a}-\hat{b}}{|\hat{a}-\hat{b}|}$ and $M = \left(1 + 2\,\hat{a}.\hat{b}\right)^{\frac{1}{2}}$

57. If the volume of a parallelopied with $\vec{a}\times\vec{b}$, $\vec{b}\times\vec{c}$, $\vec{c}\times\vec{a}$ as coterminous edges is 9 cu. Unit, then the volume of the parallelepiped with $(\vec{a}\times\vec{b})\times(\vec{b}\times\vec{c})$, $(\vec{b}\times\vec{c})\times(\vec{c}\times\vec{a})$, $(\vec{c}\times\vec{a})\times(\vec{a}\times\vec{b})$ as coterminous edges is

A) 9 cu unit B) 729 cu unit C) 81 cu unit D) 27 cu unit

58. If the distance between the plane $x - 2y + z = d$ and the plane containing the lines $\frac{x-1}{2} = \frac{y-2}{3} = \frac{z-3}{4}$ and $\frac{x-2}{3} = \frac{y-3}{4} = \frac{z-4}{5}$ is $\sqrt{6}$, then $|d|$ is

A) 3 B) 4 C) 5 D) 6

59. Let P (3, 2, 6) be a point in space and Q be a point on the line. Then, the value of μ for which the vector $\overline{PQ}$ is parallel to the plane $x - 4y + 3z = 1$ is

A) $\frac{1}{4}$ B) $\frac{-1}{4}$ C) $\frac{1}{8}$ D) $\frac{-1}{8}$

60. $\vec{a} = \hat{i} - \hat{j} + \hat{k}$ and $\vec{b} = 2\hat{i} + 4\hat{j} + 3\hat{k}$ are one of the sides and medians respectively, of a triangle through the same vertex, then area of the triangle is

A) $\frac{1}{2}\sqrt{83}$ B) $\sqrt{83}$ C) $\frac{1}{2}\sqrt{85}$ D) $\sqrt{86}$

CHEMISTRY

61. A gas absorbs a photon of 355 nm and emits at two wavelengths. If one of the emissions is at 680 nm, the other is at:

A) 1035 nm B) 325 nm C) 743 nm D) 518 nm

62. Which of the following represents the correct order of increasing first ionization enthalpy for Ca, Ba, S, Se and Ar?

A) Ca < S < Ba < Se < Ar B) S < Se < Ca < Ba < Ar

C) Ba < Ca < Se < S < Ar D) Ca < Ba < S < Se < Ar

63. Using MO theory, predict which of the following species has the shortest bond length?

A) O_2^+ B) O_2^- C) O_2^{2-} D) O_2^{2+}

64. The compressibility factor for a real gas at high pressure is:

A) $1 + \frac{RT}{pb}$ B) 1 C) $1 + \frac{pb}{RT}$ D) $1 - \frac{pb}{RT}$

65. The standard enthalpy of formation of NH_3 is -46.0 kJ mol^{-1}. If the enthalpy of formation of H_2 from its atoms is -436 kJ mol^{-1} and that of -712 kJ mol^{-1}, the average bond enthalpy of N – H bond in NH_3 is

A) -964 kJ mol^{-1} B) $+352$ kJ mol^{-1} C) $+1056$ kJ mol^{-1} D) $+1102$ kJ mol^{-1}

66. The entropy change involved in the isothermal reversible expansion of 2 mole of an ideal gas from a volume of 10 dm^3 to a volume of 100 dm^3 at 27°C is:

A) 38.3 J mol^{-1} K^{-1} B) 35.8 J mol^{-1} K^{-1} C) 32.3 J mol^{-1} K^{-1} D) 42.3 J mol^{-1} K^{-1}

67. The pK_a of a weak acid, HA is 4.80. The pK_b of a weak base, BOH is 4.78. the pH of an aqueous solution of the corresponding salt, BA, will be

A) 9.58 B) 4.79 C) 7.01 D) 9.22

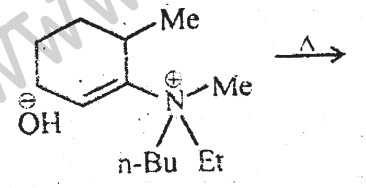
68. Solubility product of silver bromide is 5.0×10^{-13}. The quantity of potassium bromide (molar mass taken as 120 g / mol) to be added to 1 litre of 0.05 M solution of silver nitrate to start the precipitation of AgBr is

A) 1.2×10^{-10} g B) 1.2×10^{-9} g C) 6.2×10^{-5} g D) 5.0×10^{-8} g

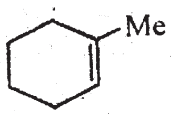
69. Which of the following on thermal decomposition yields a basic as well as acidic oxide?

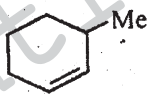
A) $NaNO_3$ B) $KClO_3$ C) $CaCO_3$ D) NH_4NO_3

70.



The alkene formed as a major product in the above elimination reaction is:

A) 

B) 

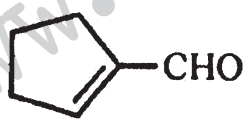
C) 

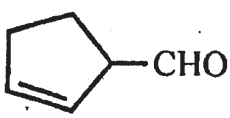
D) $CH_2 = CH_2$

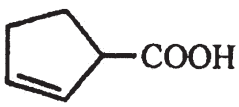
71. Identify the compound that exhibits tautomerism:

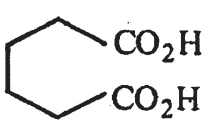
A) 2–Butene B) Lactic acid C) 2–Pentanone D) Phenol

72. Cyclohexene on ozonolysis followed by reaction with zinc dust and water gives compound E. Compound E on further treatment with aqueous KOH yields compound F. Compound F is:

A) 

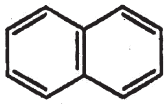
B) 

C) 

D) 

73. The non-aromatic compound among the following is:

A) 

B) 

C) 

D) 

74. 2–Hexyne gives trans–2–Hexene on treatment with:

A) Pt / H_2 B) Li / NH_3 C) $Pd / BaSO_4$ D) $LiAlH_4$

75. Gold numbers of protective colloids A, B, C and D are 0.50, 0.01, 0.10 and 0.005, respectively. The correct order of their protective powers is

A) D < A < C < B B) C < B < D < A

C) A < C < B < D D) B < D < A < C

76. The edge length of a face centered cubic cell of an ionic substance is 508 pm. If the radius of the cation is 110 pm, the radius of the anion is

A) 288 pm B) 398 pm C) 618 pm D) 144 pm

77. Two liquids X and Y form an ideal solution. At 300 K, vapour pressure of the solution containing 1 mol of X and 3 mol of Y is 550 mm Hg. At the same temperature, if 1 mol of Y is further added to this solution, vapour pressure of the solution increases by 10 mm Hg. Vapour pressure (in mmHg) of X and Y in their pure states will be, respectively:

A) 300 and 400 B) 400 and 600

C) 500 and 600 D) 200 and 300

78. What will be the emf for the given cell?

$Pt \mid H_2 (P_1) \mid H^+ (aq) \parallel H_2 (P_2) \mid Pt$

A) $\frac{RT}{F} \log_e \frac{P_1}{P_2}$ B) $\frac{RT}{2F} \log_e \frac{P_1}{P_2}$ C) $\frac{RT}{F} \log_e \frac{P_2}{P_1}$ D) None of these

79. The cell, $Zn \mid Zn^{2+}$ (1M) $\parallel Cu^{2+}$ (1M) $\mid Cu$ ($E^\circ_{cell} = 1.10$ V) was allowed to be completely discharged at 298 K. The relative

concentration of Zn^{2+} to Cu^{2+} $\left(\frac{[Zn^{2+}]}{[Cu^{2+}]}\right)$ is

A) 9.65×10^4 B) antilog (24.08) C) 37.3 D) 10^{373}

80. The half life period of a first order chemical reaction is 6.93 minutes. The time required for the completion of 99% of the chemical reaction will be ($\log 2 = 0.301$)

A) 23.03 minutes B) 46.06 minutes

C) 460.6 minutes D) 230.03 minutes

81. Which of the following has maximum number of lone pairs associated with Xe?

A) XeF_4 B) XeF_6 C) XeF_2 D) XeO_3

82. Which of the following complex species is not expected to exhibit optical isomerism?

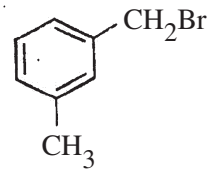
A) $[Co (en)_3]^{3+}$

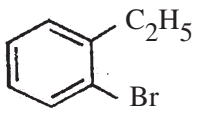
B) $[Co (en)_2 Cl_2]^+$

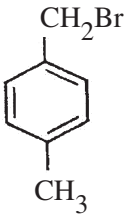
C) $[Co (NH_3)_3 Cl_3]$

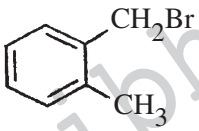
D) $[Co (en) (NH_3)_2 Cl_2]^+$

83. Compound (A), C_8H_9Br gives a white precipitate when warmed with alcoholic $AgNO_3$. Oxidation of (A) gives an acid (B), $C_8H_6O_4$. (B) easily forms anhydride on heating. Identify the compound (A).

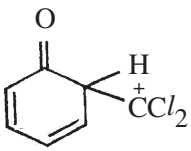
A) 

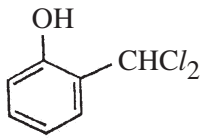
B) 

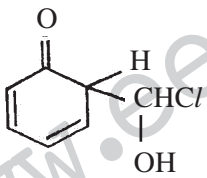
C) 

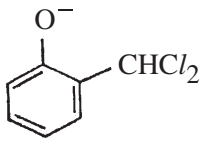
D) 

84. When phenol is reacted with $CHCl_3$ and NaOH followed by acidification, salicyladehyde is obtained. Which of the following species are involved in the above mentioned reaction as intermediate?

A) 

B) 

C) 

D) 

85. Iodoform can be prepared from all except:

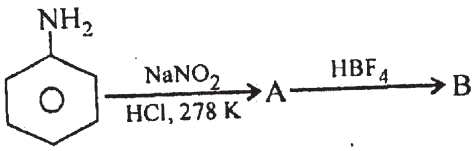
A) Ethyl methyl ketone

B) Isopropyl alcohol

C) 3–Methyl 2–butanone

D) Isobutyl alcohol

86. In the chemical reactions,



the compounds A and B respectively are

A) nitrobenzene and fluorobenzene

B) phenol and benzene

C) benzene diazonium chloride and fluorobenzene

D) nitrobenzene and chlorobenzene

87. An organic compound A upon reacting with NH_3 gives B. On heating B gives C. C in presence of KOH reacts with Br_2 to given $CH_3CH_2NH_2$ is:

A) CH_3COOH

B) $CH_3CH_2CH_2COOH$

C) $CH_3-\underset{\displaystyle CH_3}{\underset{|}{CH}}-COOH$

D) CH_3CH_2COOH

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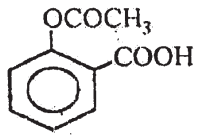
88. The compound



is used as

A) antiseptic B) antibiotic C) analgesic D) pesticide

89. α – D – (+) – glucose and β – D – (+) – glucose are

A) conformers B) epimers C) anomers D) enantiomers

90. Buta–N synthetic rubber is a copolymer of:

A) $H_2C = CH - CH = CH_2$ and $H_5C_6 - CH = CH_2$

B) $H_2C = CH - CN$ and $H_2C = CH - CHCH_2$

C) $H_2C = CH - CN$ and $H_2C = CH - \underset{\underset{CH_3}{|}}{C} = CH_2$

D) $H_2C = CH - \underset{\underset{Cl}{|}}{C} = CH_2$ and $H_2C = CH - CH = CH_2$

KEY

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

(This Model Grand Test is prepared by
Krishna Murthy IIT Academy, Hyderabad)

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