TEST-3

TOPIC COVERED :

PHYSICS: Kinematics of Particle, Laws of Motion, Work, Power, Energy, Centre of Mass.

CHEMISTRY: Gaseous State and Atomic Structure.

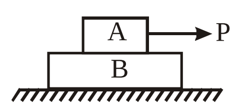
MATHEMATICS: Circle and Parabola, Pair of straight line

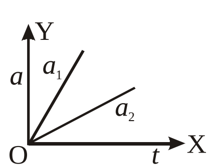
PHYSICS

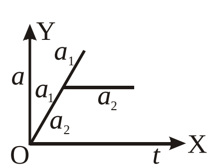
1. The speed of a homogeneous, solid sphere after rolloing down an inclined plane of vertical height *h*, from rest without sliding is

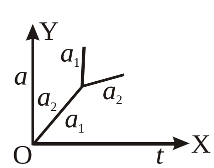
(a) $\sqrt{\left(\frac{10}{7}gh\right)}$ (b) $\sqrt{gh}$ (c) $\sqrt{\left(\frac{5}{3}gh\right)}$ (d) $\sqrt{\left(\frac{4}{3}gh\right)}$

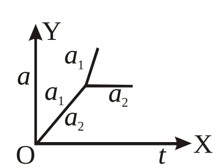
2. Block *A* is placed on block *B* whose mass is greater than that of A. There is friction between the blocks while the ground is smooth. A horizontal force *P*, increasing linearly with time, begins to act on. The accelerations a_1 and a_2 of *A* and *B* respectively are plotted against time *t*. Choose the correct graph



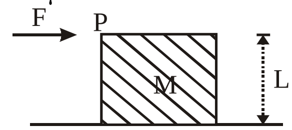
(a) 

(b) 

(c) 

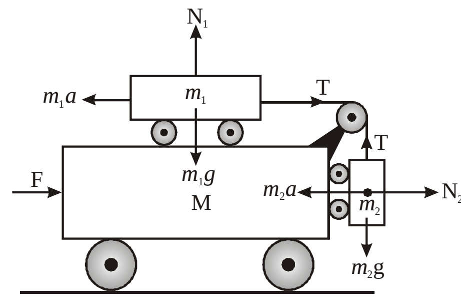
(d) 

3. A cubical block of side L rests on a rough horizontal surface with coefficient of friction μ. A horizontal force F is applied on block as shown. If the coefficient is sufficiently high so that the block does not slide before toppling, the minimum force required to topple the block is



(a) infinitesimal (b) Mg/4 (c) Mg/2 (d) Mg(1– μ)

4. A frictionless cart of mass M carries two other frictionless carts having masses m_1 and m_2 connected by a string passing over a pulley as shown in figure. The horizontal force that must be applied on M so that m_1 and m_2 do not move relative to it will be



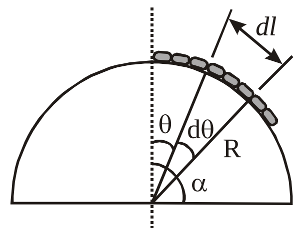
(a) $(M + M_1 + m_2)\ (m_2/m_1)g$

(b) $(M + m_1 + m_2)\ (m_1/m_2)g$

(c) $(M + m_1)\ [(m_1 + m_2) / m_2]g$

(d) $(M + m_2)\ [m_2/(m_1 + m_2)]g$

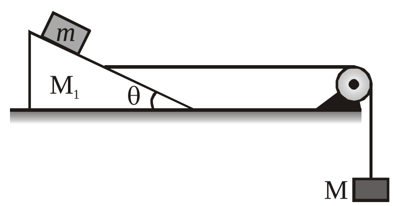
5. A chain of length l is placed on a smooth spherical surface of radius R with one of its ends fixed at the top of the sphere. It is assumed that the length of the chain $l<(\pi R/2)$. When its upper end is released, the acceleration of each element of the chain is



(a) $\dfrac{Rg}{l}[1 - \cos l / R]$ (b) $\dfrac{l}{Rg}[1 - \cos l / R]$

(c) $\dfrac{Rg}{l}[\cos l / R - 1]$ (d) $\dfrac{Rg}{l}[1 + \cos l / R]$

6. Considering the surfaces frictionless and strings and pulleys light, the mass M of the hanging block shown in figure, which will prevent the smaller block from slipping over the triangular block will be



(a) $\left(\dfrac{m + M_1}{\cot\theta - 1}\right)$ (b) $\left(\dfrac{M_1 - m}{\cot\theta - 1}\right)$

(c) $\left(\dfrac{m + M_1}{\cot\theta + 1}\right)$ (d) $\left(\dfrac{M_1 - m}{\cot\theta + 1}\right)$

7. A hammer of mass M strikes a nail of mass m with velocity of u m/s and drives it a metre into fixed block of wood. The average resistance of wood to the penetration of nail is

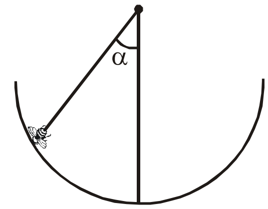
(a) $\left[\dfrac{M}{m + M}\right]\dfrac{u^2}{2a}$ (b) $\left[\dfrac{M^2}{(m + M)^2}\right]\dfrac{u^2}{2a}$ (c) $\left[\dfrac{M^2}{(m + M)}\right]\dfrac{u^2}{2a}$ (d) $\left[\dfrac{M + m}{m}\right]\dfrac{u^2}{2a}$

8. A block of mass m, lying on a rough horizontal plane, is acted upon by a horizontal force P and another force Q, inclined at an angle θ to the vertical. The block will remain in equilibrium, if the coefficient of friction between it and the surface is

(a) $(P + Q\sin\theta)/(mg + Q\cos\theta)$ (b) $(P\cos\theta + Q)/(mg - Q\sin\theta)$

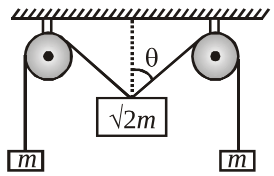
(c) $(P + Q\cos\theta)/(mg + Q\sin\theta)$ (d) $(P\sin\theta - Q)/(mg - Q\cos\theta)$

9. An insect crawls up a hemispherical surface very slowly. The coefficient of friction between the insect and the surface is 1/3. If the line joining the centre of the hemispherical surface to the insect makes an angle α with the vertical, the maximum possible value of α is given by



(a) $\cot\alpha = 3$ (b) $\tan\alpha = 3$ (c) $\sec\alpha = 3$ (d) $\operatorname{cosec}\alpha = 3$

10. The pulleys and strings shown in the figure are smooth and of negligible mass. For the system to remain in equilibrium, the angle θ should be



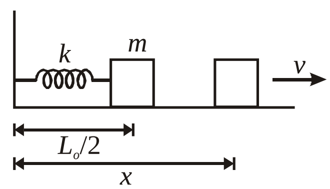
(a) 0° (b) 30°

(c) 45° (d) 60°

11. A particle performs uniform circular motion with an angular momentum L. If the frequency of particles motion is doubled, its kinetic energy is halved, the new angular momentum becomes

(a) 2L (b) 4L (c) L/2 (d) L/4

12. A block of mass m is pushed against a spring of spring constant k fixed at one end to a wall. The block can slide on a frictionless table as shown in figure. The natural length of the spring of L_o, and it is compressed to half of natural length when the block is released



(a) The velocity as a function of its distance from the wall is $v = \sqrt{\left(\frac{k}{m}\right)}\left[\frac{L_o^2}{4} - (L_o - x)^2\right]^{1/2}$

(b) $v = \sqrt{\left(\frac{k}{m}\right)}\left[\frac{L_o^2}{4} + (L_o - x)^2\right]^{1/2}$

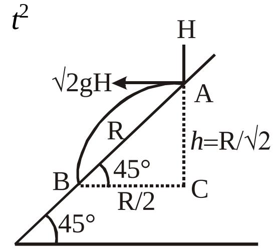
(c) For natural length $v_n = \sqrt{\left(\frac{k}{m}\right)}.\frac{L_o}{4}$

(d) none of these

13. A body is moved along a straight line by a machine delivering constant power. The distance moved by the body in time t is proportional to

(a) $t^{1/2}$ (b) $t^{3/4}$ (c) $t^{3/2}$ (d) t^2

14. A tennis ball falls freely from a height H on to an inclined smooth plane making an angle 45° with horizontal. After bouncing the ball falls on the plane again. The distance between the two points striking the plane is

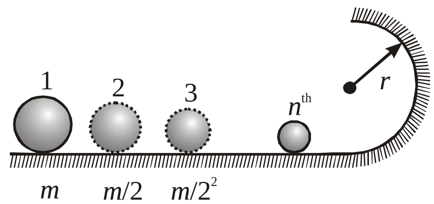


(a) $4\sqrt{2}$ H (b) H/$\sqrt{2}$ (c) H$\sqrt{2}$ (d) H

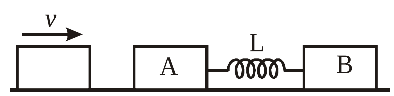
15. n elastic balls are placed at rest on a smooth horizontal plane which is circular at the end with radius r as shown in figure. The masses of the balls are m, $m/2$, $m/2^2$... $m/2^{n-1}$ respectively. The minimum velocity which should be imparted to the first ball of mass m such that the n^{th} ball with complete the vertical circle will be

(a) $\left(\frac{3}{4}\right)^{n-1}\sqrt{(5gr)}$ (b) $\left(\frac{3}{4}\right)^{n}\sqrt{(5gr)}$

(c) $\left(\frac{3}{4}\right)^{n-1}\sqrt{(2gr)}$ (d) $\left(\frac{3}{4}\right)^{n}\sqrt{(2gr)}$



16. Two blocks A and B each of mass m are connected by a massless spring of natural length L and spring constant K. The blocks are initially resting on a smooth horizontal floor with the spring at its natural length, as shown in figure. A third identical block C, also of mass m, moves on the floor with a speed v along the line joining A and B, and collides with A. Then



(a) the kinetic energy of the A-B system, at maximum compression of the spring, is zero

(b) the kinetic energy of the A-B system, at maximum compression of the spring, is $mv^2/4$

(c) the maximum compression of the spring is $v\sqrt{(m/K)}$

(d) the maximum compression of the spring is $v\sqrt{(m/4K)}$

17. Two particles of masses m_1 and m_2 in projectile motion have velocities v_1 and v_2 respectively at time t =0. They collide at time t_o. Their velocities become v_1' and v_2' at time $2t_o$ while still moving in air. The value of $[(m_1v_1' + m_2v_2') - (m_1v_1 + m_2v_2)]$ is

(a) zero (b) $(m_1 + m_2)g\,t_o$ (c) $2(m_1 + m_2)g\,t_o$ (d) $\frac{1}{2}(m_1 + m_2)g\,t_o$

18. Potential energy function describing the interaction between two atoms of a diatomic molecule is $U(x) = \frac{a}{x^{12}} - \frac{b}{x^6}$. In stable equilibrium, the distance between them would be

(a) $(2a/b)^{1/6}$ (b) $(b/2a)^{1/6}$ (c) $(a/b)^{1/6}$ (d) $(b/a)^{1/6}$

19. A thin circular ring of mass M and radius r is rotating about an axis passing through its centre and perpendicular to its plane with a constant angular velocity ω. Two objects, each of mass m are attached gently to the opposite ends of a diameter of the ring. The ring now rotates with angular velocity

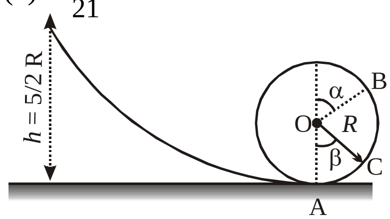
(a) $\frac{\omega(M-2m)}{M+2m}$ (b) $\omega M(M-m)$ (c) $\frac{\omega(M+2m)}{M}$ (d) $\frac{\omega M}{M+2m}$

20. A solid cylinder of mass M and radius R rolls down an inclined plane without slipping. The speed of its centre of mass when it reaches the bottom is

(a) $\sqrt{(2gh)}$ (b) $\sqrt{4/3.gh}$ (c) $\sqrt{3/4.gh}$ (d) $\sqrt{(4g/h)}$

21. Two spheres each of mass M and radius R/2 are connected with a massless rod of length 2R. What will be the moment of inertia of the system about an axis passing through the centre of one of the sphere and perpendicular to the rod?

(a) $\frac{21}{5}MR^2$ (b) $\frac{2}{5}MR^2$ (c) $\frac{5}{2}MR^2$ (d) $\frac{5}{21}MR^2$



22. A ball slides without friction down an inclined slope from a height h and then moves in a loop of radius R. What is the pressure exerted by the ball on the loop at a certain point B if the radius drawn form the centre of the loop to the point B makes an angle α with the vertical. the mass of the ball is m and height $h = (5/2)$R. Consider the size of the ball negligible.

(a) $mg(1-\cos\alpha)$ (b) $2mg(1-\cos\alpha)$ (c) $3mg(1-\cos\alpha)$ (d) $mg(1+\cos\alpha)$

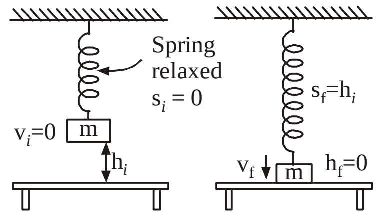
23. A box of 400 kg is pushed along 10m by two coolies over a railways platform whose coefficient of friction with the box is 0.5. The work done by the two coolies is [Assume forces applied to be horizontal and $g = 10\ ms^{-2}$]

(a) +20000J (b) –20000J (c) +10000J (d) –10000J

24. The potential energy of a particle is given by $u = \frac{a}{r^2} - \frac{b}{r}$, where a and b are positive constants, r is the distance from the centre of the field. The stable equilibrium position of the particle corresponds to the distance r_0 given by.

(a) $\frac{a}{b}$ (b) $-\frac{a}{b}$ (c) $\frac{a}{2b}$ (d) $\frac{2a}{b}$

25. A body of mass 100g is attached to a hanging spring whose force constant is 10N/m. The body is lifted until the spring is in its unstretched state. The body is then released. Using the law of conservation of total mechanical energy, calculate the speed of the body when it strikes a table 15 cm below the release point.



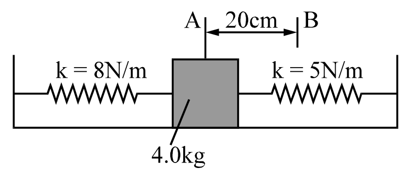
(a) 0.831 m/s (b) 1 m/s

(c) 0.982 m/s (d) 5 m/s

26. A pendulum consists of a wooden bob of mass *m* and length *l*. A bullet of mass m_1 is fired towards the pendulum horizontally with a speed v_1. The bullet emerges out of the bob with a speed $v_1/3$, and the bob just completes motion along a vertical circle. Then v_1 is

(a) $\frac{2}{3}\left(\frac{m}{m_1}\right)\sqrt{5gl}$ (b) $\frac{3}{2}\left(\frac{m}{m_1}\right)\sqrt{(5gl)}$ (c) $\frac{2}{3}\left(\frac{m_1}{m}\right)\sqrt{(5gl)}$ (d) $\left(\frac{m_1}{m}\right)\sqrt{(gl)}$

27. In figure, neither spring is distorted in the position shown. If now the mass is displaced 20 cm to point B and released, what is the speed of the block as it passes through point A.



(a) 0.36 m/s (b) 0.48 m/s

(c) 0.56 m/s (d) 3.6 m/s

28. A 30000 kg airplane takes off at a speed of 50 m/s, and 5 min later it is at an elevation of 3 km and has a speed of 100 m/s. What average power is required during this 5 min if 40 percent of the power is used in overcoming dissipative forces ?

(a) 10.625 MW (b) 5.525 MW (c) 15.025 MW (d) 0.525 MW

29. **Statement-1:** If a body is released from rough inclined plane its kinetic energy at the bottom is equal to loss of gravitational potential energy.

Statement-2: Energy is not lost down the plane in pure rolling motion.

(a) Both **Statement-1** and **Statement-2** are true and **Statement-2** is correct explanation of **Statement-1.**

(b) Both **Statement-1** and **2** are true but **Statement-2** is not a correct explanation of **Statement-1.**

(c) **Statement-1** is true and **Statement-2** is false.

(d) **Statement-1** is false but **Statement-2** is true.

30. Statement-1: Moment of inertia of a solid sphere about *x* and *y*-axis if its centre lies at origin is $\frac{2}{5}MR^2$.

Then its moment of inertia about z-axis is $\frac{4}{5}$ MR^2.

Statement-2: Perpendicular theorem states that $I_x + I_y = I_z$.

(a) Both **Statement-1** and **Statement-2** are true and **Statement-2** is correct explanation of **Statement-1.**

(b) Both **Statement-1** and **2** are true but **Statement-2** is not a correct explanation of **Statement-1.**

(c) **Statement-1** is true and **Statement-2** is false.

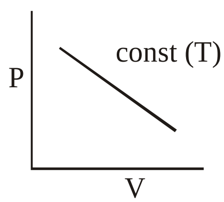
(d) **Statement-1** is false but **Statement-2** is true.

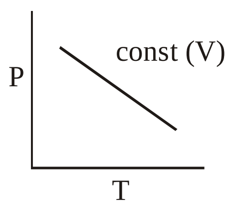
CHEMISTRY

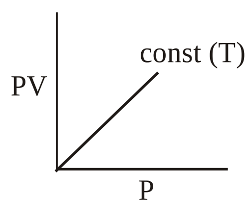
31. Which of the following gases would have the highest R.M.S velocity at 25°C?

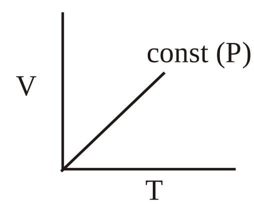
(a) Oxygen (b) Carbon dioxide (c) Sulphur dioxide (d) Carbon Monoxide

32. Which of the following diagram correctly discribes the behaviour of a fixed mass of an ideal gas? (T is measured in K)

(a)


(b)


(c)


(d)


33. Volume of the air that will be expelled from a vessel of 300 cm^3 when it is heated from 27°C to 37°C at the same pressure will be

(a) 310 cm^3 (b) 290 cm^3 (c) 37 cm^3 (d) 10 cm^3

34. Use of hot air balloons in sports and meteorological observations is an application of

(a) Charles's law (b) Boyle's law (c) Kelvin's law (d) Avagadro's law

35. Slope of the plot between PV and P at constant temperature is

(a) 1 (b) zero (c) 1/2 (d) $1/\sqrt{2}$

36. At STP the density of nitrogen monoxide is

(a) 3.0 g L^{-1} (b) 30 g L^{-1} (c) 1.34 g L^{-1} (d) 2.68 g L^{-1}

37. Molar volume of CO_2 is maximum at

(a) NTP (b) 0°C and 2.0 atm (c) 127°C and 1 atm (d) 273°C and 2 atm

38. **Statement-1:** The effusion rate of oxygen is smaller than that of nitrogen.

Statement-2: Molecular size of nitrogen is smaller than that of oxygen.

(a) Both **Statement-1** and **Statement-2** are true and **Statement-2** is correct explanation of **Statement-1.**

(b) Both **Statement-1** and **Statement-2** are true but **Statement-2** is not a correct explanation of **Statement-1.**

(c) **Statement-1** is true and **Statement-2** is false.

(d) **Statement-1** is false but **Statement-2** is true.

39. For a '*f*' electron, the orbital angular momentum is

(a) $\sqrt{12}\frac{h}{x}$ (b) $\sqrt{6}\frac{h}{\pi}$ (c) $\sqrt{3}\frac{h}{\pi}$ (d) $\sqrt{15}\frac{h}{\pi}$

40. If the wavelength of first line in Balmer series is 6300Å, the wavelength of the second line in the same series will be

(a) 6800Å (b) 7200Å (c) 4861Å (d) 4700Å

41. The ratio of $E_2 - E_1$ to $E_4 - E_3$ for the hydrogen atom is approximately equal to

(a) 10 (b) 15 (c) 17 (d) 12

42. The maximum number of electrons in a sub-shell is given by the expression

(a) $4l + 2$ (b) $4l - 2$ (c) $2l + 1$ (d) $2n^2$

43. The ratio of kinetic energy and total energy of an electron in a Bohr orbit of hydrogen like species is

(a) ½ (b) – ½ (c) 1 (d) – 1

44. In an atom two electrons are moving in orbit of radii r and $9r$. The ratio of time taken by them to complete one revolution is

(a) 1 : 9 (b) 1 : 3 (c) 1 : 27 (d) 1 : 6

45. Assume that the potential energy of a hydrogen atom in its ground state is zero. Then its energy in the first excited state will be

(a) 13.6 eV (b) 27.2 eV (c) 23.8 eV (d) 10.2 eV

46. The total number of nodes (angular plus radial) is given by

(a) $n - 1$ (b) $n - 1 - 1$ (c) $n + 1$ (d) $2l + 1$

47. If spin quantum number could have 3 values instead of 2, where would the last electron enter in the ground state electronic configuration of cobalt?

(a) $3d$ (b) $3p$ (c) $4p$ (d) $4s$

48. Calculate volume occupied by 8.8 g CO_2 gas, if 5.6 g CO gas occupies 6.24 L at same temperature and pressure.

(a) 22.4 L (b) 1.12 L (c) 4.48 L (d) 6.24 L

49. Potential energy or Li^{2+} electron is

(a) $\frac{-3e^2}{4\pi \in_o r}$ (b) $\frac{3e^2}{4\pi \in_o r}$ (c) $\frac{-2e^2}{4\pi \in_o r^2}$ (d) $\frac{-e^2}{4\pi \in_o r^2}$

50. The ratio between number of Lyman lines and Balmer lines in hydrogen spectrum during the de-excitation of electron from 7th shell to 2nd shell is

(a) 5 : 4 (b) 5 : 3 (c) 4 : 3 (d) Zero

51. The number of d-electrons in Fe^{2+} (Z = 26) is not equal to that of the

(a) p-electrons in Ne (at. no = 10) (b) s-electrons in Mg (at. no = 12)

(c) d-electrons in Fe (d) p-electrons in Cl^- (at no. of Cl = 17)

52. If n and l are respectively the principal and azimuthal quantum numbers, than the expression for the calculation of the total no. of electrons in any energy level is

(a) $\sum_{l=0}^{l=n} 2(2l+1)$ (b) $\sum_{l=n+1}^{l=n-1} 2(2l+1)$ (c) $\sum_{l=0}^{l=n+1} 2(2l+1)$ (d) $\sum_{l=0}^{l=n-1} 2(2l+1)$

53. Suggest two transitions in the atomic spectrum hydrogen for which the wave number ratio is 108 : 7

(a) First Lyman and first Bracket transition (b) First and second Lyman series transition

(c) First Lyman and first Balmer transition (d) First Lyman and first Paschen transition

54. The number of photons of light having wave number x in 1J of energy source is (Planck's constant = h, velocity of light = c)

(a) hcx (b) hc/x (c) $\frac{x}{hc}$ (d) $\frac{1}{hcx}$

55. In the ground state of Cu^+, the number of shells occupied, subshells occupied, filled orbitals and unpaired electrons respectively are

(a) 4, 8, 15, 0 (b) 3, 6, 15, 1 (c) 3, 6, 14, 0 (d) 4, 7, 14, 2

56. The energy of an electron in the second Bohr orbit of H-atom is –E. The energy of the electron in the Bohr's first orbit is

(a) –E/4 (b) – 4E (c) 4E (d) – 2E

57. A certain metal when irradiated by light ($v = 3.2 \times 10^{16}$ Hz) emits photoelectrons with same kinetic energy as the photo electrons when the same metal is irradiated by light.

($v = 2.0 \times 10^{16}$ Hz). The v_o of metal is

(a) 1.2×10^{14} Hz (b) 8×10^{15} Hz (c) 1.2×10^{16} Hz (d) 4×10^{12} Hz

58. Of the following radiations which has highest energy

(a) $\lambda = 20$ nm (b) $\lambda = 200$ pm (c) $\lambda = 2 \times 10^{8}\ s^{-1}$ (d) $\lambda = 2 \times 10^{12}\ s^{-1}$

59. The wave number of Balmer series of He^+, is ($R_H = 109700\ cm^{-1}$)

(a) $82275\ cm^{-1}$ (b) $13375\ cm^{-1}$ (c) $193700\ cm^{-1}$ (d) $124750\ cm^{-1}$

60. Among the following, the electronic transition that emits maximum amount of energy is

(a) $n_2 \longrightarrow n_1$ (b) $n_3 \longrightarrow n_2$ (c) $n_4 \longrightarrow n_3$ (d) $n_5 \longrightarrow n_4$

MATHEMATICS

61. Circle drawn having its diameter equal to focal distance of any point lying on the parabola $x^2 - 4x + 6y + 10 = 0$, will touch a fixed line whose equation is

(a) $y = 2$ (b) $y = -1$ (c) $x + y = 2$ (d) $x - y = 2$

62. Tangents drawn to parabola $y^2 = 4ax$ at the point A and B intersect at C. If S be the focus of the parabola then SA, SC and SB forms

(a) an A.P. (b) a G.P. (c) an H.P. (d) none of these

63. Locus of trisection point of any arbitrary double ordinate of the parabola $x^2 = 4by$ is

(a) $9x^2 = by$ (b) $3x^2 = 2by$ (c) $9x^2 = 4by$ (d) $9x^2 = 2by$

64. Equation of the common tangent of $y^2 = 4ax$ and $x^2 = 4ay$ is

(a) $x + y - a = 0$ (b) $x - y - a = 0$ (c) $x - y + a = 0$ (d) $x + y + a = 0$

65. If a focal chord of $y^2 = 4ax$ makes an angle α, $\alpha \in (0, \pi/4]$ with the positive direction of x-axis, then minimum length of this focal chord is

(a) $6a$ (b) $2a$ (c) $8a$ (d) none of these

66. OA and OB are two mutually perpendicular chords of $y^2 = 4ax$, O being the origin. Line AB will always pass through the point

(a) $(2a, 0)$ (b) $(6a, 0)$ (c) $(8a, 0)$ (d) $(4a, 0)$

67. PA and PB are the tangents drawn to $y^2 = 4ax$ from arbitrary point P. If the angle between the tangents is $\frac{\pi}{4}$, then locus of point P is

(a) $y^2 = x^2 + a^2 + 6ax$ (b) $y^2 = x^2 - a^2 + 6ax$ (c) $y^2 = x^2 + a^2 - 6ax$ (d) $y^2 = x^2 - a^2 - 6ax$

68. Normals AO, AA_1, AA_2 are drawn to parabola $y^2 = 8x$ from the point $A(h, 0)$. If triangle OA_1A_2 is equilateral then possible value of h is

(a) 26 (b) 24 (c) 28 (d) none of these

69. Parabola $y^2 = 4x$ and the circle having its center at (6, 5) intersect at a right angle. Possible point of intersection of these curves can be

(a) (9, 6) (b) $(2, \sqrt{8})$ (c) (1, 2) (d) $(3, 2\sqrt{3})$

70. Tangent and normal drawn to parabola at $A(at^2, 2at)$, $t \neq 0$, meet the x-axis at points B and D respectively. If the rectangle $ABCD$ is completed, then locus of C is

(a) $y = 2a$ (b) $y + 2a = 0$ (c) $x = 2a$ (d) $x + 2a = 0$

71. Slope of the normal chord of $y^2 = 8x$ that gets bisected at (8, 2) is

(a) 1 (b) –1 (c) 2 (d) –2

72. Radius of the circle that passes through the origin and touches the parabola $y^2 = 4ax$ at the point $(a, 2a)$ is

(a) $\frac{5}{\sqrt{2}}a$ (b) $2\sqrt{2}\,a$ (c) $5\sqrt{2}\,a$ (d) $3\sqrt{2}\,a$

73. A circle is drawn to pass through the extremities of the latus rectum of the parabola $y^2 = 8x$. It is given that this circle also touches the directrix of the parabola. Radius of this circle is equal to

(a) 4 (b) $\sqrt{21}$ (c) 3 (d) $\sqrt{26}$

74. A circle having its center at (2, 3) is cut orthogonally by the parabola $y^2 = 4x$. The possible intersection point of these curves can be

(a) (1, 2) or $(3, 2\sqrt{3})$ (b) (9, 6) or $(2, 2\sqrt{2})$ (c) (1, 2) or (4, 4) (d) none of these

75. Normals drawn to $y^2 = 4ax$ at the points where it is intersected by the line $y = mx + c$ intersect at P. Foot of another normal drawn to the parabola from the point P is

(a) $\left(\frac{a}{m^2}, -\frac{2a}{m}\right)$ (b) $\left(\frac{9a}{m^2}, -\frac{6a}{m}\right)$ (c) $(am^2, -2am)$ (d) $\left(\frac{4a}{m^2}, -\frac{4a}{m}\right)$

76. Equation of the circle through origin which cuts intercepts of lengths a and b on axes is

(a) $x^2 + y^2 + ax + by = 0$ (b) $x^2 + y^2 - ax + by = 0$

(c) $x^2 + y^2 + bx + ay = 0$ (d) none of these

77. The lines $3x - 4y + 4 = 0$ and $6x - 8y - 8 = 0$ are tangents to the same circle. The radius of the circle is

(a) $\frac{4}{5}$ (b) $\frac{1}{2}$ (c) $\frac{2}{3}$ (d) none of these

78. Two rods of lengths a and b slide on x-axis and y-axis respectively such that their end points are concyclic. Then the locus of the centre of the circle is

(a) $x^2 + y^2 = \frac{a^2-b^2}{4}$ (b) $x^2 - y^2 = \frac{a^2-b^2}{4}$ (c) $x^2 - y^2 = \frac{a^2+b^2}{4}$ (d) none of these

79. If the circle $x^2+y^2+2gx+2fy+c=0$ bisects the circumference of the circle $x^2 + y^2 + 2g_1x + 2f_1y + c_1 = 0$, then the condition is

(a) $2g_1(g - g_1) + 2f_1(f - f_1) = c_1 - c$ (b) $2g_1(g - g_1) + 2f_1(f - f_1) = c - c_1$

(c) $2g_1(g - g_1) + 2f_1(f - f_1) = c + c_1$ (d) none of these

80. The area of triangle formed by the tangent and normal at point (4, 3) to the circle $x^2 + y^2 = 25$ and x-axis is

(a) 75/4 (b) 75/8 (c) 25/4 (d) none of these

81. The parametric equations $x = a\left(\frac{1-t^2}{1+t^2}\right)$ and $y = \frac{2at}{1+t^2}$ represents

(a) Parabola (b) Straight line (c) Circle (d) none of these

82. The equation of a tangent to the circle $x^2 + y^2 = 25$ passing through (–2, 11) is

(a) $3x + 4y = 38$ (b) $24x - 7y + 125 = 0$ (c) $7x + 24y = 250$ (d) none of these

83. The pair of lines represented by $3ax^2 + 5xy + (a^2 - 2)y^2 = 0$ are perpendicular to each other for

(a) two values of a (b) a (c) for one value of a (d) for no value of a

84. If the pairs of lines $x^2 + 2xy + ay^2 = 0$ and $ax^2 + 2xy + y^2 = 0$ have exactly one line in common, then the joint equation of the other tow lines is given by

(a) $3x^2 + 8xy - 3y^2 = 0$ (b) $3x^2 + 10xy + 3y^2 = 0$(c) $y^2 + 2xy - 3x^2 = 0$ (d) $x^2 + 2xy - 3y^2 = 0$

85. Equation of a line which is parallel to the line common to the pair of lines given by $6x^2 - xy - 12y^2 = 0$ and $15x^2 + 14\,xy - 8y^2 = 0$ and at a distance 7 from it is

(a) $3x - 4y = -35$ (b) $5x - 2y = 7$ (c) $3x + 4y = 35$ (d) $2x - 3y = 7$

86. If the lines represented by the equation $3y^2 - x^2 + 2\sqrt{3}x - 3 = 0$ are rotated about the point $(\sqrt{3}, 0)$ through an angle 15°, one clockwise direction and other in anti clockwise direction, so that they become perpendicular, then the equation on the pair of lines in the new position is

(a) $y^2 - x^2 + 2\sqrt{3}x + 3 = 0$ (b) $y^2 - x^2 + 2\sqrt{3}x - 3 = 0$

(c) $y^2 - x^2 - 2\sqrt{3}x + 3 = 0$ (d) $y^2 - x^2 + 3 = 0$

87. If one of the lines of $my^2 + (1 - m^2)xy - mx^2 = 0$ is a bisector of the angle between the lines $xy = 0$, then m is

(a) 3 (b) 2 (c) – 1/2 (d) – 1

88. The condition that one of the straight lines given by the equation $ax^2 + 2hxy + by^2 = 0$ may coincide with one of those given by the equation $a¢x^2 + 2h'xy + b'y^2 = 0$ is

(a) $(aB' - a'b)^2 = 4(ha' - h'a)(bh' - b'h)$ (b) $(aB' - a'b)^2 = (ha' - h'a)(bh' - b'h)$

(c) $(ha' - h'a)^2 = 4(aB' - a'b)(bh' - b'h)$ (d) $(bh' - b'h)^2 = 4(aB' - a'b)(ha' - h'a)$

89. The equations $x - y = 4$ and $x^2 + 4xy + y^2 = 0$ represent the sides of

(a) an equilibrium triangle (b) a right angled triangle

(c) an isosceles triangle (d) none of these

90. The distance between the two lines represented by the equation $9x^2 - 24xy + 16y^2 - 12x + 16y - 12 = 0$ is

(a) 8/5 (b) 6/5 (c) 11/5 (d) none of these

Test-3

ANSWERS

Physics

1.	(a)	2.	(d)	3.	(c)	4.	(a)	5.	(a)
6.	(a)	7.	(c)	8.	(a)	9.	(a)	10.	(c)
11.	(d)	12.	(a)	13.	(c)	14.	(a)	15.	(a)
16.	(b)	17.	(c)	18.	(a)	19.	(d)	20.	(b)
21.	(a)	22.	(c)	23.	(a)	24.	(d)	25.	(a)
26.	(b)	27.	(a)	28.	(b)	29.	(d)	30.	(d)

Chemistry

31.	(d)	32.	(d)	33.	(d)	34.	(a)	35.	(b)
36.	(c)	37.	(c)	38.	(c)	39.	(c)	40.	(d)
41.	(b)	42.	(a)	43.	(d)	44.	(c)	45.	(d)
46.	(a)	47.	(b)	48.	(a)	49.	(a)	50.	(d)
51.	(d)	52.	(d)	53.	(d)	54.	(d)	55.	(c)
56.	(b)	57.	(b)	58.	(b)	59.	(a)	60.	(a)

Mathematics

61.	(b)	62.	(b)	63.	(c)	64.	(d)	65.	(c)
66.	(d)	67.	(a)	68.	(c)	69.	(a)	70.	(c)
71.	(c)	72.	(a)	73.	(a)	74.	(c)	75.	(d)
76.	(a)	77.	(a)	78.	(b)	79.	(b)	80.	(b)
81.	(c)	82.	(b)	83.	(a)	84.	(b)	85.	(c)
86.	(b)	87.	(d)	88.	(a)	89.	(a)	90.	(a)