



Sri Chaitanya IIT Academy, India

A.P, TELANGANA, KARNATAKA, TAMILNADU, MAHARASHTRA, DELHI, RANCHI

A right Choice for the Real Aspirant

ICON CENTRAL OFFICE, MADHAPUR-HYD

Sec: Jr.Super60-I

Time: 07:30 AM to 10:30 AM

WTM -11

Date: 15-07-17

Max.Marks:360

Name of the Student: _____

I.D.NO:

IMPORTANT INSTRUCTIONS:

- 1) Immediately fill in the particulars on this page of the Test Booklet with Blue/Black Ball Point Pen. Use of pencil is strictly prohibited.
- 2) The test is of 3 hours duration.
- 3) The Test Booklet consists of 90 questions. The maximum marks are 360.
- 4) There are three parts in the question paper A, B, C consisting of **Maths, Physics, and Chemistry** having 30 questions in each part of equal weight age. Each question is allotted 4 (four) marks for correct response.
- 5) Candidates will be awarded marks as stated above in instruction No. 4 for correct response of each question. (1/4) (one fourth) marks will be deducted for indicating incorrect response of each question. No deduction from the total score will be made if no response is indicated for an item in the answer sheet.
- 6) There is only one correct response for each question. Filling up more than one response in any question will be treated as wrong response and marks for
Wrong response will be deducted accordingly as per
Instruction 5 above.

SYLLABUS

MATHS:

2-D GEOMETRY: Distance Formula, Section formula, Finding various Centres with given vertices of a triangle, Area of Triangle, Collinearity of Points, Locus(Simple problems), Translation and Rotation of axes (30%); Equation of Straight Line: General form, Slope Form, Intercept Form, Normal form, Two Point Form & Parametric Form, Angle between two lines, Intersection of two lines, Position of Two Points w.r.t a line, Length of perpendicular distance of a

point from a line, Distance between parallel lines, Reflection of a point w.r.t a line, Optimization using Triangular Inequality (70%)

PHYSICS:

Friction: A solid surface relatively at rest on another solid surface, static friction as a force opposing the tendency of relative motion on the other surface. Limiting friction, coefficient of static friction, Difference between f_s , μ_s and static friction as a self adjusting force, angle of friction. Direction of static friction, related Numerical problems, Friction as the cause of motion (walking, vehicles etc). Minimum force required to move a block on a fixed horizontal surface on another block with horizontal surface, A solid surface moving relatively on another solid surface. Kinetic friction (Dynamic or sliding friction). Coefficient of kinetic friction. Direction of Kinetic friction, Cause of static friction, cause of kinetic friction, methods to reduce friction, Advantages and disadvantages of friction, Dependence of friction on area of contact, polishing a surface, A block on a fixed rough inclined plane, angle of repose, cases and acceleration down the plane. Body projected up along the inclined plane etc, Miscellaneous problems on Friction (70%) constraint equations, Problems in NLM without friction (Including spring problems)(30%)

CHEMISTRY:

Abnormal Colligative Properties, Theory of distillation.

Chemical Kinetics::Rates of chemical reactions; Order, Molecularity and Rate constant, Zero and First Order Reactions, First Order Reactions (EXCLUDING ARHENIUS EQUATION) (70%)

Liquid Solutions and Colligative Properties: Henry's law, Vapour pressure, Ideal solution, Determination of molecular weight by relative lowering of vapour pressure, elevation of boiling point, depression of freezing point, osmotic pressure(including Vant-hoff factor) (30%)

MATHS

1. A line is drawn through the point $(2, 3)$ to meet the coordinate axes $\overline{OX}, \overline{OY}$ at P and Q such that it forms a triangle OPQ, where O is the origin. If the area of the triangle OPQ is least, then the slope of the line PQ is:

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

2. A line has intercepts a and b on the coordinate axes. When the axes are rotated through an angle α , keeping the origin fixed, the line makes equal intercepts on the coordinate axes, then $\cot \alpha =$

- 1) $\frac{a+b}{a-b}$ 2) $\frac{a-b}{a+b}$
 3) $a^2 - b^2$ 4) $a^2 + b^2$

3. A straight line L with negative slope passes through the point $(12, 3)$ and cuts the positive coordinate axes at points P and Q. As L varies, the

absolute minimum value of $OP + OQ$ is (O is origin)

- 1) 10 2) 18
 3) 16 4) 27

4. If the origin is translated to the centroid of $\triangle ABC$ where

$A = (-1, 2), B(2, 4), C(-5, 8)$, and the

new points centre w.r.t. the new axes is

(p, q) then the value of $\left[\left[\frac{q}{p} \right] \right]$ is ([.]

denotes greatest integer function)

- 1) 8 2) 7
 3) 6 4) 5

5. In $\triangle ABC, B = (0, 0), AB = 2, \angle ABC = \frac{\pi}{3}$ and

the middle point of BC has the co-

ordinates $(2, 0)$. Then the ortho centre of

triangle can be

- 1) $(1, 3\sqrt{3})$ 2) $\left(\frac{5}{3}, \frac{1}{\sqrt{3}}\right)$
 3) $\left(1, \frac{1}{\sqrt{3}}\right)$ 4) $(1, \sqrt{3})$

6. The coordinates of two consecutive vertices A and B of a regular hexagon ABCDEF are (1,0) and (2,0), respectively. The equation of the diagonal CE is
- 1) $\sqrt{3}x + y = 4$ 2) $x + \sqrt{3}y + 4 = 0$
 3) $x + \sqrt{3}y = 4$ 4) $x - \sqrt{3}y = 4$
7. A man starts from the point $P(-3,4)$ and reaches point $Q(0,1)$ touching x axis at R such that $PR + RQ$ is minimum, then the image of R with respect to origin is
- 1) $\left(\frac{3}{5}, 0\right)$ 2) $\left(-\frac{3}{5}, 0\right)$
 3) $\left(-\frac{2}{5}, 0\right)$ 4) $(-2, 0)$
8. P, Q, R and S are the points on line joining the points $P(a, x)$ and $T(b, y)$ such that $PQ = QR = RS = ST$, then $\left(\frac{5b+3a}{8}, \frac{5y+3x}{8}\right)$ is the midpoint of
- 1) PQ 2) QR
 3) RS 4) ST
9. The equation of a line through the point (3,1) whose distance from the point (1,2) has the greatest value is
- 1) $y = 2x$ 2) $y = x + 1$
 3) $x + 2y = 5$ 4) $2x - y - 5 = 0$
10. If $A = (3,4)$ and B is a variable point on the lines $|x| = 6$. If $AB \leq 4$, then number of positions of B with integral co-ordinates is
- 1) 5 2) 4
 3) 6 4) 10
11. The point (4,1) undergoes the following three successive transformations
- i) Reflection about the line $y = x - 1$
 ii) Translation through a distance 1 units along the positive direction of x-axis
 iii) Rotation through an angle $\frac{\pi}{4}$ about the origin in the anticlockwise direction. Then, the coordinates of the final point are
- 1) (4,3) 2) $\left(\frac{7}{2}, \frac{7}{2}\right)$
 3) $(0, 3\sqrt{2})$ 4) (3,4)
12. The orthocenter, circumcentre, centroid and in centre of the triangle formed by (0,0), (a,0) and (0,a) lie on

- | | |
|---|--|
| <p>1) $x^2 + y^2 = 1$ 2) $y = x$</p> <p>3) $y = 2x$ 4) $y = 3x$</p> <p>13. If 'n_1' is the number of points on the line $3x + 4y = 5$ which is at a distance of '$1 + \sin^2 \theta$' units from $(2, 3)$ and 'n_2' denotes number of points on $3x + 4y = 5$ which is at a distance of '$\sec^2 \theta + 2 \operatorname{cosec}^2 \theta$' units from $(1, 3)$, then sum of the roots of $n_2 x^2 - 6x + n_1 = 0$ is</p> <p>1) 6 2) 5</p> <p>3) 0 4) 3</p> <p>14. If $5a + 4b + 20c = t$, then the number of values of t for which the line $ax + by + c - 1 = 0$ ($c \neq 1$) always passes through a fixed point is</p> <p>1) 0 2) 1</p> <p>3) 2 4) infinite</p> <p>15. If the point $P(\tan^2 \theta, \tan \theta)$ lies in the region corresponding to the acute angle between the lines $2y = x$ and $4y = x$, then $\left\lceil \frac{\tan \theta}{2} \right\rceil$ is equal to (where $(.)$ denotes least integer function)</p> | <p>1) 1 2) 2</p> <p>3) 3 4) 4</p> <p>16. The mid points of the sides AB and AC of a triangle ABC are $(3, 5), (-3, -3)$ then the length of the side BC is</p> <p>1) 40 2) 20</p> <p>3) 30 4) 18</p> <p>17. The value of k such that the lines $2x - 3y + k = 0, 3x - 4y - 13 = 0$ and $8x - 11y - 33 = 0$ are concurrent, is</p> <p>1) 20 2) -7</p> <p>3) 7 4) -20</p> <p>18. If the point (a, a) fall between the lines $x + y = 6$, then number of integral values of 'a' is</p> <p>1) 7 2) 1</p> <p>3) 5 4) 6</p> <p>19. If $A(x_1, y_1), B(x_2, y_2)$ and $C(x_3, y_3)$ are the vertices of a triangle ABC and $D = \left(\frac{x_1 - 22x_2 + 27x_3}{6}, \frac{y_1 - 22y_2 + 27y_3}{6} \right)$ then D lies</p> |
|---|--|

- 1) inside triangle ABC
 2) Outside triangle ABC but inside $\triangle BAC$
 3) Outside triangle ABC but inside $\triangle ABC$
 4) Outside triangle ABC but inside $\triangle ACB$
20. If one vertex of an equilateral triangle is the origin and side opposite to it has the equation $x + y = 1$, then the orthocenter of the triangle is
- 1) $\left(\frac{1}{3}, \frac{1}{3}\right)$ 2) $\left(\frac{2}{3}, \frac{2}{3}\right)$
 3) $(1, 1)$ 4) $(1, 3)$
21. Let O be the origin, and let $A(1, 0), B(0, 1)$ be two points. If $P(x, y)$ is a point such that $xy > 0$ and $x + y < 1$, then
- 1) P lies inside the $\triangle OAB$ only
 2) P lies in third quadrant only
 3) P lies either inside $\triangle OAB$ or in third quadrant
 4) P cannot be inside $\triangle OAB$
22. If the algebraic sum of the perpendicular distances from the points $(3, 1), (-1, 2)$ and $(1, 3)$ to a variable line is zero, and
- $$\begin{vmatrix} x^2 + 1 & x + 1 & x + 2 \\ 2x + 3 & 3x + 2 & x + 4 \\ x + 4 & 4x + 3 & 2x + 5 \end{vmatrix} = mx^4 + nx^3 + px^2 + qx + r$$
- , then the variable line always passes through the point
- 1) $(-m, r)$ 2) $(-r, m)$
 3) (r, m) 4) $(r, 2m)$
23. If the area of the triangle whose vertices are $(b, c), (c, a)$ and (a, b) is Δ , then the area of triangle whose vertices are $(ac - b^2, ab - c^2), (ba - c^2, bc - a^2)$ and $(cb - a^2, ca - b^2)$ is
- 1) Δ^2 2) $(a + b + c)^2 \Delta$
 3) $a\Delta + b\Delta^2$ 4) none of these
24. The number of non negative integral values of 'b' for which the origin and the point $(1, 1)$ lie on the same side of the straight line $a^2x + aby + 1 = 0, \forall a \in \mathbb{R} - \{0\}$ is
- 1) 1 2) 3
 3) 2 4) 5

25. The sum of coordinates of the point P on the line $2x+3y+1=0$, such that $|PA-PB|$ is maximum, where A is (1,0) and B is (0,5) is

- 1) $\frac{1}{13}$ 2) $\frac{2}{13}$
 3) $\frac{3}{13}$ 4) $\frac{4}{13}$

26. The co-ordinate axes are rotated about the origin in the counter clock wise direction through an angle 60° . If a, b are the intercepts made on new axes by a line whose equation referred to the original axes is $5x+12y+13=0$ then

$$\frac{1}{a^2} + \frac{1}{b^2} =$$

- 1) $\frac{1}{169}$ 2) $\frac{1}{2}$
 3) 1 4) $\frac{25}{169}$

27. Locus of the image of the point (4,6) in the line

$$(2x-3y+4)+K(x-2y+3)=0, K \in R \text{ is a}$$

- 1) Straight line parallel to x-axis
 2) Straight line parallel to y-axis

3) Circle with radius 5 units

4) Circle with radius 10 units

28. If $A(1,2), B(-4,2)$, then the number of

points 'P' in the plane such that $\angle APB = \frac{\pi}{2}$

and area of triangle PAB is 6.5 sq.units is

- 1) 2 2) 4
 3) 0 4) Infinite

29. Two lines are given

$(x-2y)^2 + k(x-2y) = 0$. The value of k, so that the distance between them is 3, is

- 1) $k = \pm\sqrt{5}$ 2) $k = \pm 3\sqrt{5}$
 3) $k = \pm 2\sqrt{5}$ 4) $k = 3$

30. The line L given by $\frac{x}{5} + \frac{y}{b} = 1$ passes

through the point (13,32), the line K is

parallel to L and has the equation

$$\frac{x}{c} + \frac{y}{3} = 1, \text{ then the equation of line which}$$

is equidistant from L and K is

- 1) $4x-y-17=0$ 2) $8x-2y-17=0$
 3) $8x-2y+17=0$ 4) $4x-y+17=0$

PHYSICS

31. A car moving with certain velocity on a frictionless road suddenly enter on to a road and then travels a distance 'S' before coming to rest. The coefficient of friction between the road and the tire is μ . The minimum time in which the car can cover the distance 'S' is proportional to
- 1) μ 2) $\sqrt{\mu}$
 3) $\frac{1}{\mu}$ 4) $\frac{1}{\sqrt{\mu}}$
32. A uniform chain of length l is placed on a rough table, with length l/n , where $n > 1$, hanging over the edge. If the chain just begins to slide off the table by itself from this position, the coefficient of friction between the chain and the table is
- 1) $\frac{1}{n}$ 2) $\frac{1}{n-1}$
 3) $\frac{1}{n+1}$ 4) $\frac{n-1}{n+1}$
33. A block released on a rough inclined plane of inclination 30° slides down the plane with an acceleration $g/4$, where g is acceleration due to gravity. The coefficient of friction between the block and the inclined plane is
- 1) $1/3\sqrt{3}$ 2) $1/\sqrt{3}$
 3) $1/2\sqrt{3}$ 4) $\sqrt{3}/2$
34. A smooth plane of certain length is held at an angle 30° with the horizontal. A rough plane of same length is held at an angle 45° . A body released at the top takes the same time to arrive at the bottom on both the planes. The coefficient of friction between the body and the rough plane is nearly
- 1) 0.4 2) 0.3
 3) 0.2 4) 0.1
35. A block of mass 1 kg is pressed against a vertical wall by a horizontal force of 20 N. If the coefficient of friction between the block and the wall is 0.5, the frictional force on the block is
 ($g = 9.8 \text{ m/s}^2$)

1) 20 N 2) 9.8 N

3) 4.9 N 4) 14.7 N

36. Suppose a block of mass 2 kg is placed over a rough horizontal surface of $\mu_s = 0.5$ $\mu_k = 0.4$. A horizontal pulling force F is applied on the block [take $g = 10 \text{ m/s}^2$].

Match the following

Column I	Column II
A) if $F=0$	p) $8\text{N} = \text{frictional force}$
B) if $F=10\text{N}$	q) $12\text{N} = \text{frictional force}$
C) if $F=20\text{N}$	r) $10\text{N} = \text{frictional force}$
D) if $F = 8\text{N}$	s) $0 = \text{frictional force}$

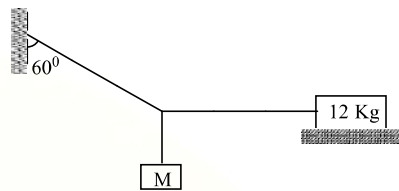
1) A-S, B-P, C-R, D-P

2) A-S, B-R, C-P, D-P

3) A-P, B-R, C-P, D-S

4) A-S, B-P, C-P, D-R

37. The maximum value of M up to which the whole system can be in equilibrium is
($\mu = 1/\sqrt{3}$, $g = 10 \text{ ms}^{-2}$)



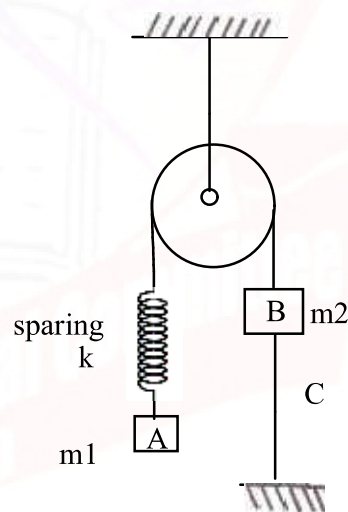
1) 4 kg 2) 3 kg

3) 2 kg 4) 1 kg

38. On applying a certain force, a body of mass 5 kg moves on a surface with an acceleration of 1 ms^{-2} . On doubling the force, the acceleration becomes 3 ms^{-2} . The coefficient of friction is ($g = 10 \text{ ms}^{-2}$)
- 1) 0.6 2) 0.4
- 3) 0.2 4) 0.1
39. Two bodies of masses 8 kg and 12 kg are on a horizontal surface and are connected by a string. The 8 kg body is pulled with a force 59 N. If the coefficient of friction for all the surfaces is 0.25, the tension in the string is ($g = 10 \text{ ms}^{-2}$)

- 1) 39.4 N 2) 24.8 N
3) 29.4 N 4) 35.4 N
40. A metal box is placed on the surface of an open truck which is moving with a uniform acceleration 6 ms^{-2} . If the coefficient of friction is 0.5, the acceleration of the box relative to truck is ($g = 9.8 \text{ m/s}^2$)
- 1) zero 2) 0.9 ms^{-2}
3) 1.1 ms^{-2} 4) 2.4 ms^{-2}
41. A block of mass 2 kg is placed on the floor a lorry moving horizontally with an acceleration of 8 ms^{-2} . The coefficient of static and kinetic frictions between the block and lorry are respectively 0.9 and 0.7. If $g = 10 \text{ ms}^{-2}$, the acceleration of the block relative to earth in ms^{-2}
- 1) 7 2) 8
3) 1 4) 7.5

42. Which of the following statements is not true?
- 1) The coefficient of friction may be greater than unity
2) The coefficient of rolling friction is less than that of kinetic friction
3) In general frictional force is independent of the moderate speed of the body
4) The frictional force is inversely proportional to the normal reaction
43. In the system shown in the figure $m_1 > m_2$, system is held at rest by thread BC. Just after the thread BC is burnt



- a) Initial acceleration of m_2 will be up wards
- b) Magnitude of initial acceleration of both blocks will be equal to $\left(\frac{m_1 - m_2}{m_1 + m_2}\right)g$
- c) Initial acceleration of m_1 will be equal to zero
- d) Magnitude of initial acceleration of two blocks will be non-zero and unequal
- 1) a is correct 2) abc are correct
3) ac are correct 4) d is correct
44. A block of mass m is lying on a horizontal surface. The coefficient of friction between block and the surface is k . The minimum possible force needed to move the block on the surface is
- 1) mg/k 2) $k(mg)$
3) $mgk/\sqrt{1+k^2}$ 4) $mg\sqrt{k^2+1}/k$
45. The coefficient of static and kinetic frictions between a block and horizontal surface are 0.6 and 0.4 respectively. A horizontal force required to just move the block is applied on the block. If this force continues to act, the acceleration acquired by the block in ms^{-2} is $(g = 9.8 \text{ m/s}^2)$.
- 1) 0.98 2) 1.96
3) 3.92 4) 5.88
46. A block of mass 6 kg is lying on a rough horizontal surface. The angles of limiting and kinetic frictions are 53° and 37° respectively. A horizontal force enough to set the block into motion is applied. If we continue to apply the force, by how much must the force, by now much must the force be reduced to move the block with uniform velocity on the surface? ($g = 10 \text{ ms}^{-2}$ and $\tan 37^\circ = 3/4$)
- 1) 20 N 2) 45 N
3) 80 N 4) 35 N

47. A body is given a horizontal velocity of 36 kmph on a horizontal surface having coefficient of friction 0.2. The distance travelled by it before it comes to rest is

- 1) 20 m 2) 15 m
3) 30 m 4) 25 m

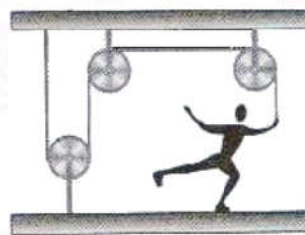
48. The rear side of a truck is open and a box of mass 50 kg is placed at 3.2 m away from the open end. The coefficient of friction between the box and the surface is 0.2. If the truck starts from rest and moves on a straight road with acceleration 2.1 ms^{-2} , the box falls off the truck after a time ($g=10 \text{ ms}^{-2}$)

- 1) $8/\sqrt{41} \text{ s}$ 2) 4 s
3) 8 s 4) $\sqrt{8} \text{ s}$

49. A body is projected up along an inclined plane of inclination θ with velocity V_1 . If it reaches the bottom of the plane with a velocity V_2 then V_1/V_2 is equal to

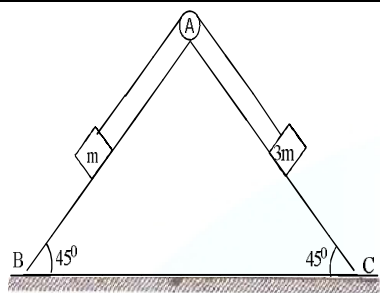
- 1) $\sqrt{\frac{\sin \theta + \mu \cos \theta}{\sin \theta - \mu \cos \theta}}$ 2) $\frac{\sin \theta + \mu \cos \theta}{\sin \theta + \cos \theta}$
3) $\sqrt{\frac{\sin \theta - \mu \cos \theta}{\sin \theta + \mu \cos \theta}}$ 4) $\frac{\sin \theta - \mu \cos \theta}{\sin \theta + \mu \cos \theta}$

50. A 50 kg person stands on a 25 kg platform. He pulls the rope which is attached to the platform via frictionless and mass less pulleys as shown in the fig. The platform moves upwards at a steady speed if the force with which the person pulls the rope is ($g = 10 \text{ m/s}^2$)



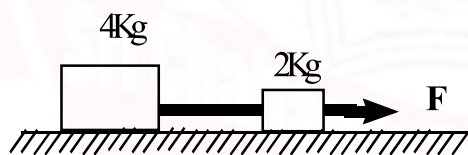
- 1) 500 N 2) 250 N
3) 25 N 4) 375 N

51. In the given figure the wedge is fixed. Pulley is frictionless and string is light. Surface AB is frictionless whereas AC is rough. If the block of mass $3m$ slides down with constant velocity. Then the coefficient of friction between surface AC and the block is



- 1) $1/3$ 2) $2/3$
 3) $1/2$ 4) $4/3$

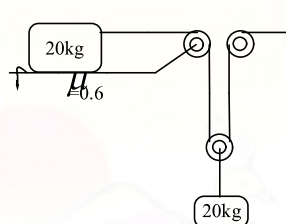
52. Two blocks of mass 4kg and 2kg are connected by a heavy string and placed on rough horizontal plane. The 2kg block is pulled with a constant force F . The coefficient of friction between the blocks and the ground is 0.5. What is the value of F so that tension in the string is constant through during the motion of the blocks ($g = 10 \text{ m/s}^2$)



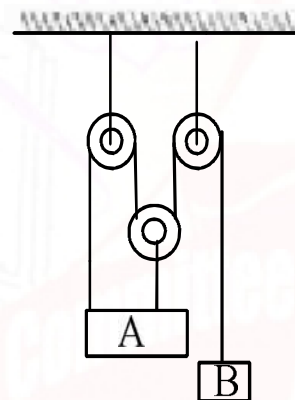
- 1) 40N 2) 30N
 3) 50N 4) 60N

53. Two blocks each of mass 20kg are connected as shown in the figure then friction on the block exerted by horizontal surface is (system is released rest)

- 1) 140N 2) 120N
 3) 130N 4) 100N

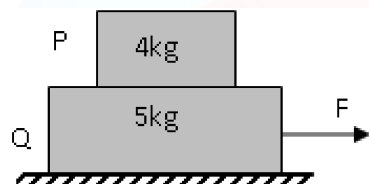


54. At a given instant, A is moving with velocity of 5m/s upwards. What is speed of B at that time:

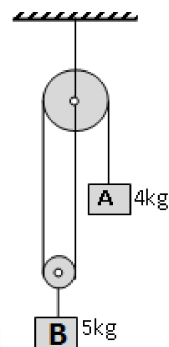


- 1) 5 m/s 2) 2.5 m/s
 3) 10 m/s 4) 15 m/s

55. The coefficient of friction between 4kg and 5kg blocks is 0.2 and between 5kg block and ground is 0.1 respectively. Choose the correct statement



- 1) Minimum force needed to cause system to move is 17N
 - 2) When force is 4N static friction at all surfaces is 4N to keep system at rest
 - 3) Maximum acceleration of 4kg block is $2m/s^2$
 - 4) Slipping between 4kg and 5kg blocks start when F is 17N
56. The acceleration of the blocks (A) and (B) respectively in situation shown in the figure is (pulleys & strings are mass less and ideal)



- 1) $2g/7$ downward, $g/7$ upward
- 2) $2g/3$ downward, $g/3$ upward
- 3) $10g/13$ downward, $5g/3$ upward
- 4) none of these

57. Coefficient of friction is $\frac{1}{\sqrt{3}}$. Then the angle of friction is

- 1) 60°
- 2) 30°
- 3) 45°
- 4) 37°

58. A block of mass 'm' is present on the frictionless floor of a truck, which is moving with an acceleration $4ms^{-2}$.

Then acceleration of the block with respect to ground is

- 1) 0
- 2) $2ms^{-2}$
- 3) $4ms^{-2}$
- 4) $3ms^{-2}$

59. A block of mass 10kg is suspended from a rigid support with the help of a string of length 2m. The horizontal force required to keep the block at a position where the string makes an angle 45° with vertical is

- 1) 50N 2) 200N
3) 100N 4) 150N

60. A ball of mass 200g is released from a height 100m in air. It reaches the ground in 5second. The air resistance on the ball is ($g = 10\text{ms}^{-2}$)

- 1) 0.8 N 2) 0.4 N
3) 0.6 N 4) 0.2 N

CHEMISTRY

61. The kinetic datas for the reaction :
 $2A + B_2 \rightarrow 2AB$ are as given below :

[A]	[B ₂]	Rate
<i>mol L⁻¹</i>	<i>mol L⁻¹</i>	<i>mol L⁻¹ min⁻¹</i>
0.5	1.0	2.5×10^{-3}
1.0	1.0	5.0×10^{-3}
0.5	2.0	1×10^{-2}

Hence, the order of the reaction with respect A and B₂ are, respectively,

- 1) 1 and 2 2) 2 and 1
3) 1 and 1 4) 2 and 2

62. Thermal decomposition of a compound is of first order. If 50% of a sample of the compound is decomposed in 120 minute how long will it take for 90% of the compound to decomposed ?

- 1) 339 min 2) 399 min
3) 250 min 4) 120 min

63. Two substances A and B are present such that $[A_0] = 4[B_0]$ and half-life of A is 5 minutes and that of B is 15 minute if they start decaying at the same time following first order kinetics how much

time later will the concentration of both of the them would be same.

- 1) 15 minutes 2) 10 minutes
3) 5 minutes 4) 12 minutes

64. For the first order reaction

$A_{(g)} \rightarrow 2B_{(g)} + C_{(g)}$, the initial pressure is

$P_A = 90\text{mm Hg}$ total pressure after 10 minutes is found to be 180mm Hg . The rate constant of the reaction is

($\log_{10} 2 = 0.3$)

- 1) $1.15 \times 10^{-3} \text{ sec}^{-1}$ 2) $2.3 \times 10^{-3} \text{ sec}^{-1}$
3) $3.45 \times 10^{-3} \text{ sec}^{-1}$ 4) $6 \times 10^{-3} \text{ sec}^{-1}$

65. The reaction

$A(g) + 2B(g) \rightarrow C(g) + D(g)$ is an elementary process. In an experiment the initial partial pressure of A and B are $P_A = 0.60$ and $P_B = 0.80 \text{ atm}$. When $P_C = 0.2 \text{ atm}$ the rate of reaction relative to the initial rate is

- 1) $\frac{1}{48}$ 2) $\frac{1}{24}$
3) $\frac{9}{16}$ 4) $\frac{1}{6}$

66. The inversion of cane sugar proceeds with half-life of 500 minute at pH 5 for any concentration of sugar. However if pH=6, the half life changes to 50 minute. The rate law expression for the sugar inversion can be written as

- 1) $r = K [\text{sugar}]^2 [H^+]^2$
2) $r = K [\text{sugar}]^1 [H]^0$
3) $r = K [\text{sugar}]^0 [H^+]^2$
4) $r = K [\text{sugar}]^0 [H^+]^1$

67. For the reaction, $2N_2O_5 \rightarrow 4NO_2 + O_2$ rate of reaction is

- 1) $\frac{1}{2} \frac{d}{dt} [N_2O_5]$ 2) $2 \frac{d}{dt} [N_2O_5]$
3) $\frac{1}{4} \frac{d}{dt} [NO_2]$ 4) $4 \frac{d}{dt} [NO_2]$

68. At particular concentration the half-life of the reaction is 100 minutes. When the concentration of the reactant becomes 10 times, the half-life of the reaction becomes 60 seconds, then what will be the order of reaction ?

- 1) 1 2) 2
3) 0 4) 3

69. $A \rightarrow \text{Product}$, $\frac{dx}{dt} = k[A]^3$. If a is the initial concentration and $(a-x)$ is the concentration of A after time t , then rate constant is given by :

1) $k = \frac{1}{t} \left[\frac{1}{(a-x)} - \frac{1}{a} \right]$

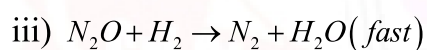
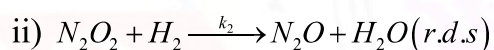
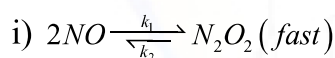
2) $k = \frac{1}{2t} \left[\frac{1}{(a-x)} - \frac{1}{a^2} \right]$

3) $k = \frac{2.303}{t} \log \left(\frac{a}{a-x} \right)$

4) $k = \frac{x}{t}$

70. For the reaction

$2H_2 + 2NO \rightarrow N_2 + 2H_2O$ the following mechanism has been proposed :

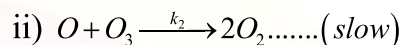
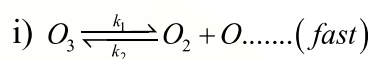


then what will be the rate law of this reaction ?

1) $r = k[NO][H_2]^2$ 2) $r = k[NO][H_2]$

3) $r = k[NO]^0[H_2]^3$ 4) $r = k[NO]^2[H_2]$

71. The decomposition of ozone into oxygen gas i.e, $2O_3 \rightarrow 3O_2$ proceeds through the following mechanism



then what will be the order with respect O_3, O_2 and reaction respectively ?

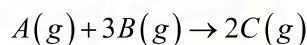
1) 3, -1, 2

2) 1, 2, 3

3) 1, -2, 1

4) 2, -1, 1

72. Observe the following reaction :



The rate of this reaction $\left\{ \frac{-d[A]}{dt} \right\}$ is

$3 \times 10^{-3} \text{ mol liter}^{-1} \text{ min}^{-1}$. What is the value of

$\frac{-d[B]}{dt}$ in $\text{mol liter}^{-1} \text{ min}^{-1}$?

1) 3×10^{-3}

2) 9×10^{-3}

3) 10^{-3}

4) 1.5×10^{-3}

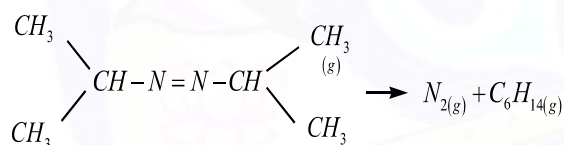
73. Consider the following two 1st order reaction $A \rightarrow B \dots\dots\dots 1P \rightarrow Q \dots\dots\dots 2$.

The initial concentration of 'A' is twice that of 'p'. How long will it take for the two reaction to have equal rates

(Given half life period of reaction (1) and reaction (2) are 15 min and 30 min respectively)

- 1) 15 min 2) 30 min
3) 60 min 4) 120 min

74. Thermal decomposition of azo-isopropane to hexane and nitrogen follows as first order kinetics. If P_i is the initial pressure after time t sec is P , then the expression for rate constant 'k' can be given by



- 1) $\frac{1}{t} \ln \frac{P}{2P_i}$ 2) $\frac{1}{t} \ln \frac{P_i}{P}$
3) $\frac{1}{t} \ln \frac{P_i}{2P_i - P}$ 4) $\frac{1}{t} \ln \frac{P}{2P_i - P}$

75. For the reaction, $2A + B \rightarrow 3C + D$, which of the following does not express the reaction rate ?

- 1) $\frac{-d[C]}{3 dt}$ 2) $\frac{-d[B]}{dt}$
3) $\frac{d[D]}{dt}$ 4) $\frac{-d[A]}{2 dt}$

76. For a first order homogeneous gaseous reaction, $A \rightarrow 2B + C$ If the total pressure after time t was P_t and after long time ($t \rightarrow \infty$) was P_∞ then k in terms of P_t, P_∞ t is :

- 1) $k = \frac{2.303}{t} \log \left(\frac{P_\infty}{P_\infty - P_t} \right)$
2) $k = \frac{2.303}{t} \log \left(\frac{2P_\infty}{P_\infty - P_t} \right)$
3) $k = \frac{2.303}{t} \log \left(\frac{2P_\infty}{3(P_\infty - P_t)} \right)$
4) $k = \frac{2.303}{2t} \log \left(\frac{2P_\infty}{P_\infty - P_t} \right)$

77. For the reaction $\frac{1}{2} A \rightarrow 2B$ rate of disappearance of A is related to the rate of appearance of B by the expression;

- 1) $\frac{-d[A]}{dt} = 4 \frac{d[B]}{dt}$
2) $\frac{-d[A]}{dt} = \frac{1}{2} \frac{d[B]}{dt}$
3) $\frac{-d[A]}{dt} = \frac{1}{4} \frac{d[B]}{dt}$
4) $\frac{-d[A]}{dt} = + \frac{d[B]}{dt}$

78. In the following gaseous phase first order reaction, $A(g) \rightarrow 2B(g) + C(g)$
Initial pressure was found to be 400 mm of Hg and it changed to 1000 mm of Hg after 20 min. Then which is incorrect ?

- 1) Half life for A is 10 min
- 2) Rate constant is 0.0693 min^{-1}
- 3) Partial pressure of C at 30 min is 350 mm of Hg
- 4) Total pressure after 30 min is 1000 mm of Hg

79. The half life of a first order reaction is 60 min. How long will it take to consume 90% of the reactant ?

- 1) 199 min 2) 45 min
- 3) 90 min 4) 120 min

80. Decomposition of $3A(g) \rightarrow 2B(g) + 2C(g)$ follows first order kinetics. Initially only A is present in the container. Pressure developed after 20 min. and infinite time are 3.5 and 4 atm respectively. Which of the following is not true

- 1) $t_{50} = 20 \text{ min}$ 2) $t_{75\%} = 40 \text{ min}$
- 3) $t_{99\%} = 64/3 \text{ min}$ 4) $t_{87.5\%} = 60 \text{ min}$

81. Rate constant of a reaction is $175 \text{ liter}^{-2} \text{ mol}^{-2} \text{ sec}^{-1}$. What is the order of reaction?

- 1) First 2) Second
- 3) Third 4) Zero

82. An aqueous solution containing a weak monobasic acid boils at 100.52°C . 100 ml of the solution requires 50 ml 1.5M NaOH for complete neutralization. The value of α (degree of dissociation of weak acid)

- 1) 1 2) $1/3$
- 3) $1/4$ 4) 0.5

83. pH of a 0.1M monobasic acid is found to be 2. Hence its osmotic pressure at a given temperature TK is

- 1) 0.1 RT 2) 0.11RT
- 3) 1.1 RT 4) 0.01RT

84. If relative decrease in VP is 0.4 for a solution containing 1 mol NaCl in 3 mol of H_2O , the degree of ionization of NaCl is

- 1) 60% 2) 50%
- 3) 100% 4) 40%

85. 1.2% (mass/volume) solution of NaCl is isotonic with 7.2% (mass/volume) solution of glucose. The degree of ionization of NaCl is (molar mass of NaCl = 58.5 molar mass of glucose = 180)

- 1) 5% 2) 95%
3) 50% 4) 90%

86. Two liquids A and B are mixed at temperature T in a certain ratio to form an ideal solution. If it is found that the partial vapour pressure of A, i.e., p_A is equal to p_B , the vapour pressure of B for the liquid mixture. What is the total vapour pressure of the liquid mixture in terms of p_A^0 and p_B^0 ?

- 1) $\frac{p_A^0 p_B^0}{p_A^0 + p_B^0}$ 2) $\frac{2p_A^0 p_B^0}{p_A^0 + p_B^0}$
3) $\frac{p_A^0}{p_A^0 + p_B^0}$ 4) $\frac{2p_B^0}{p_A^0 + p_B^0}$

87. Depression in freezing point of 0.01 molal aqueous CH_3COOH solution is 0.02046. 0.1 molal urea solution freezes at -1.86°C . Assuming molality of

solution equal to its molarity, pH of CH_3COOH solution would be

- 1) 2 2) 3
3) 3.5 4) 4.2

88. If the total vapour pressure of the liquid mixture A and B is given by the equation: $P = 180X_A + 90$ then the ratio of the vapour pressure of the pure liquids A and B is given by

- 1) 3:2 2) 4:1
3) 3:1 4) 6:2

89. Organic liquids A and B have vapour pressures, p_1^0 and p_2^0 as pure liquids at 80°C . A mixture of the two behaving ideally and boiling at 80°C has mole fraction of A = 0.16. If $(p_2^0 - p_1^0) = 472\text{ mm}$, what is the value of p_1^0 ? (in mm)

- 1) 536.3 2) 635.3
3) 363.5 4) 335.6

90. 0.002 molar solution of NaCl having degree of dissociation of 90% at 27°C has osmotic pressure equal to :

- 1) 0.94 bar 2) 9.4 bar
3) 0.094 bar 4) 9.4×10^{-4} bar



Sri Chaitanya IIT Academy, India

A.P, TELANGANA, KARNATAKA, TAMILNADU, MAHARASHTRA, DELHI, RANCHI

A right Choice for the Real Aspirant

ICON CENTRAL OFFICE, MADHAPUR-HYD

Sec: Jr.Super60-I

Date: 15-07-17

Time: 07:30AM to 10:30AM

WTM-11

Max. Marks: 360

KEY SHEET

MATHS

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

PHYSICS

31	4	32	2	33	3	34	2	35	2	36	2
37	1	38	4	39	4	40	3	41	2	42	4
43	3	44	3	45	2	46	4	47	4	48	3
49	1	50	2	51	2	52	2	53	4	54	4
55	3	56	1	57	2	58	1	59	3	60	2

CHEMISTRY

61	1	62	2	63	1	64	1	65	4	66	2
67	3	68	4	69	4	70	4	71	4	72	2
73	3	74	3	75	1	76	3	77	3	78	2
79	1	80	3	81	3	82	2	83	2	84	3
85	2	86	2	87	2	88	3	89	3	90	3

SOLUTIONS:**MATHS**

1. Conceptual

2. $\frac{x}{a} + \frac{y}{b} = 1$

Its transformable equation is

$$\frac{x \cos \alpha - y \sin \alpha}{a} + \frac{x \sin \alpha + y \cos \alpha}{b} = 1$$

 $\therefore$ Intercepts are equal

$$\therefore \frac{\cos \alpha}{a} + \frac{\sin \alpha}{b} = \frac{\cos \alpha}{b} - \frac{\sin \alpha}{a}$$

$$\Rightarrow \cot \alpha = \frac{a+b}{a-b}$$

3. $y-3 = m(x-12), m < 0$

$$\Rightarrow OP = 12 - \frac{3}{m}, OQ = 3 - 12m \Rightarrow OP + OQ \geq 27$$

4. ΔABC is right angled triangle and $\angle A = 90^\circ$

 $\therefore$ Orthocenter is $(-1, 2)$ Circumcentre is $\left(-\frac{3}{2}, 6\right)$ Centroid is $\left(-\frac{4}{3}, \frac{14}{3}\right)$ Nine points centre = $\left(-\frac{5}{4}, 4\right)$ In new system, 'N' is $\left(\frac{1}{12}, -\frac{2}{3}\right)$

5. $B(0, 0), C(4, 0), A(1, \sqrt{3})$

$$\angle BAC = 90^\circ$$

 $\therefore$ A is orthocenter

6. $A(1, 0), C(4, 0) \Rightarrow C = \left(\frac{5}{2}, \frac{\sqrt{3}}{2}\right)$ and $F = \left(\frac{1}{2}, \frac{\sqrt{3}}{2}\right)$

$$\text{Slope of CE} = \text{slope of BF} = -\frac{1}{\sqrt{3}}$$

Equation of CE is $x + \sqrt{3}y = 4$

7. Conceptual

8. Conceptual

9. Conceptual

10. Conceptual

11. Conceptual

12. Conceptual

13. $1 + \sin^2 \theta < 1$ Perpendicular distance from (2,3) to the line $3x + 4y - 5 = 0$

$$\therefore n_1 = 0$$

$\sec^2 \theta + 2 \cos \theta > 0$ Perpendicular distance from (1,3) to $3x + 4y - 5 = 0$

$$\therefore n_2 = 2$$

14. $\frac{a}{c-1} + \frac{b}{c-1}y + 1 = 0$ and

$$\frac{5a}{c-1} + \frac{4b}{c-1} = \frac{t-20c}{c-1} \Rightarrow t = 20(c \neq 1)$$

15. Conceptual

16. Conceptual

17. Conceptual

18. $\frac{a+a-2}{a+a+2} < 0 \Rightarrow -1 < a < 1$

19. Conceptual

20. Conceptual

21. Conceptual

22. fixed point (1,2)

23. Conceptual

24. $a^2 + ab + 1 > 0, a \in R, b > 0$

$$\Rightarrow b^2 - 4 < 0 \Rightarrow -2 < b < 2$$

25. Conceptual

26. Conceptual

27. Conceptual

28. Conceptual

29. $x - 2y = 0, x - 2y + k = 0$

$$30. \quad \frac{13}{5} + \frac{32}{b} = 1 \Rightarrow b = -20$$

$\therefore$ lines are parallel

$$\therefore 4 = -\frac{3}{c} \Rightarrow c = -\frac{3}{4}$$

$\therefore$ lines are $4x - y - 20, 4x - y + 3 = 0$

PHYSICS

$$31. \quad s = \mu t + \frac{1}{2}at^2$$

$$S - \mu t = \frac{1}{2}at^2$$

$$t^2 = \frac{2(s - \mu t)}{a}$$

$$t \propto \frac{1}{\sqrt{\mu}} \quad (\because a = \mu g)$$

$$32. \quad \text{Weight of the chain lying on the table } mg \left[1 - \frac{1}{n} \right]$$

weight of the hanging part of the chain = frictional force blow the chain on the table

$$\frac{mg}{n} = \mu mg \left[1 - \frac{1}{n} \right]$$

$$\frac{mg}{n} = \mu mg \left(\frac{n-1}{n} \right)$$

$$\therefore \mu = \frac{1}{n-1}$$

$$33. \quad \text{Acceleration } a = \mu g \cos \theta$$

$$\frac{g}{4} = \mu g \cos 30^\circ$$

$$\frac{g}{4} = \mu g \frac{\sqrt{3}}{2}, \mu = \frac{1}{2\sqrt{3}}$$

$$34. \quad \text{Time taken by a body to slide down on smooth inclined plane is } t_{\text{smooth}}$$

$$= \sqrt{\frac{2l}{g \sin \theta}} \quad t_{\text{rough}} = \sqrt{\frac{2l}{g(\sin \theta - \mu \cos \theta)}}$$

$$35. \quad mg = f$$

$$36. \quad \text{i) If applied force } F = 0 \text{ then force of friction is zero}$$

$$\text{ii) If applied force } F < f_s, \text{ the block does not move and force of friction is } f_s$$

37. $T \sin 60^\circ = M \cdot 12 \times g$

$T \cos 60^\circ = mg$

find: $m = 4\text{kg}$

38. $a = \frac{F - mg}{m}$

39.

40. If $a > \mu g$ block is move then $a' = a - \mu g$

41. acceleration of the block relative to ground $a = \mu_k g$

42. Conceptual

43. Conceptual

44. $f_{\min} = \mu mg$

45. $a = (\mu_s - \mu_k)g$

46. $\mu_l = 4/3$

$\mu_k = 3/4$

$F = m(\mu_l - M_k)g$

47. $v^2 - u^2 = 2as$ ($\because a = \mu g$)

48. $t = \sqrt{\frac{2l}{a - \mu g}}$

49. up the plane velocity $v_1 = \sqrt{\sin \theta + m \cos \theta}$

Down the plane velocity $= \sqrt{\sin \theta - m \cos \theta}$

($\because v^2 = u^2 = 2as$)

50. Down word force $= (50 + 25)g = 750\text{ N}$ pulling force is $2T \Rightarrow 2T = 750 \Rightarrow T = 375\text{ N}$

Don word force $= \therefore$ system in equilibrium pulling force

51. $3mg \sin \theta - M mg \cos \theta - Mg \sin \theta$

$3mg \sin \theta - \mu g \sin \theta = \mu mg \cos \theta$

53. $F = \mu mg$

54. $T_B = -3T_A$

56. $T_A = -2T_B$

57. $\mu = \tan \phi \Rightarrow \phi = \tan^{-1}(\mu)$

$$= \tan^{-1} \left(\frac{1}{\sqrt{3}} \right)$$

$$30^\circ$$

58. Conceptual

59. $F = mg \tan \theta$

60. $\frac{1}{2}(g-a)t^2 = h$

CHEMISTRY

61. $2.5 \times 10^{-3} = K [0.5]^\alpha [1.0]^\beta \quad \dots(1)$

$$5 \times 10^{-3} = K [1.0]^\alpha [1.0]^\beta \quad \dots(2)$$

$$1 \times 10^{-2} = K [0.05]^\alpha [2.0]^\beta \quad \dots(3)$$

Dividing equation (1) and (2).

$$\frac{1}{2} = \left[\frac{1}{2} \right]^\alpha$$

Hence $\alpha = 1$

Dividing equation (1) and (3),

$$\frac{2.5 \times 10^{-3}}{1 \times 10^{-2}} = \left(\frac{1.0}{2.0} \right)^\beta$$

$$\frac{1}{4} = \left(\frac{1}{2} \right)^\beta \quad \beta = 2$$

62. $K = \frac{0.6932}{120} \quad \dots(1)$

$$K = \frac{2.303}{t} \log \frac{a}{0.10a}$$

$$= \frac{2.303}{t} \log 10 \quad \dots(2)$$

Equation (1) and (2),

$$\frac{0.6932}{120} = \frac{2.303}{t} t = 399 \text{ minutes}$$

63. Amount of A left in n_1 halves $= \left(\frac{1}{2} \right)^{n_1} [A_0]$

Amount of B left in n_2 halves $= \left(\frac{1}{2} \right)^{n_2} [B_0]$

At the end, according to the question,

$$\frac{[A^0]}{2^{n_1}} = \frac{[B_0]}{2^{n_2}}$$

$$\Rightarrow \frac{4}{2^{n_1}} = \frac{1}{2^{n_2}}, [A_0] = 4[B_0]$$

$$\therefore \frac{2^{n_1}}{2^{n_2}} = 4 \Rightarrow 2^{n_1-n_2} = (2)^2 \therefore n_1 - n_2 = 2$$

$$\therefore n_2 = (n_1 - 2) \quad \dots(1)$$

$$\text{Also } t = n_1 \times t_{1/2(A)} \quad t = n_2 \times t_{1/2(B)}$$

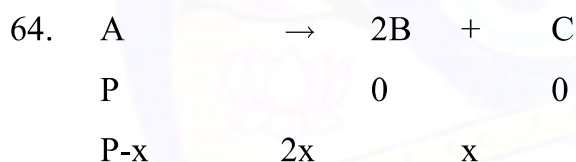
(Let concentration of both become equal after time t)

$$\therefore \frac{n_1 \times t_{1/2(A)}}{n_2 \times t_{1/2(B)}} = 1 \Rightarrow \frac{n_1 \times 5}{n_2 \times 15} = 1 \Rightarrow \frac{n_1}{n_2} = 3 \quad \dots(2)$$

For equation (1) and (2),

$$n_1 = 3, n_2 = 1$$

$$t = 3 \times 5 = 15 \text{ minute}$$



At equilibrium,

$$180 = P - x + 2x + x$$

$$180 = 90 + 2x$$

$$2x = 90, x = 45$$

$$K = \frac{2.303}{t} \log \frac{P}{P-x}$$

$$= \frac{2.303}{10} \log \frac{90}{90.45} = \frac{2.303}{10} \log 2 = \frac{0.6932}{10}$$

$$= 0.6932 = \frac{0.06932}{60} = 1.1555 \times 10^{-3} \text{ sec}^{-3}$$

65. $R_1 = K[A][B]$

$$= K[0.6][.80]^2$$

After reaction,

A	+	2B	→	C	+	D
0.6 – 0.2		0.8 – 0.4		0.2		0.2
0.4		0.4		0.2		0.2

$$\frac{R_2}{R_1} = \frac{K(0.4)(0.4)^2}{(0.6)(0.8)^2} = \frac{1}{6}$$

66. Since $t_{1/2}$ does not depend upon the sugar concentration means it is first order respect to sugar concentration. $t_{1/2} \propto [\text{sugar}]^1$

$$t_{1/2} \times a^{n-1} = k$$

$$\frac{(t_{1/2})_1}{(t_{1/2})_2} = \frac{[H^+]_1^{1-n}}{[H^+]_2^{1-n}}$$

$$\frac{500}{50} = \left(\frac{10^{-5}}{10^{-6}} \right)^{1-n}$$

$$10 = (10)^{1-n}$$

Hence, $n=0$

67. Conceptual

68. $\therefore t_{1/2} \propto \frac{1}{C_0^{n-1}}$ where C_0 is the initial concentration,

$$\Rightarrow \frac{100}{1} = \left(\frac{10C_0}{C_0} \right)^{n-1}$$

$$\text{or } 10^2 = 10^{n-1}$$

$$\Rightarrow n = 3$$

69. $\therefore k_{eqn} = \frac{k_1}{k_{-1}} = \frac{[N_2O_2]}{[NO]^2} \quad \dots(i)$

$$\therefore \text{Rate} = R = k_2 [N_2O_2][H_2] \quad \dots(ii)$$

$$R = k_2 \times \frac{k_1}{k_{-1}} [NO]^2 [H_2] = k [NO]^2 [H_2]$$

70. $\therefore \frac{k_1}{k_{-1}} = \frac{[O_2][O]}{[O_3]}$

$$\Rightarrow [O] = \frac{k_1}{k_{-1}} \frac{[O_3]}{[O_2]} \quad \dots(i)$$

$$\therefore \text{rate} = r = k_2 [\text{O}_3][\text{O}] \quad \dots(\text{ii})$$

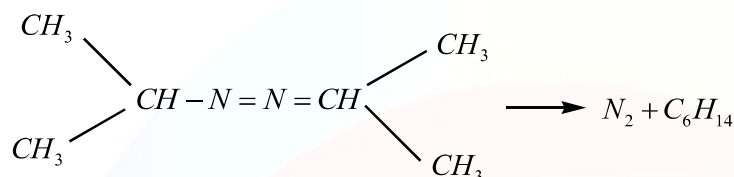
From equation (i) and (ii), we get,

$$= k_2 [\text{O}_3]^2 [\text{O}_2]^{-1}$$

$\therefore$ Order with respect to O_3, O_2 and reaction are 2, -1, 1.

72. Conceptual

73.



Initial pressure, $P_i = 0$ after time t sec, let p' be the decrease in pressure of azo-isopropane. Hence, pressure after t sec.

$$P_i - p' \quad p' \quad p'$$

$$\text{Total pressure} = P = p_{\text{azopropane}} + p_{\text{N}_2} + p_{\text{C}_6\text{H}_{14}}$$

$$= P_i = P_i - p' + p' + p'$$

$$\Rightarrow P = P_i + p' = \text{partial pressure of azo-isopropane after time } t \text{ seconds.}$$

$$p' = P - P_i$$

$$\text{Hence, } K = \frac{1}{t} \ln \frac{a}{a-x}$$

$$a \propto P_i (a-x) \propto P_i - p'$$

$$\Rightarrow k = \frac{1}{t} \ln \frac{P_i}{2P_i - P}$$

It follows that (a), (b) and (d) are incorrect.

74. For 2nd order reactions, $k = \frac{2.303}{t \{ [A]_0 - [B]_0 \}} \log \frac{[B]_0 [A]}{[A]_0 [B]}$

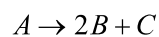
$$\text{When } t = t_{1/2}, [A] = [A]_0 / 2 = 0.05$$

$$\text{At that time } [B] = 5 - 0.05 = 4.95M$$

$$\therefore t_{1/2} = \frac{2.303}{6 \times 10^{-3} (0.1 - 5.0)} \log \frac{5 \times 0.05}{0.1 \times 4.95}$$

$$= \frac{2.303}{6 \times 10^{-3} (-4.9)} \log \frac{1}{2} \approx 23.5s$$

75. Conceptual

76. Let n is the moles of reagent 'R' when R is reactant with A at time $t=0$ 

$$t = 0 \quad n \quad 0 \quad 0$$

$$\text{At } t \quad n-x \quad 2x \quad 3x$$

$$\text{At } t \rightarrow \infty \quad 0 \quad 2n \quad 3n$$

$$\therefore 5n = n_2 \Rightarrow n = \frac{n_2}{5} \quad n+4x=n_1 \Rightarrow x = \frac{n_1-n}{4} \quad k = \frac{2.303}{t} \log \left(\frac{n}{n-x} \right)$$

$$\text{So, } k = \frac{1}{t} \ln \left(\frac{4n_2}{5(n_2-n_1)} \right)$$

77. Conceptual



$$t = 0 \quad 400 \quad 0 \quad 0$$

$$t = 20 \text{ min} \quad 400-p \quad 2p \quad p$$

$$\text{Given} \quad 400-p+2p+p=1000$$

$$400+2p=1000$$

$$P=300\text{mm}$$

$$k = \frac{1}{2} \ln \frac{400}{400-300} = \frac{1}{20} \ln 4$$

$$k = \frac{\ln 2}{10} \text{ min}^{-1}$$

$$t_{1/2} = 10 \text{ min}$$

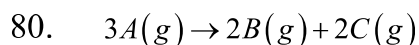
After 30 min Partial pressure of A is 50 mm

After 30 min Partial pressure of B is 700 mm

After 30 min Partial pressure of C is 350 mm

After 30 min total pressure of become 1000mm

79. Conceptual



$$t = 0 \quad P_0$$

$$t = 20 \quad P_0 - x \quad \frac{2x}{3} \quad \frac{2x}{3}$$

$$t = \alpha \quad \frac{2P_0}{3} \quad \frac{2P_0}{3}$$

$$\Rightarrow \frac{4P_0}{3} = 4$$

$$P_0 = 3 \text{ atm}$$

$$P_0 + \frac{x}{3} = 3.5 \Rightarrow t_{50\%} = 20 \text{ is the half life.}$$

$$t_{75\%} = 2 \times 20 = 40 \text{ min}$$

$$t_{78.5\%} = 3 \times t_{50\%} = 3 \times 20 = 60 \text{ min}$$

$$t_{99\%} = \frac{2}{3} \times t_{99.9\%} = \frac{2}{3} \times 10 \times t_{50\%} = \frac{400}{3}$$

81. Conceptual

$$82. \Delta T_b = iK_b m = (1 + \alpha)(0.52)m = 0.52c(1 + \alpha) = 1$$

100 ml of the solution requires 50 ml 1.5 M NaOH for complete neutralization

$$100 \times M = 50 \times 1.5$$

$$M = 1.5 / 2 = 5 / 4$$

$$5 / 4(1 + \alpha) = 1 \Rightarrow 1 + \alpha = 4 / 3$$

$$\alpha = 4 / 3 - 1 = 1 / 3$$

83. pH=2

$$(H^+) = 0.01 M = C_x = 0.1x$$

$$x = 0.1; i = 1 + x = 1.1$$

$$P = \frac{n}{v} RT(i) = MRT i = 0.11 RT$$

84. NaCl is binary solute

$$\frac{\Delta P}{P^0} = \frac{n_1 i}{n_1 i + n_2}$$

$$0.4 = \frac{i}{i + 3}$$

$$i = z = (1 + x) \text{ hence } x=1$$

$$85. 1.2 \text{ g of NaCl is } 100 \text{ ml of solution} \Rightarrow 1 \text{ litre} = 12 \text{ g} = \frac{12}{58.5} M$$

$$7.2 \text{ g of glucose is } 100 \text{ ml of solution} \Rightarrow 1 \text{ litre} = 72 \text{ g} = \frac{72}{180}$$

NaCl

Glucose

$$i_1 = 1 + \alpha$$

$$i_2 = 1$$

$$C_1 = \left(\frac{12}{58.5} \right)$$

$$C_2 = \frac{72}{180} i_1 C_1 = i_2 C_2$$

$$(1 + \alpha) \left(\frac{12}{58.5} \right) = \frac{72}{180}$$

$$\alpha = \frac{58.5}{30} - 1 = 0.95$$

86. $P_A = P_A^\circ X_A$

$$P_B = P_B^\circ X_B = P_B^\circ [1 - X_A]$$

For $P_A = P_B; X_A = \frac{P_B^\circ}{P_A^\circ + P_B^\circ}$

$$P_{\text{Total}} = P_A + P_B = 2P_A = \frac{2P_A^\circ \times P_B^\circ}{P_A^\circ + P_B^\circ}$$

$$P_{\text{Total}} = \frac{2P_A^\circ P_B^\circ}{P_A^\circ + P_B^\circ}$$

87. The elevation in boiling point is given by

$$\Delta T_b = K_b \times m \times i$$

$$2.08 = 0.52 \times 1 \times i \quad \therefore i = 4$$

This implies that the salt on dissociation gives 4 ions. Thus, the salt that gives four ions is $K_3[Fe^{III}(CN)_6]$

88. As we know

$$P_T = P_A^\circ X_S + P_B^\circ X_A$$

$$= \frac{P_A^\circ X_A}{P_{\text{total}}} = (P_A^\circ - P_B^\circ) X_A + P_B^\circ \quad \dots(1)$$

But from question, $P_T = 180X_A + 90 \quad \dots(2)$

Equation equation (1) and (2)

$$\therefore P_A^\circ - P_B^\circ = 180$$

$$P_B^\circ = 90; P_A^\circ = 180 + 90 = 270$$

$$\frac{P_A^\circ}{P_B^\circ} = \frac{270}{90} = 3:1$$

89. $p_1 + p_2 = p_1^\circ x + p_2^\circ (1 - x) = p_1^\circ (0.16) + p_2^\circ (0.84)$

$$=760 \text{ mm}$$

$$p_2^\circ - p_1^\circ = 472 \text{ mm} \therefore p_2^\circ = (p_1^\circ + 472) \text{ mm}$$

$$\therefore p_1^\circ (0.16) + (p_1^\circ + 472) 0.84 = 760$$

$$\therefore p_{1\text{mm}}^\circ = 760 - (0.84 \times 472)$$

$$p_1^\circ = 363.5 \text{ mm}$$

90. Conceptual

