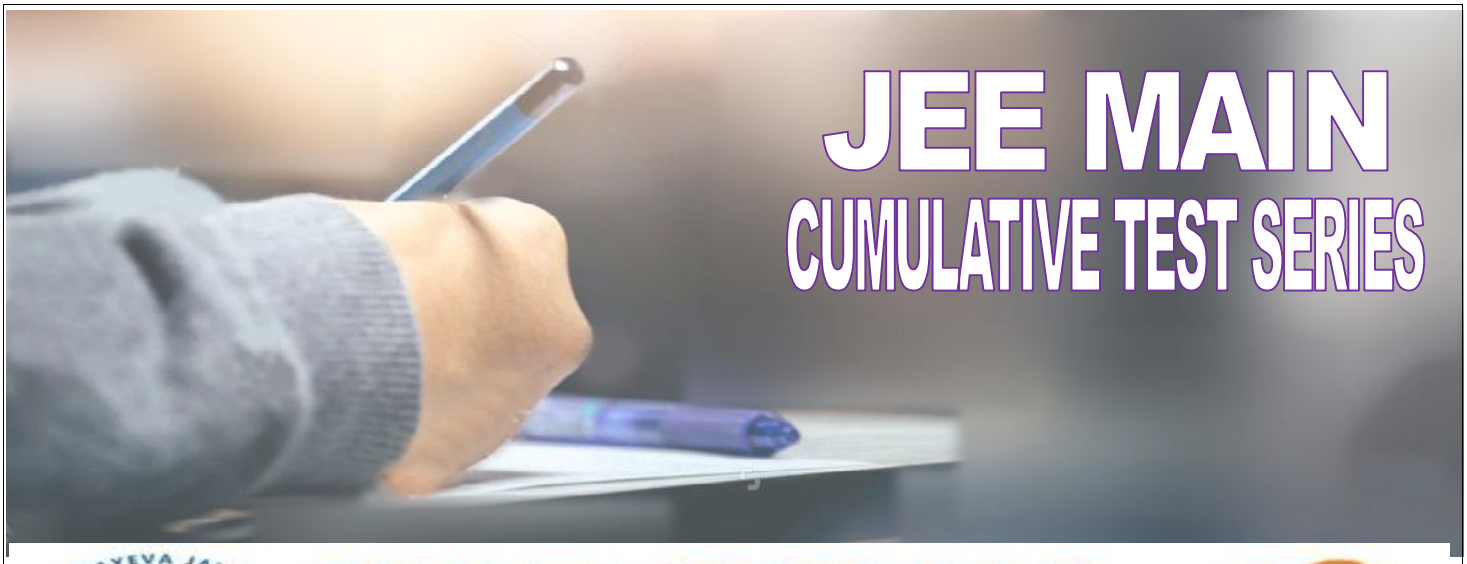


NARAYANA IIT ACADEMY INDIA

40+ YEARS OF EXCELLENCE

Sec: JR_*CO-SC(MODEL-B) **Date: 04-09-22**
Time: 3 Hrs **Max. Marks: 300**

04-09-22_JR.IIT_STAR CO-SC(MODEL-B)_JEE MAIN_CTM-10_SYLLABUS

PHYSICS:

PRESENTWEEK (50%): Centre of Mass & Collisions: Centre of Mass - Location of Center of Mass of Point Objects, Rigid Bidies and Combination of Bodies, Displacement of Center of Mass (Exclude: Conservation of Linear Momentum, Impulse, Collisions and Variable Mass Systems)

PREVIOUS WEEK (25%): Power , Vertical Circular Motion

CUMULATIVE (25%): Syllabus covered From 06-06-22 TO 03-09-22

CHEMISTRY:

PRESENTWEEK (50%): Buffer solution & Buffer capacity, Solubility of sparingly soluble salts and solubility product , Indicator, Acid base titration curves,

PREVIOUS WEEK (25%): Ionic Equilibrium-I: Theories of acid & bases – Arhenius, Bronsted-Lowry and Lewis theory

(Exclude: Comparision of Acidic & Basic strength), Ionic product of water and pH scalepH calculation involving strong acid, Strong base and their mixtures, pH of weak acids and bases, Mixture of weak acids, Levelling effect, Common ion effect, Dissociation of polyprotic acids, Salts and their Hydrolysis

CUMULATIVE (25%): Syllabus covered From 06-06-22 TO 03-09-22

MATHEMATICS:

PRESENTWEEK (50%): MATRICES: Types of Matrices and their properties, Algebra of Matrices, Transpose of Matrix, Symmetric & Skew-Symmetric Matrix, Determinant of a square Matrix, Adjoint and Inverse of a matrix and its properties

PREVIOUS WEEK (25%): DETERMINANTS : Introduction of Determinants & its Properties, Properties of Determinants

CUMULATIVE (25%): Syllabus covered From 06-06-22 TO 03-09-22

PHYSICS **MAX.MARKS: 100**

SECTION – I
(SINGLE CORRECT ANSWER TYPE)

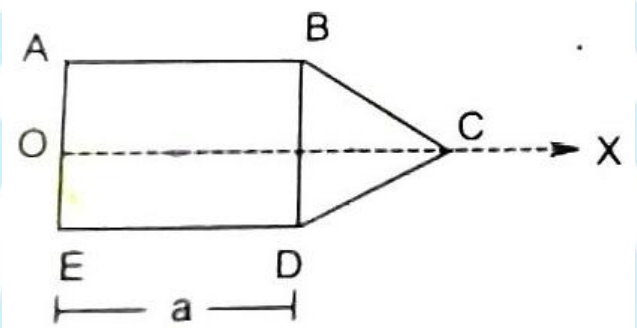
This section contains 20 multiple choice questions. Each question has 4 options (1), (2), (3) and (4) for its answer, out of which **ONLY ONE** option can be correct.

Marking scheme: +4 for correct answer, 0 if not attempted and -1 if not correct.

1. Two particles one of mass $1kg$ and the other of $2kg$ are projected simultaneously with same speed from the roof of a tower, the one of mass $1kg$ vertically upwards and the other horizontally. What is the acceleration of centre of mass of these two particles?

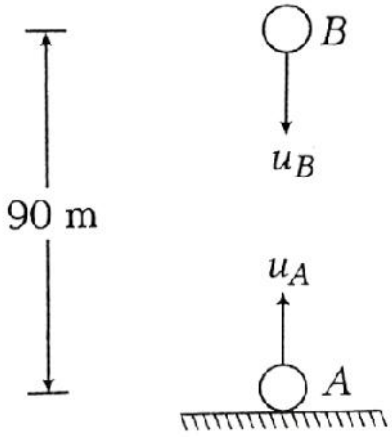
A) g B) $2g$ C) $\frac{g}{2}$ D) 0

2. A uniform Lamina ABCDE is made from a square ABDE and an equilateral triangle BCD. Find the distance of centre of mass of Lamina from O



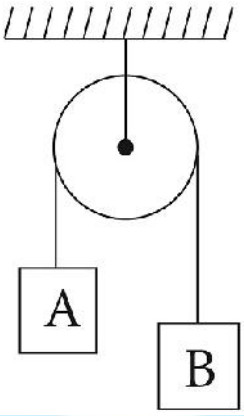
A) $1.5a$ B) $1.62a$ C) $0.74a$ D) $0.6a$

3. Two particles A & B of mass $1kg$ & $2kg$ respectively are projected in the directions show in figure with speeds $U_A = 200\ m/s$ & $U_B = 55m/s$. Initially they were $90\,m$ apart. Find the maximum height attained by the centre of mass of the particles $\left(g = 10m/s^2\right)$



A) 45 m B) 90 m C) 120 m D) 105 m

4. In the arrangement shown in figure $m_A = 2kg,\ m_B = 4kg$, string is light and inextensible. Find displacement of centre of mass of blocks A & B in time $t = 3\,\text{sec}$ (Initially blocks at rest & released, $g = 10\,m/s^2$)

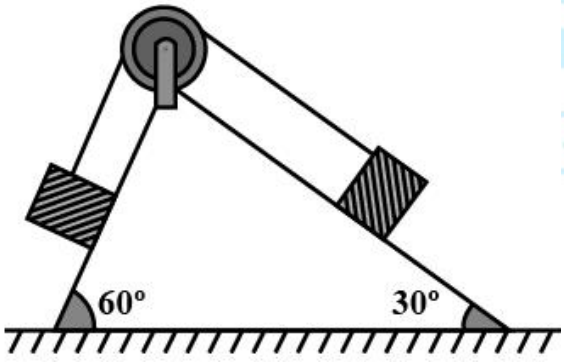


A) 2 m B) 4 m C) 5 m D) 8 m

5. Three point mases of 1g, 2g, 3g have their centre of mass at $(2, 2, 2)$. A fourth mass of 4g is placed at position vector $\vec{r}$ such that the centre of mass of new system is now at $(0, 0, 0)$. Then $\vec{r}$ is

A) $-\hat{i}-\hat{j}-\hat{k}$ B) $-2\hat{i}-2\hat{j}-2\hat{k}$ C) $-3\hat{i}-3\hat{j}-3\hat{k}$ D) $-4\hat{i}-4\hat{j}-4\hat{k}$

6. Two blocks of equal masses are tied to a light string, which passes over a massless pulley as shown in fig. The magnitude of acceleration of centre of mass of both the blocks is (neglect friction everywhere)



A) $\frac{g}{2}$ B) $\left(\sqrt{3}-1\right)g$ C) $\left(\frac{\sqrt{3}-1}{4\sqrt{2}}\right)g$ D) $\left(\frac{\sqrt{3}-1}{\sqrt{2}}\right)g$

7. Distance of the centre of mass of a solid uniform cone from its vertex is Z. if the radius of its base is R and its height is h. Then Z is equal to

A) $\frac{h^2}{4R}$ B) $\frac{5h}{8}$ C) $\frac{3h^2}{8R}$ D) $\frac{3h}{4}$

8. All the particles of a body situated at distance l from the origin. The distance of the centre of mass of the body from the origin is

A) l B) $\leq l$ C) $> l$ D) $\geq l$

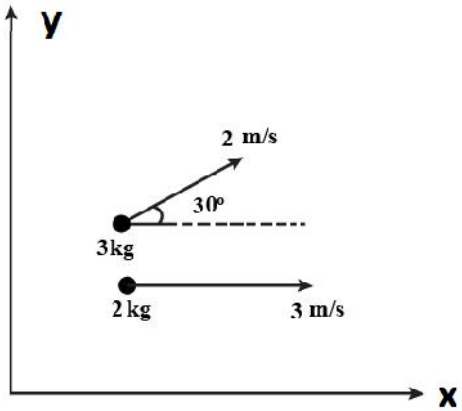
9. A solid hemisphere and a solid cone have a common base. The centre of mass of common structure coincides with the common base. If R radius of hemi sphere and h is the height of the cone. Then $\frac{h}{R}$ will be (sphere &cone have same material)

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

10. The linear mass density of a rod of length L is given by $\lambda = \frac{\lambda_0 x}{L}$. Where λ_0 is constant and x is distance from lighter end of rod. The distance of centre of mass of rod from this end is

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

11. Consider the two particles as shown in figure. The velocity of centre of mass is (in m/s)



A) $\frac{\left(6+3\sqrt{3}\right)\hat{i}+3\hat{j}}{4}$ B) $\frac{\left(6+3\sqrt{3}\right)\hat{i}-3\hat{j}}{5}$

C) $\frac{6\hat{i}-3\hat{j}}{5}$ D) $\frac{\left(6+3\sqrt{3}\right)\hat{i}+3\hat{j}}{5}$

12. Two spheres of masses m and $2m$ are initially at rest at distance $10d$. Due to mutual force of attraction, they approach each other. When separation between them is $5d$. The acceleration of centre of mass is

A) zero B) $2g$ C) $3g$ D) s $4g$

13. Two balls made of same material and of radii r and $2r$ are placed on smooth surface with initial separation between their centres $10r$. They move towards each other due to mutual attractive force. The distance travelled by larger ball before collision is

A) $\frac{80r}{9}$ B) $\frac{10r}{9}$ C) $\frac{40r}{9}$ D) $\frac{7r}{9}$

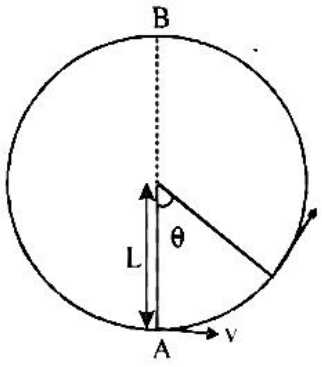
14. A boy of mass $40kg$ is at one end of a boat of mass $160\,kg$ and length $4\,m$. Now boy goes to other end of boat. The distance travelled by boat with respect to ground is (assume no friction between boat and water, system is at rest initially)

A) 0.4 m B) 0.8 m C) 1.0 m D) 1.2 m

15. A ball attached to a string is oscillating like a simple pendulum of angular amplitude 37^0. The ratio of maximum and minimum tension in the string is

A) 7 : 4 B) 7 : 3 C) 7 : 2 D) 7 : 5

16. A bob of mass M is suspended by a massless string of length L. The horizontal velocity v at position A is just sufficient to make it reach the point B. The angle $^{-}$ at which the speed of the bob is half of that at A, satisfies



A) $\frac{3®}{4} < ^{-} < ®$ B) $\frac{®}{2} < ^{-} < \frac{3®}{4}$ C) $\frac{®}{4} < ^{-} < \frac{®}{2}$ D) $^{-} = \frac{®}{4}$

17. A stone tied to a string of length L is whirled in a vertical circle with the other end of the string at the centre. At a certain instant of time. The stone is at its lowest position and has a speed u. The magnitude of change in its velocity as it reaches a positon where the string is horizontal is

A) $\sqrt{u^2 - 2gL}$ B) $\sqrt{2gL}$ C) $\sqrt{u^2 - gL}$ D) $\sqrt{2\left(u^2 - gL\right)}$

18. A ball of mass m is released from top of tower of height h. At time $t = t_0$, the kinetic energy of the ball is double of potential energy. Average power delivered to ball between $t = 0$ to $t = t_0$ is

A) $\sqrt{\frac{2}{3}m^2g^3h}$ B) $\sqrt{\frac{4}{3}m^2g^3h}$ C) $\sqrt{\frac{1}{3}m^2g^3h}$ D) $\sqrt{\frac{5}{3}m^2g^3h}$

19. 2 kw motor pumps out water from a well 10 m deep. The quantity of water pumped out per second in kg is

A) 10 B) 20 C) 40 D) 60

20. A small disc is on the top of a hemi sphere of radius R. What is the smallest horizontal velocity that should be given to the disc for it to have the hemi sphere and not slide down it

A) $\sqrt{2gR}$ B) $\sqrt{gR}$ C) $\frac{g}{R}$ D) $\sqrt{g^2R}$

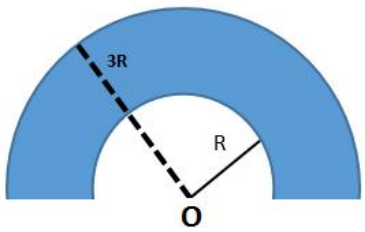
SECTION-II
(NUMERICAL VALUE ANSWER TYPE)

This section contains 10 questions. The answer to each question is a Numerical value. If the Answer in the decimals , **Mark nearest Integer only. Have to Answer any 5 only out of 10 questions** and question will be evaluated according to the following marking scheme:
Marking scheme: +4 for correct answer, -1 in all other cases.

21. Power given to a particle of mass 100 g is given by $p = 4t^3w$ (t is time in second) if at $t = 0$, $v_0 = \sqrt{80}\, m/s$. The velocity in m/s is $5x$ at $t = 2\sec$. Then value of x is

22. Masses $8kg, 2kg, 4kg, 2kg$ are placed at the corners A, B, C, D respectively of a square ABCD of diagonal 80 cm. the distance of centre of mass from "A"(in cm) will be $10x$. The value of x is

23. From a semi-circular disc of radius 3R another concentric disc of radius R is removed. The centre of mass of remaining portion from O(sec figure) is $\frac{26R}{k®}$. The value of k is _



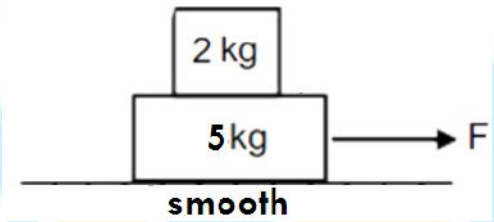
24. A particle is moving in a circle of radius R with speed $v = 3\ t^2$, where is a constant. If angle between velocity and acceleration is $\tan^{-1}\left(\frac{a\ t^3}{3R}\right)$. Then value of a is _____

25. A block slides down on a rough inclined plane of inclination 30^0 with constant velocity. If this block is projected up the plane with a velocity of 10 m/s. then at what distance (in m) along inclined plane, the block will come to rest

26. A particle is moving such that $s = t^3 - 6t^2 + 8t + 9$. Where s is in meter and t is in second. Find the minimum velocity attained by the particle (in ms^{-1})

27. A particle is projected at an angle with horizontal after 3 second it reaches to one point p and after 7 more seconds it strikes the ground. Find the height of p in metre $\left(g = 10\,m/s^2\right)$

28. The coefficient of friction between the blocks are $\mu_s = 0.3$ and $\mu_k = 0.2$. Find maximum value of F so that the blocks move together (in newton) $\left(9 = 10\,m/s^2\right)$



29. Two uniform discs made of same material and thickness of radii 10 m & 20 m are placed in contact side by side distance of their centre of mass from centre of big disc

30. A particle of mass 2kg is moving in a straight line such that its velocity is given by $v = 3t^2\ m/s$, where t is in second. Find the work done by all forces in the first 2 seconds of motion (in Joule)

CHEMISTRY **MAX.MARKS: 100**

SECTION – I
(SINGLE CORRECT ANSWER TYPE)

This section contains 20 multiple choice questions. Each question has 4 options (1), (2), (3) and (4) for its answer, out of which **ONLY ONE** option can be correct.

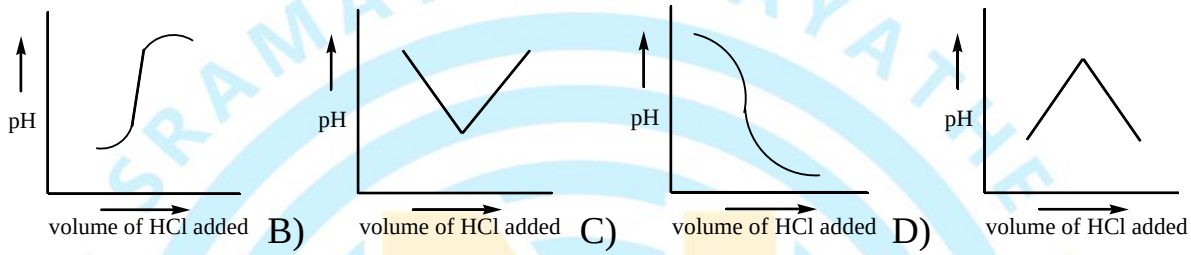
Marking scheme: +4 for correct answer, 0 if not attempted and -1 if not correct.

31. Which of the following indicators is best situated in the titration of a weak acid versus a strong base? (PK_{In}) values are given in brancket)

A) Phenolphthalein (8.3 – 10.0) B) Methyl orange (3.1 – 4.4)

C) Methyl red (4.2 – 6.3) D) Litmus (4.5 – 8.3)

32. Titration curve if a strong base is titrated with strong acid is



A) B) C) D)

33. The volume of water needed to dissolve 1g of $BaSO_4$ ($K_{SP}=1.1x10^{-10}$) at 25^0C is

A) 820L B) 430L C) 250L D) None of these

34. 100mL of each 0.25M NaF and 0.015M $Ba(NO_{C)2}$ are mixed. K_{SP} of $BaF_2 = 1.7x10^{-6}$

A) A ppt is formed B) No ppt is formed

C) cannot say D) Some more data is needed

35. At 298K, the K_{SP} value of $Fe(OH)_3$ in aqueous solution $3.8x10^{-38}$. The solubility of Fe^{3+} ions will increase when

A) P^H is increased

B) P^H is 7

C) P^H is decreased

D) saturated solution is exposed to sun light

36. Which of the following pair solutions does not form a buffer solution?

A) NaH_2PO_4 and $NaHPO_4$ B) H_2CO_3 and $NaHCO_3$

C) NH_4OH and NH_4Cl D) KOH and K_2SO_4

37. From the following table

Buffer Solution	vol.of 0.1M weak acid (ml)	vol.of 0.1M sodium salt weak acid (ml)
I	4.0	4.0
II	4.0	40.0
III	40.0	4.0
IV	0.1	10

Which of the two sets of buffer solutions have least pH?

A) I & II B) I & III C) II & III D) II & IV

38. In the titration of a solution of weak acid, HX with NaOH, the pH is 5.8 after 10mL of NaOH solution has been added and 6.40after 20.0mL of the NaOH is added. What is the ionization constant of the acid HX?

A) 7.94×10^{-7} B) 7.94×10^{-6} C) 7.94×10^{-8} D) 7.94×10^{-9}

39. In the buffer capacity of a buffer solution is x, the volume of 1M NaOH is added to 100mL of this solution to change the pH by 1 is

A) 0.1x mL B) 10x mL C) 100x mL D) x mL

40. To Ag_2CrO_4 solution over its own precipitate, CrO_4^{2-} ions are added. This result in

A) Increase in Ag^+ concentration

B) Decrease in Ag^+ concentration

C) Increase in solubility product

D) Shifting of Ag^+ ions from the precipitate into the solution

41. Among the following statements

a) If two salts have equal solubility then their solubility products are equal

b) $BaSO_4$ in more soluble in water than in dil.H_2SO_4

c) When KI is added to PbI_2, then the $[Pb^{+2}]$ decreases

d) In any solution containing AgCl, the value of $[Ag^+]$ $[Cl^-]$ is constant at constant temperature

A) All are correct B) a, b and d are correct

C) a, c and d are correct D) b, c and d are correct

42. Liquid ammonia ionizes to a slight extent? Its self ionization constant is $10^{-30} M^2$ at $-50^0 C$, then the number of amide ions present per 1cc of it at $-50^0 C$ is

A) 6×10^{12} B) 3×10^{12} C) 6×10^{5} D) 3×10^{3}

43. What is the concentration of CN^- ions in a solution with 0.1M HCl and 0.01M HCN where K_2 of HCN is 10^{-6}?

A) 10^{-4}M B) 10^{-5}M C) 10^{-6}M D) 10^{-7}M

44. pH of a solution of the mixture of 0.1N HCl and 0.1N CH_3COOH is ($K_a=2x10^{-5}$)

A) 1 B) 2 C) 1.7 4) 0.7

45. The conjugate base of $\left[Al(H_2O)_3(OH)_3\right]$ is

A) $\left[Al(H_2O)_3(OH)_2\right]^+$ B) $\left[Al(H_2O)_3(OH)_2O\right]^+$

C) $\left[Al(H_2O)_3(OH)_3\right]^+$ D) $\left[Al(H_2O)_2(OH)_4\right]^-$

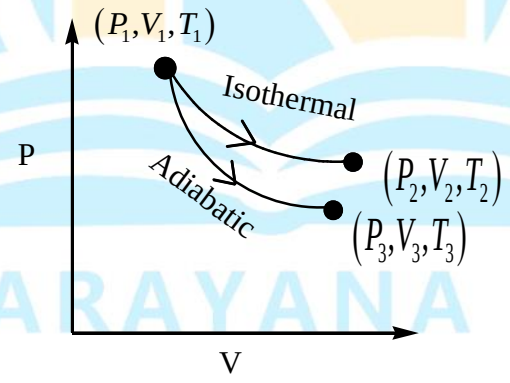
46. 2 moles of N_2H_4 loses 16 moles of electrons is being converted to a new compound x. Assuming that all of the N appears in the new compound, what is the oxidation state of N in x?

A) -1 B) -2 C) +2 D) +4

47. A 10 lt vessel contains He gas at 10 atm and TK. How many balloons of one litre capacity at 1 atm and 2TK can be filled by using the gas present in the cylinder.

A) 200 B) 190 C) 180 D) 170

48. The reversible expansion of and ideal gas under adiabatic and isothermal conditions is shown in figure. Which of the following statements(s) is incorrect?



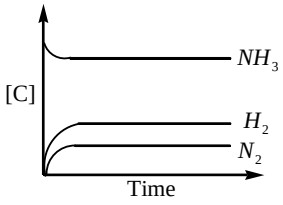
A) $T_1>T_2$ B) $T_3>T_1$

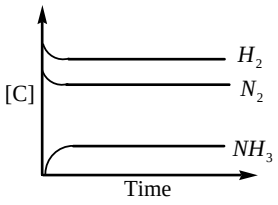
C) $W_{isothermal}>W_{adiabatic}$ D) $\Delta U_{isotermic} > \Delta U_{adiabatic}$

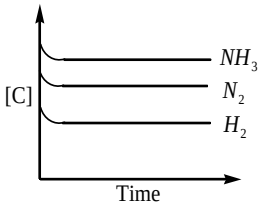
49. The heat of combustion of benzene at 27^0C found by a bomb calorimeter i.e. for the reaction $C_6H_{6(l)} + 7\frac{1}{2}O_{2(g)} \rightarrow 6CO_{2(g)} + 3H_2O_{(l)}$ is $780 Kcal\, mol^{-1}$. The heat evolved on burning 39g of benzene in an open vessel will be

A) 390kCal B) 780.9kCal C) 390.45kCal D) 780kCal

50. Which of the following is correct for $N_2 + 3H_2 \rightleftharpoons 2NH_3$

A) 

B) 

C) 

D) All

SECTION-II
(NUMERICAL VALUE ANSWER TYPE)

This section contains 10 questions. The answer to each question is a Numerical value. If the Answer in the decimals , **Mark nearest Integer only. Have to Answer any 5 only out of 10 questions** and question will be evaluated according to the following marking scheme:

Marking scheme: +4 for correct answer, -1 in all other cases.

51. 20ml of 0.1M NH_3 solution is titrated with 0.025M HCl solution. What is the pH of the reaction mixture at equivalence point at 25^0C? (K_b of NH_3 is $2x10^{-6}$)

52. If $[SO_4^{2-}]$ must exceed $x \times 10^y$, to obtain a $RaSO_4$ ($K_{SP}=4x10^{-11}$) ppt in 522mL of a solution containing $1x10^{-4}$ mole of Ra^{2+} ions, then, then y/x=

53. Calculate the pH at which an acid indicator with $K_a=1.0x10^{-5}$ changes colour when the indicator concentration is $1.0x10^{-3}$ M.

54. K_{SP} of $M(OH)_x$ is $27x10^{-12}$ and its solubility in water is 10^{-3} mole $litre^{-1}$. Find the value of x.

55. Solubility products of ACO_3, BSO_4 and ASO_4 are $4x10^{-10}$, $6x10^{-10}$ and $8x10^{-10}$ respectively. The solubility product of BCO_3 is $x \times 10^{-10}$. What is x.

56. Find the percentage degree of dissociation of 0.05M NH_3 at 25^0C in a solution pf pH=11.

57. The degree of dissociation of 0.1M weak acid is 10^{-2} and the degree of dissociation of the same acid in 0.025M concentration is 'x'. then find 100x____

58. How many of the following species acts as a Lewis acid and also as a Lewis base?

SO_2, SCl_4, SO_3, PCl_3

59. 4.48L of an ideal gas at STP requires 12 cal to raise the temperature by 15^0C at constant volume. The C_P of the gas is _____ cal.

60. A quantity of 4.0 moles of an ideal gas at 20^0C expands isothermally against a constant pressure of 2.0 atm from 1.0 L to 10.0L. If entropy change of system =2.303x cal, x=?

MATHEMATICS **MAX.MARKS: 100**

SECTION – I
(SINGLE CORRECT ANSWER TYPE)

This section contains 20 multiple choice questions. Each question has 4 options (1), (2), (3) and (4) for its answer, out of which **ONLY ONE** option can be correct.

Marking scheme: +4 for correct answer, 0 if not attempted and -1 if not correct.

61. If $A=\begin{bmatrix} 2 & 1 \\ -4 & -2 \end{bmatrix}$, then $I+2A+3A^2+.....\infty =$

A) $\begin{bmatrix} 4 & 1 \\ -4 & 0 \end{bmatrix}$ B) $\begin{bmatrix} 3 & 1 \\ -4 & -1 \end{bmatrix}$ C) $\begin{bmatrix} 5 & 2 \\ -8 & -3 \end{bmatrix}$ D) $\begin{bmatrix} 5 & 2 \\ -3 & -8 \end{bmatrix}$

62. A square matrix P satisfies $P^2=I-P,$ where I is the identity matrix. If $P^n=5I-8P,$ then n is equal to

A) 4 B) 5 C) 6 D) 7

63. Matrix $A=\begin{bmatrix} x & 3 & 2 \\ 1 & y & 4 \\ 2 & 2 & z \end{bmatrix}$. If $xyz=60$ and $8x+4y+3z=20,$ then $A(adj\ A)$ is equal to

A) $\begin{bmatrix} 64 & 0 & 0 \\ 0 & 64 & 0 \\ 0 & 0 & 64 \end{bmatrix}$ B) $\begin{bmatrix} 88 & 0 & 0 \\ 0 & 88 & 0 \\ 0 & 0 & 88 \end{bmatrix}$ C) $\begin{bmatrix} 68 & 0 & 0 \\ 0 & 68 & 0 \\ 0 & 0 & 68 \end{bmatrix}$ D) $\begin{bmatrix} 34 & 0 & 0 \\ 0 & 34 & 0 \\ 0 & 0 & 34 \end{bmatrix}$

64. Let three matrices $A=\begin{bmatrix} 2 & 1 \\ 4 & 1 \end{bmatrix}, B=\begin{bmatrix} 3 & 4 \\ 2 & 3 \end{bmatrix}$ and $C=\begin{bmatrix} 3 & -4 \\ -2 & 3 \end{bmatrix}$ then

$Tr(A)+Tr\left(\frac{A(BC)}{2}\right)+Tr\left(\frac{A(BC)^2}{4}\right)+Tr\left(\frac{A(BC)^3}{8}\right)+.....\infty$ is equal to

A) 6 B) 9 C) 12 D) 10

65. The coefficient of x in the expansion of $\begin{vmatrix} (1+x)^{22} & (1+x)^{44} & (1+x)^{66} \\ (1+x)^{33} & (1+x)^{66} & (1+x)^{99} \\ (1+x)^{44} & (1+x)^{88} & (1+x)^{144} \end{vmatrix}$ is

A) 22 B) -22 C) 0 D) 1

66. If $r^2 = a^2 + b^2 + c^2,\ s^2 = ab + bc + ca$ then $\begin{vmatrix} r^2 & s^2 & s^2 \\ s^2 & r^2 & s^2 \\ s^2 & s^2 & r^2 \end{vmatrix} =$

A) $3abc - a^3 - b^3 - c^3$ B) $a^3 + b^3 + c^3 + 3abc$

C) $\left(3abc - a^3 - b^3 - c^3\right)^2$ D) 0

67. A and B are two non singular matrices so that $A^6 = I$ and $AB^2 = BA\left(B \neq I\right)$. A value of K so that $B^K = I$ is

A) 31 B) 32 C) 64 D) 63

68. If $a \neq p, b \neq q, c \neq r$ and $\begin{vmatrix} p & b & c \\ a & q & c \\ a & b & r \end{vmatrix} = 0$ then the value of $\frac{p}{p-a} + \frac{q}{q-b} + \frac{r}{r-c}$ is equal to

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

69. If $A(\sim, \ ) = \begin{bmatrix} \cos\sim & \sin\sim & 0 \\ -\sin\sim & \cos\sim & 0 \\ 0 & 0 & e \end{bmatrix}$, then $A^{-1}(\sim, \ )$ (i,e. inverse of A) is equal to

A) $A(-\sim, - \ )$ B) $A(-\sim, \ )$ C) $A(\sim, - \ )$ D) $A(\sim, \ )$

70. If $A = \left[a_{ij}\right]_{4\times4}$, such that $a_{ij} = \begin{cases} 2, & when\ i = j \\ 0, & when\ i \neq j \end{cases}$, then $\left\{\frac{\det\left(adj\left(adjA\right)\right)}{7}\right\}$ is (where {.} represents fractional part function)

A) 1/7 B) 2/7 C) 3/7 D) 4/7

71. Let $A = \begin{bmatrix} 1 & -1 & 1 \\ 2 & 1 & -3 \\ 1 & 1 & 1 \end{bmatrix}$ and $10B = \begin{bmatrix} 4 & 2 & 2 \\ -5 & 0 & \sim \\ 1 & -2 & 3 \end{bmatrix}$. If B is the inverse of A then ~ is

A) -2 B) -1 C) 2 D) 5

72. The product of matrices $A = \begin{bmatrix} \cos^2- & \cos-\sin- \\ \cos-\sin- & \sin^2- \end{bmatrix}$ and $B = \begin{bmatrix} \cos^2¤ & \cos¤\sin¤ \\ \cos¤\sin¤ & \sin^2¤ \end{bmatrix}$ is null matrix if $- - ¤ =$

A) $(2n+1)\frac{®}{2}$ B) $n®$ C) $2n®$ D) $n\frac{®}{2}$

73. When the determinant $\begin{vmatrix} \cos 2x & \sin^2 x & \cos 4x \\ \sin^2 x & \cos 2x & \cos^2 x \\ \cos 4x & \cos^2 x & \cos 2x \end{vmatrix}$ is expanded in power of sinx, then the constant term in that expansion is

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

74. If $x^2+4+3\cos(ax+b)=2x$ has a solution. Then a possible value of $a+b$ is equal to

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

75. If a,b ,c are real distinct numbers such that $a^3+b^3+c^3=3abc,$ then the quadratic equation $ax^2+bx+c=0$ has

A) Real roots B) Both roots negative

C) Non real roots D) can not be said

76. If $2^x=3^y=6^{-z}$ then the value of $\frac{1}{x}+\frac{1}{y}+\frac{1}{z}=$

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

77. The third term of of G.P is 2. Then the product of the first five terms is

A) 2^3 B) 2^4 C) 2^5 D) 2^6

78. Consider the sequence 1,2,2,4,4,4,4,8,8,8,8,8,8,8,8,…….. then 1025^{th} term is

A) 2^9 B) 2^{11} C) 2^{10} D) 2^{12}

79. The value of $\frac{\sin 10^0+\sin 20^0}{\cos 10^0+\cos 20^0}$ equals

A) $2+\sqrt{3}$ B) $\sqrt{2}-1$ C) $2-\sqrt{3}$ D) $\sqrt{2}+1$

80. Let A and B be 3×3 symmetric matrices such that $X=AB+BA$ and $Y=AB-BA,$ then $(XY)^T$ is equal to

A) XY B) YX C) $-XY$ D) $-YX$

SECTION-II
(NUMERICAL VALUE ANSWER TYPE)

This section contains 10 questions. The answer to each question is a Numerical value. If the Answer in the decimals , **Mark nearest Integer only. Have to Answer any 5 only out of 10 questions** and question will be evaluated according to the following marking scheme:

Marking scheme: +4 for correct answer, -1 in all other cases.

81. If $\begin{pmatrix}3 & 2\\ 7 & 5\end{pmatrix} A \begin{pmatrix}-1 & 1\\ -2 & 1\end{pmatrix} = \begin{pmatrix}2 & -1\\ 0 & 4\end{pmatrix}$ then $|Trace\ of\ A| =$

82. If A is non singular matrix of order 5, then $\left|\left(A - A^T\right)^2\right| =$

83. If A is a 2×2 matrix such that $A\begin{pmatrix}1\\ -1\end{pmatrix} = \begin{pmatrix}-1\\ 2\end{pmatrix}$ and $A^2\begin{pmatrix}1\\ -1\end{pmatrix} = \begin{pmatrix}1\\ 0\end{pmatrix}$. Then sum of elements of A is

84. Let $A = \begin{pmatrix} & -1\\ 1 & 2\end{pmatrix}$ and $|A^4| = 16$. The product of all possible real values of is ~ . Then $|2\sim| =$

85. If a,b,c are roots of $x^3 + 2x^2 + 1 = 0$, then $\begin{vmatrix}a & b & c\\ b & c & a\\ c & a & b\end{vmatrix} =$

86. The value of $[\log_{0.01} 1000 + \log_{0.1} 0.0001] =$ (where [.] is G.I.F)

87. The number of solutions of the equation $\sin^{4-} - 2\sin^{2-} - 1 = 0$ which lie between 0 and $2®$ is

88. The total number of ordered pairs (x,y) satisfying $|x| + |y| = 2$ and $\sin\left(\frac{®x^2}{3}\right) = 1$ is

89. The degree of the polynomial $f(x) = \begin{vmatrix}x^2 + x & x+1 & x-2\\ 2x^2 + 3x - 1 & 3x & 3x-3\\ x^2 + 2x + 3 & 2x-1 & 2x-1\end{vmatrix}$ is

90. The value of $\begin{vmatrix}\cos\left(\frac{2®}{63}\right) & \cos\left(\frac{3®}{70}\right) & \cos\left(\frac{4®}{77}\right)\\ \cos\left(\frac{®}{72}\right) & \cos\left(\frac{®}{40}\right) & \cos\left(\frac{3®}{88}\right)\\ 1 & \cos\left(\frac{®}{90}\right) & \cos\left(\frac{2®}{99}\right)\end{vmatrix} =$