SRIGAYATRI EDUCATIONAL INSTITUTIONS

INDIA

Sec: SR MPC	**Jee Main**	**Date: 25-08-20**
Time:3 hrs	**GT-17**	**Max.Marks:300**

MATHEMATICS

1. Let $2\alpha,-2\beta$ are the roots of the quadratic equation $x^2+2x+2=0$ then the value of $\alpha^{18}+\beta^{18}=$_____

   1) $\frac{i}{2^8}$ 2) $\frac{-i}{2^8}$ 3) $\frac{-i}{2^9}$ 4)0

2. Let y (0) =0 and $\frac{d^2y}{dx^2}+\frac{2}{x}.\frac{dy}{dx}=x \text{ and } y^1(1)=\frac{1}{4}$ then the value of y (1)=____

   1)1/4 2)-1/4 3)1/12 4)-1/12

3. Let $a,b,c,d\in R, |a-b|=2, |b-c|=3, |c-d|=4$ then the maximum value of $|a-d|=$

   1)11 2)3 3)5 4)9

4. Let the curves $x^2=1+y^2$, and $(x-1)^2=1-y^2$ intersect at $P(x_1,y_1), Q(x_2,y_2)$ then the value of $|x_1+x_2|=$___

   1)1 2)2 3) $1+\sqrt{3}$ 4) $2+2\sqrt{3}$

5. Let a,b are real numbers, let a relation "R", aRb, such that $|a-b|<1$then the relation 'R' is

   1) Reflexive 2) symmetric 3)transitive 4)reflexive and symmetric

6. Let an arithmetic progression whose $5^{th},9^{th},11^{th}$ terms are in G.P then the common ratio of the G.P is_____

   1)2 2)3 3)3 4)1/4

7. Let $A=\sin1^0+\cos3^0, B=\sin2^0+\cos2^0, C=\sin3^0+\cos1^0$ then

   1)A=B 2)A>C 3)B<C 4)A=B=C

8. Let the planes $2x+3y+4z=0, (2+\lambda)x+(3+\lambda)y+(4+\lambda)z=0,$ $(2-\lambda)x+(3-\lambda)y+(4-\lambda)z=0$ has infinite number of solutions then the number of possible values of 'λ'=_____

   1)0 2)1 3)3 4) infinity

9. Let the tangent lines drawn from P (1, 1) to the circle, $x^2+y^2=1$, they touch the circle at A,B then the centroid of the ΔPAB is_____

   1) (0, 0) 2) $\left(\frac{1}{2},\frac{1}{2}\right)$ 3) $\left(\frac{2}{3},\frac{2}{3}\right)$ 4) $\left(\frac{1}{3},\frac{1}{3}\right)$

10. A bag contains 4-coins having both sides heads and 4-other fair coins, now a coin is selected from the bag then tossed, the probability that the coin shows head is____

    1)3/8 2)3/4 3)1/4 4)1/8

11. Let the tetrahedron OABC, OA=4, OB=2, OC=3 and AB=3, BC=4, CA=2 then the square of the distance between the midpoint of $\overline{AB}$ and $\overline{OC}$

    1)10 2)5 3)11/2 4)20

12. Let a data of 30 elements of which 10 elements are identical to $\frac{1}{2}-d$, 10elements are identical to ½, and the rest 10 elements are identical to $\frac{1}{2}+d$ then the standard deviation of all 30-elements is=_____

    1) $\frac{|d|}{\sqrt{3}}$ 2) $\frac{2}{\sqrt{3}}|d|$ 3) $\sqrt{\frac{2}{3}}.|d|$ 4) $\frac{2}{3}|d|^2$

13. The length of the maximum common chord of two parabolas $y^2=1+x, x^2=1+y$

    1) $2\sqrt{5}$ 2) $\sqrt{10}$ 3) $5\sqrt{2}$ 4)10

14. The logical statement $\left[\sim(\sim p\vee q)\vee(p\wedge q)\right]\wedge(\sim q\wedge r)$ is equivalent to

1) $(\sim p\vee r)$ 2) $(p\wedge q)\vee r$ 3) $(p\wedge r)\wedge(\sim q)$ 4) $(\sim p\wedge\sim q)\wedge r$

15. Consider an ellipse and a hyperbola in their standard forms, and one passes through the foci of other, then the product of their eccentricities =_____

1)1/2 2)1/4 3) $\sqrt{2}$ 4)1

16. Let matrix $A=\begin{bmatrix} x & 3 & 2 \\ 1 & y & 4 \\ 2 & 2 & z \end{bmatrix}$; x.y.z=2019, 8x+4y+3z=2020, then the determinant of "A (adj A)" is

1) 3^9 2) 3^3 3) 3^6 4) 3^8

17. Let $\bar{a}=2\bar{i}+\bar{j}+2\bar{k}$ and $\bar{b}=\bar{i}+\bar{j}$. If C is a vector such that $\bar{a}.\bar{c}=|\bar{c}|, |\bar{c}-\bar{a}|=2\sqrt{2}$ and the angle between $\bar{a}\times\bar{b}$ and c is 30^0, then $\left|(\bar{a}\times\bar{b})\times\bar{c}\right|=$_____

1)2/3 2)3/2 3)2 4)9/4

18. The number of ways of choosing 'n' objects out of (3n+1) objects of which 'n' of them are identical and (2n+1) of them are distinct, is

1) 2^{2n} 2) 2^{2n+1} 3) $2^{2n}-1$ 4) 2^{2n-1}

19. The sum of the intercepts made by any tangent to the curve $\sqrt{x}+\sqrt{y}=\sqrt{a}, a>0$ with the coordinate's axes is

1)2a 2) a 3) a/2 4) $\sqrt{a}$

20. $f(x)=\int x^{\frac{-2}{3}}\left(1+x^{\frac{2}{3}}\right)^{-1}dx,\ f(0)=0 \text{ then } f\left(\sqrt{27}\right)=$

1) $\frac{\pi}{2}$ 2) $\frac{\pi}{3}$ 3) $\frac{\pi}{4}$ 4) π

21. Let z_1, z_2, z_3 are three complex numbers and $|z_1|=|z_2|=|z_3|=2, {z_1}^2+{z_2}^2+{z_3}^2=0$ then the value of ${z_1}^3+{z_2}^3+{z_3}^3=$_____

22. The sum of all the positive real solutions of $\sin^{-1}\sqrt{1-x^3}+\sin^{-1}\sqrt{x}=\frac{\pi}{2}$ is

23. Let $\left(1+x+x^2\right)^{10}=\sum_{r=0}^{20}(a_r).(x)^r$ then the value of $\frac{a_8}{a_{12}}=$_____

24. It $\lim_{n\to\infty}\sum_{r=1}^{n}\frac{2r}{n^2+2r}=$_____

25. Let ΔABC, the feet of in-center up on the sides $\overline{BC}, \overline{CA}, \overline{AB}$ of ΔABC are (3,4),(4,3),(5,0) respectively, then the slope of the internal angle bisector of $\angle A$ is_____

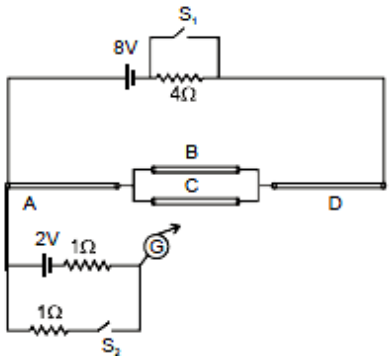
PHYSICS

26. Ultraviolet light of wavelength λ_1 and $\lambda_1(\lambda_2>\lambda_1)$ when allowed to fall on hydrogen atoms in their ground state is found to liberate electrons with maximum kinetic energies E_1 *and* E_2 respectively. The value of Planck`s constant can be found from the relation

1) $h=\frac{1}{c}(\lambda_2-\lambda_1)(E_1-E_2)$ 2) $h=\frac{1}{c}(\lambda_2+\lambda_1)(E_1+E_2)$

3) $h=\frac{(E_1-E_2)\lambda_1\lambda_2}{c(\lambda_2-\lambda_1)}$ 4) $h=\frac{(E_1+E_2)\lambda_1\lambda_2}{c(\lambda_1+\lambda_2)}$

27 Four wire A, B, C and D each of length $\ell=10cm$ and each of area of cross section is $0.1m^2$ are connected in the given circuit then, the position of null point is



Given that resistivity $\rho_A = 1\Omega - m; \rho_B = 3\Omega - m; \rho_C = 6\Omega - m; \rho_D = 1\Omega - m$

1) Midpoint of wire B or wire C when both the switches S_1 *and* S_2 open

2) Midpoint of wire B when both the switches S_1 *and* S_2 are closed.

3) Midpoint of wire D when both the switches S_1 *and* S_2 are open

4) 3 cm from the left end of B when both the switches S_1 *and* S_2 open.

28 Carbon resistor has resistance specified by three bands having colours red, yellow and black. If the resistor is remolded to make a resistor twice of previous length, the new colour code will de

1) White, blue, black 2) Red, orange, black

3) Brown, red, black 4) Yellow, gray, black

29 Magnetic moments of two identical magnets are M and 2M respectively. Both are combined in such a way that their similar poles are same side the time period in this is case. T_1.If polarity of one magnets is reversed its period becomes T_2 than find out ratio of their time periods T_1 / T_2

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

30 A telescope consisting of an objective of focal length 60 cm and a single-lens eye piece of focal length 5 cm is focused at a distant object in such a way that parallel rays emerge from the eye piece. If the object subtends an angle of 2° at the objective, then find the angular width of the image

1) 6° 2) 12° 3) 24° 4) $\frac{1}{6}^\circ$

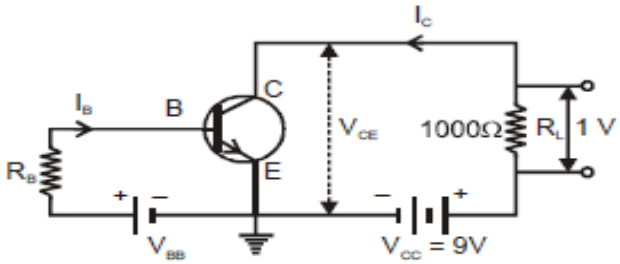
31. A string fixed at one end is vibrating in its second overtone. The length of the string is 10 cm and maximum amplitude of vibration of particles of the string is 2mm. Then the amplitude of the particle at 9cm from the open end is:

(1) $\sqrt{3}mm$ (2) $\sqrt{2}mm$ (3) $\frac{\sqrt{3}}{2}mm$ (4) None of these

32. Two point objects are placed on principal axis of a thin converging lens. One is 20cm from the lens and other is on the other side of lens at a distance of 40 cm from the lens. The images of both objects coincide. The magnitude of focal length of lens is

1) $\frac{80}{3}cm$ 2) $\frac{40}{3}cm$ 3) 40 cm 4) $\frac{20}{3}cm$

33. An N-P-N transistor is connected in common emitter configuration in which collector supply is 9V and the voltage drop across the load resistance of 1000Ω connected in the collector circuit is 1V. If current amplification factor is $(25/26)$, if the internal resistance of the transistor is 200Ω, then which of the following options is **incorrect**:



1) $V_{CE} = 8V$ 2) collector current is 1.0 mA

3) Voltage gain $\frac{50}{23}$, and power gain is 4.6 4) emitter current is 1.04 mA

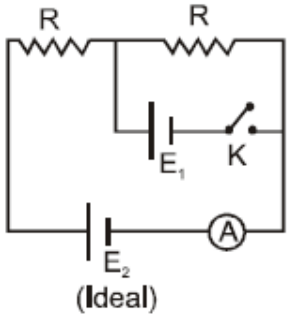
34. A sample of hydrogen atoms is in excited state (all the atoms). The photons emitted from this sample are made to pass through a filter through which light having wavelength greater than 800 nm can only pass. Only one type of photons is found to pass the filter. The sample's excited state initially is: [Take hc = 1240 eV -nm, ground state energy of hydrogen atom = 13.6 eV]

1) 5^{th}excited state 2) 4^{th}excited state 3) 3^{rd} excited state 4) 2^{nd} excited state

35. Two concentric conducting spheres of radii R and 2R carrying charges Q and -3Q respectively. If the charge on inner sphere is doubled, the potential difference between two spheres will:

1) Become two times 2) become four times 3) Remain same 4) be halved

36. In the given circuit, when key K is open, reading of ideal ammeter is I. Now key K is closed, then correct statement(s).



1) If $E_1 < IR$ reading of ammeter is less than I.

2) If $IR < E_1 < 2IR$ reading of ammeter is greater than I.

3) If $E_1 = 2IR$ reading of ammeter is zero

4) If $E_1 = 2IR$ reading of ammeter is I

37. The average rotational kinetic energy of hydrogen molecule at a temperature T is E. The average translational kinetic energy of helium at same temperature will be

1) $\frac{2E}{3}$ 2) $\frac{5E}{3}$ 3) E 4) $\frac{3E}{2}$

38. A carrier wave of peak voltage 12 V is used to transmit a message signal. What should be the peak voltage of the modulating signal in order to have a modulation index of 75%?

(1) 18 V (2) 9 V (3) 16 V (4) 27 V

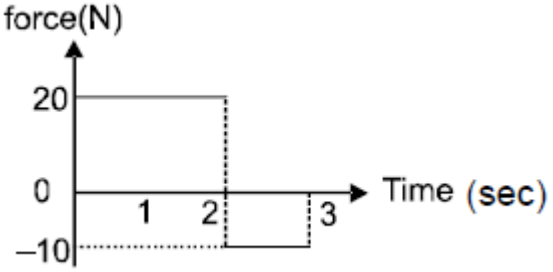
39. A thin uniform rod of length *l* is hinged at one end & is released from the vertical position as shown. The speed of the centre of the rod when the rod makes an angle θ from the vertical.

1) $\sqrt{6gl}\sin\frac{\theta}{2}$ 2) $\sqrt{3gl}\sin\frac{\theta}{2}$ 3) $\sqrt{1.5gl}\sin\frac{\theta}{2}$ 4) $\sqrt{gl}\sin\frac{\theta}{2}$

40. A slab of stone of area $0.36m^2$ and thickness 0.1m is exposed on the lower surface to steam at 100^0C. A block of ice 0^0C rests on the upper surface of the slab. In one hour 4.8 kg of ice is melted. The thermal conductivity of slab is approximately:
(Given latent heat of fusion of ice $=3.36\times10^5\ J\ kg^{-1}$)

1) $1.24\ J/m/s/^0C$ 2) $1.69\ J/m/s/^0C$ 3) $2.05\ J/m/s/^0C$ 4) $1.02\ J/m/s/^0C$

41. Starting at rest, a 5 kg object is acted upon by only one force as indicated in figure. Find the total work done by the force.



(1) 70 J (2) 80 J (3) 90 J (4) None of these

42. A car is travelling north along a straight road at $50km\ hr^{-1}$. An instrument in the car indicates that the wind is directed towards east. If car's speed is $80km\ hr^{-1}$, then instrument indicates that the wind is directed towards south-east. The angle made by wind's direction is given by

1) $\theta=\tan^{-1}\left(\frac{3}{5}\right)N\ of\ E$ 2) $\theta=\tan^{-1}\left(\frac{5}{3}\right)N\ of\ E$

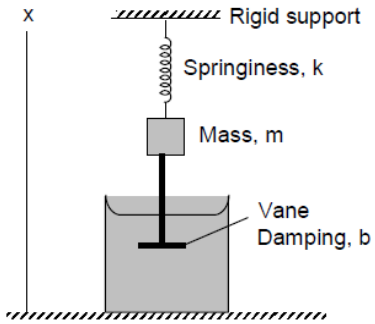
3) $\theta=\tan^{-1}\left(\frac{1}{2}\right)N\ of\ W$ 4) $\theta=\tan^{-1}(5)N\ of\ E$

43. A student performs an experiment to determine the Young's modulus of a wire, exactly 2m long, by Searle's method. In a particular reading, the student measures the extension in the length of the wire to be 0.8 mm with an uncertainty of $\pm0.05mm$ at a load of exactly 1.0 kg. The student also measures the diameter of the wire to be 0.4mm with an uncertainty of $\pm0.01mm$. Take $g=9.8\text{m/s}^2$ (exact) and $\pi=\frac{49}{16}$ (exact). The Young's modulus obtained from the reading is most appropriately given by.

1) $(2.0\pm0.3)\times10^{11}N/m^2$ 2) $(2.0\pm0.2)\times10^{11}N/m^2$

3) $(2.0\pm0.1)\times10^{11}N/m^2$ 4) $(2.0\pm0.05)\times10^{11}N/m^2$

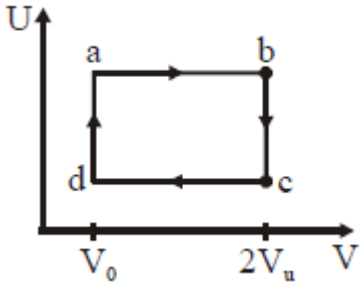
44. For the damped oscillator shown in figure, the mass m of the block is 200g, $k=90Nm^{-1}$ and the damping constant b is $40gs^{-1}$. Calculate the time taken for its amplitude of vibrations to drop to half of its initial value.



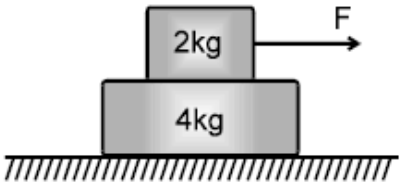
A damped simple harmonic oscillator. A vane immersed in a liquid exerts a damping force on the block as it oscillates up and down.

1) 1 s 2) 3.5 s 3) 7 s 4) 14 s

45. Unpolarized light of intensity $32 Wm^{-2}$ passes through three polarizer's such that transmission axis of the first and second polarizer makes an angle 30^0 with each other and the transmission axis of the last polarizer is crossed with that of the first. The intensity of final emerging light will be (in Wm^{-2})
46. A particle is moving along straight line with initial velocity +7 m/sec and uniform acceleration -2 $m/\sec^2$ the distance travelled by the particle in 4^{th} second of its motion is (in m) :
47. The figure given below shows the variation in the internal energy U with volume V of 2.0 moles of an ideal gas in a cyclic process a-b-c-d-a. The temperatures of the gas during the processes ab and cd are 500K and 300K respectively, the heat absorbed by the gas during the complete process is (in J):
(Take R = 8.3 J/mol–K and ln 2 = 0.69)

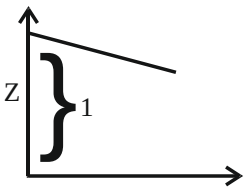


48. A uniform metal rod (fixed at both ends) of $2 mm^2$ cross-section is cooled from $40^0 C$ to $20^0 C$. The co-efficient of the linear expansion of the rod is 12×10^{-6} per degree & its young modulus of elasticity is $10^{11} N/m^2$. The energy stored per unit volume of the rod is ($in\ J/m^3$)
49. The half life of a radioactive isotope 'X' is 20 years. It decays into another stable element 'Y'. The two elements 'X' and 'Y' were found to be in the ratio 1: 7 in a sample of a given rock. Then age of the rock is estimated to be:
50. Consider the shown arrangement the coefficient of friction between the two blocks is 0.5. There is no friction between 4 kg block and horizontal surface. If a horizontal force of 12N is applied on 2kg block as shown in figure, acceleration of 4 kg block would be $\left[g = 10 m/s^2\right]$

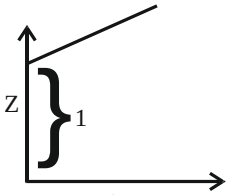


CHEMISTRY

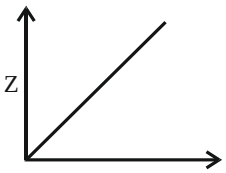
51. Which of the given statement(s) is/are **false.**
I. Orbital angular momentum of the electron having n =5 and having value of the azimuthal quantum number as lowest for this principle quantum number is $\frac{h}{\pi}$.
II. If $n=3, l=0, m=0$, for the last valence shell electron, then the possible atomic number must be 12 or 13.
III. Total spin of electrons for the atom $_{25}Mn$ is $\pm\frac{7}{2}$.
IV. Spin magnetic moment of inert gas is 0.
1) I, II and III 2) II and III only 3) I and IV only 4) II & IV only
52. For a real gas under low pressure conditions, which of the following graph is correct?



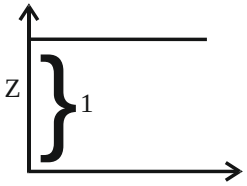
1)



2)



3)



4)

53. Solid ammonium cyanide decompose into $NH_3(g)$ & $HCN(g)$ reversibly. The two gases are in equimolar ratio at all moments. If K_p for $NH_4CN(s)$ $NH_3(g)+HCN(g)$ is 4 atm. The increase in moles of ammonia due to decomposition is 33.3% then maximum amount of solid decomposed is (V-volume of container & T-temperature)
1) V/RT moles 2) 2V/RT moles 3) V/3RT moles 4) 3V/RT moles

54. Which has maximum solubility AB, AB_2, AB_3 and AB_4 if K_{SP} for all the salts are 10^{-10} ?
1) AB 2) AB_2 3) AB_3 4) AB_4

55. For the reaction $2NO(g)+2H_2(g)\rightarrow N_2(g)+2H_2O(g)$ the rate expression can be written in the following ways:
$\frac{d[N_2]}{dt}=k_1[NO][H_2];\frac{d[H_2O]}{dt}=k[NO][H_2];-\frac{d[NO]}{dt}=k'[NO][H_2];-\frac{d[H_2]}{dt}=k''_1[NO][H_2]$
The relationship between k,k_1,k'_1,k''_1 is
1) $k=k_1=k'_1=k''_1$ 2) $k=2k_1=k'_1=k''_1$ 3) $k=2k'_1=k_1=k''_1$ 4) $k=k_1=k'_1=2k''_1$

56. The following facts are available
$2A^-+B_2\rightarrow 2B^-+A_2;2C^-+B_2\rightarrow No\ reaction;2D^-+A_2\rightarrow 2A^-+D_2$
Which of the following is correct?
1) $E^0_{C^-|C_2}>E^0_{B^-|B_2}>E^0_{A^-|A_2}>E^0_{D^-|D_2}$ 2) $E^0_{C^-|C_2}<E^0_{B^-|B_2}<E^0_{A^-|A_2}<E^0_{D^-|D_2}$
3) $E^0_{C^-|C_2}<E^0_{B^-|B_2}>E^0_{A^-|A_2}>E^0_{D^-|D_2}$ 4) $E^0_{C^-|C_2}>E^0_{B^-|B_2}<E^0_{A^-|A_2}<E^0_{D^-|D_2}$

57. Although nitrogen does not adsorb on surface at room temperature. It adsorbs on the same surface of 83K. Which of the following statement is correct?
1) At 83K, there is formation of monomolecular layer
2) At 83K, there is formation of multimolecular layer
3) At 83K, nitrogen molecules are held by chemical bonds
4) At 83K, nitrogen is adsorbed as atoms

58. Which of the following statement is incorrect?
1) Oxide of aluminum (Al_2O_3), and arsenic (As_2O_3) are amphoteric
2) Oxide of chlorine (Cl_2O_7) is less acidic than oxide of nitrogen (N_2O_5)
3) Oxide of carbon (CO_2) is more acidic than oxide of silica (SiO_2)
4) The correct increasing order of basic character of various oxides is $H_2O<CuO<MgO<CaO$

59. The INCORRECT statement is
1) In metallurgy, flux is a substance used to convert infusible impurities to fusible mass.
2) Cryolite is Na_3AlF_6 and is used in the electrolysis of alumina for lowering the melting point of alumina.
3) Extraction of iron metal from iron oxide ore is carried out by heating with coke.
4) The chemical composition of carnallite is $K_2Mg_2(SO_4)_3$.

60. Knowing that the Chemistry of lanthanoids (Ln) is dominated by its +3 oxidation state, which of the following statements are correct?
(I) The ionic size of Ln (III) decrease in general with increasing atomic number
(II) Ln (III) compounds are generally colourness
(III) Ln (III) hydroxides are mainly basic in character

(IV)Because of the large size of Ln (III) ions, the bonding in its compounds is predominantly ionic in character.

1) I, II and III 2) II, III and IV 3) I, II and IV 4) I, III and IV

61. Which of the following statements is false?

1) H_3PO_2, H_3PO_3 and H_3PO_4 all are tribasic and reducing in nature.

2) Among anions, $NO_3^-, SO_3^{2-}, CO_3^{2-}$ and BO_3^{3-}, only SO_3^{2-} have $p\pi - d\pi$ bonding

3) Among anions $SO_3^{2-}, SO_4^{2-}, S_2O_4^{2-}$ and HSO_4^-, SO_3^{2-} is basic and reducing in nature

4) Number of lone pair(s) of electrons on Xe atoms in XeF_2, XeF_4 and XeF_6 are 3, 2 and 1 respectively

62. Consider the following statements and pick out the correct one

I. The solubility, thermal stability and the basic character of the hydroxides of alkaline earth metals increases from $Mg(OH)_2$ to $Ba(OH)_2$

II. The dehydration of hydrated chlorides, bromides and iodides of Ca, Sr and Ba can be achieved on heating

III. The chlorides of both beryllium and aluminium are soluble in organic solvents and are strong Lewis acids

1) I and II only 2) I and III only 3) I, II and III 4) II & III only

63. Match the column-I (containing anions) with column-II (containing reagent used in testing) using the codes as given below in the columns

Column-I (anions)	**Column-II (reagents)**
(a) S^{2-}	1) Barium chloride solution in presence of HCl
(b) NO_3^-	2) Sodium nitroprusside
(c) I^-	3) Chlorine water and chloroform
(d) SO_4^{2-}	4) Iron (II) sulphate solution and conc. H_2SO_4

1) a -1, b – 4, c – 3, d - 1 2) a -1, b – 4, c – 3, d - 2

3) a -2, b – 1, c – 3, d – 4 4) a -1, b – 2, c – 3, d - 4

64. Match list I and list II. Choose the correct matching codes from the choices given

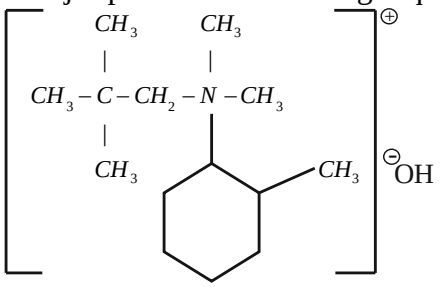
List-I	**List-II**
(a) Ionic hydride	p) NH_3
(b)Electron rich covalent hydride	q) CH_4
(c) Electron precise covalent hydride	r) $TiH_{1.73}$
(d) Electron deficient covalent hydride	s) B_2H_6
	t) CaH_2

1) (a-t), (b-p), (c-q), (d-s) 2) (a-t), (b-p), (c-r), (d-s)

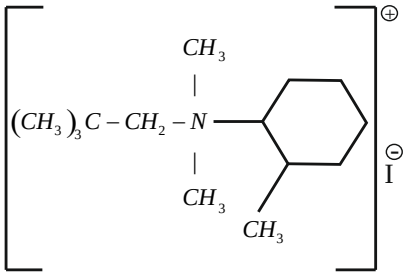
3) (a-r), (b-p), (c-q), (d-s) 4) (a-s), (b-p), (c-q), (d-t)

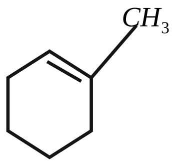
65. The major product of following sequence of reactions is

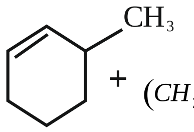
1)

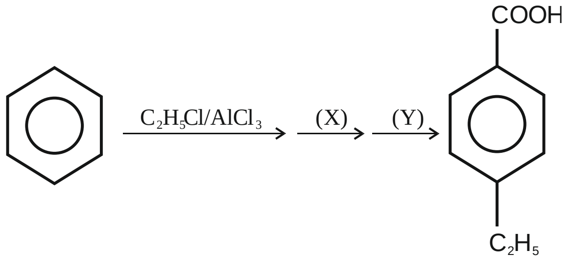


2)



3) $(CH_3)_3C-CH_2-N(CH_3)_2$ + 

4)  + $(CH_3)_3C-CH_2-N(CH_3)_2$

66. 

The reagents X and Y are respectively:

1) $X = CH_3COCl / AlCl_3, Y = KMnO_4 / OH^{\ominus} / \Delta$, acidification

2) $X = CH_3CH_2Cl / AlCl_3, Y = CrO_3 / H^{\oplus} / \Delta$

3) $X = CH_3COCl / AlCl_3, Y = I_2 / NaOH$, acidification

4) $X = KMnO_4 / OH^{\ominus} / \Delta$, acidification, $Y = CH_3CH_2Cl / AlCl_3$

67. Arrange the correct order of ease of acid catalysed dehydration of given alcohols is

I: $CH_2(NO_2)-CH_2-CH_2-CH_2-OH$

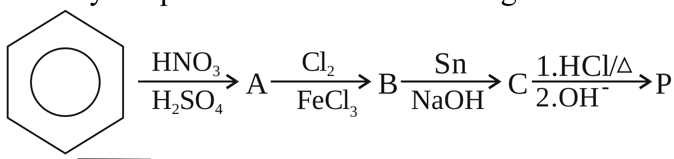
II: $CH_3-CH_2-CH(NO_2)-CH_2-OH$

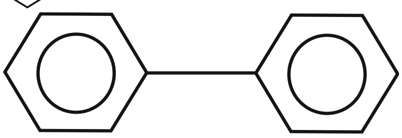
III: $CH_3-CH(NO_2)-CH_2-CH_2OH$

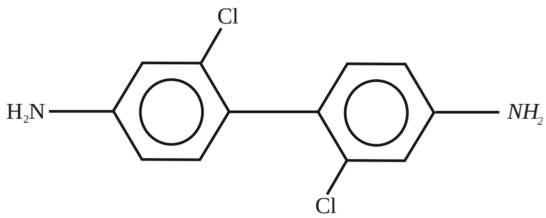
IV: $CH_3CH_2CH_2-CH_2OH$

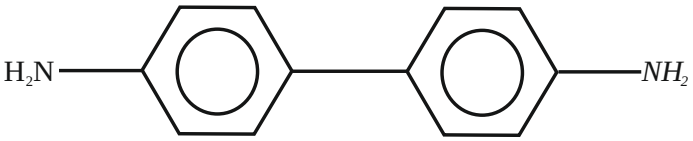
1) I > II> IV > III 2) I > II > III > IV 3) IV > I > III > II 4) IV > III > II > I

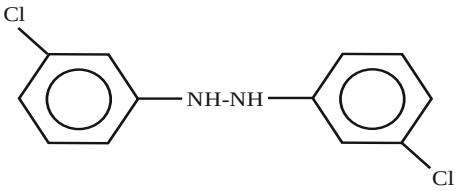
68. Identify the product "P" formed in the given reaction sequence



1) 

2) 

3) 

4) 

69. In fibrous proteins, polypeptide chains are held together by
(i)van der Waals forces (ii) disulphide linkage
(iii) electrostatic forces of attraction (iv) hydrogen bonds
1) i& ii 2) ii & iii 3) iii & iv 4) ii & iv

70. Which of the following is an example of liquid dishwashing detergent?

1) $CH_3(CH_2)_{10}-CH_2OSO_3-Na^+$

2) $C_9H_{19}-C_6H_4-O-(CH_2-CH_2-O)_5-CH_2CH_2OH$

3) $CH_3-C_6H_4-SO_3-Na^+$

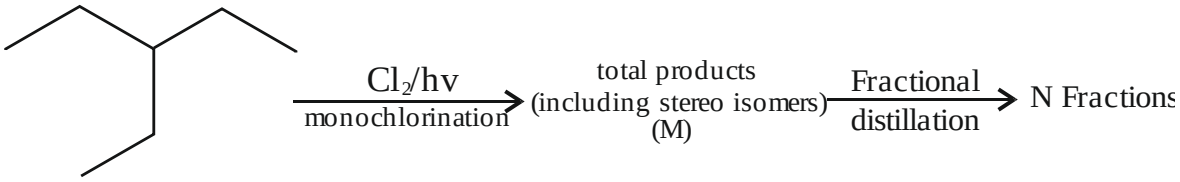
4) $\left[CH_3(CH_2)_{15}-\underset{\displaystyle CH_3}{\overset{\displaystyle CH_3}{\overset{|}{\underset{|}{N}}}}-CH_3\right]^+ Br^-$

71. 20 ml of H_2O_2 after acidification with dil. H_2SO_4 Required 30 ml of $\frac{N}{12}KMnO_4$ for complete oxidation. The strength of H_2O_2 solution is [Molar mass of H_2O_2 = 34] (in g/L)

72. Calculate the enthalpy change when 50ml of 0.01M $Ca(OH)_2$ reacts with 25 mL of 0.01 M HCl. Given that ΔH^0 neutralisation of a strong acid and strong base is 140 kcal/eq. (in cal)

73. The silver perchlorate benzene complex, $AgClO_4.C_6H_6$ is orthorhombic with unit cell dimensions $a_0 = 7.96$, $b_0 = 8.34$ and $c_0 = 11.7\,\overset{0}{A}$. The formula weight is 285 and there are four molecules per unit cell. Calculate the density of the crystal. ($in\ g/cm^3$)

74. The lowest concentration of oxygen that can support aquatic life is about $1.3\times10^{-4} mol/L$. The partial pressure of oxygen is 0.21 atm at sea level. What is the lowest partial pressure of oxygen that can support life? $k_H(O_2) = 1.3\times10^{-3} mol/L.atm$ (in atm)

75. 

The values of M +N =

SRIGAYATRI EDUCATIONAL INSTITUTIONS

INDIA

Sec: SR MPC **Jee-Main** **Date: 25-08-20**
Time:3 hrs **GT-17** **Max.Marks:300**

KEY SHEET
MATHS

1	**4**	2	**3**	3	**4**	4	**4**	5	**4**
6	**1**	7	**3**	8	**4**	9	**3**	10	**2**
11	**3**	12	**3**	13	**2**	14	**3**	15	**4**
16	**1**	17	**2**	18	**1**	19	**2**	20	**4**
21	**24**	22	**3**	23	**1**	24	**1**	25	**0.3334**

PHYSICS

26	**3**	27	**1**	28	**1**	29	**2**	30	**3**
31	**2**	32	**1**	33	**3**	34	**3**	35	**1**
36	**3**	37	**4**	38	**2**	39	**3**	40	**1**
41	**3**	42	**2**	43	**2**	44	**3**	45	**2**
46	**0.5**	47	**2291**	48	**2880**	49	**60**	50	**2**

CHEMISTRY

51	**1**	52	**1**	53	**1**	54	**4**	55	**2**
56	**3**	57	**2**	58	**2**	59	**1**	60	**4**
61	**1**	62	**3**	63	**1**	64	**1**	65	**4**
66	**3**	67	**3**	68	**2**	69	**4**	70	**2**
71	**2**	72	**35**	73	**2.44**	74	**0.1**	75	**7**

SOLUTIONS
MATHS

1. $2\alpha = i - 1$

   $2\beta = i + 1$

2. $\frac{dy}{dx} = y$ *let* $y = \frac{x^2}{4}, \frac{dy}{dx} = \frac{x^2}{4}$

3. $a - d = (a - b) + (b - c) + (c - d)$

   $= (\pm 2) + (\pm 3) + (\pm 4)$

4. $x_1 = x_2 = 1 + \sqrt{3}$ by eliminating 'y'

5. $|a - a| < 1, |a - b| < 1 \Leftrightarrow |b - c| < 1$

   $\frac{1}{2} < a - b < 1$

   $\frac{1}{2} < b - c < 1$ then transitive fails

6. $\frac{T_5 - T_9}{T_9 - T_{11}} = r$

7. $A = 2\sin 44^0 \cos 43^0$; $B = 2\cos 45^0 . \cos 43^0$; $C = 2\sin 46^0 \cos 43^0$

8. $\Delta = 0$

9. Chord of contact x + y=1

   Midpoint of AB=foot =1/2, 1/2

10. $P(A \cap E) + P(B \cap E)$

    $= P(A).P\left(\frac{E}{A}\right) + P(B).P\left(\frac{E}{B}\right) \quad = \frac{1}{2}(1) + \frac{1}{2}\left(\frac{1}{2}\right)$

11. $|PQ|^2 = \left|\frac{a + b - c}{2}\right|^2$

    $= \frac{1}{4}\left[|a|^2 + |b|^2 + |c|^2 - |a - b|^2 + |a - c|^2 + |c - b|^2\right]$

    $= \frac{1}{4}[16 + 4 + 9 - 9 + 4 + 16] = \frac{1}{4}[40] = 10$

12. $\sigma^2 = \frac{\sum (X_i)^2}{n} - (M)^2$

13. Solve with y=x

14. $\left[(p \wedge \square q) \vee (p \wedge r)\right] \wedge (\square q \wedge r)$

    $[A \vee B] \wedge C = (A \wedge C) \vee (B \wedge C)$ apply

15. $a_1 = a_2 e_2$

$a_2 = a_1 e_1$

16. Conceptual

17. $a \times b = \begin{vmatrix} i & j & k \\ 2 & 1 & -2 \\ 1 & 1 & 0 \end{vmatrix} = 2i + 2j + k$

$|a \times b| = \sqrt{4+4+1} = 3. also |c-a|^2 = 8$

$|c|^2 + |a|^2 - 2ac = 8 \; |c|^2 + 9 - 2|c| = 8 \Rightarrow |c|^2 - 2|c| + 1 = 0 \; |c|^2 + |a|^2 - 2|c| = 8$

$(|c|-1)^2 \Rightarrow |c| = 1$

Now $|(a \times b) \times c| = |a \times b| \times |c| sin30^0 = 3.1.\frac{1}{2} = \frac{3}{2}$

18. $\sum_{k=0}^{n} {}^{2n+1}C_{n-k} = {}^{2n+1}C_n + {}^{2n+1}C_{n-1} + ... + {}^{2n+1}C_0 = 2^{2n}$

19. $\frac{1}{2\sqrt{x}} + \frac{1}{2\sqrt{y}} \frac{dy}{dx} = 0 \; \frac{dy}{dx} = -\frac{\sqrt{y}}{\sqrt{x}}$

Equation of tangent at any point (x,y) of the curve is Y-y= $-\frac{\sqrt{y}}{\sqrt{x}}(X - x)$

So intercepts of X-axis and Y-axis are $x + \sqrt{xy}$ *and* $y + \sqrt{xy}$

Therefore, the sum of intercepts $x + y + 2\sqrt{xy} = \left(\sqrt{x} + \sqrt{y}\right)^2 = a$

20. $x = t^3$

21. $z_1 = 2, z_2 = 2\omega, z_3 = 2\omega^2$

22. $\sin^{-1}\sqrt{1-x^3} = \cos^{-1}\sqrt{x} = \sin^{-1}\sqrt{1-x}$

23. $a_r = a_{2n-r}$

24. Sand witch $\frac{\sum 2n}{n^2+2n} < \frac{\sum 2r}{n^2+2r} < \frac{\sum 2n}{n^2+2.1}$

25. I = (0,0)

Equation of $\overline{AE} : 4x + 3y = 25$

Equation of $\overline{AF} : x = 5$

A = (5,5/3)

PHYSICS

26. $E_1 = \frac{hc}{\lambda_1} - \phi; E_2 = \frac{hc}{\lambda_2} - \phi$

27. With both open, ΔV in second circuit = 2V ΔV in unite `A` = volt

$\therefore$ oftion(1) is corret

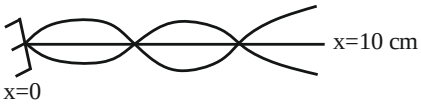
28. Conceptual

29. $MB\,\theta = I\alpha \Rightarrow \alpha\left(\frac{MB}{I}\right)\theta$

$T = 2\pi\sqrt{\frac{I}{3MB}}, T_2 = 2\pi\sqrt{\frac{I}{MB}}$

$T = 2\pi\sqrt{\frac{I}{3MB}}, T_2 = 2\pi\sqrt{\frac{I}{MB}}$

30. $m = f_o / f_e$

31. 

$\frac{5\lambda}{4} = \lambda = 8\,cm$

$k = \frac{2\pi}{8} = \frac{\pi}{4}\,cm^{-1}$

$a(x) = 2\sin\frac{\pi}{4}x$

$\therefore a(1) = \sqrt{2}\ mm$

32. One should from real image and one should from virtual image

33. $\alpha = \frac{25}{26} = \frac{I_C}{I_e}$

$I_c = \frac{1}{1000}A = 1mA$ (from out pant resistor)

$\Rightarrow I_e = \frac{26}{25}mA = 1.04\,ma$

$V_{CE} = 8V(see\,out\,pant\,side)$

$I_B = I_e = I_c = \frac{1}{25}mA \Rightarrow \Delta V_{in} = 200\left(\frac{1}{25}\right)_{10}\frac{1}{3} = \frac{1}{1000}$

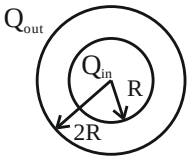
$V.Gaim = \frac{1000}{8} = 125$

34. $\Delta E \angle \frac{1240}{800} eV$

$\Rightarrow \Delta E \angle 1.55 eV$

Now check differences between various energy levels

35.



$V_{in} = \frac{K\theta in}{R} + \frac{K\theta out}{R}$

$V_{out} = \frac{K\theta in}{2R} + \frac{K\theta out}{R}$

$\Delta V = \frac{K\theta_{in}}{2R}$

36. Use kickoffs low

37. $E = \frac{f}{2} KT$

38. $m = \frac{A_m}{A_c}$

39. Use work energy theorem

$Wagon = \frac{1}{2} I_{axis} w^2$

$\frac{L}{2} w = v_{cm}$

40. $\frac{\Delta Q}{\Delta t} = \frac{mL}{3600} = KA\frac{\Delta T}{\Delta x}$

41. Area = Impulse = change in momentum

$\Delta KE = \frac{\rho_f^2 - \rho_i^2}{2m}$

42. Let $\vec{V}_w = V_x\hat{i} + V_y\hat{j}$

Case 1: $\vec{V}_{rel} = V_x\hat{i} + (V_y - 50)\hat{j}(\text{this is eastward})$

$V_Y - 50 = 0 \_ = V_Y - 50 km/h$

Case 2: $\vec{V}_{rel} = V_x\hat{i} + (V_y - 80)\hat{j}$

$= V_x\hat{i} - 30\hat{j}(\text{This is SE})$

$V_x = 30\,km/h$

43. $Y = \dfrac{Mgl}{A\Delta l}$

44. $A(t) = A_o e$

45. Use Malu's law.

46. $V = u - at \Rightarrow V = 2t \Rightarrow \underset{V\,=\,0}{t} = 3.5\,sec$

$S_3 = 7(3) - \dfrac{1}{2}(2)(9) = 12\,m$

$S_4 = 7(4) - \dfrac{1}{2}(2)(16) = 12\,m$

$S_{3\to 3.5} = 0.25\,m$

$\therefore \Delta S \text{ in } 4^{th}\,sec ond = 0.5$

47. Q net = W net

48. $u = \dfrac{1}{2}\ \sigma\,\varepsilon = \dfrac{1}{2} Y \varepsilon^2$

$\varepsilon = \dfrac{\Delta l}{l} = \Delta T$

$x \to y \qquad o$

$t = o\ N_o \qquad N_o(1 - e^{-\lambda t})$

49. $t = t\ N_o e^{-xt}$

50. $a_c = \dfrac{F}{4+2} = 2\,m/\Delta^2,\ f_{\Delta} = 8N; f_L = 10N$

$= a_{4kg} = 2\,m/\Delta^2$

CHEMISTRY

51. I: for $n = 5, 1_{min} = 0$

$\therefore$ Orbital angular momentum $\sqrt{\ell(\ell+1)}\,h = 0.$(False)

II: outermost electronic configuration $= 3s^1 or\ 3s^2$

$\therefore possible\ atomic\ number = 11 or$ (False)

III: $Mn_{25} = [Ar]3d^5\ 4s^2$

$\therefore 5\ Unpired\ electrons$

$\therefore Total\ spin = +\dfrac{5}{-2}$(False)

IV: inert gases have no unpaired electrons

$\therefore$ Spin magnetic moment = 0 (true)

52. At low pressure Van der waal`s equation for real gas is given as

$$Z = 1 - \frac{a}{RTV}$$

Intercept = 1 $\Rightarrow$ slop = -ve

53. $NH_4CN(S) \rightleftharpoons NH_3(g) + HCN(g)$

t = 0	n	a	a
	n-x	a+x	a+x

$$\frac{x}{a} \times 100 = 33.3 \Rightarrow X = \frac{a}{3}$$

So $(p_{NH_3})_{eq} = 2\,atm$ $\qquad 2 \times V = \frac{2a}{3} RT$

Amount of solid decomposed $X = (a/3) = \frac{V}{RT}$

54. For AB $K_{sp} = S^2 \quad \Rightarrow \quad S = 10^{-5}$

For AB_2 $\rightleftharpoons$ $\underset{S}{A^{2+}} + \underset{2S}{2B^-}$

$$K_{sp} = 4S^3 = 10^{-10}$$

$$S = \left(\frac{K_{sp}}{4}\right)^{1/3}$$

For AB_3 $K_{sp} = 27S^4$

$$S = \left(\frac{K_{sp}}{27}\right)^{1/4}$$

For AB_4. $K_{sp} = (4)^4 S^5$

$$S = \left(\frac{K_{sp}}{(4)^4}\right)^{1/5}$$

Hence, solubility will be maximum for AB_4.

55. $$-\frac{1}{2}\frac{d[NO]}{dt} = -\frac{1}{2}\frac{d[H_2]}{dt} = \frac{d[N_2]}{dt} = \frac{1}{2}\frac{d[H_2O]}{dt}$$

$$\frac{1}{2}k_1^{1}[NO][H_2] = \frac{1}{2}k_1^{11}[NO][H_2] = k_1[NO][H_2] = \frac{1}{2}k[NO][H_2]$$

$$\therefore k_1^{1} = k_1^{11} = 2k_1 = k$$

56. Oxidation potential α reducing strength, order of standard reduction potential

$D_2 / D^- < A_2 / A^- < B_2 / B^- < C_2 / C^-$ order of standard oxidation potential

$D_2 / D^- > A_2 / A^- > B_2 / B^- > C_2 / C^-$

57. Conceptual

58. $\overset{+7}{C}l_2O_7$ having higher oxidation state is more acidic than $\overset{+5}{N}_2O_5$ having lower oxidation state

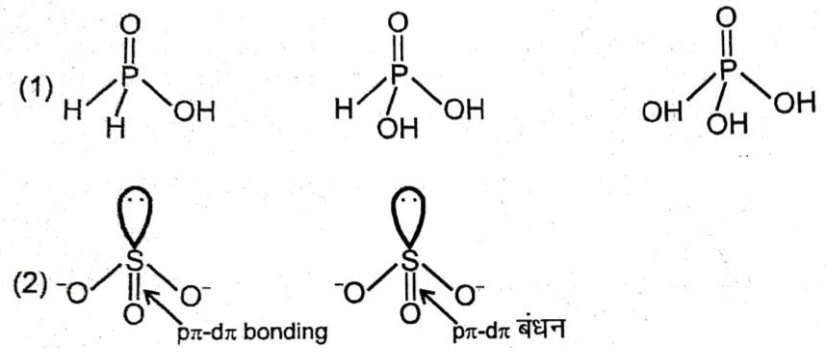
59. Iron is obtained from Fe_2O_3 by heating it with a mixture of coke and $CaCO_3$ in a blast furnace in with co formed reduces Fe_2O_3 to fe

$Fe_2O_3 + CO \rightarrow Fe + CO_2$

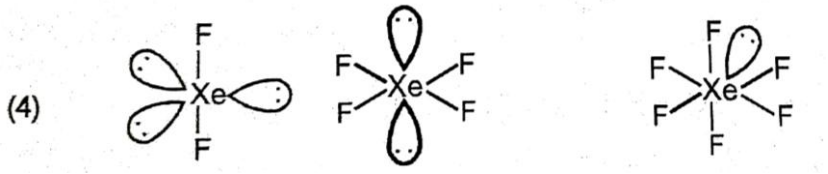
$KCI.MgCI_2.6H_2O(\mathrm{K}_2 MgCI_4.6H_2O)$

60. (ii) is only incorrect statement because most of the trivalent lanthanoid compounds except that of La^{3+} and Lu^{3+} are coloured both in the solid state and in the aqueous solution. The colour of these ions can be attributed due to the presence of unpaired F-electrons.

61.



(3) SO_3^{2-} contains one lone pair of electrons on sulphur atom.



62. I. The solubility increases down the group because the change in lattice energy is more as compared to hydration energy. Thermal stability and the basic character both increase down the group as metallic character increases.
II. It is correct statement
III. Beryllium and aluminum are diagonally related. Chlorides of both are covalent in nature and thus are soluble in organic solvents. Chlorides of both are electron deficient and thus act as strong Lewis acids.

63. a) $\left[Fe(CN)_6 NO\right]^{2-} + S^{2-} \rightarrow \left[Fe(CN)_5 NOS\right]^{4-}$ (purple colouration)

$S^2 + BaCl_2 \rightarrow$ no precipitate

b) $2NO_3^- + 4H_2SO_4 + 6Fe^{2+} \rightarrow 6Fe^{3+} + 2NO\uparrow + 4SO_4^{2-} + 4H_2O$

$$\left[Fe\left(H_2O\right)_6\right]^{2+} + NO \rightarrow \underset{(Brown\ complex)}{\left[Fe\left(H_2O\right)_5 NO\right]^{2+}} + H_2O$$

c) $2I^- + Cl_2 \rightarrow I_2 + 2Cl^-$

$I_2 + CCI_4 \rightarrow I_2$ dissolves forming a violet solution

d) $Ba^{2+} + SO_4^{2-} \rightarrow BaSO_4 \downarrow (white)$

HCl removes the impurities of S^{2-}, I^- and NO_3^- and white precipitate of $BaSO_4$ is thus obtained

64. CaH_2 - ionic hydride as it exists as Ca^{2+} and H^-

NH_3-containing one lone pair of electrons is called electron rich covalent hydride

CH_4-containing no lone pair of electrons is called electron precise covalent hydride

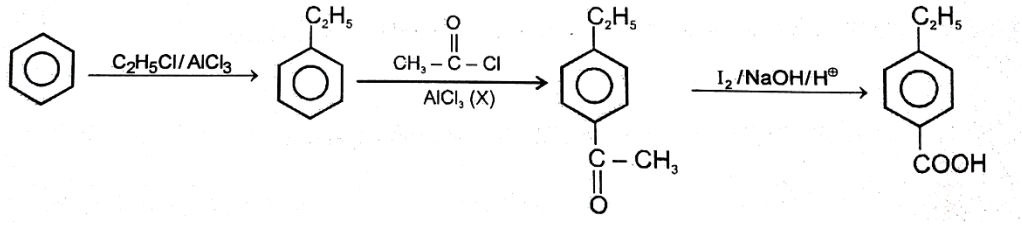
B_2H_6-has too few electrons for writing its Lewis dot structure is called electron deficient covalent hydride

$TiH_{1.73}$-hydrogen atoms entangled into the voids of the lattice of transition elements

It is therefore, called as interstitial or metallic hydride

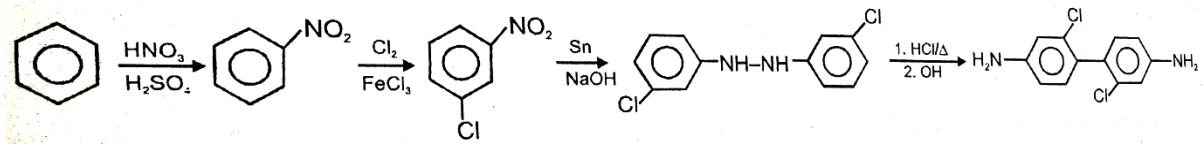
65. Hoffman elimination of quaternary ammonium salt

66.



67. Acid catalysed dehydration of alcohol is S_N1 mechanism

68.



69. Conceptual

70. Conceptual

71. $30 \times \frac{1}{12} = 20 \times N \Rightarrow N = \frac{30}{12 \times 20} = \frac{1}{8}$

$\therefore$ Strength = N $\times$ equivalent mass $= \frac{1}{8} \times 17 = 2.12 g / L$

72. m. eq. of base = 50 x 0.01 x 2 = 1

m. eq. of acid = 25 x 0.01

$\therefore$ m. eq. of base reacted = 0.25

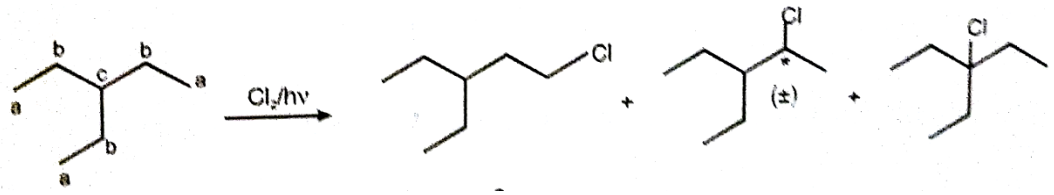
$\therefore$ Energy released = $\frac{140}{1000} \times 0.25 Kcal = \frac{140 \times 0.25 \times 1000}{1000} cal = 35 cal$

73. $d = \frac{ZM}{N_A \times a \times b \times c} = \frac{4 \times 285 \times (10^8)^3}{6.02 \times 10^{23} \times 7.96 \times 8.34 \times 11.7} = 2.44 g / cm^3$

74. The minimum partial pressure is;

$$P = \frac{S}{k_H} = \frac{1.3\times10^{-4} mol/L}{1.3\times10^{-3} mol/(\mathrm{L.atm})} = 0.10\, atm$$

75.



Total isomers = 4; Fractions = 3