Sample Paper (2023-24)

Class 11th (Sr. Secondary) **Code: CHE-856**

Roll No. | | | | | | | | | | |

Chemistry

(English Medium)

Academic

[Time allowed: 3 hours] **[Maximum Marks: 70]**

General Instructions:-

Read the following instructions carefully and strictly follow them.

(i) This question paper is divided into five sections A, B, C, D and E.

(ii) This question paper contains 35 questions. All questions are compulsory.

(iii) In Section A – Question No. 1 to 18 are multiple choice (MCQ) type questions carrying 1 mark each.

(iv) In Section B – Question No. 19 to 25 are very short answer (VSA) type questions carrying 2 marks each.

(v) In Section C – Question No. 26 to 30 are short answer (SA) type questions carrying 3 marks each.

(vi) In Section D – Question No. 31 and 32 are case based questions carrying 4 marks each.

(vii) In Section E – Question No. 33 to 35 are long answer (LA) type questions carrying 5 marks each.

(viii) There is no overall choice. However an internal choice has been provided in two questions in Section B, two questions in Section C, two questions in Section D and two questions in Section E.

(ix) Use of calculators is not allowed.

SECTION-A

Question No. 1 to 18 are multiple choice (MCQ) type questions, carrying 1 mark each.

(18x1=18)

1. How many significant figures are present in 0.0025

   (a) 2 (b) 4 (c) 1 (d) 3

2. How many unpaired electrons are present in chromium

   (a) 5 unpaired e^- s (b) 6 unpaired e^- s

   (c) 3 unpaired e^- s (d) 1 unpaired e^-

3. Among halogens the correct order of amount of energy released during the gain of electron is.

   (a) F > Cl > Br > I (b) F < Cl < Br < I

   (c) F < Cl > Br > I (d) F < Cl < Br > I

4. Which among the following are diamagnetic?

   (a) N_2^+ (b) N_2^{2-} (c) O_2 (d) O_2^{2-}

5. What is the molar mass of H_2O in gm/mol

   (a) 44 (b) 18 (c) 17 (d) 60

6. For the process to occur under adiabatic conductions the correct condition is

   (a) $\Delta T = 0$ (b) $\Delta P = 0$ (c) q = 0 (d) w = 0

7. Find the oxidation number of iron in $K_4[Fe(CN)_6]$

   (a) +2 (b) +3 (c) +4 (d) +1

8. An electrophillic reagent is

   (a) Electron deficient species (b) Electron rich species

   (c) Negatively charged species (d) Lewis base

9. $\Delta U°$ of combustion of methane is –X KJ/mol. The value of ΔH is

   (a) = $\Delta U°$ (b) > $\Delta U°$ (c) < $\Delta U°$ (d) = 0

10. Arrange the following in the decreasing order of their boiling point.

    n-butane, n-pentane, 2-methyl butane

    (a) n-pentane > 2-methyl butane > n-butane

(b) n-butane > 2-methyl butane > n-pentane

(c) 2-methyl butane > n-butane > n-pentane

(d) 2-methyl butane > n-pentane > n-butane

11. Magnetic Quantum number for the valence electron of Potassium is

(a) 0 (b) 1 (c) 2 (d) 7

12. The shape of carbocation is

(a) planar (b) linear (c) pyramidal (d) Tetrahedral

13. How many molecules of water are present in 0.01 mole of it.

(a) 6.022×10^{23} (b) 6.022×10^{21}

(c) 6.022×10^{22} (d) 6.022×10^{24}

14. How many hydrogen bonded water molecules are associated with $CuSO_4.5H_2O$

(a) 1 (b) 2 (c) 3 (d) 4

For questions 15 to 18, two statements are given one labelled as Assertion(A) and the other labelled as Reason(R). Select answer to these questions from the codes (a), (b), (c), (d) as given below.

(a) Both Assertion(A) and Reason(R) are true and Reason(R) is the correct explanation of the Assertion(A)

(b) Both Assertion(A) and Reason(R) are true but Reason is not the correct explanation of the Assertion

(c) Assertion(A) is true but Reason(R) is false.

(d) Assertion(A) is false but Reason(R) is true.

15. Assertion : A substance which gets reduced can act as the reducing agent.

Reason : An oxidizing agent itself get reduced.

16. Assertion : Graphite is an element

Reason : Element is the pure form of a substance containing same kind of atoms.

17. Assertion : Acetylene is more acidic than ethane.
    Reason : Acetyleve has sp character of carbon and therefore more s-character.
18. Assertion : Dipole moment of cis Isomer is less than the trans isomer.
    Reason : cis and trans are the geometrical isomers.

SECTION-B

19. (a) What is the lowest value of n that allows g orbital to exist?
    (b) How many electrons in an atom may have the following quantum numbers?
    n = 4, ms = $-\frac{1}{2}$ (2x1=2)
20. (a) What will be the effect on equilibrium of the following reaction, when volume of vessel increases?
    $2N_2O(g) + O_2(g) \rightleftharpoons 4NO(g), \Delta H > 0$
    (b) $PCl_5(g) \rightleftharpoons PCl_3(g) + Cl_2(g)$ $\Delta_r H° = 124$ KJ/mol
    What will be the value of Kc for the reverse reaction, if Kc for the decomposition of phosphorus pentachloride is 8.3×10^{-3} (2x1=2)
21. Balance the following equation by ion electron method in acidic medium.
    $Cr_2O_7^{2-} + C_2H_4O \rightarrow C_2H_4O_2 + Cr^{3+}$ (2)
22. Draw the resonance structures for the compound $CH_2=CH-\underset{\underset{H}{|}}{C}=O$ (2)
23. What do you mean by buffer solution. Explain the types of buffer with suitable example. (2)
24. Discuss the mechanism of Friedal Craft Acylation of benzene ring. (2)

OR

Draw Newman projections for the conformations of ethane. Which of these conformations is more stable and why? (2)

25. Arrange the elements N,P,O and S in the order of
    (a) Increasing first ionization enthalpy
    (b) Increasing Non-metallic character (2)

OR

Assign the position of the elements having outer electronic configuration.

(a) $ns^2\ np^4$ for n=3

(b) $(n-1)\ d^2ns^2$ for n=4 (2)

SECTION-C

26. In three moles of ethane (C_2H_6) calculate the following

(a) Number of moles of carbon.

(b) Number of moles of hydrogen atoms

(c) Number of molecules of ethane (3x1=3)

27. The first IE_1 and second IE_2 ionisation enthalpies (KJ/mol) of three elements A, B and C are given below

Element	IE_1	IE_2
A	403	2640
B	549	1060
C	1142	2080

Identify the element which is likely to be

(a) a non metal

(b) An alkali metal

(c) An alkaline earth metal (3x1=3)

28. Enthalpy and entropy changes of a reaction are 40.63 KJ/mol and 108.8 J/K/mol respectively. Predict the feasibility of the reaction at 27°C. (3x1=3)

OR

The standard enthalpies of formation of $SO_2(g)$ and $SO_3(g)$ are - 296.6 KJ and -395.6 KJ respectively. Calculate $\Delta H°$ for the reaction.

$SO_2(g) + \frac{1}{2} O_2(g) \longrightarrow SO_3(g)$ (3)

29. (a) 0.3780 gm of an organic compound gave 0.5740 gm of silver chloride in carius estimation. Calculate the %age of chlorine present in the compound

(b) What is the principle of paper chromatography? (2+1)

OR

Explain the term Inductive effect and electromeric effect with suitable examples. (3)

30.(a) Calculate the pH value of 0.01 M NaOH

(b) What will be the conjugate base of HSO^-_4 (2+1)

SECTION-D

The following questions are case based questions. Read the case carefully and answer the questions.

31. In thermodynamics, the energy changes may be measured in the laboratories under two common conditions: One in which the volume of the system is kept constant and other in which the pressure applied on the system is kept constant. The energy change at constant volume is called internal energy change (ΔU) and energy change at constant pressure is called enthalpy change (ΔH).

The two quantities are related to each other as $\Delta H = \Delta U + P\Delta V$. The heat changes reported are enthalpy changes because most of the processes are carried out in open vessels i.e. at-constant pressure. The common enthalpy changes are enthalpy of solution, enthalpy of neutralization, enthalpy of hydration etc.

Answer the following questions:-

(a) When a reaction is carried out at constant volume, the heat evolved at 298K – 87.425 KJ. Calculate the enthalpy change for this reaction of ammonia formation.

$N_2(g)+3H_2(g) \longrightarrow 2NH_3(g)$ (2)

OR

(a) Under what conditions heat exchange at constant volume becomes equal to heat exchange at constant pressure. Explain it by taking suitable example. (2)

(b) For which of the following reaction $\Delta H < \Delta U$ and $\Delta H > \Delta U$

(i) $CH_4(g) + 2O_2(g) \longrightarrow CO_2(g) + 2H_2O(l)$

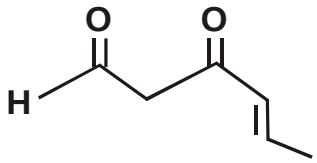
(ii) $C(s) + O_2(g) \longrightarrow CO_2(g)$

(iii) $H_2O(l) \longrightarrow H_2O(g)$ (2)

32. Organic compounds are vital for sustaining life on earth. We depend on these compound for our food, clothing medicines etc. For systematic study of organic compounds, we classify these compounds depending upon their structural features and chemical behaviour. We have assigned name to these organic compounds on the basis of certain standard rule as per IUPAC system of naming. The name of organic compound consist of three parts word root, suffix and prefix.

Answer the following questions

(a) Write the IUPAC name of the compound



(b) Draw the bond line formula for the compound pent-3-en-1-yne

(c) Draw the structures and write the IUPAC names of first four homologues members of carboxylic acid series. (1+1+2)

OR

(c) Give IUPAC names of the following compounds

(i) 

(ii) $CH_3 - \underset{\displaystyle OH}{\underset{|}{CH}} - \underset{\displaystyle Br}{\underset{|}{CH}} - CH_3$ (2)

SECTION-E

33. (a) A golf ball has a mass of 40gm and a speed of 45 m/s. If the speed can be measured with accuracy of 2%. Calculate the uncertainly in position.

(b) Write two difference between orbit and orbital. (3+2)

OR

(a) Two particles A and B are in motion. If the wavelength associated with the particles A is $5x10^{-8}$m, calculate the wavelength of particle B if its momentum is half of A.

(b) Write two differences between emission and absorption spectrum. (3+2)

34. (a) Describe the hybridization in case of PCl_5. Why the axial bonds are longer than equatorial bonds in PCl_5.

(b) Why BeH_2 molecule has a zero dipole moment although, the Be-H bonds are polar. (3+2)

OR

(a) Compare relative stability of the following species and indicate their magnetic properties i.e. O_2, O_2^+, O_2^- on the basis of Molecular Orbital Theory.

(b) Although CO_2 and H_2O are triatomic molecules, the shape of H_2O molecule is bent while that of CO_2 is linear. Explain on the basis of dipole moment. (3+2)

35. (a) Write a short note on following name reactions

(i) Sabatier Sanderson's reaction
(ii) Swartz reaction
(iii) Wurtz reaction

(b) Write the product and their IUPAC name obtained when hex-1-ene reacts with HBr in the presence of peroxide. (3+2)

OR

(a) Convert ethane into butane.

(b) What product is formed when vapours of ethyne are passed over red hot iron tube.

(c) Ozonolysis of an alkene 'x' followed by decomposition with water and a reducing agent gave a mixture of two isomers of the formula C_3H_6O. Give the structure of the alkene and its IUPAC name. (1+1+3)

Marking Scheme

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1. (a) 2 (1)
2. (b) 6 unpaired e^- (1)
3. (c) F<Cl>Br>I (1)
4. (d) O_2^{2-} (1)
5. (b) 18 gm/mol (1)
6. (c) q=0 (1)
7. (a) +2 (1)
8. (a) electron deficient species (1)
9. (c) < $\Delta U°$ (1)
10. (c) (1)
11. (a) 0 (1)
12. (a) planar (1)
13. (b) 6.022 $x10^{21}$ molecules (1)
14. (a) 1 (1)
15. (d) Assertion(A) is false but Reason(R) is true. (1)
16. (a) Assertion(A) and Reason(R) are correct and (R) is correct explanation of Assertion(A) (1)
17. (a) Assertion(A) and Reason(R) are correct and (R) is the correct explanation of Assertion(A) (1)
18. (d) Assertion(A) is wrong statement Reason(R) is correct statement. (1)

SECTION-B

19. (a) n=5 (1)

    (b) $16e^-$ (1)
20. (a) as the volume increases, pressure decreases so equilibrium move in forward direction where number of moles increases. (1)

    (b) K_C(Reverse) = $\frac{1}{8.3x15^{-3}}$ = 120.48 (1)

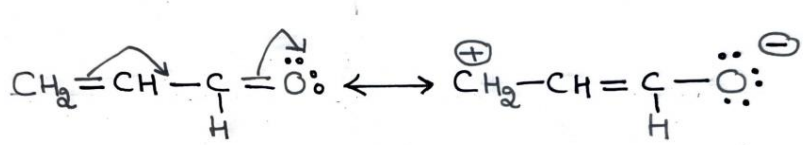
21. $16H^+ + Cr_2O_7^{2-} + 6e^- \longrightarrow 2Cr^{3+} + 7H_2O$

$[C_2H_4O + H_2O \longrightarrow C_2H_4O_2 + 2e^- + 2H^+]3$

$Cr_2O_7^{2-} + 16H^+ + 3C_2H_4O + 3H_2O \longrightarrow 2Cr^{3+} + 7H_2O + 3\,C_2H_4O_2 + 6H^+$

$Cr_2O_7^{2-} + 3\,C_2H_4O_2 + 10H^+ \longrightarrow 2Cr^{3+} + 3\,C_2H_4O_2 + 4H_2O$ (2)

22.



(2)

23. Buffer solution is the solution which resist change in the pH value of solution when small amount of acid or base is added to it.

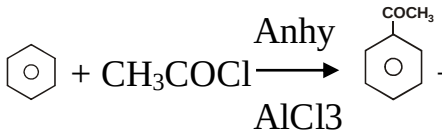
Buffer solutions are of two types

(a) Acidic buffer:- It contains equimolar quantities of weak acid and its salt with strong base.

Example acetic acid and sodium acetate

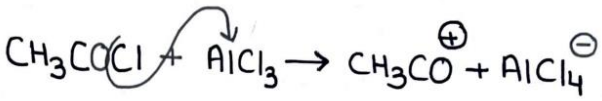
(b) Basic Buffer:- It contains equimolar quantities of weak base and its salt with strong acid

Example ammonium hydroxide and ammonium chloride (2)

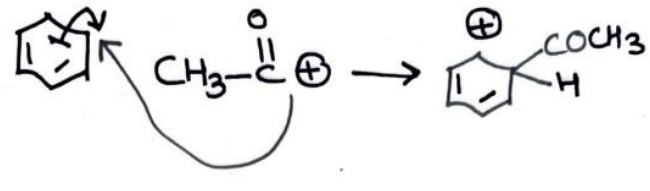
24. 

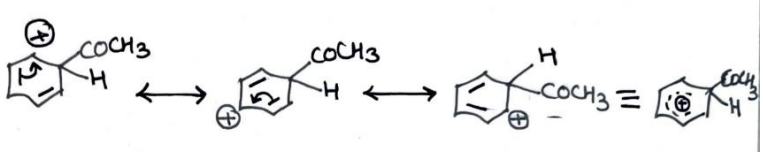
Mechanism

(i) Generation of Electrophile

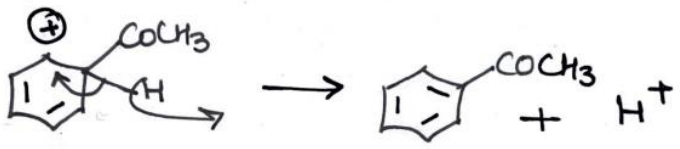


(ii) Attack of electrophile to form intermediate carbocation.





(iii) Loss of proton from carbocation

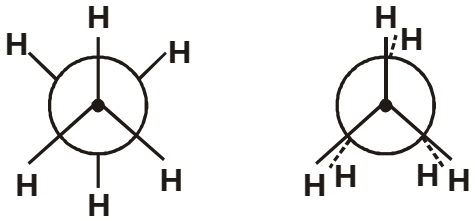


(2)

$AlCl_4^- + H^+ \longrightarrow AlCl_3 + HCl$

OR

Newman's Representation



(1)

Staggerred Eclipsed

Staggerred Conformation is more stable due to less repulsions. (1)

25.(a) S<P<O<N (1)

(b) P<S<N<O (1)

OR

(a) $3s^2 3p^4$

Group ⟶ 16^{th} group

Block ⟶ p-block

Period ⟶ 3^{rd} period (1)

(b) $4s^2 \quad 3d^2$

Group ⟶ 4^{th} group

Block ⟶ d-block

Period ⟶ 4^{th} period (1)

SECTION-C

26.(a) 1 mole C_2H_6 contains 2 moles of carbon, 3 mole C_2H_6 contains 3x2=6 moles carbon. (1)

(b) 1 mole C_2H_6 contains 6 mole hydrogen, 3 mole C_2H_6 contains 6x3=18 mole hydrogen. (1)

(c) 1 mole C_2H_6 = 6.022 x 10^{23} molecules

3 mole C_2H_6 = 3x6.022 x 10^{23} molecules

= 18.066 x 10^{23} molecules (1)

27. (a) C non metal (1)

(a) A alkali metal (1)

(b) B alkaline earth metal (1)

28. $\Delta G = \Delta H - T\Delta S$ (1)

= 40.63x1000 – 300 x 108.8

= 7990 J/mol (1)

ΔG = +ve $\therefore$ reaction is not feasible (1)

OR

$SO_2(g) + \frac{1}{2} O_2 \rightarrow SO_3(g)$

$\Delta H = \Sigma \Delta_f H°$ products - $\Sigma \Delta_f H°$ reactants (1)

= $\Delta_f H°\ SO_3 - \Delta_f H°\ SO_2$

= - 395.6 – (-296.6) (1)

= - 395.6 + 296.6

= - 99 KJ (1)

29.(a) AgCl ≡ Cl

108+35.5 35.5

143.5 35.5

$$\% \text{ of Cl} = \frac{35.5}{143.5} \times \frac{\text{Amt.of AgCl formed}}{\text{Wt.of Organic Compound}} \times 100$$

$$\% \text{ of Cl} = \frac{35.5}{143.5} \times \frac{0.5740}{0.3780} \times 100$$ (2)

= 37.57%

(b) Paper chromatography is a type of partition chromatography which is based upon the differences in the tendencies of substance to distribute between two phases. (1)

OR

(c) The process of displacement of σ electrons along the saturated carbon chain due to the presence of a polar covalent bond at one end of the chain is called inductive effect (I effect). It is of two types.

(i) + I effect → substituent has less e^- attracting power than H.

(ii) - I effect → substituent has more e^- attracting power than H.

+ I effect example - CH_3, - C_2H_5

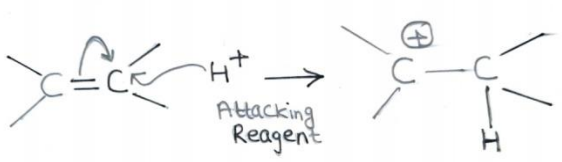
- I effect example – NO_2, - CN, -X (1½)

Electromeric effect is the complete transfer of shared pair of π e^- to one of the atom joined by multiple bond. It is of two types

(i) + E effect

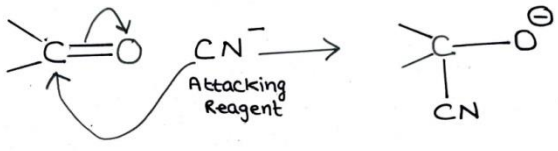
(ii) - E effect

(i) + E effect is when π e^-s are transferred to atom to which attacking reagent get attached example



(ii) - E effect is when π bond e^- all transferred to atom other than the one to which reagent get attached.

Example



(1½)

30.(a) $NaOH \rightarrow Na^+ + OH^-$

0.01 M 0.01M

$K_W = [H^+]\,[OH^-] = 10^{-14}$

$[H^+] = \frac{10^{-14}}{0,01} \times 100 = 10^{-12}$ (1)

$pH = -\log [H^+]$

$= - \log 10^{-12}$

$= 12$ (1)

(b) SO_4^{2-} (1)

31.(a) $N_2 + 3H_2 \rightarrow 2NH_3$

$\Delta ng = 2 - 4 = -2$

$\Delta H = \Delta U + \Delta ng\ RT$

$= - 87.425 \times 1000 + (-2) \times 8.314 \times 298$ (2)

$= - 87425 - 4955.14$

$= - 77514.7J$

OR

(a) $\Delta H = \Delta U$ when $\Delta ng = 0$

eg. $H_2 + I_2 \rightarrow 2HI$

$\Delta ng = 2-2=0$

$\therefore\ \Delta H = \Delta U + 0RT$

$\therefore\ \Delta H = \Delta U$

$\Delta H = \Delta U + P\Delta V$

when $\Delta V = 0$ then $\Delta H = \Delta U$ (2)

OR

any other relevant example.

(b) (i) $\Delta ng = 1-3 = -2$ $\Delta H = \Delta U - 2RT$ $\Delta H < \Delta U$

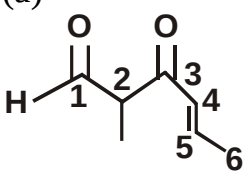
(ii) $\Delta ng = 1 - 1 = 0$ $\Delta H = \Delta U + O$

(iii) $\Delta ng = 1 - 0 = 1$ $\Delta H = \Delta U + RT$ $\Delta H > \Delta U$

$\Delta H < \Delta U$ in (i) (1)

$\Delta H > \Delta U$ in (iii) (1)

32.(a)



3-keto-2-methylhex – 4 – en – 1 – al (1)

(b) pent - 3 – en -1 - yne

$HC \cong C\text{-}CH=CH\text{-}CH_3$

(1)

(c) (i) $H-\overset{\overset{O}{\|}}{C}-OH$ Methonic acid

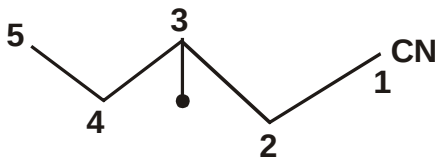
(ii) $CH_3-\overset{\overset{O}{\|}}{C}-OH$ Ethanoic acid

(iii) $CH_3-CH_2-\overset{\overset{O}{\|}}{C}-OH$ Propanoic acid

(iv) $CH_3-CH_2-CH_2-\overset{\overset{O}{\|}}{C}-OH$ Butanoic acid (2)

OR

(i)



3-methyl pentane nitrile (1)

(ii) $\overset{1}{CH_3}-\overset{2}{CH}(OH)-\overset{3}{CH}(Br)-\overset{4}{CH_3}$

3-Bromobutan-2-o1 (1)

SECTION-E

33.(a) $\Delta V = 45 \times \frac{2}{100} = 0.9$ (1)

$m = \frac{40}{1000}$

$\Delta x = \frac{h}{4\pi m \Delta v}$ (1)

$= \frac{6.626x10^{-34}}{4x3.14x40x10^{-3}x0.9}$

$= 1.46x10^{-33}m$ (1)

(b)

	Orbit	Orbital
(a)	It I well defined circular path around which e^- revolve	It is region in space around nucleus where the probability to find e^- is maximum
(b)	Represent planar motion	three dimensional motion of electron

OR / any other relevant difference. (2)

OR

(a) $\frac{\lambda_A}{\lambda_B} = \frac{h}{P_A}\frac{P_B}{h} = \frac{P_B}{P_A}$ (1)

$P_B = \frac{P_A}{2}$

$\frac{\lambda_A}{\lambda_B} = \frac{P_A}{2.PA} = \frac{1}{2}$ (1)

$\frac{5x10^{-8}}{\lambda B} = \frac{1}{2}$ $\therefore \lambda B = 10x10^{-8}m$

$= 10^{-7}m$ (1)

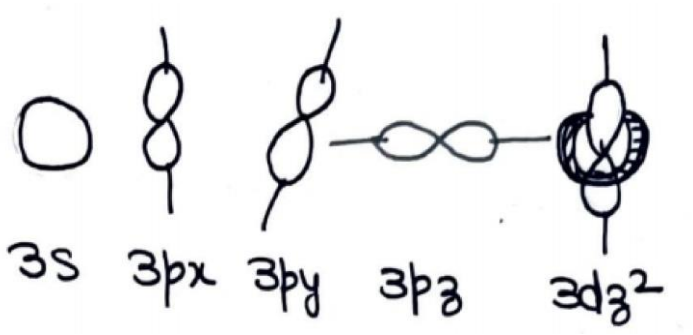
(b)

	Emission Spectrum	Absorption Spectrum
(i)	It is obtained when radiation emitted by the excited substance are analysed with spectroscope	It is obtained when white white light is passed through solution and transmitted light is analysed through spectroscope
(ii)	Emission spectrum consist of bright coloured lines separated by dark spaces.	Consist of dark lines lines in otherwise continuous spectrum

(2)

34.(a) P(Ground State) $ls^2\ 2s^2\ 2p^6\ 3s^2\ 3px^1\ 3py^1\ 3pz^1$

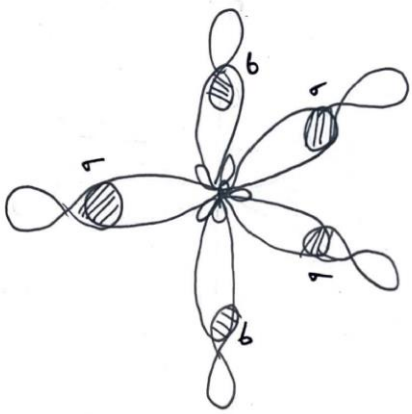
P(Excited State) $ls^2\ 2s^2\ 2p^6\ 3px^1\ 3py^1\ 3pz^1\ 3dz^{2\,1}$

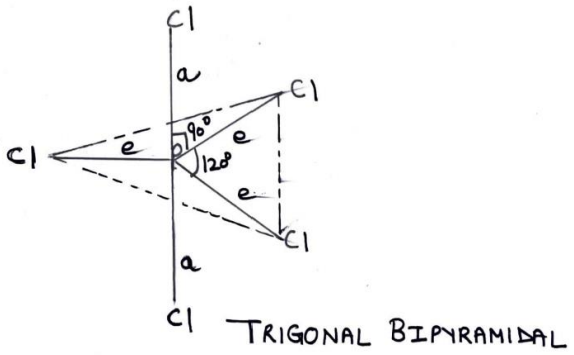


(1)

5 orbital hybridise and form 5 new orbitals of same energy and same shape.

5 sp3d hybrid orbitals adopt trigonal bipyramidal arrangement which overlap with 3pz orbital to form 5 σ bonds

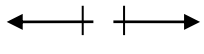




(1)

Axial bonds are longer than equatorial bonds due to greater repulsions from other bonds in axial position. (1)

(b) BeH_2 is linear molecule. Therefore the resultant dipole moment of two Be-H bonds get cancelled giving zero dipole moment.



H – Be – H $\mu=0$ (2)

OR

(a) $O_2 = \sigma ls^2\ \sigma^* ls^2\ \sigma 2s^2\ \sigma^* 2s^2\ \sigma 2pz^2\ \pi 2px^2 = \pi 2py^2\ \pi^* 2px^1 = \pi^* 2py^1$

$O^+_2 = \sigma ls^2\ \sigma^* ls^2\ \sigma 2s^2\ \sigma^* 2s^2\ \sigma 2pz^2\ \pi 2px^2 = \pi 2py^2\ \pi^* 2px^1 = \pi^* 2py^0$

$O^-_2 = \sigma ls^2\ \sigma^* ls^2\ \sigma 2s^2\ \sigma^* 2s^2\ \sigma 2pz^2\ \pi 2px^2 = \pi 2py^2\ \pi^* 2px^2 = \pi^* 2py^1$ (1)

Bond order $O_2 = \frac{8-4}{2} = \frac{4}{2} = 2$

$O^+_2 = \frac{8-3}{2} = \frac{5}{2} = 2.5$

$O^-_2 = \frac{8-5}{2} = \frac{3}{2} = 1.5$ (1)

Higher is the bond order, more is the stability.

$O_2^+ > O_2 > O_2^-$ (1)

(b) CO_2 has zero dipole moment so CO_2 is linear as two C=O bond moments get cancelled where as H_2O molecule has resultant dipole moment. Two O-H bonds are arranged in angular shape and the bond moment of two O-H bonds give resultant dipole moment. (2)

35.(a)

(i) $CH_2=CH_2+H_2 \xrightarrow[523\text{-}573K]{Ni} CH_3\text{-}CH3$ (1)

(ii) $2CH_3CH_2Cl + Hg_2F_2 \longrightarrow 2CH_3CH_2F + Hg_2Cl_2$ (1)

(iii) $CH_3Br + 2Na + CH_3Br \xrightarrow[ether]{Dry} CH_3\text{-}CH_3$ (1)

(b) $H_2C{=}CH{-}CH_2{-}CH_2{-}CH_2{-}CH_3 \xrightarrow[\text{peroxide}]{HBr} CH_2{-}(CH_2)_4{-}CH_3$

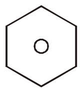
(with Br attached to the first CH_2, written below it)

1 – bromohexane (2)

OR

(a) $C_2H_6 + Cl_2 \xrightarrow{hv} CH_3{-}CH_2 \xrightarrow[\text{dry ether}]{2Na} CH_3CH_2CH_2CH_3$ (1)

(with C1 attached to the CH_2, written below it; the product is Butane)

(b) $3CH{\cong}CH \xrightarrow[\text{Fe tube}]{\text{Red Hot}}$  (1)

(c) Two isomers of C_3H_6O are

$CH_3{-}CH_2{-}CHO$ and $CH_3{-}\underset{\underset{O}{||}}{C}{-}CH_3$ (1)

$CH_3{-}\underset{\underset{H}{|}}{C}{=}$ [O   O] $={\underset{\underset{CH_3}{|}}{C}}{-}CH_3$ (1)

(the two O atoms are boxed)

$CH_3{-}CH{=}\underset{\underset{CH_3}{|}}{C}{-}CH_3$ (1)

2-methyl but-2-ene