Questions 1-5 – 1 score each

1) 2

2) pauling scale.

3) sp^3

4) NH_4Cl

5) Metamerism.

Questions 6–15 – 2 score each

6) Law of definite proportions.

This law was proposed by Joseph Proust, The same compound always contains the same elements combined in a fixed ratio by mass.

Eg :- carbon dioxide can be formed in various method like respiration, burning of fuel. All these, sample of CO_2 contains only two elements C & O combined in mass ratio

7) * He could not explain stability of atoms.

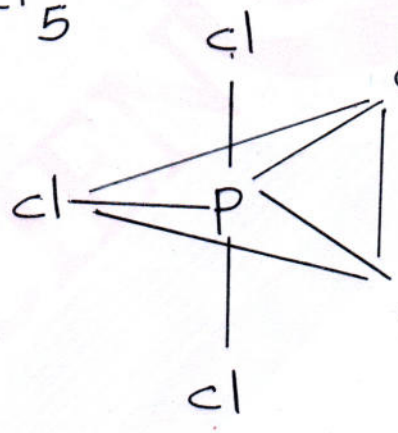
* He could not explain electronic structure of atoms.

8) i) $\lambda = \frac{h}{p}$ or $\lambda = \frac{h}{mv}$

ii) Azimuthal quantum Number (l)

9) i) Trigonalbipyramidal.

ii) PCl_5



In PCl_5 3-equitorial and 2-axial bond present. Equitorial Cl bond present in same plane, axial bond suffer more repulsion, and longer than equitorial.

10) i) Measure of randomness or disorder of a system, is called entropy.

ii) ΔS = -ve

Entropy of system decreases.

11) i)

$$K = \frac{[NO]^2}{[N_2][O_2]}$$

ii) * Equillibrium constant does not depend upon catalyst.

* Independent upon intial concentration of reactant & Product.

12) i) Blue colour become fade.

ii) $Zn + Cu(NO_3)_2 \longrightarrow Zn(NO_3)_2 + Cu$

13) i) Inductive effect (I effect)

ii) It is a permanent effect arising due to shifting of sigma electrones through a carbon chain, in presense of an atom or group of atoms (have different electronegativity) attached to carbon chain.

14) i) 3,3 - dimethylpentane.

ii) 3 - ethyl - 5 - methylheptane.

15) Wurtz Reaction.

When alkyl halide treated with sodium in presence of dry ether to form alkane.

$$2RX + 2Na \xrightarrow[\text{ether}]{\text{Dry}} R-R + 2NaX$$

$$2CH_3Cl + 2Na \xrightarrow[\text{ether}]{\text{Dry}} CH_3-CH_3 + 2NaCl$$

Questions 16 – 26 – 3 score each.

16) i)

Empirical Formula	Molecular Formula.
* It is the simplest form.	* It is the actual formula of compound.
eg: CH_2O	eg: $C_6H_{12}O_6$

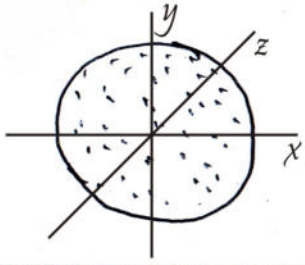
ii) Molecular Formula = Empirical Formula x n

where $n = \frac{MM}{EFM}$

17) i) Pauli Exclusion Principle.

No two electrons in an atom can have same set of four quantum numbers.

ii)



→ 15

iii) zero node.

18) i) Diagonal Relationship.

Li → Be → B ⟶ 2nd period.

Na → Mg → Al ⟶ 3rd period.

The similarity in property shown by diagonaly placed elements of 2nd and 3rd period.

ii) * Due to smaller size.
* Due to high electronegativity.

iii) Due to the absence of vaccant d orbital.

19) i) Electron gain enthalpy :— It is the heat change when an electron is added to the outermost shell of an isolated gaseous atom.

$$X_{(g)} + e^- \longrightarrow X^-_{(g)}$$

19) ii) Left to right in period $\Delta_{eg}H$ become more negative.

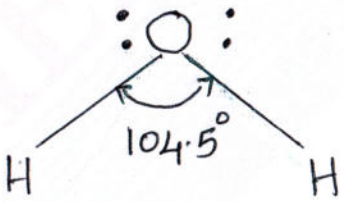
Down the group $\Delta_{eg}H$ is less -ve.

20) i) * The shape of molecule depend upon the number of valence shell electron pair around central metal atom.

* valence shell electron repul each other.

* LP - LP > LP - BP > BP - BP

ii) H_2O



In water the central atom O has 6 valance electrons (8O - 2,6). Two of them are used for the formation of bonds with hydrogen and the remaining 4 electrons stay as lone pairs.

So there are 4 VSEPs. Hence expected shape of molecule is tetrahedral. But due to the presence of 2 lone pairs, the shape is distorted bent or angular or V shape.

21) i) Energy can neither be created nor be destroyed

$$\Delta U = q + W$$

ii) Adiabatic process.

The process occure at constant heat energy. $\Delta q = 0$

iii) State function → Temperature, pressure, volume.

22) i) Differ only by a proton.

$$CH_3COOH + H_2O \rightleftharpoons CH_3COO^- + H_3O^+$$

Acid — Base — conjugate base — conjugate acid.

22) ii) $H_2O + H_2O \rightleftharpoons H_3O^+ + OH^-$

$K_w = [H_3O^+]\ [OH^-]$

$K_w = [H^+]\ [OH^-] = 1 \times 10^{-14}$ at $25^\circ C$

iii) The solution which can resist the change in PH if we add small drop of acid or base.

23) i) oxidation is the process of increasing oxidation number.

Reduction is the process of decreasing oxidation number.

ii) $KMnO_4 \longrightarrow Mn = +7$

$K_2Cr_2O_7 \longrightarrow Cr = +6$

24) i) Column chromatography.

Thin layer chromatography.

24) ii) Distillation → Aniline and chloroform

Fractional distillation → Fractions of crude oil

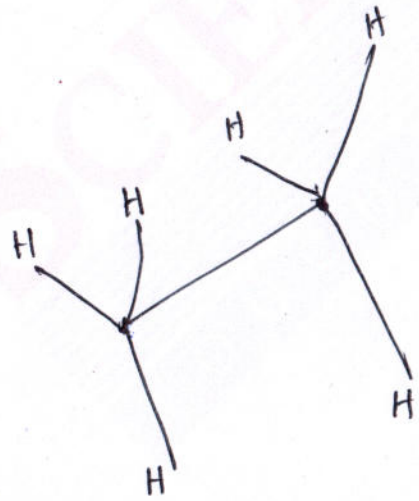
Distillation under reduced pressure → Glycerol from spent lye.

Steam distillation → Aniline and water.

25) i) Decarbonylation.

$$CH_3COONa \xrightarrow[CaO]{NaOH} CH_4 + Na_2CO_3.$$

ii) Saw horse projection.



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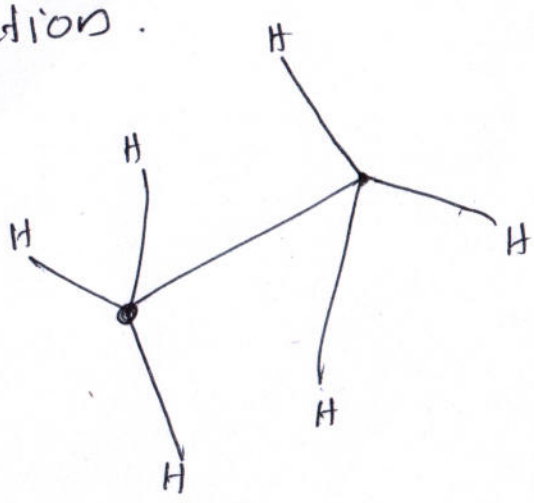
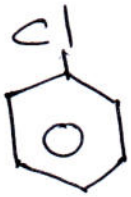


Staggered

26) i) $CH_2 = CH_2$

ii) $CH_3 - \underset{\underset{Br}{|}}{CH} - CH_3$

iii) 

Questions 27 - 31 - 4 score each.

27) i) *Electrones are revolving around nucleus in a circular path having fixed radious and energy is called orbit

* Angular momentum

$$MVr = \frac{nh}{2\pi} \qquad \Delta x = 0.1 \times 10^{-10}$$

ii) $$\Delta x \times m\Delta V \geq \frac{h}{4\pi}$$

$$\Delta V = \frac{h}{4\pi m \Delta V} = \frac{6.62 \times 10^{-34}}{4 \times 3.14 \times (0.1 \times 10^{-10})(9.1 \times 10^{-31})}$$

$$\Delta V = 0.579 \times 10^{7} \text{ m/s}$$

28) i) $\sigma 1s^2\ \sigma^* 1s^2\ \sigma 2s^2\ \sigma^* 2s^2\ \sigma 2p_z^2\ \pi_2 p_x^2 = \pi_2 p_y^2$

$\pi^* 2p_x^1 = \pi^* 2p_y^1$

ii) Paramagnetic

ii) Bond order $= \frac{1}{2}[N_b - N_a]$

$= \frac{1}{2}[10-6]$

$= \underline{\underline{2}}$

29) i) Hess's law

The law states that total enthalpy change of a chemical reaction is same whether the reaction takesplace in single step or several step.

Application.

* To calculate enthalpy of formation.
* To calculate lattice enthalpy of born-habour cycle of Nacl.

29) ii) $\Delta_r H^\circ = (\Delta_f H^\circ_{CaO} + \Delta_f H^\circ_{CO_2}) - (\Delta H_f^\circ CaCO_3)$

$= -635.1 + (-393.5) - (-1206.9)$

$= 178.3$ KJ/mol

30) i) Lewis acids.

The substance which accept electron pair.

Lewis Base.

The substance which donate electron pair.

ii) Lewis acid – $AlCl_3$, BF_3, H^+

Lewis Base – NH_3, H_2O, Cl^-

iii) pH is defind as -ve logarithm of hydrogen ion.

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

31) i) Nucleophiles.

Electron rich species or a reagent is that bring an electron pair.

eg: OH^-, CN^-, Cl^-

Electrophiles

Electron deficient species.

eg: R^+, CHO

ii) Detection of Sulpur:

Lassaigne's extract + Sodiumnitroprusside $\longrightarrow$ Violet colour.

or

Lassaigne's extract + acetic acid + lead acetate $\longrightarrow$ a black precipitate.

$$S^{2-} + Pb^{2+} \longrightarrow PbS.$$