Tirupathur District – Second Mid Term Examination – Nov - 2024
11th Std Chemistry – Answer Key

Time: 1.30 Hours **Total marks: 50**

Part – I **10 x 1 = 10**

Q. No	Answer	Q. No	Answer
1	c) Kerosene	6	d) Isopropyl chloride
2	d) Ethanol + water	7	b) Lindlar's
3	d) 2,3 – dimethyl but – 2 – ene	8	c) 1.50
4	b) Rubidium	9	b) He
5	d) Both assertion and reason are false	10	a) $MgCl_2$

Part **– II**

Answer any 5 questions and question No. 17 is compulsory. **5 x 2 = !0**

11 **Why gypsum is referred to as 'desert rose'?**

Gypsum crystals are sometimes found to occur in a form that resembles the petals of a flower. This type of formation is referred to as 'desert rose', as they mostly occur in arid areas or desert terrains.

12 **How will you identify the unsaturated hydrocarbons?**

- Unsaturated hydrocarbons decolourise reddish brown colour of bromine water, but saturated hydrocarbons do not decolourise bromine water.
- Unsaturated hydrocarbons decolourise pink coloured acidified $KMnO_4$ solution but saturated hydrocarbons do not decolourise it.

13 **Define the term 'isotonic solution**'?

- Two solutions having same osmotic pressure at a given temperature are called isotonic solutions.
- When such solutions are separated by a semipermeable membrane, solvent flow between one to the other on either direction is same, i.e. the net solvent flow between the two isotonic solutions is zero.

14 **Find the molality of the solution containing 45 g of glucose dissolved in 2 kg of water.**

$$\text{Molality (m)} = \frac{\text{Number of moles of the solute}}{\text{Mass of the solvent (in kg)}} = \frac{45/180}{2} = \frac{0.25}{2} = 0.125\text{m}$$

15 **Write note on anomalous nature of lithium?**

The distinctive behaviour of Li^+ ion is due to its exceptionally small size, high polarising power, high hydration energy and non-availability of d-orbitals.

16 **What is osmosis?**

Osmosis is a spontaneous process by which the solvent molecules pass through a semi permeable membrane from a solution of lower concentration to a solution of higher concentration.

17 **Draw the structural formula for 4,5 – diethyl – 3,4,5 – trimethyl octane.**

$$\begin{array}{ccccccccccccccc} & & & & CH_3 & & C_2H_5 & & C_2H_5 & & & & & & \\ & & & & | & & | & & | & & & & & & \\ CH_3 & - & CH_2 & - & CH & - & C & - & C & - & CH_2 & - & CH_2 & - & CH_3 \\ & & & & & & | & & | & & & & & & \\ & & & & & & CH_3 & & CH_3 & & & & & & \end{array}$$

Prepared by Dr.R.Karthic, PG Assistant (Chemistry), GHSS – Vallipattu

Part – III

Answer any 5 questions and question No. 24 is compulsory. **5 x 3 = 15**

18 **What is mean by colligative properties? Name them.**

The properties that do not depend on the chemical nature of the solute but depends only on the number of solute particles (ions/molecules) present in the solution is called as colligative properties. They are,

i) Relative lowering of vapour pressure
ii) Elevation of boiling point
iii) Depression in freezing point
iv) Osmotic pressure

19 **Defferentiate ideal and non-ideal solutions?**

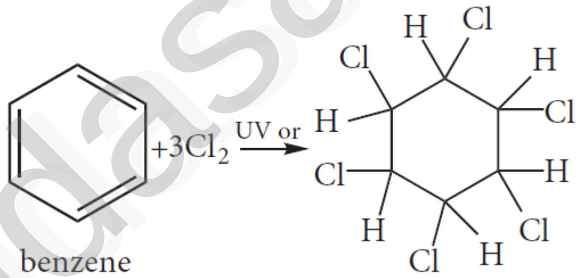
- An ideal solution is a solution in which each component i.e. the solute as well as the solvent obeys the Raoult's law over the entire range of concentration.
  Eg: Benzene & Toluene, n-hexane & n-heptane, Ethyl bromide & Ethyl iodide,,Chlorobenzene & Bromobenzene. **(Anyone example)**
- The solutions which do not obey Raoult's law over the entire range of concentration, are called non-ideal solutions.
  Eg: Ethyl alcohol & cyclohexane, Benzene & acetone, Carbon tetrachloride & chloroform, Acetone & ethyl alcohol, Ethyl alcohol & water. **(Anyone example)**

20 **Write Dow's process? (Out of syllabus – mere attempt)**

$$C_6H_5Cl + NaOH \xrightarrow[300\ atm]{350\ ^\circ C} C_6H_5OH + HCl$$

21 **How will you prepare BHC? Write its use?**

Benzene reacts with three molecules of Cl_2 in the presence of sun light or UV light to yield Benzene Hexa Chloride (BHC) $C_6H_6Cl_6$. This is known as gammaxane or Lindane.
Uses: it is a powerful insecticide.



BHC

22 **Discuss briefly about the similarities between Be and Al.**

Beryllium shows a diagonal relationship with aluminium. So, their properties per unit area is closer.

	Properties
1	Beryllium chloride forms a dimeric structure like aluminium chloride with chloride bridges. Beryllium chloride also forms polymeric chain structure in addition to dimer. Both are soluble in organic solvents and are strong Lewis acids.
2	Beryllium hydroxide dissolves in excess of alkali and gives beryllate ion and $[Be(OH)_4]^{2-}$ and hydrogen as aluminium hydroxide which gives aluminate ion, $[Al(OH)_4]^-$.
3	Beryllium and aluminium ions have strong tendency to form complexes, BeF_4^{2-}, AlF_6^{3-}.
4	Both beryllium and aluminium hydroxides are amphoteric in nature.
5	Carbides of beryllium (Be_2C) like aluminium carbide (Al_4C_3) give methane on hydrolysis.
6	Both beryllium and aluminium are rendered passive by nitric acid.

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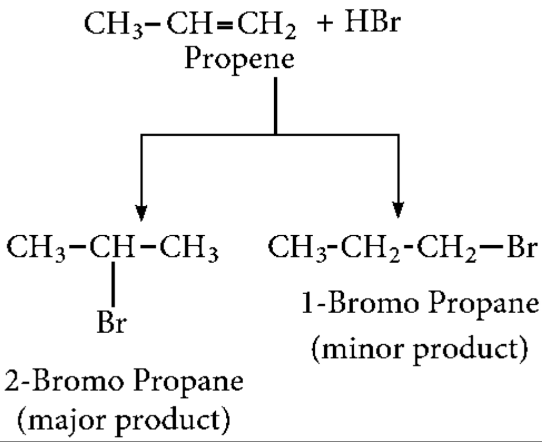
23 **Explain Markownikoff's rule with an example.**

"When an unsymmetrical alkene reacts with hydrogen halide, the hydrogen adds to the carbon that has more number of hydrogen and halogen add to the carbon having fewer hydrogen". Eg:



24 **0.24 g of a gas dissolves in 1 L of water at 1.5 atm pressure. Calculate the amount of dissolved gas when the pressure is raised to 6.0 atm at constant temperature.**

$P_{solute} = K_H X_{solute\ in\ solution}$

At pressure 1.5 atm,

$p_1 = K_H x_1$ ------------(1)

At pressure 6.0 atm,

$p_2 = K_H x_2$ ------------(2)

Dividing equation (1) by (2)

$p_1/p_2 = x_1/x_2$

$1.5/6.0 = 0.24/x_2$

Therefore $x_2 = 0.24 \times 6.0/1.5 = 0.96$ g/L

Part – IV

Answer all the questions. **3 x 5 = 15**

25 **a) State Henry's law and explain its limitations? (5)**

"The partial pressure of the gas in vapour phase (vapour pressure of the solute) is directly proportional to the mole fraction(x) of the gaseous solute in the solution at low concentrations". This statement is known as henry's law.

$P_{solute} \propto X_{solute\ in\ solution}$

$P_{solute} = K_H X_{solute\ in\ solution}$

P_{solute} = partial pressure of the gas in vapour state (vapour pressure)

K_H = empirical constant with the dimensions of pressure

$X_{solute\ in\ solution}$ = mole fraction of solute in the solution

Limitations:

- Henry's law is applicable at moderate temperature and pressure only.
- Only the less soluble gases obey Henry's law
- The gases reacting with the solvent do not obey Henry's law. Eg: ammonia or HCl.
- The gases obeying Henry's law should not associate or dissociate while dissolving in the solvent.

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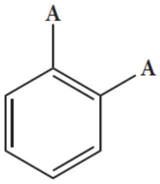
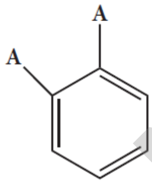
(or) b) Explain the structural elucidation of benzene? (5)

1. Elemental Analysis and molecular weight determination have proved that the molecular formula of benzene is C_6H_6. This indicates that benzene is a highly unsaturated compound.
2. Benzene could be constructed as a straight chain or ring compound but it not feasible since it does not show the properties of alkenes or alkynes.
3. Benzene reacts with bromine in the presence of $AlCl_3$ to form mono bromo benzene. It indicates that all the six hydrogen atoms in benzene were identical. This is possible only if it has a cyclic structure of six carbons each containing one hydrogen.
4. Benzene can add on to three moles of hydrogen in the presence of nickel catalyst to give cyclohexane. This confirms cyclic structure of benzene and the presence of three carbon-carbon double bond.
5. In 1865, August Kekule suggested that benzene consists of a cyclic planar structure of six carbon with alternate single and double bonds. There were two objections:
   (i) Benzene forms only one ortho disubstituted products whereas the Kekule's structure predicts two o-di substituted products as shown below.

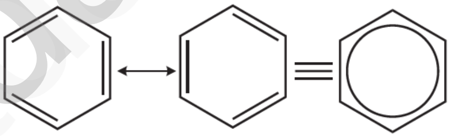


Presence of double bond between the substituents



Presence of single bond between the substituents

   (ii) Kekule's structure failed to explain why benzene with three double bonds did not give addition reactions like other alkenes.
6. The phenomenon in which two or more structures can be written for a substance which has identical position of atoms is called resonance. The actual structure of the molecule is said to be resonance hybrid of various possible alternative structures. In benzene, Kekule's structures I & II represented the resonance structure, and structure III is the resonance hybrid of structure I &II



[1] [2] [3]

7. Spectroscopic measurements show that benzene is planar and all of its carbon-carbon bonds are of equal length 1.40A°. This value lies between carbon-carbon single bond length 1.54A° and carbon-carbon double bond length 1.34A°.
8. All the six carbon atoms of benzene are sp^2 hybridized. six sp^2 hybrid orbitals of carbon linearly overlap with six 1s orbitals of hydrogen atoms to form six C - H sigma bonds. Overlap between the remaining sp^2 hybrid orbitals of carbon forms six C-C sigma bonds.
9. All the σ bonds in benzene lie in one plane with bond angle 120°. Each carbon atom in benzene possesses an unhybridized p-orbital containing one electron. The lateral overlap of their p-orbital produces 3 π- bond The six electrons of the p-orbitals cover all the six carbon atoms and are said to be delocalised. Due to delocalization, strong π-bond is formed which makes the molecule stable.
10. Hence unlike alkenes and alkynes benzene undergoes substitution reactions rather addition reactions under normal conditions.

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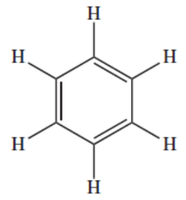
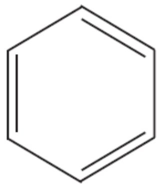
11. Hence, there are three ways in which benzene can be represented.



Expanded form


Kekule structure


Short hand representation

26

a) i) Discuss the similarities between beryllium and aluminium. (3)

Beryllium shows a diagonal relationship with aluminium. So, their properties per unit area is closer.

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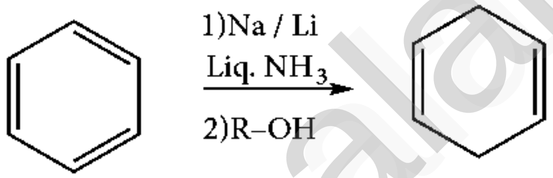
3	Beryllium and aluminium ions have strong tendency to form complexes, BeF_4^{2-}, AlF_6^{3-}.
4	Both beryllium and aluminium hydroxides are amphoteric in nature.
5	Carbides of beryllium (Be_2C) like aluminium carbide (Al_4C_3) give methane on hydrolysis.
6	Both beryllium and aluminium are rendered passive by nitric acid.

ii) write Birch reduction? (2)



Benzene Cyclohexa-1,4-diene

(or) b) i) How will you prepare Lindane? Write its use? (3)

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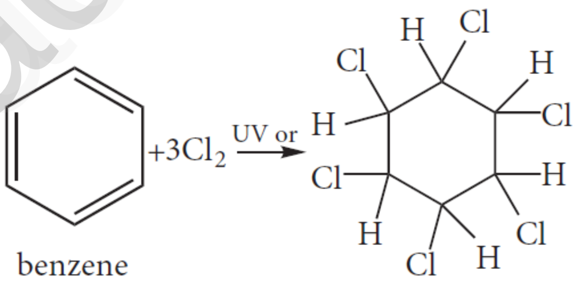
Uses: it is a powerful insecticide.



BHC

ii) State Raoult law (2)

In the case of a solution of volatile liquids, the partial vapour pressure of each component of the solution is directly proportional to its mole fraction".

$$P_{solution} \propto x_A$$

(or)

The relative lowering of vapour pressure of an ideal solution containing the non-volatile solute is equal to the mole fraction of the solute at a given temperature.

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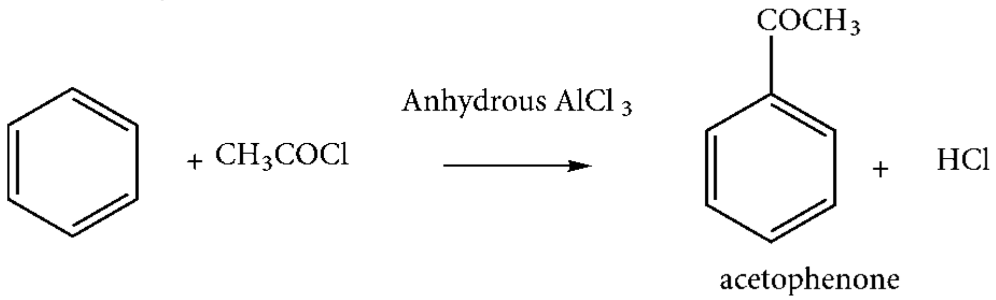
27

a) Write the following reactions.

i) Friedel Craft's Acetylation? (3)



ii) wurtz reaction (2)

$$CH_3 - Br + 2Na + Br - CH_3 \xrightarrow{\text{dry ether}} CH_3 - CH_3 + 2NaBr$$

(or) b) i) How is plaster of paris prepared? Write its uses. (3)

- It is a hemihydrate of calcium sulphate.
- It is obtained when gypsum, $CaSO_4{\cdot}2H_2O$, is heated to 393 K.

$$2CaSO_4.2H_2O_{(S)} \longrightarrow 2CaSO_4.\frac{1}{2}H_2O + 3H_2O$$

Uses:

- Building industries (plasters)
- Immobilising (bone fracture or sprain)
- Dentistry, in ornamental work and for making casts of statues and busts.

ii) Write Huckel rule? (2)

A compound may be aromatic, if it obeys the following rules

(i) The molecule must be co-planar

(ii) Complete delocalization of π electron in the ring

(iii) Presence of (4n+2) π electrons in the ring where n is an integer (n=0,1,2….)

This is known as Huckel's rule.