SACRED HEART MATRICULATION HIGHER SECONDARY SCHOOL

UNIT TEST – 01, JULY - 2024

STD: **12** **CHEMISTRY ANSWERKEY**

TIME: **90 MINUTES** MAXIMUM MARKS: **35**

I. ***Answer all the questions. Choose the correct answer from the given four alternatives and write the option code and the corresponding answer.*** ***(5x1=5)***

1. a) Sodium
2. b) Molecular solid
3. c) basic
4. c) First Order
5. a) Both assertion and reason are true and reason is the correct explanation of assertion.

II. ***Answer any three questions. Question No.10 is compulsory.*** **(3x2=6)**

6. **Give the limitations of Ellingham diagram?**

- Ellingham diagram is constructed based only on thermodynamic considerations.
- It gives information about the thermodynamic feasibility of a reaction.
- It does not tell anything about the rate of the reaction. Moreover, it does not give any idea about the possibility of other reactions that might be taking place.
- The interpretation of ΔG is based on the assumption that the reactants are in equilibrium with the product which is not always true.

7. **Define Half-life of a reaction.**

The half life of a reaction is defined as the time required for the reactant concentration to reach one half its initial value.

8. **Write short note on Hydroboration?**

- Diborane adds on to alkenes and alkynes in ether solvent at room temperature.
- This reaction is called as hydroboration and is highly used in synthetic organic chemistry especially for anti-Markovnikov addition.

$$B_2H_6 + 3RCH = CHR \rightarrow B(CH_2 - CH_2R)_3 + 6H_2$$

9. **Write Bragg's equation and explains the terms involved?**

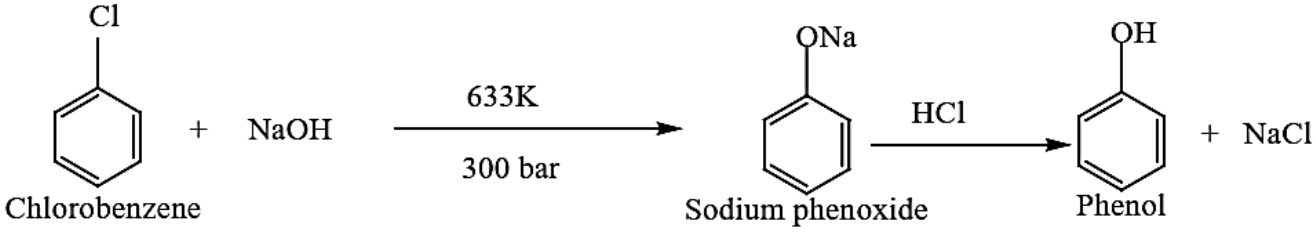
The fundamental equation that gives a simple relation between the wavelength of the X-rays, the interplanar distance in the crystal and the angle of reflection is known as Bragg's equation.

$$\mathbf{n\lambda = 2d \sin\Theta}$$

where **n** is the order of reflection; **λ** is the wavelength of X-rays; **d** is the interplanar distance in the crystal; **Θ** is the angle of reflection

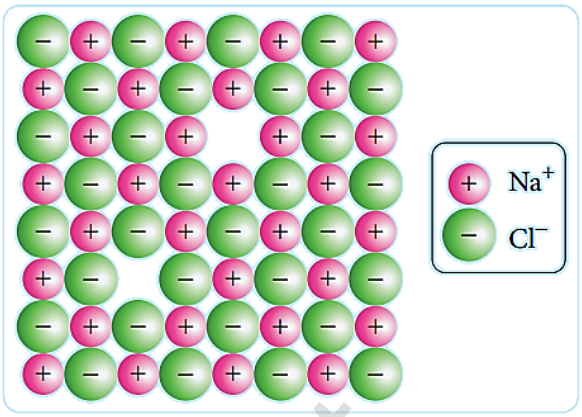
10. **How is Phenol prepared from Chlorobenzene?**

When Chlorobenzene is hydrolysed with 6-8% NaOH at 300 bar and 633K in a closed vessel, sodium phenoxide is formed which on treatment with dilute HCl gives phenol (Dow process).



III. ***Answer any three questions. Question No.15 is compulsory.*** **(3x3=9)**

11. Explain Schottky defect?



- The schottky defect arises due to the missing of an equal number of cations and anions from the crystal lattice.
- This effect does not change the stoichiometry of the crystal.
- Ionic solids in which the cation and anion are of almost similar size show Schottky defect.
  Example: NaCl.
- Presence of large number of schottky defects in crystal, lowers its density.

12. How will you identify Borate radical?

- When boric acid or borate salt is heated with ethyl alcohol in presence of concentrated H_2SO_4, an ester triethyl borate is formed.
- The Vapour of this ester burns with a green edged flame and this reaction is used to identify the presence of borate.

$$H_3BO_3 + 3C_2H_5OH \xrightarrow[H_2SO_4]{\text{Conc.}} B(OC_2H_5)_3 + 3H_2O$$

13. Describe a method for refining Titanium?

- This method is based on the thermal decomposition of metal compounds which lead to the formation of pure metals. Titanium and zirconium can be purified using this method.
- For example, the impure titanium metal is heated in an evacuated vessel with iodine at a temperature of 550 K to form the volatile titanium tetra-iodide.(TiI_4). The impurities are left behind, as they do not react with iodine.

$$Ti\,(s) + 2I_2\,(s) \xrightarrow[\Delta]{550K} TiI_4\,(\text{vapour})$$

- The volatile titanium tetraiodide vapour is passed over a tungsten filament at a temperature aroud 1800 K. The titanium tetraiodide is decomposed and pure titanium is deposited on the filament. The iodine is reused.

$$TiI_4\,(\text{vapour}) \xrightarrow[\Delta]{1800\,K} Ti\,(s) + 2I_2\,(s)$$

14. Write short notes on Schotten-Baumann reaction?

Phenol on treatment with acid chlorides gives esters. The acetylation and benzoylation of phenol are called Schotten-Baumann reaction.

$$\underset{\text{phenol}}{C_6H_5OH} + \underset{\text{acetyl chloride}}{CH_3COCl} \xrightarrow[Py]{NaOH} \underset{\text{phenyl ethanoate}}{CH_3\text{-}COOC_6H_5} + HCl$$

$$\underset{\text{phenol}}{C_6H_5OH} + \underset{\text{benzoyl chloride}}{C_6H_5COCl} \xrightarrow[Py]{NaOH} \underset{\text{phenyl benzoate}}{C_6H_5\text{-}COOC_6H_5} + HCl$$

15. Barium has a body centred Cubic unit cell with a length of 508pm along an edge. What is the density of Barium in gcm^{-3}?

$$\rho = \frac{n\,M}{a^3 N_A}$$

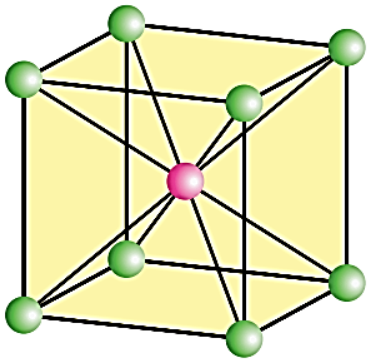
In this case,

n=2 ; M=137.3 $gmol^{-1}$; a = 508pm= $5.08X10^{-8}cm$

$$\rho = \frac{2 \text{ atoms} \times 137.3 \text{ g mol}^{-1}}{(5.08 \times 10^{-8} \text{ cm})^3 (6.023 \times 10^{23} \text{ atoms mol}^{-1})}$$

$$\rho = \frac{2 \times 137.3}{(5.08)^3 \times 10^{-24} \times 6.023 \times 10^{23}} \text{ g cm}^{-3}$$

$$\rho = 3.5 \text{ g cm}^{-3}$$



IV. *Answer all the questions.* **(3x5=15)**

16.(a) (i) **What is Acid Leaching?**

- Leaching of sulphide ores such as ZnS, PbS etc., can be done by treating them with hot aqueous sulphuric acid.

$$2ZnS\,(s) + 2H_2SO_4\,(aq) + O_2(g) \longrightarrow 2ZnSO_4\,(aq) + 2S\,(s) + 2\,H_2O$$

- In this process the insoluble sulphide is converted into soluble sulphate and elemental sulphur.

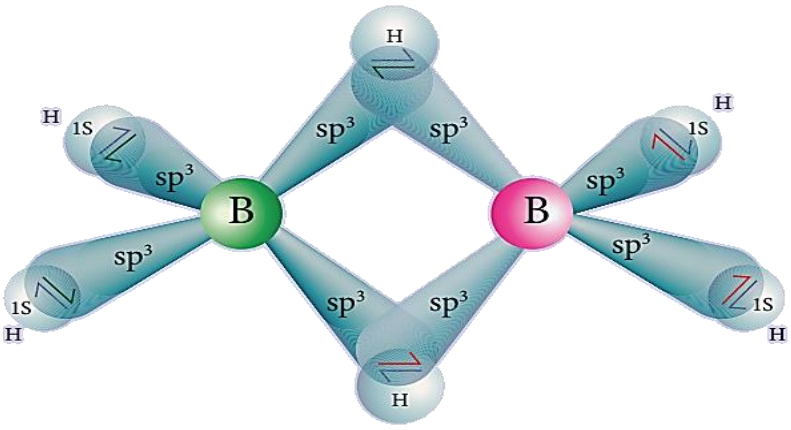
(ii) **Give the uses of Zinc?**

- Metallic zinc is used in galvanising metals such as iron and steel structures to protect them from rusting and corrosion.
- Zinc is also used to produce die-castings in the automobile, electrical and hardware industries.
- Zinc oxide is used in the manufacture of many products such as paints, rubber, cosmetics, pharmaceuticals, plastics, inks, batteries, textiles arid electrical equipment.
- Zinc sulphide is used in making luminous paints, fluorescent lights and x-ray screens.
- Brass an alloy of zinc is used in water valves and communication equipment as it is highly resistant to corrosion.

(OR)

(b) **Describe the structure of Diborane.**

- In diborane two BH_2 units are linked by two bridged hydrogens.
- Therefore, it has eight B-H bonds.
- However, diborane has only 12 valance electrons and are not sufficient to form normal covalent bonds.
- The four terminal B-H bonds are normal covalent bonds (two centre – two electron bond or 2c-2e bond).



- The remaining four electrons have to used for the bridged bonds, i.e. two three centred B-H-B bonds utilise two electrons each. Hence, these bonds are three centre – two electron bonds. The bridging hydrogen atoms are in a plane as shown in the figure. In dibome, the boron is sp^3 hybridised.

- Three of the four sp^3 hybridised orbitals contains single electron and the fourth orbital is empty.
- Two of the half-filled hybridised orbitals of each boron overlap with the two hydrogens to form four-terminal 2c-2e bonds, leaving one empty and one half filled hybridised orbitals on each boron.
- The Three centre – two-electron bonds, B-H-B bond formation involves overlapping the half filled hybridised orbital of one boron, the empty hybridised orbital of the other boron and the half-filled 1s orbital of hydrogen.

17.(a) **Differentiate Crystalline Solids and Amorphous Solids?**

S. NO.	CRYSTALLINE SOLIDS	AMORPHOUS SOLIDS
1	Long range orderly arrangement of constituents	Short range, random arrangement of constituents
2	Definite shape	Irregular shape
3	Generally crystalline solids are anisotropic in nature	They are isotropic like liquids
4	They are true solids	They are considered as pseudo solids (or) super cooled liquids
5	Definite Heat of fusion	Heat of fusion is not definite
6	They have sharp melting points	Gradually soften over a range of temperature and so can be moulded
7	Examples: NaCl, diamond etc.,	Examples: Rubber, plastics, glass etc

(OR)

(b) (i) **Define Rate law?**

The expression in which reaction rate is given in terms of molar concentration of the reactants with each term raised to some power, which may or may not be same as the Stoichiometric coefficient of the reacting species in a balanced chemical equation.

$xA + yB \rightarrow$ products $\quad$ Rate $= k[A]^m[B]^n$ $\quad$ k = Rate constant

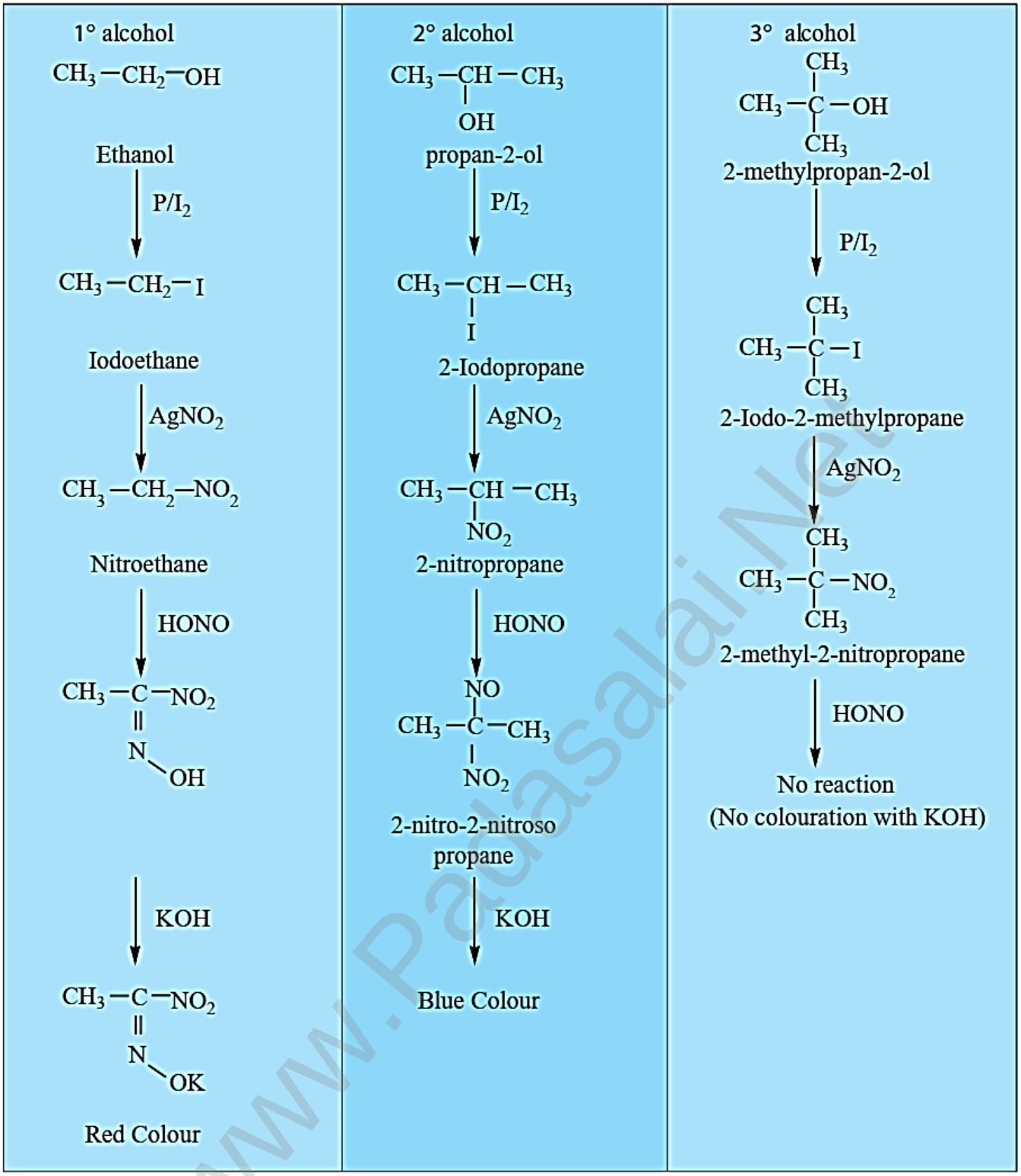
(ii) **Give the differences between order and Molecularity of a reaction?**

ORDER OF A REACTION	MOLECULARITY OF A REACTION
It is the sum of the powers of concentration terms involved in the experimentally determined rate law.	It is the total number of reactant species that are involved in an elementary step.
It can be zero (or) fractional (or) integer	It is always a whole number, cannot be zero or a fractional number.
It is assigned for a overall reaction.	It is assigned for each elementary step of mechanism.

18.**(a) Explain Victor Meyer's Test?**

Result:

- Primary alcohol gives red colour
- Secondary alcohol gives blue colour.
- No colouration will be observed in case of tertiary alcohol.



(OR)

(b) (i) **Why ionic solids are hard and Brittle?**

- Ionic crystalline are hard because they are bound together by strong electrostatic attractive forces.
- To maximize the attractive force, cations are surrounded by as many anions as possible and vice versa.
- The electrostatic repulsion can be enough to split or disorient completely the lattice infrastructure. Thus imparts the brittle character.

(ii) **Give the uses of Silicones?**

- Silicones are used for low temperature lubrication and in vacuum pumps, high temperature oil baths etc.
- They are used for making water proofing clothes.

- They are used as insulting material in electrical motor and other appliances
- They are mixed with paints and enamels to make them resistant towards high temperature, sunlight, dampness and chemicals.

PREPARED BY,

Mr. S.JOHNSON., M.Sc., M.Sc., B.Ed.,

PGT – CHEMISTRY

SACRED HEART MAT. HR. SEC. SCHOOL,

SHOLINGANALLUR, CHENNAI – 600119.