

ACHARYA A.V. PATEL JUNIOR COLLEGE

Date: / /2019

EXCELLENCE PROGRAMME - SYJC

Marks: 20

CHEMISTRY – TUTORIAL

TOPIC: SOLID STATE

- Q. 1. Distinguish between Crystalline solids and amorphous solids (2 M)
- Q. 2. Write a note on metallic solid. (2 M)
- Q. 3. Gold occurs as FCC and has density of 19.30 kg dm^{-3} . Calculate the atomic radius of gold.
(Molar Mass of Au=197) (2 M)
- Q. 4. Sodium metal crystallizes in bcc structure with the edge length of unit cell $4.29 \times 10^{-8} \text{ cm}$.
Calculate the radius of sodium atom. (2 M)
- Q. 5. Niobium Crystallises as BCC and has a density of 8.55 kg/dm^3 . Calculate the atomic
radius of Niobium. (Atomic mass of Niobium = 93) (3 M)
- Q. 6. Explain Schottky defect with the help of diagram. (3 M)
- Q. 7. Calculate the percentage efficiency of packing in case of simple cubic cell. (3 M)
- Q. 8. A unit cell of iron crystal has edge length 288 pm and density 7.86 g/cm^3 . Find the
number of atom per unit cell and type of the crystal lattice.
(Given: Molar mass of iron = 56g/mol, Avogadro number, $N_A = 6.022 \times 10^{23}$) (3 M)

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CHEMISTRY – TUTORIAL

TOPIC: SOLUTIONS & COLLIGATIVE PROPERTIES

- Q. 1. Define: a) Cryoscopic constant b) Isotonic solution **(2 M)**
- Q. 2. Derive the relationship between relative lowering of vapour pressure and molar mass of Non-volatile solute. **(2 M)**
- Q. 3. Explain, why do aquatic animals prefer to stay at lower level of water during summer? **(2 M)**
- Q. 4. Calculate the mole-fraction of HNO_3 , in a solution containing 12.2 % HNO_3 ,
(Given-Atomic masses: H=1, N=14, O=16) **(2 M)**
- Q. 5. Calculate the amount of CaCl_2 (Van't Hoff factor, $i = 2.47$) dissolved in 2.5 L solution
So that it's osmotic pressure at 300 K is 0.75 atmospheres. **(3 M)**
- Q. 6. A solution containing 0.739 of Camphor (molar mass 152 g/mole) in 36.8g of acetone
(boiling point 56.3°C) boils at 56.55°C . A solution of 0.564 g of unknown compound
in the same weight of acetone boils at 56.46°C . Calculate the molar mass of the
unknown compound. **(3 M)**
- Q. 7. State Van't H.off -Avogadro's law and Van't H.off- Charles law. Why is molality of a solution
independent of temperature? **(3 M)**
- Q. 8. Explain the following terms: **(3 M)**
- a) Mole fraction
 - b) Semi-permeable membrane
 - c) Raoult's law

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CHEMISTRY – TUTORIAL

TOPIC: CHEMICAL THERMODYNAMICS & ENERGETICS

- Q.1) Define: a) State function b) Residual entropy (2 M)
- Q.2) Derive the relationship between ΔH & ΔU (2 M)
- Q.3) Derive the expression for work when gas expands against constant external pressure. (2 M)
- Q.4) Explain with reason sign conventions of ΔS in the following reactions: (2 M)
- i) $N_{2(g)} + 3 H_{2(g)} \longrightarrow 2 NH_{3(g)}$ ii) $CO_{2(g)} \longrightarrow CO_{2(s)}$
- Q.5) Calculate the maximum work when 24 g of oxygen are expanded isothermally & reversibly from pressure of 1.6×10^5 Pa to 1000 kPa at 298 K. (3 M)
- Q.6) Derive the expression for maximum work done. (3 M)
- Q.7) Calculate the C-Cl bond enthalpy from following reaction: (3 M)
- $CH_3Cl_{(g)} + Cl_{2(g)} \longrightarrow CH_2Cl_{2(g)} + HCl_{(g)}$; $\Delta H^0 = -104$ kJ if C-H, Cl-Cl & H-Cl bond enthalpies are 414, 243 & 431 kJ mole⁻¹ respectively.
- Q.8) Calculate ΔH^0 for the following reactions: $2H_3BO_{3(aq)} \longrightarrow B_2O_{3(s)} + 3H_2O_{(l)}$ (3 M)
- Given that:
- a) $H_3BO_{3(aq)} \longrightarrow HBO_{2(aq)} + H_2O_{(l)}$ $\Delta H_1^0 = -0.02$ kJ
- b) $H_2B_4O_{7(s)} \longrightarrow 2B_2O_{3(s)} + H_2O_{(l)}$ $\Delta H_2^0 = 17.3$ kJ
- c) $H_2B_4O_{7(s)} + H_2O_{(l)} \longrightarrow 4HBO_{2(aq)}$ $\Delta H_3^0 = -11.58$ kJ

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TOPIC: ELECTROCHEMISTRY

- Q. 1. Define: a) Faraday's 1st law b) Molar Conductivity (2 M)
- Q. 2. Draw a neat labelled diagram of SHE. (2 M)
- Q. 3. Write the Nernst equation and explain the terms involved. (2 M)
- Q. 4. Calculate e. m. f of the following Cell at 25° C, (2 M)
- $\text{Zn} \mid \text{Zn}_{(\text{aq})}^{+2} \parallel \text{Cu}_{(\text{aq})}^{+2} \parallel \text{Cu}_{(\text{s})}$
- (6.1 M) (0.5 M)
- Standard reduction potential of Zn and Cu are – 0.76V and 0. 334 V respectively.
- Q. 5. Resistance of Conductivity cell filled with 0.1 M KCl Solution is 100 Ohms,
Calculate the conductivity and Molar Conductivity of 0.02 M KCl solution.
(Given: Conductivity of 0.1 M KCl solution is 1.29 Sm⁻¹) . (3 M)
- Q. 6. What is Electrochemical series? Explain its application in the determination of
relative Strength of oxidising and Reducing Agent. (3 M)
- Q. 7. Explain the reactions involved in lead accumulator battery? (3 M)
- Q. 8. What is corrosion? Explain any two methods for prevention of corrosion. (3 M)

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CHEMISTRY - TUTORIAL

TOPIC: CHEMICAL KINETICS

- Q. 1. Define: a) Rate law b) Average rate of reaction (2 M)
- Q. 2. Distinguish between Molecularity and order of reaction. (2 M)
- Q. 3. Derive a relation between half life and rate constant for a first order reaction. (2 M)
- Q. 4. The reaction $2\text{H}_{2(g)} + 2\text{NO}_{(g)} \longrightarrow 2\text{H}_2\text{O}_{(g)} + \text{N}_{2(g)}$ is 1st order in H_2 and 2nd order in NO . (2 M)
- The rate constant of the reaction at a certain temperature is $0.42 \text{ M}^{-2}\text{s}^{-1}$.
- Calculate the rate when $[\text{H}_2] = 0.015 \text{ M}$ and $[\text{NO}] = 0.025 \text{ M}$.
- Q. 5. What is Pseudo first order reaction? Write 2 examples of it. (3 M)
- Q. 6. How does a catalyst differ from reaction intermediate? (3 M)
- Q. 7. The half life of a 1st order reaction is 900 min at 820K, estimate its half life at 720K if the energy of activation of reaction is 250 kJ mol^{-1} (Given $R = 8.314 \text{ J/K}$) (3 M)
- Q. 8. The rate constant of a 1st order reaction 25°C is 0.24 s^{-1} . If the energy of activation of the reaction have rate constant of $4 \times 10^{-2} \text{ s}^{-1}$? (3 M)

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CHEMISTRY – TUTORIAL

TOPIC: GENERAL PRINCIPLES & PROCESSES OF ISOLATION OF ELEMENTS

- Q. 1. What is Calcination? Explain it with reactions. (2 M)
- Q. 2. Write chemical formulae of the following ores, (2 M)
- a) Calamine b) Haematite c) Magnetite d) Corundum
- Q. 3. Describe froth floatation process for concentration of sulphide ore. (2 M)
- Q. 4. Define: i) Gangue ii) Pig tin (2 M)
- Q. 5. Define Flux. Draw a neat and labelled diagram of Bessemer converter used in the extraction of copper. (3 M)
- Q. 6. Define Smelting. Draw a neat and labelled diagram of electrolytic cell for extraction of aluminium. (3 M)
- Q. 7. Write the reactions involved at different temperatures in the blast furnace. (3 M)
- Q. 8. Explain electrolytic refining method for extraction of pure alumina. (3 M)

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CHEMISTRY - TUTORIAL

TOPIC: p - Block Elements(15 gp)

- Q. 1. Draw the structure of Nitrogen dioxide & two uses of phosphine. (2 M)
- Q. 2. Explain non-metallic & metallic character of elements of group 15. (2 M)
- Q. 3. Draw structure and write geometry of PCl_3 & PCl_5 (2 M)
- Q. 4. NF_3 is possible, but NF_5 is not why? (2 M)
- Q. 5. What is the action of the following reagents on Ammonia? (3 M)
- i) Excess air ii) Excess of Chlorine iii) Na metal
- Q. 6. How is phosphine prepared from the following reagent? (3 M)
- i) HCl ii) H_2SO_4 iii) Caustic soda
- Q. 7. Write the reactions involved in large scale preparation of nitric acid. (3 M)
- Q. 8. Explain how does nitrogen exhibit anomalous behaviour amongst group 15 elements. (3 M)

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TOPIC: p – Block Elements(16 gp)

- Q. 1. How is sulphuric acid manufactured by lead Chamber process ? (2 M)
- Q. 2. Explain the structure of Sulphur dioxide. (2 M)
- Q. 3. Draw the structure of orthophosphoric acid and Dithionous acid. (2 M)
- Q. 4. Write the electronic configuration of the following elements: (2 M)
- a) Sulphur (z = 16) b) Selenium (z = 34)
- Q. 5. What is the action of the following reagents on dioxygen? (3 M)
- i) Ca ii) Iron iii) CS₂
- Q. 6. Explain the trends in the following properties with reference to group 16 : (3 M)
- i) Density ii) Ionization enthalpy iii) Electronegativity
- Q. 7. What are the different types of oxides? Give Examples. (3 M)
- Q. 8. Describe anomalous behavior of oxygen as compared with other (3 M)
- elements of group 16 reference to ---
- a) Magnetic property b) Oxidation state c) Hydrides

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TOPIC: p – BLOCK ELEMENTS(Group 17 & Group 18)

- Q. 1. Why does fluorine shows anomalous behaviour? (2 M)
- Q. 2. Write four uses of Argon. (2 M)
- Q. 3. Define inter halogen compounds. Give examples. (2 M)
- Q. 4. Draw the Structure of ClF_3 , XF_6 , IF_7 . (2 M)
- Q. 5. What happens when: (3 M)
- i) Thin copper leaves are thrown in a jar of chlorine?
 - ii) Chlorine is treated with excess of ammonia?
 - iii) Chlorine is passed over dry slaked lime?
- Q. 6. Write the names and electronic configuration of group 18 elements. (3 M)
- Q. 7. What is the action of halogen with Alkali & Water? (3 M)
- Q. 8. Explain the trends in the following properties with reference to group 17 : (3 M)
- i) Non-metallic character ii) Ionization enthalpy iii) Electronegativity

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TOPIC: d & f - Block elements

- Q. 1. What are chemical twins? Write two examples. (2 M)
- Q. 2. Why chromium & copper showing anomalous behavior? (2 M)
- Q. 3. Define: a) Interstitial Compound b) Lanthanoid Contraction (2 M)
- Q. 4. Transition elements show variable oxidation states. Explain. (2 M)
- Q. 5. Differentiate between Lanthanides & Actinides. (3 M)
- Q. 6. Write balanced chemical equations for action of potassium permanganate on
i) Hydrogen ii) warm H_2SO_4 iii) Heat (3 M)
- Q. 7. What is action of acidified potassium dichromate on
i) SO_2 ii) KI & Draw structure of dichromate ion. (3 M)
- Q. 8. Write any one method of preparation of KMnO_4 . (3 M)

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TOPIC: CO-ORDINATION COMPOUNDS

- Q. 1. Illustrate with example, the difference between double salt and Co-ordination compounds. (2 M)
- Q. 2. Write applications of co-ordination compounds in medicine and electroplating. (2 M)
- Q. 3. Write the IUPAC names of the following complexes: $[\text{PtBr}_2(\text{NH}_3)_4]$ & $[\text{Co}(\text{en})_3]\text{Cl}_3$ (2 M)
- Q. 4. State the superiority of CFT over valence bond theory. (2 M)
- Q. 5. What are hydrate isomers? Give examples. Draw structure of $\text{Ni}(\text{CO})_4$. (3 M)
- Q. 6. Explain sidwick's theory with suitable example. Draw structure of $[\text{CoCl}_4]^{-2}$ (3 M)
- Q. 7. Define : a) Homoleptic Complex b) Central metal atom/ions c) Linkage isomer. (3 M)
- Q. 8. Calculate the effective atomic number of central atom in the following: (3 M)
i) $\text{Ni}(\text{CO})_4$ ii) $[\text{Zn}(\text{NH}_3)_4]^{2+}$

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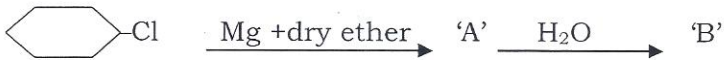
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TOPIC: HALOGEN DERIVATIVES OF HALO ALKANE & HALO ARENE

- Q. 1. Explain Sandmeyer Reaction. (2 M)
- Q. 2. Distinguish between S_N1 & S_N2 mechanism. (2 M)
- Q. 3. What is the action of (2 M)
- (a) Sodium metal on Chlorobenzene (b) PCl_3 on Propan-2-ol
- Q. 4. Complete the following reaction and identify 'A' and 'B' (2 M)
- 
- Q. 5. Explain mechanism of hydrolysis of tert-butyl bromide. (3 M)
- Q. 6. Explain optical activity of lactic acid. (3 M)
- Q. 7. Draw structure of DDT. Why does p-nitrochlorobenzene undergoes displacement reaction readily with attack of nucleophilic OH^- ion? (3 M)
- Q. 8. Write the conversion of - (3 M)
- (a) 2-Bromobutane to But-2-ene
- (b) Chlorobenzene to 2-Chloroacetophenone
- (c) Chloroethane to diethylether

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TOPIC: ALCOHOLS, PHENOLS & ETHERS

- Q. 1. What is Metamerism? Explain with suitable example of ethers. (2 M)
- Q. 2. Explain Kolbe's Reaction. (2 M)
- Q. 3. Write chemical reactions for the following conversion. (2 M)
(a) Phenol to Anisole (b) Aniline to Phenol
- Q. 4. Complete the following reaction and identify 'A' and 'B' (2 M)
$$\text{CH}_3 - \text{CH} = \text{CH}_2 \xrightarrow[\Delta]{\text{Con H}_2\text{SO}_4} \text{'A'} \xrightarrow{\text{H}_2\text{O}} \text{'B'}$$
- Q. 5. Explain the mechanism of action of hydroiodic acid on 3-Methylbutano-2-ol. (3 M)
- Q. 6. How is Ethanol, Propan-2-ol and 2-Methylpropan-2-ol prepared from Grignard's reagent? (3 M)
- Q. 7. Write the following conversion :- (3 M)
(a) Cyclopentanone to Cyclopentanol
(b) Phenol to Benzoquinone
(c) Ethoxyethane to Ethyl iodide
- Q. 8. Write chemical test to distinguish between carboxylic acid and alcohol. Write the uses of methanol. (3 M)

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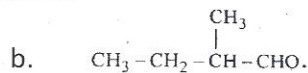
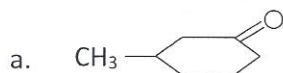
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CHEMISTRY – TUTORIAL**

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TOPIC: ALDEHYDES, KETONES & CARBOXYLIC ACIDS

Q. 1. Write IUPAC names of the following compounds: (2 M)



Q. 2. How is Ethanoic acid prepared from dry ice? (2 M)

Q. 3. How following conversions are carried out? (2 M)

(a) Aniline to sulphuric acid (b) Benzene diazonium chloride to Fluorobenzene

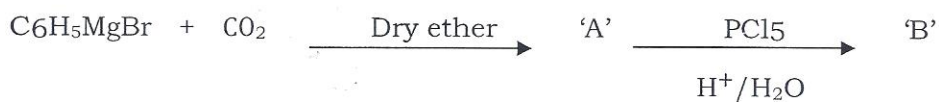
Q. 4. Explain, why boiling points of carboxylic acids higher than corresponding alcohols. (2 M)

Q. 5. Explain the mechanism of Aldol addition reaction. (3 M)

Q. 6. Write balanced chemical equations for action of ammonia on – (3 M)

a) Formaldehyde b) Acetaldehyde c) Acetone

Q. 7. What is Stephen reaction? Identify 'A' and 'B' in the following reaction: (3 M)



Q. 8. How are the following conversions carried out? (3 M)

a) 2-Methylbutan-1-ol into 2-Methylbutanoic acid.

b) Phenylethene into Benzoic acid

c) Benzoic acid into meta-nitrobenzoic acid.

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TOPIC: COMPOUNDS CONTAINING NITROGEN

- Q. 1. Write a note on Gabriel phthalimide synthesis. (2 M)
- Q. 2. Explain: Aryl amines are less basic than ammonia? (2 M)
- Q. 3. How following conversions are carried out? (2 M)
- (a) Aniline to sulphuric acid (b) Benzene diazonium chloride to Fluorobenzene
- Q. 4. Complete the following reaction and identify 'A' and 'B' (2 M)
- $$\text{CH}_3 - \text{CH}_3 \xrightarrow[\Delta]{\text{HNO}_3} \text{'A'} \xrightarrow{\text{Zn} | \text{NH}_4\text{Cl}} \text{'B'}$$
- Q. 5. Write a note on Nef carbonyl synthesis. (3 M)
- Q. 6. Explain Hoffmann elimination reaction. (3 M)
- Q. 7. How are 1 - Nitro propane , 2 - Nitropropane and 2 - Methyl - 2 - nitropropane (3 M)
- are distinguished each other using acidic hydrolysis ?
- Q. 8. What is the action of mixture of NaNO_2 and HCl on :- (3 M)
- (a) Ethylamine (b) Aniline (c) Diethylamine

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CHEMISTRY – TUTORIAL

TOPIC: BIOMOLECULES

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|-------|--|-------|
| Q. 1. | Define Proteins? How are protein classified? | (2 M) |
| Q. 2. | What is the action of the following on glucose i) Dil. HNO_3 ii) HCN | (2 M) |
| Q. 3. | How is Glucose prepared from sucrose? | (2 M) |
| Q. 4. | Explain Zwitter ion. | (2 M) |
| Q. 5. | Define Lipids. How are carbohydrates classified? | (3 M) |
| Q. 6. | Define peptide linkage. Write the Haworth structural formula of $\alpha - \text{D} - (+) - \text{Glucofuranose}$ and $\alpha - \text{D} - (-) - \text{Fructofuranose}$. | (3 M) |
| Q. 7. | What is the action of following reagents on glucose?
(a) Bromine water (b) Hot HI (c) NH_2OH | (3 M) |
| Q. 8. | What are vitamins? How are they classified? | (3 M) |

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CHEMISTRY – TUTORIAL

TOPIC: POLYMERS

- Q. 1. Define: a) Homo polymer b) Natural Rubber (2 M)
- Q. 2. Write names and chemical formulae of monomers used in preparing Buna-S. (2 M)
- Q. 3. Write Chemical reaction involved in preparation of Terylene. (2 M)
- Q. 4. Distinguish between Thermo plastic polymer and Thermosetting polymer (2 M)
- Q. 5. What are non-bio-degradable polymer. Write any one example. How is PHBV prepared? (3 M)
- Q. 6. Explain the mechanism of Bakelite formation in acidic basic medium. (3 M)
- Q. 7. Write a note on Vulcanisation process. Write monomer used in preparing ABS-plastic? (3 M)
- Q. 8. Write the structure of Neoprene. Explain the classification of polymer based on sources. (3 M)

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CHEMISTRY – TUTORIAL

TOPIC: CHEMISTRY IN EVERYDAY LIFE

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|-------|--|-------|
| Q. 1. | What are soaps? How are they prepared? | (2 M) |
| Q. 2. | Define: Antacids & Antiseptic | (2 M) |
| Q. 3. | Write molecular formula & structural formula of BHT & BHA. | (2 M) |
| Q. 4. | Describe 'any two' Physical methods of food preservation. | (2 M) |
| Q. 5. | What are detergents? Write a note on cationic detergents. | (3 M) |
| Q. 6. | Explain the mechanism of receptor-drug interaction. | (3 M) |
| Q. 7. | Explain the chemical methods for the preservation of food. | (3 M) |
| Q. 8. | Explain the mechanism of cleansing action of soap. | (3 M) |

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