R.K. Vigyan (P.G.) Mahavidyalay, Kalwar, Jaip
Chemistry sem-IV FLP-1

Sec. A: Attempt all 10 questions. Each question carries a mark weightage of 2.

1. What are transition elements? Give their definition. 2. Write any two properties of d-block elements. 3. What is d-d transition? 4. What are alcohols and how many parts are they divided into? 5. Give one example each of primary, secondary and tertiary alcohols. 6. What happens when ethanol reacts with methyl magnesium bromide. 7. What are carboxylic compounds and what is their general formula. 8. Write two chemical reactions for the formation of carboxylic compounds. 9. What was the need for the second law of thermodynamics? 10. Write the definition of the second law of thermodynamics given by Kelvin.

Sec.- B Choose any 4 questions, choosing 1 question from each unit. Each question carries a mark weightage of 15.

UNIT-I (1) Explain the properties of transition elements in detail. (2) Explain the stereochemistry of complexes (coordination number 4) of first series transition elements with examples.

UNIT-II (1) Explain the following reactions (a)
(a) Pinacol Pinacolone rearrangement reaction (b) Haben-Hosch reaction (c) Claisen rearrangement reaction (b) How is epoxide obtained from methyl magnesium iodine

(2) Write a note on the following:
(a) Reimer-Tiemann reaction (b) Frisch rearrangement reaction (c) Laderer-Mannase reaction (d) Kolbe-Schmidt reaction (e) Explain why ethers have lower boiling points than isovaleric alcohols

UNIT-III (1) What happens when
(a) Citric acid is reduced with HI. (b) Tartaric acid is treated with Fenton's reagent. (c) Adipic acid is heated. (d) Give the complete synthesis of tartaric acid. (e) What happens when malic acid is treated with HI?

(2), explain the following
(a) How will you prove that citric acid contains one hydroxyl and three carboxylic groups? (b) Give the oxidation of tartaric acid in different oxidation states. (c) What happens when 3-oxobutyric acid is heated at 150°C? (d) What happens when methyl acrylate is distilled with butanol?

UNIT-IV (1) Write short notes on the following (a)
Applications of Carnot's theorem (b) Gibbs-Helmholtz equation (c) Third law of thermodynamics

(2) Write short notes on the following: (a)
Explain what is Carnot cycle (b) Explain the entropy of mixing of ideal gases (c) Clausius

what is inequality

Scanned with CamScanner

R.K. Vigyan (P.G.) Mahavidyalay, Kalwar, Jaipur
CHEMISTRY sem-IV FLP-2

Sec. A: Attempt all 10 questions. Each question carries a mark weightage of 2.

1. State the catalytic activity of transition elements. 2. In MnO_4, Mn^{+2} is diamagnetic but explain why it is coloured. 3. Why are Cu^{+} and Cu^{+2} more stable? 4. What happens when ethylene glycol is treated with terephthalic acid? 5. Why is alcohol acidic in nature? 6. Give the esterification reaction of alcohol. 7. Write two physical properties of carboxylic acids. 8. State the acidic properties of carboxylic acids. 9. Define the second law of thermodynamics. 10. What is meant by reversible cycle?

Sec.- B Choose any 4 questions, choosing 1 question from each unit. Each question carries a mark weightage of 15.

UNIT-I (1) Explain that transition elements show variable oxygen states. Explain the different oxidation states of the elements of the first series. (2) Discuss the oxidation states for the elements of the second transition series and compare them with the lighter elements of their group.

UNIT-II (1) Explain the following
(a) How will you obtain phenol from cumene? (b) Give the structure of the following
(i) Phenolphthalein (ii) Fluorescein (c) Ortho and para nitrophenol are more acidic than alcohols why (d) The boiling point of ethanol is higher than that of methoxy methane why (e) Reaction of propene with dilute H_2SO_4

(2) What happens when
(a) Reaction of propane with concentrated H_2SO_4 and concentrated HNO_3 is done with a cold mixture of (b) If methanol is treated with sterol indigo chloride (c) 2-propanol chlorine and What happens when it reacts with NaOH? (d) Ethanol is heated with concentrated H_2so_4 at 140C (e) What happens when ethylene glycol is heated with $ZnCl_2$?

UNIT-III (1) Explain the following
(a) Write the mechanism of acid catalyzed water addition of ester (b) Write the mechanism of Reformastki reaction (c) What happens when acetyl chloride is subjected to Rosen Mundt reduction (d) Acetyl anhydride What happens when you heat it with ethanol? (2) (a) Carboxylic acid Explain the effect of substituents on the acidity of (b) carboxylic acid and alcohol Both have O group but the carboxylic group is more acidic why (c) How will you obtain malonic acid from acetic acid (d) Explain the mechanism of acid catalyzed esterification

UNIT-IV (1) (a) What are the limitations of the first law of thermodynamics? Why was the second law of thermodynamics needed? (b) What do you understand by residual entropy? (c) Derive the Gibbs-Helmholtz equation. (2) (a) What is the physical significance of entropy? (b) What is entropy? Derive the expression for entropy change for an ideal gas. (c) The efficiency of an engine is 0.527. If the temperature of the sink is 25°C, find the temperature of the source.

Scanned with CamScanner

R.K. Vigyan (P.G.) Mahavidyalay, Kalwar, Jaipur

CHEMISTRY sem-IV (Unit 1 & 2) HLP-I

Sec. A Choose any 5 questions. Each question carries a mark weightage of 2.

1. Why is CrO4 basic, Cr2O4 amphoteric and CrO3 acidic? 2. Why do transition elements have high melting points? 3. Explain the magnetic properties of transition elements. 4. Why do transition elements show variable oxidation states? 5. In KMnO4, the oxidation state of Mn is +7 and despite being diamagnetic, it is coloured. 6. What are vicinal greycols? Give the formula. 7. Explain the hydrogen bond in alcohols. 8. What are ketones in aldehydes? Write their structural formula. 9. Write two methods of preparation of aldehydes. 10. Write two methods of preparation of ketones.

Sec. B: Choose any 2 questions, choosing 1 question from each unit. Each question carries a mark weightage of 15.

UNIT-I (1) Explain the stereochemistry of transition elements of the second and third series.

(2) Explain the oxidation state and magnetic behaviour of second and third transition elements.

UNIT-II (1) (a) Explain in detail the acidic nature of alcohols and also state the acidic reactions (b) How will you obtain the following from glycol (i) polyester (ii) glyoxal (c) BUVO block Explain what reduction is

(2) (a) Ethylene glycol can be used to How to achieve the following (i) 1,4-dioxane (ii) acetaldehyde (b) What happens when oxalic acid is treated with glycerol at 230-260 C (at high temperature) (c) What happens when glycerol is treated with KHSO4

Scanned with CamScanner

R.K. Vigyan (P.G.) Mahavidyalay, Kalwar, Jaipur

Chemistry sem-IV (Unit 3 & 4) HLP-II

Sec. A Choose any 5 questions. Each question carries a mark weightage of 2.

1. Why direct nitration of aniline is not possible? 2. Benzil is more basic than p-toluene. 3. State the stereoisomerism of amino compounds. 4. Give the synthesis of citric acid from glycerol. 5. Hale-Bolay-Zeliski reaction. 6. What is Carnot cycle? 7. Explain spontaneous process with an example. 8. Write the expression for work done by the system in isothermal expansion. 9. What is meant by heat reservoir? 10. Define entropy.

Sec. B: Choose any 2 questions, choosing 1 question from each unit. Each question carries a mark weightage of 15.

UNIT-III (1) How will you obtain (a) Fumaric acid (b) Succinic acid from maleic acid (c) (d) Maleic acid to maleic acid (e) Ethyne to lactic acid

(2) Give one method of preparing each of the following

(a) Lactic acid (b) Succinic acid (c) Tartaric acid (d) Citric acid (e) What is lactic acid heated to 170 degrees centigrade

UNIT-IV (1) (a) Explain Klaus-Klopper equation and its applications. (b) Explain residual entropy taking the example of carbon monoxide. (c) What is Carnot cycle and explain its efficiency.

(2) (a) Derive the relation between Kp and Kc. (b) Explain Le-Shatel's principle. (c) What is meant by reaction isotherm?

Scanned with CamScanner

R.K. Vigyan (P.G.) Mahavidyalay, Kalwar, Jaipur
Chemistry sem-IV (Unit 1) QLP-I

Sec. A Choose any 3 questions. Each question carries 2 marks.

1. What are transition elements? Why are Zn, Cd, Hg not considered transition elements? 2. Why are transition metals most suitable for complex compounds? 3. Consider the second ionization potential of Cr and Cu compared to their neighbouring elements. Why are they larger than each other? 4. The covalent radii of Zr and Hf are almost the same. 5. MnO_3 is acidic while MnO is basic. 6. Cu^+ is white while Cu^{+2} is coloured. 7. Define lanthanide elements and write the formula for their general electronic configuration. 8. Define actinide elements and write the formula for their general electronic configuration. 9. Define lanthanide contraction. 10. What is the effect of lanthanide contraction on atomic size?

Sec. B Choose any 1 question. Each question carries 15 marks.

UNIT-I (1) (a) Mn^{+2} ion is more stable whereas Mn^{+3} ion is misty. (b) The size of atoms and ions of second and third transition series are almost similar. Why? (c) FeO is more basic than FeO_3.

(2) (a) Write a note on the colour and behaviour of transition elements in spectra. (b) Explain the stereochemistry of transition elements of the second and third series.

(3) (a) Ionization energy decreases from top to bottom in a group, but why do metals in the third transition series have higher ionization energies than those above them? (b) Write a note on the colour and spectral behaviour of transition elements.

(4) What is lanthanide contraction and what effect does lanthanide contraction have on their properties?

Scanned with CamScanner

R.K. Vigyan (P.G.) Mahavidyalay, Kalwar, Jaipur
Chemistry sem-IV (Unit 2) QLP-II

Sec. A Choose any 3 questions. Each question carries 2 marks.

1. What are phenols? State their structure. 2. State two methods of preparation of phenol. 3. State two methods of preparation of alcohol. 4. Write two chemical properties of alcohols. 5. Write two chemical properties of phenols. 6. Compare the acidic properties of phenols and alcohols. 7. What happens when PCl5 is reacted with glycerol. 8. Write two physical properties of aldehydes. 9. How will you prepare aldehyde by Rosen Mund reduction. 10. Synthesize ketone using 1,3 dithiene.

Sec. B Choose any 1 question. Each question carries 15 marks.

UNIT-II (1) (a) What happens when a glycol is treated with periodic acid (HIO4)? (b) Write the mechanism of esterification of alcohol. (c) How will you obtain isopropyl iodine from glycerol?

(2) (a) What is the Garter Mann synthesis reaction in phenol? Give its mechanism. (b) Why is the acid strength of phenols higher than that of alcohols?

(3) Explain the following reactions with their mechanism. (a) Cannizzaro reaction (b) Knoevenage reaction (c) Mannich reaction (d) Clemmensen reduction

(4) Explain the following reactions with their mechanism. (a) Wolf (b) Küschner reduction (c) Aldol condensation (d) Benzene condensation

Scanned with CamScanner

R.K. Vigyan (P.G.) Mahavidyalay, Kalwar, Jaipur
Chemistry sem-IV (Unit 3) QLP-III

Sec. A Choose any 3 questions. Each question carries 2 marks.

1. Beer-Villiger oxidation 2. Give two methods of preparation of nitroalkene 3. Give two methods of preparation of nitrobenzene 4. What is diazotization reaction 5. Give one method of preparation of aryl amine 6. What is picric acid, write its structural formula 7. What happens when picric chloride is treated with sodium methoxide at 20°C 8. Write one reaction of reduction of nitro compounds 9. How will you obtain fluorobenzene from aniline 10. How will you synthesize biphenyl from aniline

Sec. B Choose any 1 question. Each question carries 15 marks.

UNIT-III (1) (a) Give the reduction of nitrobenzene under different pH conditions (b) Explain Gabriel phthalimide reaction (c) Give two reactions of azo conjugation

(2) Write a note on the following reactions.
(a) Hofmann bromide reaction (b) Bolzschmann reaction (c) Schotten Baumann reaction (d) Explain what is Sandmeyer reaction

(3) (a) Write a note on the stereochemistry of amino acids. (b) Separation of 1,2,3' amines by Heinzberg's method.

(c) Give the method of formation of amine by reductive amination of ketone to aldehyde.
(4) Explain the following (a) Write the Hofmann method for the separation of a mixture of 1,2,3' amines (b) Explain the Curtius reaction (c) Explain the basic nature of amine group

Scanned with CamScanner

R.K. Vigyan (P.G.) Mahavidyalay, Kalwar, Jaipur
Chemistry sem-IV (Unit 4) QLP-IV

Sec. A Choose any 3 questions. Each question carries 2 marks.

1. What do you understand by the efficiency of Carnot cycle 2. What is Carney's theorem 3. What do you understand by isothermal compression 4. Write the definition of the second law of thermodynamics given by Claudius 5. Write the definition of the first law of thermodynamics 6. What is an isothermal process 7. What is chemical equilibrium 8. Define Nernst's heat theorem 9. What is Gibbs energy 10. What is a reversible reaction, give one example

Sec. B Choose any 1 question. Each question carries 15 marks.

(1) (a) Derive the relation between equilibrium constant and free energy (b) State the condition for spontaneous conversion (c) Derive the law of active mass based on thermodynamics.

(2) (a) Explain Nersert's heat theorem (b) Explain Carnot cycle for a system containing one mole of ideal gas (c) Define spontaneous process. What will be the value of ΔG for it to be in equilibrium?

(3) (a) Two masses of an ideal gas at 27°C are allowed to expand from a volume of 1 litre to a volume of 10 litres. Calculate ΔS for this change. (R = 1987 calories) (b) Find the heat of vaporization of two masses of benzene at its boiling point of 80°C.

Scanned with CamScanner