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IV Semester B.Sc. Degree Examination, September/October- 2022

CHEMISTRY
(Scheme Regular)

Paper : IV



Time : 3 Hours

Maximum Marks : 70

Instructions to Candidates :

- 1) Question paper has two sections. Answer both section-A and Section-B.
- 2) Write equations and diagrams wherever necessary.

SECTION - A

Answer any FIVE questions from the following. Each question carries SEVEN marks.
(5×7=35)

1.
 - a) Give two advantages of powder metallurgy.
 - b) Why is aluminium preferred over carbon in the reduction of chromic oxide?
 - c) Describe the extraction of thorium from monazite sand. (2+2+3)
2.
 - a) Explain Lanthanide contraction. What are the consequences of Lanthanide contraction?
 - b) Write the general electronic configuration of actinoids.
 - c) What are Latimer diagrams? (3+2+2)
3.
 - a) Describe Mond's process of purification of Nickel.
 - b) Discuss the properties of 'd' block elements with respect to.
 - i) Complex formation.
 - ii) Catalytic activity. (3+4)
4.
 - a) How are Lanthanides separated by ion exchange chromatography?
 - b) Give the IUPAC names of the following complexes.
 - i) $[\text{Pt}(\text{NH}_3)\text{ClBrNO}_2]^+$
 - ii) $[\text{Co}(\text{en})(\text{C}_2\text{O}_4)_2]^-$
 - iii) $\text{K}_3[\text{Fe}(\text{CN})_6]$ (4+3)

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(2)

12422

5. a) Based on valence bond theory explain
- i) Formation.
 - ii) Hybridization
 - iii) Structure
 - iv) Magnetic property of tetrachlorido nickelate(II).
- b) Give the postulates of crystal field theory. (4+3)
6. a) Write the structure of EDTA. Indicate the donor atoms in EDTA.
- b) Explain ionisation Isomerism in coordination compounds with an example.
- c) Write the structure of $K_2[PtCl_2(NH_3)_4]$ (3+2+2)
7. a) Describe briefly about the use of
- i) Wilkinson's Catalyst in hydrogenation of alkene.
 - ii) Cis-platin in cancer chemotherapy.
- b) Write the geometric isomers of octahedral complexes with the formula $[Ma_3b_3]$.
- c) What are ambidentate ligands? (4+2+1)

SECTION - B

Answer any FIVE questions from the following questions. Each question carries SEVEN marks. (5×7=35)

8. a) Define compressibility factor and give the mathematical expression.
- b) Calculate the most probable velocity of oxygen molecule at 300K. $R = 8.314 \text{ J mol}^{-1} \text{ K}^{-1}$.
- c) Explain Andrew's isotherm for carbon dioxide. (2+2+3)
9. a) Discuss Amagat's mean density method for determination of critical volume.
- b) Define collision frequency of gas molecules.
- c) What is Joule - Thomson effect? (3+2+2)
10. a) Derive the expression for critical temperature, Critical volume and critical pressure in terms of van der Waal's constants.
- b) State the law of corresponding states. (5+2)



(3)

12422

11. a) Define surface tension of a liquid.
b) Explain the effect of temperature on surface of a liquid.
c) Discuss the determination of viscosity of a liquid using ostwald's viscometer. (2+2+3)
12. a) Derive Bragg's equation, $n\lambda = 2d \sin \theta$
b) Explain plane of symmetry and axis of symmetry with an example. (3+4)
13. a) Define "Temperature coefficient of reaction".
b) Explain Lindemann's Hypothesis of unimolecular reaction.
c) For a reaction, the values of rate constants at 298 and 338K are 3.46×10^{-5} and 4.81×10^{-3} respectively. Calculate the energy of activation $R = 8.314 \text{ J K}^{-1} \text{ mol}^{-1}$. (2+3+2)
14. a) The half change time for a second order reaction is 20 mins. When the initial concentration of the reactant is 0.018 mol/dm^3 . calculate the value of k.
b) Write Arrhenius equation and explain the terms involved in it.
c) What is zero order reaction? Give an example. Write the expression for its rate constant. (2+2+3)
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11422

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IV Semester B.Sc. Degree Examination, September/October- 2022

CHEMISTRY

Chemistry - IV

(CBCS Scheme Repeaters 2019-20 onwards)

Paper : IV



Time : 3 Hours

Maximum Marks : 70

Instructions to Candidates :

1. The question paper has two parts. Answer both the parts.
2. Write equations wherever necessary.

PART - A

Answer any EIGHT of the following questions. Each question carries TWO marks.

(8×2=16)

1. Calculate the number of degrees of freedom of water system
 - i) At a triple point
 - ii) On a curve.
2. Define “degrees of freedom” of a system.
3. What are alloy steels? Give an example.
4. Mention two methods of treatment of water for domestic and industrial purposes.
5. What are isotopes? Mention the radioactive isotope of hydrogen.
6. Calculate the half life of a radioactive element whose decay constant is $1.64 \times 10^{-2} \text{ yr}^{-1}$.
7. What are the advantages of heat treatment of steel?
8. Write Gattermann koch aldehyde synthesis.
9. What is Greenhouse effect?
10. Explain aldol condensation with an example.
11. Why is formic acid stronger than acetic acid?
12. How is ethyl acetoacetate prepared?

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PART - B

Answer any NINE of the following questions. Each question carries SIX marks.

(9×6=54)

13. a) Draw a labelled phase diagram for water system indicate the triple point and curves.
b) Mention the number of phases in the following systems:
i) $\text{H}_2(\text{g}) + \text{O}_2(\text{g}) \rightarrow \text{H}_2\text{O}(\text{l})$
ii) $\text{CaCO}_3(\text{s}) \rightleftharpoons \text{CaO}(\text{s}) + \text{CO}_2(\text{g})$ (4+2)
14. a) Derive Bragg's equation, $n\lambda = 2d \sin \theta$
b) Sketch the unit cell of caesium chloride and indicate the caesium ions. (4+2)
15. a) What are Smectic and Nematic liquid crystals? Give an example for each.
b) What is a freezing mixture? Give an example. (4+2)
16. a) Describe the production of tungsten powder from wolframite.
b) Write a note on hardness of water. (4+2)
17. a) Derive the relation $N = N_0 e^{-\lambda t}$ for the decay of a radioactive element.
b) What is the role of a coolant in a nuclear reactor? Give two examples. (4+2)
18. a) Differentiate nuclear fission from nuclear fusion.
b) What is radiocarbon dating? (4+2)
19. a) What are the causes and remedial measures taken for depletion of Ozone layer?
b) Give the influence of chromium and tungsten on the properties of steel. (4+2)
20. a) Describe the manufacture of Ferrosilicon.
b) What is Austenite? Mention its properties. (4+2)
21. a) How are ketones prepared from
i) Nitriles
ii) Acid chlorides
b) Explain Knoevenagel condensation with an example. (4+2)



22. a) Explain the reactions of :
- i) Acetaldehyde with ethanol
 - ii) Acetone with LiAlH_4
- b) How is acetyl chloride converted to acetaldehyde? (4+2)
23. a) Describe the action of heat on the following:
- i) Oxalic acid
 - ii) Malonic acid
- b) Arrange the following in the increasing order of acid strength.
 CH_3COOH , Cl_2CHCOOH , ClCH_2COOH , Cl_3CCOOH (4+2)
24. a) How are following compounds prepared from ethyl acetoacetate?
- i) Butanoic acid
 - ii) Cinnamic acid
- b) Write the keto-enol forms of ethyl acetoacetate (4+2)
25. a) Describe the different stages of sewage treatment.
- b) Define Biochemical Oxygen Demand. (4+2)
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