



K23U 2336

Reg. No. : .....

Name : .....

V Semester B.Sc. Degree (C.B.C.S.S. – O.B.E. – Regular/Supplementary/  
Improvement) Examination, November 2023

(2019-2021 Admissions)

CORE COURSE IN CHEMISTRY/POLYMER CHEMISTRY

5B10CHE/PCH : Physical Chemistry – II

Time : 3 Hours

Max. Marks : 40

**Instruction** : Answer the questions in **English** only.

SECTION – A

Answer **all** questions. **Each** carries **1** mark.

1. What is inversion temperature ?
2. Give Gibb's-Helmholtz equation.
3. What is the relationship between  $K_p$  and  $K_c$  ?
4. Give one example each for water in oil and oil in water emulsion. (4×1=4)

SECTION – B

Answer **any 7** questions out of 10. **Each** carries **2** marks.

5. If enthalpy change of reaction for the process  $N_{2(g)} + 3H_{2(g)} \rightarrow 2NH_{3(g)}$  is  $-85$  kJ at  $25^\circ\text{C}$ . Calculate the internal energy change for this reaction.
6. Briefly explain bond energy.
7. Define the term partial molar free energy.
8. What are exact and inexact differentials ?
9.  $K_p$  for a reversible reaction at  $25^\circ\text{C}$  was found to be 0.14. Calculate the standard Gibb's free energy for this reaction.
10. Distinguish between true equilibrium and meta stable equilibrium.

P.T.O.



11. What is meant by desilverisation of lead ?
12. Give two examples each for deliquescent and efflorescent substances.
13. What is the mathematical form of Freundlich adsorption isotherm ? Represent it graphically.
14. What is Zeta potential ? How it is calculated ? (7×2=14)

### SECTION – C

Answer **any 4** questions out of 6. **Each** carries **3** marks.

15. Derive the equation for work done in a reversible isothermal expansion of an ideal gas.
16. Explain the variation of enthalpy of reaction with temperature using mathematical equations.
17. The efficiency of a heat engine is 42%. If it absorbs 500 J from the high temperature source at 300 K, find the temperature of the low temperature sink, work done and the heat rejected.
18.  $K_p$  for a reaction at 600 K is  $1.6 \times 10^{-4}$ . Calculate the  $K_p$  at 700 K if the standard heat of reaction in this temperature range is  $-100$  kJ/mol.
19. Discuss on the two important electrokinetic phenomena of colloidal particles.
20. Explain the terms eutectic point and congruent melting point with suitable examples. (4×3=12)

### SECTION – D

Answer **any 2** questions out of 4. **Each** carries **5** marks.

21. Derive the (a) relation between temperature and pressure for a reversible adiabatic expansion of an ideal gas and (b) work done in a reversible adiabatic expansion of an ideal gas.
  22. Describe the Carnot's cycle and derive an expression for efficiency of a heat engine.
  23. Derive the Van't Hoff equation and from it arrive at its integrated form.
  24. State Nernst distribution law and discuss its application to study association and dissociation of salt. (2×5=10)
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CORE COURSE IN CHEMISTRY/POLYMER CHEMISTRY  
5B09CHE/PCH : Physical Chemistry – I

Time : 3 Hours

Max. Marks : 40

**Instruction :** Answer the questions in **English** only.

SECTION – A

Answer **all** questions. **Each** carries **1** mark.

1. Define compressibility factor.
2. What are surfactants ?
3. What is meant by anisotropy ?
4. State Henry's law.

(4×1=4)

SECTION – B

Answer **any 7** questions out of 10. **Each** carries **2** marks.

5. Define the terms mean free path and collision diameter. How are they related ?
6. State the virial equation of state and explain the terms involved.
7. State and explain principle of Corresponding states.
8. Define the term coefficient of viscosity. What are the SI and CGS units of viscosity ?
9. How is molar refraction of a liquid related to its refractive index and density ?
10. Calculate the number of atoms per unit cell of an element with (a) fcc structure and (b) simple cubic structure.
11. How the diffraction pattern of NaCl and KCl differs ? Why ?

P.T.O.



12. Why Frenkel defects are not found in pure alkali metal halides ?

13. Define ebullioscopic constant.

14. What are azeotropes ? Give two examples.

(7×2=14)

### SECTION – C

Answer **any 4** questions out of 6. **Each** carries **3** marks.

15. Calculate the ratio of root mean square velocities of He and Ne gases at 25°C. Also calculate the ratio of average kinetic energies for these two gases.

16. Define the term parachor. Why it is considered both as an additive and constitutive property ?

17. What are liquid crystals ? How are they classified ? Explain.

18. Silver (atomic mass = 107.9 g/mol) which crystallizes with the fcc lattice has a unit cell edge of 4.08Å. Its density is found to be 10.53 g/cm<sup>3</sup>. Calculate the Avogadro number from this data.

19. State Raoult's law of relative lowering of vapour pressure. How the molar mass of a solute is calculated using this ?

20. Differentiate between ideal and non-ideal solutions.

(4×3=12)

### SECTION – D

Answer **any 2** questions out of 4. **Each** carries **5** marks.

21. Derive the relationship between critical constants of a gas and van der Waals constants.

22. Discuss different types of non-stoichiometric defects found in crystals.

23. Define osmotic pressure. Explain its determination using Berkeley and Hartley's method and list out the advantages of this method.

24. a) What are the various factors influencing the solubility of gases in liquids ? Explain.

b) State and explain the principle of equipartition of energy.

(3+2)

(2×5=10)



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(2019 – 2021 Admissions)  
Core Course in Chemistry/Polymer Chemistry  
5B08CHE/PCH : INORGANIC CHEMISTRY

Time : 3 Hours

Max. Marks : 40

*Instruction : Answer the questions in **English** only.*

SECTION – A

Answer **all** questions. **Each** carries **1** mark.

1. The colour of  $\text{Sc}^{3+}$  is
2. The effective atomic number of  $[\text{Co}(\text{NH}_3)_6]^{3+}$  is
3. The shape of  $[\text{Ni}(\text{CO})_4]$  is
4. Give an example for a zinc containing enzyme.

(4×1=4)

SECTION – B

Answer **any 7** questions out of 10. **Each** carries **2** marks.

5. Why the effective magnetic moment of transition metal compounds is only that due to spin contribution ?
6. Why gadolinium shows only +3 oxidation state ?
7. Why actinide ions are generally coloured ? What is the colour of the actinide ions with seven 5f electrons ?
8. Which compound has higher stability constant and why ?  
 $[\text{Fe}(\text{CN})_6]^{3-}$  or  $[\text{Fe}(\text{CN})_6]^{4-}$  ?
9. What are high spin octahedral complexes ? Explain with an example.

P.T.O.



10. What is meant by crystal field splitting ? What is the CFSE of an octahedral complex with  $d^5$  configuration ?
11. What is meant by Bohr Effect ?
12. Calculate the number of metal-metal bonds in  $Mn_2(CO)_{10}$ .
13. Differentiate between homoleptic and heteroleptic organometallic compounds.
14. What are geopolymers ? Give one example. (7×2=14)

## SECTION – C

Answer **any 4** questions out of 6. **Each** carries **3** marks.

15. What is lanthanide contraction ? Briefly explain its consequences.
16. How the various factors affect the stability of complexes ?
17. Discuss the structure and magnetic nature of  $[Fe(CN)_6]^{3-}$  on the basis of VB theory.
18. Briefly explain the toxicity of lead.
19. Differentiate between Haemoglobin and Myoglobin.
20. How carbonyls are classified ? Explain. (4×3=12)

## SECTION – D

Answer **any 2** questions out of 4. **Each** carries **5** marks.

21. How lanthanides are separated by ion-exchange chromatography ?
  22. Discuss the application of complex formation in qualitative and quantitative analysis with illustrative examples.
  23. Briefly explain the application of CFT in explaining the magnetic properties and colour of metal complexes with examples.
  24. Write note on (a) Mechanism of oxygen binding by Haemoglobin (b) Ionic organometallic compounds. (2×5=10)
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(2019-2021 Admissions)

CORE COURSE IN CHEMISTRY/POLYMER CHEMISTRY  
5B07CHE/PCH : Analytical and Inorganic Chemistry – II

Time : 3 Hours

Max. Marks : 40

*Instruction : Answer the questions in **English** only.*

SECTION – A

Answer **all** questions. **Each** carries **1** mark.

1. What is the general structure of polyphosphazines ?
2. Give the name of a carbonate ore of copper.
3. What is meant by elution in chromatography ?
4. What is the hybridization of I in  $IF_7$  molecule ?

(4×1=4)

SECTION – B

Answer **any 7** questions out of 10. **Each** carries **2** marks.

5. What is carborundum ? Give any two uses of it.
6. Why hot solutions are preferred for precipitation in gravimetric analysis ?
7. What are the factors affecting differential thermal analysis ?
8. What are clathrate compounds of noble gases ?
9. Explain zone refining.
10. Briefly explain stress corrosion.

P.T.O.



11. Discuss any two methods to minimize co-precipitation.
12. What is the basic principle of neutron activation method ?
13. What is Mond's process ?
14. Give the anodic and cathodic reactions taking place during corrosion of Fe. (7×2=14)

## SECTION – C

Answer **any 4** questions out of 6. **Each** carries **3** marks.

15. List out any six uses of noble gases.
16. Arrange  $\text{HClO}$ ,  $\text{HClO}_2$ ,  $\text{HClO}_3$ , and  $\text{HClO}_4$  in the increasing order of acidic strength and justify your answer.
17. Give the composition and applications of any three alloy steels.
18. Briefly give the instrumentation involved in thermo gravimetric analysis.
19. Give the hybridization and geometry of  $\text{XeF}_6$  and  $\text{XeOF}_4$ .
20. How nickel is estimated gravimetrically ? (4×3=12)

## SECTION – D

Answer **any 2** questions out of 4. **Each** carries **5** marks.

21. Explain different corrosion control methods.
  22. What are refractories ? How are they classified ? Explain.
  23. a) Write a brief note on gel chromatography. 2½  
b) Write a short note on thermometric titrations. 2½
  24. a) Explain the application of hydrometallurgy in the extraction of silver from its native ore. 2½  
b) Write a note on the fluorides of Krypton. 2½
- (2×5=10)**
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