

FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE  
Sixth Semester B.Sc Chemistry Degree Examination, April 2025

**BCH6B09 - Inorganic Chemistry IV**

(2022 Admission onwards)

Time: 2 hours

Max. Marks : 60

**Section A (Short answers)**

(Answer questions up to 20 marks. Each question carries 2 marks)

1. Explain the cause and consequence of lanthanide contraction.
2. Liquid ammonia is a poor conductor of electricity, yet salt solutions in liquid ammonia conduct electricity better than their aqueous solution. Why?
3. Give the autoionization of liquid  $\text{N}_2\text{O}_4$  and  $\text{SO}_2$
4. Account for the high melting point and boiling points of transition metals.
5. Write a note on non-stoichiometric compounds of transition elements.
6. Place the following elements in their respective category - bulk, trace or toxic.  
Fe, Cu, Cd, Zn,
7. What is Wilkinson's catalyst? Give its application.
8. What are metalloenzymes? Give two examples.
9. Comment on toxicity of Mercury.
10. Name the type of isomerism in the following complexes  
i)  $[\text{Co}(\text{NH}_3)_4(\text{H}_2\text{O})\text{Cl}]\text{Cl}_2$  and  $[\text{Co}(\text{NH}_3)_4\text{Cl}_2]\text{Cl}\cdot\text{H}_2\text{O}$   
ii)  $[\text{Co}(\text{NH}_3)_5\text{Br}]\text{SO}_4$  and  $[\text{Co}(\text{NH}_3)_5(\text{SO}_4)]\text{Br}$
11. Which among  $[\text{Rh}(\text{NH}_3)_6]^{3+}$  and  $[\text{Ir}(\text{NH}_3)_6]^{3+}$  will have greater crystal field splitting energy and why?
12. Using the 18-electron rule as a guide find m and n in  
i)  $[(\eta^6\text{-C}_6\text{H}_6)_m\text{Cr}(\text{CO})_n]$  ii)  $\text{Fe}_3(\text{CO})_n$

[Ceiling of marks: 20]

**Section B (Paragraph)**

(Answer questions up to 30 marks. Each question carries 5 marks)

13. Discuss various chemical reactions in liquid Hydrogen Fluoride.
14. Describe Scanning Electron Microscopy.
15. Explain ion exchange method for the separation of lanthanides.
16. Explain the shape and magnetic moment of the following complexes using VBT  
i)  $[\text{Ni}(\text{CN})_4]^{4-}$  ii)  $[\text{CoCl}_4]^-$

17. Discuss the analytical applications of the following reagents along with the chemistry involved.
- (i) Potassium hexacyanoferrate (II)
  - ii) Dimethylglyoxime
18. How is ferrocene prepared? Discuss various reactions of the ferrocene that depicts its aromatic character.
19. Citing suitable examples, discuss the information obtained by carrying out thermogravimetric analysis.

[Ceiling of marks:30]

**Section c (Essay)**

**(Answer any one. Each question carries 10 marks)**

20. i) Describe the active transport with reference to Sodium-Potassium pump. Illustrate with a suitable diagram, the working of the pump.
- ii) Why does only cisplatin and not transplatin, act as an anti-cancer drug. Give the mechanism of its action.
21. Differentiate kinetic and thermodynamic stability of complexes. Discuss various factors that affect the stability of complexes.

[ 1 x 10 = 10 Marks]

FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE  
Sixth Semester B.Sc Chemistry Degree Examination, April 2025

**BCH6B10 - Organic Chemistry III**

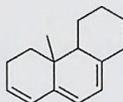
(2022 Admission onwards)

Time: 2 hours

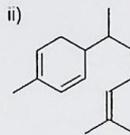
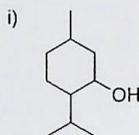
Max. Marks : 60

**Section A (Short answers)**  
(Answer questions up to 20 marks. Each question carries 2 marks)

1. Differentiate between chromophore and auxochrome.
2. Calculate the  $\lambda_{\text{max}}$  value for the following compound.



3. How can we differentiate between *ortho* and *meta*-xylene using  $^1\text{H}$  NMR?
4. Identify the terpene units in the following compounds.



5. Why fats are solids and oils are liquids?
6. Which are the possible interactions that hold the two strands of DNA together?
7. Explain the chemistry of C-terminal and N-terminal protection in peptide synthesis.
8. Describe two simple tests to detect sugar in urine.
9. Explain the ninhydrin test.
10. Draw the highest occupied and lowest unoccupied molecular orbitals of pentadienyl cation.
11. Validate that claisen rearrangement is [3,3] sigmatropic.
12. Explain one method for the preparation of pyridine.

[Ceiling of marks: 20]

**Section B (Paragraph)**  
(Answer questions up to 30 marks. Each question carries 5 marks)

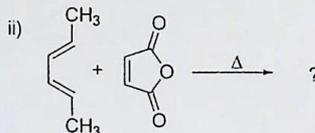
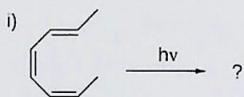
13. Explain (i) Killiani – Fischer synthesis (ii) Ruff degradation.
14. Describe the  $^1\text{H}$  NMR splitting pattern of 1,1,2-tribromoethane, ethyl bromide and ethyl acetate.
15. Differentiate between epimers and anomers.

16. Explain one method for the conversion of D-glucose to D-fructose.
17. Briefly explain two methods for the synthesis of aminoacids.
18. From the resonance structures, predict whether indole is acidic, basic or neutral.
19. Explain the processes involved in polymerase chain reaction. [Ceiling of marks: 30]

### Section C (Essay)

(Answer any one. Each question carries 10 marks)

20. a) How can we identify the completion of a reaction using TLC?  
 b) Differentiate between the working principle of liquid-liquid and liquid-solid chromatography.  
 c) Explain the instrumentation method and advantages of Gas chromatography. [2 + 3 + 5]
21. a) Identify the details of the following reactions;



- b) Describe one method to extend the carbon chain in an aldopentose. [5 + 5]

[1 x 10 = 10 marks]

FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE  
Sixth Semester B.Sc Chemistry Degree Examination, April 2025

**BCH6B12 - Advanced & Applied Chemistry**

(2022 Admission onwards)

Time: 2 hours

Max. Marks : 60

**Section A (Short answers)**

**(Answer questions up to 20 marks. Each question carries 2 marks)**

1. What are nanocatalysts? Name a nanocatalyst
2. How do hosts recognize and selectively bind to specific guests?
3. What are ionic liquids? Give two examples
4. Define prodrug. Give one example.
5. Name two software used in computational chemistry calculations
6. Draw the structure of BHT and mention its applications
7. What are quantum dots?
8. Define micro scale experiments.
9. Define Pi-stacking interactions in supramolecular chemistry.
10. Define pharmacokinetics.
11. What are holoenzymes? Name any two metalloenzymes.
12. Define heterogeneous catalysis.

**(Ceiling of marks: 20)**

**Section B (Paragraph)**

**(Answer questions up to 30 marks. Each question carries 5 marks)**

13. Define phase-transfer catalysis and phase transfer catalyzed reactions.
14. Discuss the basic principles of Transmission Electron Microscope.
15. Differentiate between AbInitio and Semi-Empirical methods.
16. What is atom economy, and how is it achieved? Mention any two 100% atom economy reactions.
17. Differentiate antiseptic and disinfectants .
18. Discuss the natural pigments present in fruits and vegetables.
19. Write a short note on the forces involved in molecular recognition.

**(Ceiling of marks: 30)**

**Section C (Essay)**

**(Answer any one. Each question carries 10 marks)**

20. Discuss the 12 principles of green chemistry and provide examples of how they can be applied in industrial processes.
21. (a) Discuss radio diagnosis and mention its benefits and risks.  
(b) Mention the role of food preservatives and antioxidants in the food preservation processes.

**(1 x 10= 10 marks)**

FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE

Sixth Semester B.Sc Chemistry Degree Examination, April 2025

BCH6B11 - Physical Chemistry III

(2022 Admission onwards)

Time: 2 hours

Max. Marks : 60

**SECTION A (Short Answers)****(Answer questions up to 20 marks. Each question carries 2 marks).**

1. State Walden's rule with respect to ionic conductivity.
2. What is meant by Wien effect.
3. What are fuel cells? Give one example with cell reaction.
4. Write the expression for  $\Delta S^0$  and  $\Delta H^0$  in a cell in terms of  $E^0$
5. Explain the term buffer index with respect to a buffer solution.
6. What is meant by reverse osmosis?
7. State Henry's law. Give one application.
8. Give the Lorentz-Lorenz equation for molar refraction. Explain the terms.
9. Illustrate the common ion effect with one example.
10. Calculate the Miller indices for a plane with intercepts (2a, 2b, 3c)
11. What is meant by intrinsic semiconductor? Give one example.
12. What are F-centres? Give one example.

**[Ceiling of marks:20]****SECTION B (Paragraph)****(Answer questions up to 30 marks. Each question carries 5 marks)**

13. Distinguish between molar conductance and specific conductance. How do they vary with dilution? Explain.
14. Explain the construction and working of Calomel electrode.
15. How is the pH of a solution measured using glass electrode? What are its disadvantages?
16. Derive Henderson equation for a basic buffer with a suitable example.
17. Draw the crystal planes (200), (110), and (222) for BCC unit cell.
18. Distinguish between Schottky and Frenkel defects.
19. Benzoic acid associates in benzene to form dimers. When 2.5 g of benzoic acid is dissolved in 100 g of benzene, it lowers the freezing point by 0.55 K. Calculate the van't Hoff factor and the degree of association of the solute in benzene.  $K_f$  of benzene is 12 K kgmol<sup>-1</sup>.

**[Ceiling of marks:30]**

**SECTION C (Essay)**

**(Answer anyone. Each question carries 10 marks)**

20. (a) Explain conductometric titrations of a strong acid against a strong base and a weak acid against a strong base.

(b) In a moving Boundary experiment with 0.1 N KCl solution, the boundary moved 2.2 cm in 35 minutes when a current of 5.0mA was used. The cross-sectional area of the tube was  $0.2\text{cm}^2$ . Calculate the transport number of  $\text{K}^+$  and  $\text{Cl}^-$  ions

21. (a) Derive Bragg's equation.

(b) Explain how the systematic presence or absence of planes in a powder diffraction pattern helps to identify the structure of cubic crystals.

**(1 × 10 = 10 Marks)**

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FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE  
Sixth Semester B.Sc Chemistry Degree Examination, April 2025

**BCH6E02 - Polymer Chemistry**

(2022 Admission onwards)

Time: 2 hours

Max. Marks : 60

**Section A (Short answers)**

**(Answer questions up to 20 marks. Each question carries 2 marks)**

1. Describe addition polymerisation with example.
2. Differentiate linear and branched chain polymers.
3. Explain the Glass Transition temperature ( $T_g$ ) with its significance.
4. What is meant by Vulcanisation of rubber?
5. What is meant by calendaring?
6. Discuss bulk polymerisation technique.
7. Explain solution casting process with example.
8. What is the role of coupling agents used in polymer processing?
9. What is meant by anti-ageing additives used in polymer processing?
10. What are colouring agents? Give two examples.
11. Why cross linking agents are used in the processing of certain polymers?
12. Differentiate HDPE and LDPE polyethylene.

[Ceiling of Marks:20]

**Section B (Paragraph)**

**(Answer questions up to 30 marks. Each question carries 5 marks)**

13. Describe the classification of polymers based on their intermolecular forces with examples.
14. Differentiate chain and step growth polymerisation.
15. Discuss the weight average and viscosity average molecular weights.
16. Explain Poly Dispersity Index and its significance.
17. Explain melt condensation and interfacial polycondensation polymerisation.
18. Discuss blow moulding and thermoforming process
19. Explain preparation, properties and uses of nitrile and neoprene synthetic rubber?

[Ceiling of Marks: 30]

**Section C (Essay)**

**(Answer any one. Each question carries 10 marks)**

20. Explain the detailed mechanism of Zeigler-Natta polymerisation.

21. Discuss preparation structure and uses of the following polymers:

a. PAN

b. teflon

c. Polystyrene d. PMMA

**[1x10 = 10 Marks]**