

FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE

Third Semester B.Sc Chemistry Degree Examination, November 2024

BCH3B03 – Physical Chemistry – I

(2022 Admission onwards)

Time: 2 hours

Max. Marks: 60

Section B (Paragraph)

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

1. Give the expressions connecting collision diameter of a gas to (i) collision number, and (ii) its mean free path
2. Calculate the RMS velocity of oxygen molecule at 25 °C
3. What is *Carnot's theorem*?
4. What is the entropy criterion for *spontaneity*?
5. Give the *Gibbs-Helmholtz* equation and explain the terms.
6. Show that $S = k \ln w$.
7. Define *residual entropy* of a crystal.
8. State the *law of mass action*.
9. What is the effect of high pressure on the melting point of ice?
10. Identify the *symmetry elements* and assign the *point group* of the following molecules
(i) naphthalene (ii) eclipsed ethane
11. Name a molecule belonging to the point group (i) C_{4v} and (ii) D_{4h}
12. What are the symmetry elements associated with the point group C_{2v} .

(Ceiling of marks: 20)

Section B (Paragraph)

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

13. Calculate the translational KE of 2 moles of an ideal gas at 300 K. What is the average KE per molecule at this temperature ?
14. How does the critical volume of a gas determined?
15. Derive the relation : $dG = VdP - SdT$
16. 1 mole of an ideal gas is isothermally compressed from 10 dm^3 to 1 dm^3 . Calculate (i) ΔG and (ii) ΔS
17. Derive expressions for K_c and K_p in terms of degree of dissociation for
 $\text{N}_2\text{O}_4 (\text{g}) \rightleftharpoons 2\text{NO}_2 (\text{g})$
18. Differentiate (i) *finite* and *infinite* group (ii) *abelian* and non-*abelian* group.
19. What is the group multiplication table? Give the group multiplication table for C_{2v} .

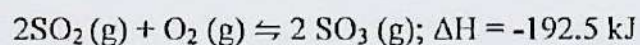
(Ceiling of marks: 30)

Section C (Essay)

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

20. Describe the Carnot's cycle and derive an expression for the efficiency of a heat engine

21. State Le Chatelier principle and apply it to the equilibrium :



(1x10 = 10 Marks)

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Third Semester B.Sc Degree Examination, November 2024

BCH3C03 – Organic 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. Write a method of preparation of benzene diazonium chloride.
2. Differentiate between rectified spirit, absolute alcohol, and denatured spirit.
3. State and explain isoprene rule.
4. Phenol is stronger acid than an alcohol. Why?
5. Name the electrophiles in nitration and sulphonation reactions of benzene.
6. Compare the reactivity of aldehydes and ketones in nucleophilic addition reaction.
7. Give any four applications of DNA fingerprinting.
8. Define isoelectric point.
9. How carboxylic acid is prepared from Grignard Reagent ?
10. State Huckel's rule of aromaticity.
11. How meso-tartaric acid differs from racemic tartaric acid ?
12. Give two physical methods to distinguish geometrical isomers.

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

13. Explain Huckel's rule of aromaticity, with suitable examples.
14. Draw the conformations of cyclohexane and explain their stabilities
15. Write a note on optical isomerism.
16. Explain the term hyperconjugation with illustrative examples.
17. Give an example for the alkylation of benzene and give its mechanism .
18. Give any five synthetic applications of benzene diazonium chloride.
19. Write a short note on the different classification of amino acids.

[Ceiling of marks: 30]**Section C (Essay)****(Answer any one. Each question carries 10 marks)**

20. (a) Explain the source, structure, and uses of Piperine.
(b) How phenolphthalein prepared? Mention its uses.
21. Discuss the significance of various electron displacement effects in organic molecule.
(1 x 10 = 10 Marks)