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Reg. No:.....

Name:

FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE

Third Semester B.Sc. Chemistry Degree Examination, November 2019

BCHE3B03 – Physical Chemistry I

(2018 Admission onwards)

Time: 3 hours

Max. Marks: 80

SECTION A (one word)

Answer all questions. Each question carries 1 mark

1. The efficiency of heat engine operating between 400 K and 300 K is -----
2. For an exothermic process, the enthalpy change is -----
3. The entropy of mixing of gases is always-----
4. A state function is a ----- differential
5. Give two examples of state function.
6. The instrument employed for measuring surface tension is-----.
7. The unit of van der Waal's constant 'b' is -----.
8. The value of the compressibility factor of an ideal gas is -----
9. For a homogeneous chemical reaction $K_p = K_c$ when
a. $\Delta n = 0$ b. $\Delta n = 1$ c. $\Delta n = 2$ d. $\Delta n = \infty$
10. Give the relation between surface tension and temperature.

(10x 1= 10 Marks)

SECTION B (Short answer)

Answer any TEN questions. Each question carries 2 marks

11. Explain the basic principle applied in Linde's process for liquefying gases.
12. What are the different types of free energies? Give the mathematical expression for both.
13. What is Joule-Thomson coefficient; give the relation between μ_{JT} and C_p . Mention its value for different cases?
14. Explain why the viscosity of ethyl alcohol is greater than that of diethyl ether. What is the effect of temperature on viscosity of a liquid?
15. Discuss the origin of surface tension of a liquid.

16. Why chemical equilibrium is termed dynamic?
17. Calculate the mean square speed of an oxygen molecule at 288 K velocity of O_2 in SI units.
18. What is meant by thermodynamic probability?
19. Given the molar refraction of liquid is $13 \text{ cm}^3 \text{ mol}^{-1}$, Calculate the refractive index. Density and molecular mass of the liquid are 1.046 g cm^{-3} and 60 gmol^{-1} respectively.
20. Give an example of homogeneous equilibrium.
21. Derive the relation between K_p and K_x .
22. Define the term equilibrium constant.

(10 x 2 = 20 Marks)

SECTION C (Paragraph)

Answer any FIVE questions. Each question carries 6 marks

23. A sample of gas changes in volume from 4.00 L to 6.00 L against an external pressure of 1.50 atm, and simultaneously absorbs 1000 J of heat. What is the change in internal energy of the system in joules?
24. Calculate K_c and K_x for the reaction $N_2O_4 \leftrightarrow 2NO_2$ for which $K_p = 0.157 \text{ atm}$ at 27°C and 1 atm pressure.
25. Derive the Gibb's Helmholtz equation.
26. Derive the relation between temperature and volume during a reversible adiabatic process.
27. One mole of carbon dioxide was found to occupy a volume of 1.32 litre at 48°C and at a pressure of 16.40 atmosphere. Calculate the pressure that would have been expected from: i) ideal gas equation ii) van der Waal's equation
28. Derive Vant Hoff reaction isotherm?
29. Write down the four postulates of kinetic theory of gases
30. Explain the criteria for spontaneity

(5 x 6 = 30 Marks)

SECTION D (Essay)

Answer any TWO question. Each question carries 10 marks

31. Discuss Nernst Heat Theorem. How does it lead to the Third law of Thermodynamics?

How can the Third law of Thermodynamics help in finding the absolute entropy of a gas?

32. i) Define Parachor and explain its importance. (5)

ii) Describe a method employed for the measurement of vapour pressure of a liquid.

Explain the factors which affect the vapour pressure. (5)

33. A) Calculate the height to which water will rise in a glass capillary if the radius of the tube is 0.02cm. Surface tension of water is 72.8 dynes/cm.

B) Derive the Vander Waal's equation of state. How are Vander Waal's constant and critical constants related

34. A) The surface tension of water is 0.728 N m^{-1} . Calculate the energy required to disperse one spherical drop of radius 3 mm into spherical drops of 3×10^{-3} mm.

B) Explain Maxwell's distribution of Molecular velocities. What is the effect of temperature on the distribution of velocities?

(2 x 10 = 20 Marks)

FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE
Third Semester B.Sc. Degree Examination, November 2019
BCHE3C03 – Organic Chemistry
(2018 Admission onwards)

Time: 3 hours

Max. Marks: 64

Section A (One word)

Answer all questions. Each question carries 1 mark

1. Homolytic fission of a covalent bond liberates.....
2. The IUPAC name of $(CH_3)_2CH-COOH$ is.....
3. The optical isomers which are mirror images of each other are called.....
4. Name a heterocyclic aromatic compound.
5. What is the product obtained when benzene reacts with ethyl chloride in presence of anhydrous aluminium chloride?
6. Name the enzyme which hydrolyses sucrose into glucose and fructose.
7. How many chiral carbon atoms are there in tartaric acid?
8. Name a neutral aminoacid.
9. The monomer of natural rubber is.....
10. The separation of a racemic mixture into its d and l components is called.....

(10 x 1=10 Marks)

Section B (Short answer)

Answer any seven questions. Each question carries 2 marks

11. Illustrate metamerism with an example.
12. Explain the term chirality.
13. What are the products obtained when benzene is first chlorinated and then nitrated? Justify your answer.
14. Phenol is a stronger acid than alcohol. Why?
15. What are crown ethers?
16. Explain the significance of Hofmann's carbylamine reaction.
17. What is meant by diazotization? Explain with an example.
18. Explain the aromaticity of pyridine using Huckel's rule.
19. What is mutarotation?
20. Draw the two conformations of methylcyclohexane. Which is more stable? Why?

(7 x 2 =14 Marks)

Section C (Paragraph)

Answer any four questions. Each question carries 5 marks

21. Explain the mechanism of Friedal –Crafts alkylation. What is the product obtained when benzene is treated with n-propyl chloride in presence of anhydrous aluminium chloride?
22. Discuss different methods for resolution of racemic mixtures.
23. Explain the geometrical isomerism of but-2-ene-1, 4-dioic acid. How can the isomers be distinguished?
24. What is Iodoform test? How will you distinguish methanol and ethanol using this test?
25. Compare the basicity of ammonia, methyl amine and aniline.
26. Explain the term saponification value with respect to fats and oils? What is its significance?

(4 x 5 = 20 Marks)

Section D (Essay)

Answer any two questions. Each question carries 10 marks

27. Discuss the mechanism, kinetics and stereochemistry of S_N1 and S_N2 reactions of alkyl halides.
28. Write notes on
 - (i) Kolbe electrolysis
 - (ii) Preparation and uses of Phenolphthalein.
 - (iii) Compare the stability of t-butylcation, isopropyl cation, ethyl cation and methyl cation.
29. Explain the structure of proteins.
30.
 - (i) Explain conformational isomerism with respect to ethane. Explain the relative stability of conformations.
 - (ii) What are enzymes? Discuss the characteristics of enzyme action.
 - (iii) Distinguish DNA and RNA.

(2 x 10 = 20 Marks)