Write the following information in the first page of Answer Script before starting answer

ODD SEMESTER EXAMINATION: 2020-21

Exam ID Number_____

Course_____ Semester_____

Paper Code _____Paper Title _____

Type of Exam: _____ (Regular/Back/Improvement)

Important Instruction for students:

1. Student should write objective and descriptive answer on plain white paper.
2. Give page number in each page starting from 1st page.
3. After completion of examination, Scan all pages, convert into a single PDF, rename the file with Class Roll No. **(2019MBA15)** and upload to the Google classroom as attachment.
4. Exam timing from 10am – 1pm (for morning shift).
5. Question Paper will be uploaded before 10 mins from the schedule time.
6. Additional 20 mins time will be given for scanning and uploading the single PDF file.
7. Student will be marked as ABSENT if failed to upload the PDF answer script due to any reason.

B.Sc. CHEMISTRY
THIRD SEMESTER
PHYSICAL CHEMISTRY-III
BSC-303

Duration : 3 hrs. **Full Marks : 70**

(PART-A : Objective)

Time : 20 min. **Marks : 20**

Choose the correct answer from the following: ***1X20=20***

1. Determine the number of components, number of phases & degrees of freedom for the System
Na2SO4 . 10H2O (s) <----> Na2 SO4 (s) + 10 H2O (g)
a. 3, 2, 2 **b.** 2, 3, 1
c. 1, 3, 2 **d.** 2, 2, 1

2. In a binary azeotrope the number of components, number of phases & degrees of freedom are:
a. 2, 2, 1 **b.** 3, 2, 1
c. 1, 3, 4 **d.** 2, 1, 2

3. Which of the following is true?
a. Carbon dioxide has a fusion curve with positive slope **b.** Water has a fusion curve with negative slope
c. Sulphur has a metastable triple point **d.** All of the above

4. Why helium system is unique?
a. Has two different isotropic liquid phases **b.** Does not form solid phase
c. Both A & B **d.** None of the above

5. For which of the following equilibrium Clapeyron-Clausius equation can't be integrated easily?
a. Solid <--> Gas **b.** Solid <--> Liquid
c. Liquid <--> Gas **d.** All of them

6. Azeotropic mixtures:
a. Have constant boiling point **b.** Have fixed composition
c. Cannot be separated into its composition **d.** All of the above

7. Which form of ice has not been confirmed?
a. Ice-I **b.** Ice-II
c. Ice-IIce-III **d.** Ice-IV

8. Which of the following is a 3rd order reaction?
a. $k = 5.2 \times 10^{-1} L^2 mol^{-2} sec^{-1}$ **b.** $k = 5.2 \times 10^{-2} sec^{-1}$
c. $k = 5.2 \times 10^{-3} L\ mol^{-1} sec^{-1}$ **d.** $k = 5.2 \times 10\text{-}3\ mol\ L^{-1}\ sec^{-1}$

9. The unit of which order is similar to unit of rate of a reaction?

a. Zero **b.** First

c. Second **d.** n^{th}

10. In a first order reaction, if k is the rate constant and initial concentration of A is 0.5M, then half life is:

a. $\frac{log2}{k}$ **b.** $\frac{log2}{k\sqrt{0.5}}$

c. $\frac{ln2}{k}$ **d.** $\frac{0.693}{0.5k}$

11. For a reaction, rate of disappearance of A is related to the rate of appearance of B by the expression:

a. $-\frac{d[A]}{dt} = \frac{3d[B]}{dt}$ **b.** $-\frac{d[A]}{dt} = \frac{6d[B]}{dt}$

c. $-\frac{d[A]}{dt} = \frac{1}{6}\frac{d[B]}{dt}$ **d.** $-\frac{d[A]}{dt} = \frac{1}{3}\frac{d[B]}{dt}$

12. If the rate constant for a first order reaction is 69.3 min^{-1}, then the half life f the reaction will be:

a. 6 X 10^{-3} Sec **b.** 6 X 10^{-1} Sec

c. 6 X 10^{3} Sec **d.** 6 X 10^{-2} Sec

13. If temperature of a reaction is increased by 10 ^{0}C, then rate constant will be:

a. Increased by two times **b.** Decreased by two times

c. Remain same **d.** None of the above

14. Order of a reaction:

a. Is always a whole number **b.** Is always a fraction

c. Is always zero **d.** May be zero or fraction or a whole number

15. A promoter is a substance which:

a. Lowers the kinetic energy of reactants **b.** Lowers the activation energy of reaction

c. Enhances the activity of the catalyst **d.** Enhances the concentration of the catalyst

16. Catalytic poisoning:

a. Reduces the reaction rate of the reaction **b.** Reduces the activity of the catalyst

c. Increases the activation energy of the reaction **d.** Increases the temperature of the reaction

17. The phenomenon of negative catalysis is also known:

a. Auto catalysis **b.** Self catalysis

c. Inhibition **d.** Enzyme catalysis

18. For the study of distribution law the two solvents should be:

a. Non-miscible **b.** Miscible

c. Volatile **d.** Reacting with each other

19. While studying the distribution law:

a. The temperature should be constant throughout **b.** There should be no association or dissociation of the solute

c. The concentration of the solute in solvents **d.** All of the above

20. The process of adsorption is:

a. Exothermic
b. Endothermic
c. Sometimes exothermic, sometimes endothermic
d. None of the above

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(PART-B : Descriptive)

Time : 2 hrs. 40 min. **Marks : 50**

[Answer question no.1 & any four (4) from the rest]

1. **a.** Derive an expression for rate constant of a reversible reaction. 7
b. Show that for a 1st order reaction, the time required for 99.9% completion of the reaction is 10 times that required for 50% completion. 3

2. **a.** What is meant by order and molecularity of a reaction? Write some of the differences between them. 5
b. What is meant by the term catalyst? Give general characteristics of catalytic reactions. 5

3. **a.** What is meant by activation energy? How can you determine activation energy with the help of Arrhenius equation? 7
b. If half life of a reaction is doubled then concentration of the reaction also become doubled, determine order of the reaction. 3

4. **a.** Write a short note on chain reaction. 5
b. Draw phase diagram of a simple eutectic system leveling all phases and points. 2
c. Draw phase diagram of two component system forming a compound with incongruent melting point. 3

5. **a.** Derive the equations of conditions for three different types of equilibrium between phases. 5
b. Discuss Langmuir theory of adsorption and derive expression for Langmuir monolayer adsorption Isotherm. 5

6. **a.** Draw and describe phase diagram for the three–component system consisting of acetic acid–chloroform–water. 5
b. Derive Michaelis-Menten equation for enzyme catalysed reaction. 5

7. **a.** What is steady state treatment in kinetics? Derive an expression for the rate of an acid catalysed reaction. 5
b. Draw phase diagram of sulphur leveling all phases and points. 3
c. Integrate Clapeyron equation of Liquid <--> Gas equilibrium to obtain Clapeyron-Clausius equation. 2

8. **a.** What is meant by the term adsorption? Give four points of differences between physical adsorption and chemical adsorption. 5
b. State Nernst Distribution law. When varying amounts of Iodine were shaken with CCl_4-water mixture, the following concentrations of iodine (in g/ cc) were obtained: 5

In water layer	0.0244	0.071	0.121
In ether layer	0.0046	0.013	0.022

Show that these results illustrate the distribution law.

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