

B. Sc. CHEMISTRY  
SECOND SEMESTER  
ORGANIC, INORGANIC & PHYSICAL CHEMISTRY II  
BSC – 721 [SPECIAL REPEAT]  
[USE OMR SHEET FOR OBJECTIVE PART]

**SET  
A**

Duration: 3 hrs.

Full Marks: 70

Time: 30 min.

( PART-A: Objective )

Marks: 20

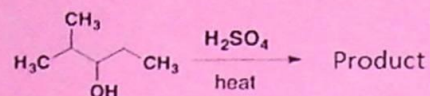
Choose the correct answer from the following:

1X20=20

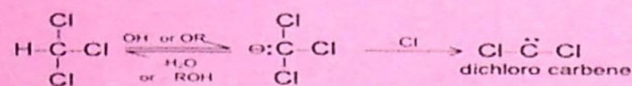
- The rate constant of 1<sup>st</sup> order reactions has the unit  
a. s<sup>-1</sup>                      b. mol L<sup>-1</sup> s<sup>-1</sup>                      c. L<sup>2</sup> mol<sup>-2</sup> s<sup>-1</sup>                      d. None of these
- 2HI  $\longrightarrow$  H<sub>2</sub> + I<sub>2</sub>  
What is the molecularity of the above reaction?  
a. 1                      b. 2                      c. 3                      d. 0
- Decomposition of ammonia is a  
a. 3<sup>rd</sup> order reaction                      b. 2<sup>nd</sup> order reaction  
c. 1<sup>st</sup> order reaction                      d. Zero (0) order reaction
- In adiabatic process, between system and surroundings  
a. Heat can exchange                      b. Heat cannot exchange  
c. Mass and heat can exchange                      d. Temperature is constant
- H = U + PV in this equation, U refer to  
a. Enthalpy                      b. Internal Energy                      c. Entropy                      d. Residual heat
- The concept of entropy is related to  
a. 1<sup>st</sup> law of thermodynamics                      b. 2<sup>nd</sup> law of thermodynamics  
c. Zeroth law                      d. Steady state
- The oxidation state of Mn in KMnO<sub>4</sub>  
a. +5                      b. +7                      c. +6                      d. +4
- The bond order of O<sub>2</sub><sup>2+</sup> ion is  
a. 1                      b. 3                      c. 3                      d. 1.5
- Which of the following is Lewis acid  
a. BCl<sub>3</sub>                      b. AlCl<sub>3</sub>                      c. GaCl<sub>3</sub>                      d. All of the above
- The oxidation state of oxygen in Na<sub>2</sub>O<sub>2</sub>  
a. -1                      b. -2                      c. -3                      d. None of these
- The bond order of N<sub>2</sub> molecule  
a. 3                      b. 2                      c. 1                      d. 4

12. Which of the following is correct statement of Lewis acid-base
- Acid is electron donor base is proton donor
  - Acid is electron acceptor base electron donor
  - Both (a) & (b)
  - None of the above

13. Identify the major product of the following reaction:



- 2-Methylpent-2-ene
  - 2-Methylpent-3-ene
  - 4-Methylpent-2-ene
  - 4-Methylpent-3-ene
14. In the Victor Meyer test, alcohol is treated with HI, AgNO<sub>2</sub> and HNO<sub>2</sub> respectively and finally the reaction mixture is made alkaline with KOH solution. If the colour of the resulting mixture is found to be red then the alcohol will be
- Primary
  - Secondary
  - Tertiary
  - None of the above
15. E1cB reaction is usually seen to involve the intermediate
- Carbocation
  - Carbanion
  - Carbene
  - Free radical
16. The formation of dichlorocarbene from chloroform in the following reaction is seen to take place via



- β-elimination
  - α-elimination
  - γ-elimination
  - δ-elimination
17. The product P in the following reaction of alkyl halide with alcoholic KOH will be
- $$\begin{array}{c} \text{H} \quad \text{X} \\ | \quad | \\ \text{R}-\text{C}-\text{C}-\text{H} \\ | \quad | \\ \text{H} \quad \text{H} \end{array} \xrightarrow{\text{Alcoholic KOH}} \text{P}$$
- Alkyl halide

- Alkane
  - Aldehyde
  - Alkene
  - Ketone
18. When glycerol is treated with excess amount of HI the product obtained is
- 1,3- Diiodo propane
  - 1,2- Diiodo propane
  - n-Propyl iodide
  - Isopropyl iodide
19. If glycol is heated with conc sulphuric acid the product obtained is
- Dioxan
  - Glycollic acid
  - Glycolaldehyde
  - Glyoxal
20. The structure of carbonyl group is
- Tetrahedral
  - Linear

c. Planar

d. Square planar

**( PART-B: Descriptive )**

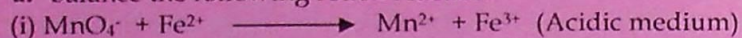
Time : 2 hrs. 40 min.

Marks : 50

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

1. a. Write down the differences between order and molecularity of a reaction. 2+3+5  
=10
- b. Draw the molecular orbital energy diagram for F<sub>2</sub> molecule and calculate the bond order of F<sub>2</sub> molecule.
- c. Explain fermentation? Discuss the various steps involved in the manufacture of ethanol from molasses.
2. a. Deduce the equation for rate const *k* for a 1<sup>st</sup> order reaction. What change will be seen in the equation for gaseous reaction? 6+3+1  
=10
- b. A reaction which is first order with respect to A has rate constant 6 min<sup>-1</sup>. If we start with [A] = 0.5 mol L<sup>-1</sup>, when would [A] reach the value of 0.05 ML<sup>-1</sup>
- c. Give an example of pseudo 1<sup>st</sup> order reaction.
3. a. Write down the statement of 1<sup>st</sup> law of thermodynamics with mathematical expression. Define internal energy (U). 5+3+2  
=10
- b. Prove that  $\Delta H = \Delta U + \Delta n_g RT$
- c. For the reaction at 298 K,  
 $1/2 N_2(g) + 3/2 H_2(g) \rightarrow NH_3(g)$ ;  $\Delta H = -46 \text{ kJ}$   
Calculate the value of  $\Delta U$ .
4. a. Define 2<sup>nd</sup> law of thermodynamics. Describe Carnot engine in detailed. 5+5=10
- b. Write the following acid base concept with examples  
(i) Arrhenius acid -base concept  
(ii) Bronsted Lowry acid base concept  
(iii) Lewis acid base concept

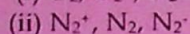
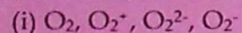
5. a. balance the following redox reaction 5+5=10



b. Write five rules for determination of oxidation state with examples.

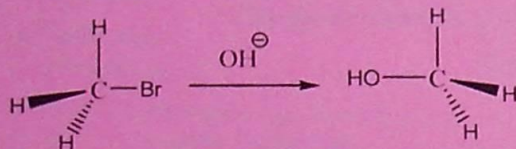
6. a. Explain the molecular orbital energy level diagram for  $\text{O}_2$  and  $\text{N}_2$  molecule. 5+5=10

b. Arrange the following species on increasing order of bond length, bond order, bond strength



7. a. What are nucleophilic substitutions? Write the difference between  $\text{S}_{\text{N}}1$  and  $\text{S}_{\text{N}}2$  reactions. 3+4+3=10

b. Discuss the mechanism and stereochemistry of the following reaction.

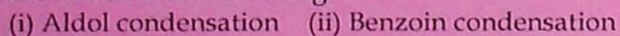


c. What are elimination reactions? Explain Saytzeff's and Hofmann's rules.

8. a. Write the Lucas test to distinguish between  $1^\circ$ ,  $2^\circ$  and  $3^\circ$  alcohols. 3+2+5=10

b. Give the preparation of phenol from cumene with chemical reaction.

c. Write notes on the following:



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