

**B.Sc. CHEMISTRY**  
**FOURTH SEMESTER**  
**ORGANIC, INORGANIC & PHYSICAL CHEMISTRY II**  
**BSC – 741 OLD COURSE REPEAT**  
[USE OMR FOR OBJECTIVE PART]

**SET**  
**A**

Duration: 3 hrs.

Full Marks: 70

Time: 30 min.

( Objective )

Marks: 20

*Choose the correct answer from the following:*

*1×20=20*

- If a reaction's rate is represented as rate = k [A][B], the reaction's order will be
  - 2
  - 3
  - 1
  - 0
- The relation between  $K_p$  and  $K_x$  is
  - $K_p = K_x P$
  - $K_p = K_x (RT)^{\Delta n}$
  - $K_p = K_x$
  - $K_p = K_x P^{\Delta n}$
- In which thermodynamic process does the temperature remain constant throughout the process?
  - Isobaric
  - Isothermal
  - Isochoric
  - Adiabatic
- The unit of rate constant for a zeroth order reaction is
  - $\text{mol L}^{-1} \text{s}^{-1}$
  - $\text{s}^{-1}$
  - $\text{mol}^{-2} \text{L}^2 \text{s}^{-1}$
  - $\text{mol L}^{-1}$
- The \_\_\_ of thermodynamics states that if a body A is in thermal equilibrium with body C while body B is in thermal equilibrium with body C then bodies A and B are also in equilibrium with each other.
  - Zeroth law
  - Second law
  - First law
  - Third law
- Which one of the following reactive intermediate formed in Aldol condensation reaction
  - Carbocation
  - Carbene
  - Carbanion
  - Nitrene
- Which one of the following will undergo Aldol condensation reaction
  - Formaldehyde
  - Benzaldehyde
  - Ethanol
  - Acetaldehyde
- Which one of the following doesn't contain  $\alpha$ -Hydrogen
  - Acetone
  - Benzophenone
  - Acetaldehyde
  - Acetophenone
- The reagent used for mono bromination of phenol is
  - $\text{Br}_2(\text{aq.})$
  - $\text{Br}_2/\text{CS}_2$
  - $\text{Br}_2(\text{acetic acid})$
  - $\text{Br}_2(\text{alc.})$

10. Phenol react with  $\text{Br}_2(\text{aq.})$  to form
- 2-bromophenol
  - 2,4- dibromophenol
  - 2,4,6- tribromophenol
  - None of these
11. Which of the following is *not* a nucleophile?
- $\text{NH}_3$
  - $\text{H}_2\text{O}$
  - $\text{H}^+$
  - $\text{H}_2\text{C}=\text{CH}_2$
12. Which of the following is 'ambident nucleophile'?
- $\text{NO}_2^-$
  - $\text{CN}^-$
  - None of the above
  - Both A and B
13. Choose the correct statement
- Phenols are more acidic than carboxylic acids
  - Most of the pure phenols are in gaseous state
  - Boiling point of phenol is lower than aliphatic alcohols
  - None of the above
14. Boiling Point of phenol is effected by
- Intermolecular hydrogen bonding
  - Carbon-Carbon double bond
  - Aromatic Ring
  - Phenoxide
15. Tertiary alkyl halide undergo
- $\text{S}_{\text{N}}1$  reaction
  - $\text{S}_{\text{N}}2$  reaction
  - $\text{S}_{\text{N}}1$  reaction
  - All of the above
16. Which of the following is Lewis acid
- $\text{AlCl}_3$
  - $\text{BCl}_3$
  - $\text{GaCl}_3$
  - All of the above
17. Which of the following is paramagnetic substance
- $\text{O}_2^-$
  - $\text{Be}_2$
  - $\text{He}_2$
  - None of the above
18. The oxidation state of Mn in  $\text{MnO}_4^-$
- +6
  - +7
  - +4
  - +3
19. Oxidation and Reduction means
- Loss of electron and gain of electron
  - Addition of oxygen and removal of hydrogen
  - Addition of more electronegative element and removal of electropositive element.
  - None of the above
20. The bond order of CO molecule is
- 2
  - 3
  - 4
  - 1

**( Descriptive )**

Time : 2 hrs. 30 mins.

Marks : 50

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

1. a. What do you mean by reversible and irreversible processes in thermodynamics? 2+3+3+  
b. What is Brady's reagent? Write the reaction of Benzaldehyde with Brady's reagent.  
c. How ethyl alcohol is prepared industrially?  
d. State and explain disproportionation reaction

2. a. What do you mean by Joule-Thomson effect? What is Joule-Thomson coefficient? 3+3+4  
=10  
b. Write the second law of thermodynamics and Hess's law of constant heat summation.  
c. Calculate  $K_c$  and  $K_x$  for the reaction  $N_2O_4(g) \rightleftharpoons 2NO_2(g)$  for which  $K_p = 0.157$  atm at  $27^\circ C$  and 1 atm pressure.

3. a. Write the differential rate equation for the reaction  $2A + B \rightarrow C + 3D$  and  $A + 2B + 3C \rightarrow$  products. 3+2+5  
=10  
b. What do you mean by order and molecularity of a reaction?  
c. For the hypothetical reaction,  $2A + B \rightarrow$  products, the following data have been obtained:

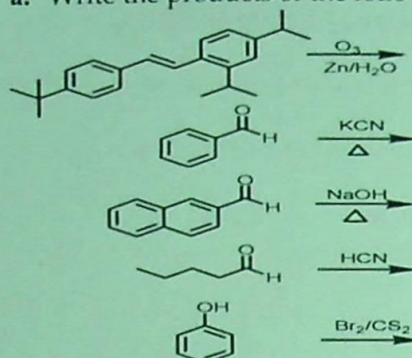
Expt. No.	$[A]_0$ (mol $dm^{-3}$ )	$[B]_0$ (mol $dm^{-3}$ )	Initial rate (mol $dm^{-3}s^{-1}$ )
1	0.10	0.20	$3.0 \times 10^2$
2	0.30	0.40	$3.6 \times 10^3$
3	0.30	0.80	$1.44 \times 10^4$

Determine the rate law expression, the overall order of the reaction, the order of the reaction with respect to A and B.

4. a. Why are aromatic aldehydes and ketones are less reactive than the corresponding aliphatic aldehydes and ketones? 2+4+4  
=10  
b. What is Aldol condensation reaction? Write the product of Aldol condensation reaction of Acetaldehyde. Give mechanism.  
c. Explain Kolbe's reaction of phenol. What happened when phenol reacts with  $Br_2(aq.)$ ?

5. a. Write the products of the following reactions

5+2+2+  
1=10



b. Explain: (i) Acidity of phenols, (ii) Stability of phenoxide, (iii) Why phenols have higher melting point than aliphatic alcohols.

6. a. What happen when

1+2+3+  
2+2=10

- (i) Glycerol is treated with Nitric acid  
(ii) Glycol is treated with Hydrochloric acid at 160° and then at 200°

b. Why Glycol and Glycerol are called polyhydric alcohols, Give an example each.

c. How does breathalyzer used for 'roadside breath test' work, explain with the reaction.

d. Identify the hybridization of Oxygen-carbon and Carbon-Oxygen in phenol.

7. a. Explain the following acid -base concept with examples

6+4=10

- (i) Arrhenius acid base concept  
(ii) Lewis acid base concept  
(iii) Bronsted Lowry acid base concept

b. Write four difference between oxidation and reduction reaction.

8. a. Balance the following

6+4=10

- (i)  $\text{Cr}_2\text{O}_7^{2-} + \text{NO}_2 \longrightarrow \text{Cr}^{3+} + \text{NO}_3^-$  (In Acidic Medium)  
(ii)  $\text{MnO}_4^- + \text{I}^- \longrightarrow \text{MnO}_2 + \text{I}_2$  (In Basic Medium)

b. Explain the molecular orbital energy level diagram of  $\text{O}_2^-$  and  $\text{N}_2^+$  molecule.

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