B.Sc. BOTANY
FOURTH SEMESTER
ORGANIC, INORGANIC & PHYSICAL CHEMISTRY II

SET A

BSC – 741

[USE OMR FOR OBJECTIVE PART]

Duration: 3 hrs.

Full Marks: 70

(**Objective**)

Time: 30 min.

Marks: 20

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

1. If a reaction's rate is represented as rate = k [A][B], the reaction's order will be
    a. 2
    b. 3
    c. 1
    d. 0

2. The relation between Kp and Kx is
    a. $K_p = K_x P$
    b. $K_p = K_x (RT)^{\Delta n}$
    c. $K_p = K_x$
    d. $K_p = K_x P^{\Delta n}$

3. In which thermodynamic process does the temperature remain constant throughout the process?
    a. Isobaric
    b. Isothermal
    c. Isochoric
    d. Adiabatic

4. The unit of rate constant for a zeroth order reaction is
    a. $mol\ L^{-1}\ s^{-1}$
    b. s^{-1}
    c. $mol^{-2}\ L^2\ s^{-1}$
    d. $mol\ L^{-1}$

5. 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.
    a. Zeroth law
    b. Second law
    c. First law
    d. Third law

6. Which one of the following reactive intermediate formed in Aldol condensation reaction
    a. Carbocation
    b. Carbene
    c. Carbanion
    d. Nitrene

7. Which one of the following will undergo Aldol condensation reaction
    a. Formaldehyde
    b. Benzaldehyde
    c. Ethanol
    d. Acetaldehyde

8. Which one of the following doesn't contain α-Hydrogen
    a. Acetone
    b. Benzophenone
    c. Acetaldehyde
    d. Acetophenone

9. The reagent used for mono bromination of phenol is
    a. $Br_2(aq.)$
    b. Br_2/CS_2
    c. $Br_2(acetic\ acid)$
    d. $Br_2(alc.)$

10. Phenol react with Br_2(aq.) to form
    a. 2-bromophenol
    b. 2,4- dibromophenol
    c. 2,4,6- tribromophenol
    d. None of these

11. Which of the following is *not* a nucleophile?
    a. NH_3
    b. H_2O
    c. H^+
    d. $H_2C=CH_2$

12. Which of the following is 'ambident nucleophile'?
    a. NO_2^-
    b. CN^-
    c. None of the above
    d. Both A and B

13. Choose the correct statement
    a. Phenols are more acidic than carboxylic acids
    b. Most of the pure phenols are in gaseous state
    c. Boiling point of phenol is lower than aliphatic alcohols
    d. None of the above

14. Boiling Point of phenol is effected by
    a. Intermolecular hydrogen bonding
    b. Carbon-Carbon double bond
    c. Aromatic Ring
    d. Phenoxide

15. Tertiary alkyl halide undergo
    a. S_N1 reaction
    b. S_N2 reaction
    c. S_Ni reaction
    d. All of the above

16. Which of the following is Lewis acid
    a. $AlCl_3$
    b. BCl_3
    c. $GaCl_3$
    d. All of the above

17. Which of the following is paramagnetic substance
    a. O_2
    b. N_2
    c. He_2
    d. None of the above

18. The oxidation state of Cr in $Cr_2O_7^{2-}$
    a. +6
    b. +5
    c. +4
    d. +3

19. Oxidation and Reduction means
    a. Loss of electron and gain of electron
    b. Addition of oxygen and removal of hydrogen
    c. Addition of more electronegative element and removal of electropositive element.
    d. None of the above

20. The bond order of CO molecule is
    a. 2
    b. 3
    c. 4
    d. 1

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(**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   2+3+3+
        in thermodynamics?   2=10
    b. What is Brady's reagent? Write the reaction of Benzaldehyde
        with Brady's reagent.
    c. How ethyl alcohol is prepared industrially?
    d. Write the postulates of VSEPR theory.

2. a. What do you mean by Joule-Thomson effect? What is Joule-   3+3+4
        Thomson coefficient?   =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 °C and 1 atm pressure.

3. a. Write the differential rate equation for the reaction $2A + B \rightarrow$ 3+2+5
        $C + 3D$ and $A + 2B + 3C \rightarrow$ products.   =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	3.0×10^2
2	0.30	0.40	3.6×10^3
3	0.30	0.80	1.44×10^1

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   2+4+4
        than the corresponding aliphatic aldehydes and ketones?   =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.)?

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5. a. Write the products of the following reactions $\qquad$ 5+2+2+1=10
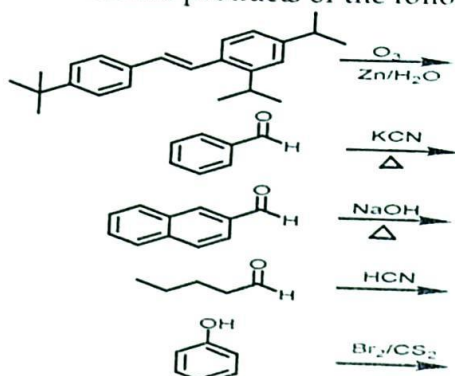
   b. Explain: (i) Acidity of phenols, (ii) Stability of phenoxide, (iii) Why phenols have higher melting point than aliphatic alcohols.

6. a. What happen when
      (i) Glycerol is treated with Nitric acid
      (ii) Glycol is treated with Hydrochloric acid at $160°$ and then at $200°$

      1+2+3+2+2=10

   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 $\qquad$ 6+4=10
      (i) Arrhenius acid base concept
      (ii) Lewis acid base concept
      (iii) Bronsted Lowry acid base concept
   b. Write four differences between oxidation and reduction reaction.

8. a. Balance the following $\qquad$ 6+4=10
      (i) $Cr_2O_7^{2-} + Fe^{2+} \longrightarrow Cr^{3+} + Fe^{3+}$ (In Acidic Medium)
      (ii) $MnO_4^- + I^- \longrightarrow MnO_2 + I_2$ (In Basic Medium)
   b. Explain the molecular orbital energy level diagram of O_2 and N_2 molecule.

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[4]