RAMAKRISHNA MISSION VIDYAMANDIRA

(Residential Autonomous College affiliated to University of Calcutta)

B.A./B.Sc. FOURTH SEMESTER EXAMINATION, AUGUST 2021

SECOND YEAR (BATCH 2019-22)

Date : 13/08/2021 **CHEMISTRY (General)**

Time : 11.00 am – 1.00 pm **Paper : IV** Full Marks : 50

Group –A

UNIT – I

[Attempt any one] [1×10]

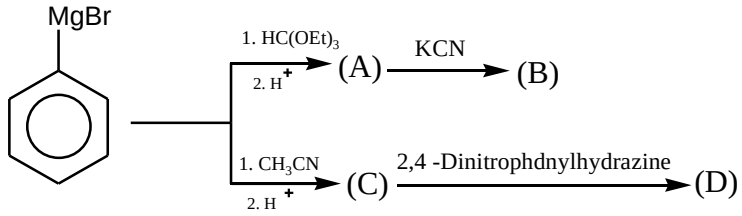
1. a) Predict the product(s) of the following reactions. [2]

(i) $PhCHO + H\text{-}CHO \xrightarrow{KOH}$

(ii) $CH_3-C(=O)-OC_2H_5 \xrightarrow{NaOEt}$

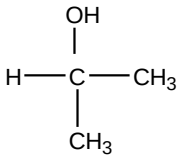
b) Write short note on Aldol condensation. [3]

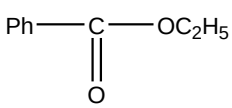
c) Predict the products(A) to (D) in the following reaction sequence. [5]



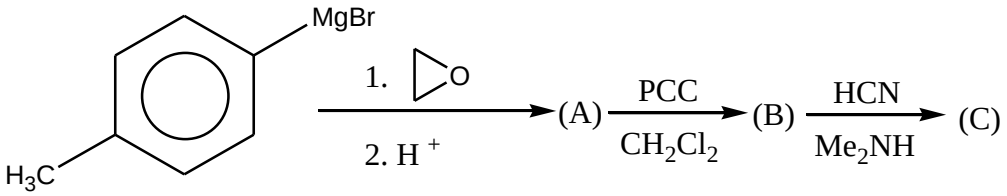
2. a) Write note on Perkin reaction [2]

b) Carry out the following conversions. [2×2]

(i) $CH_3MgBr \longrightarrow$ 

(ii) $PhMgBr \longrightarrow$ 

c) Predict the products(A) to (C) in the following reaction sequence: [3]



d) What happens when acetylene is treated with excess Me Mg Br? [1]

UNIT – II

[Attempt any one] [1×10]

3. a) Write the structure of α-D-glucopyranose in Haworth projection formula. Predict the product when it is refluxed with methanol in acid medium and also explain why the product this formed does not undergo mutarotation. [3]

   b) Write short note on : Osazone formation. [3]

   c) Carry out the following conversions: [2×2]

   i) Phthalimide → Methylamine

   ii) D-Arabinose → D- glucose.

4. a) Write the structure of the following. [2]

   i) β-D-glucopyranose (Haworth projection)

   ii) L – Phenylalanine (Fischer projection)

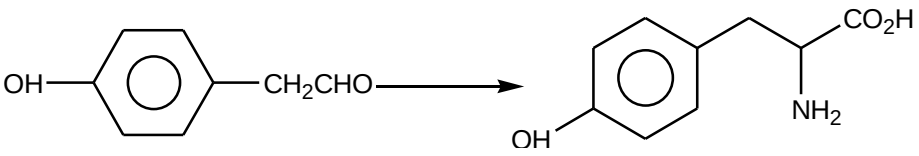
   iii) Glyceryl trioleate

   b) Write short note on : [2×2]

   i) Isoelectric point ii) Mutarotation

   c) Carry out the following conversions: [2×2]

   (i) D — glucose ⟶ D — Arabinose

   (ii) 

Group –B
Unit – III

[Attempt any one] [1×6]

5. a) Explain the significance of the terms k, A and E_a mentioned in the Arrhenius equation. How does the reaction change, if the temperature is increased?

   b) A first order reaction takes 20 mins to complete 50% of the reaction. Calculate the time taken for 75% completion of the same reaction. What is the half-life of the reaction? [3+3]

6. a) Acid catalysed ester hydrolysis seems to have dependency on ester, water and acid, but it is called a pseudo-1st order reaction. Explain with rate equation.

   b) Plot a straight line curve for both 1st and 2nd order reaction, with proper description of axis. [3+3]

Unit – IV

[Attempt any one] [1×6]

7. a) Define law of equipartition of energy for N_2 molecule. Also show that for this molecule, C_P is greater than C_V.

   b) Indicate graphically the variation of Z with the pressure of a real gas at a constant T, which initially decreases then increases. Explain the nature of behaviour with van der Waals gas of equation. [3+3]

8. a) Write down the Maxwell's distribution of speed for gas molecules moving in 3 dimensions. How the plot will change if the temperature is doubled?

   b) At what temperature, the rms speed of H_2 will be same as to the average speed of O_2 gas at NTP? What is the other type of speed available for the gas molecules? [3+3]

Unit – V

[Attempt any one] [1×6]

9. a) Write down any of the alternative statements of the First Law of Thermodynamics .

   b) This law leads us to define a fundamental state function and a derived one. Name them

   c) One mole of an ideal gas with C_v = 2.5 R is expanded adiabatically until the temperature drops from 293 K to 283 K. Calculate Q, W, ΔU. [2+2+2]

10. a) Find out which of the following represent differential change of a state function :

   (i) $df = 2xdx + 2ydy$
   (ii) $df = x^2 dx + ydy$

   b) For a system to be isolated from the surrounding the walls need to be

   i) non-adiabatic/ adiabatic

   ii) open/closed

   iii) movable/fixed

   (in every case just mention the correct option)

   For a system to be closed the walls need to be

i) non-adiabatic/ adiabatic

ii) open/closed

iii) movable/fixed

(in every case just mention the correct option) [(1.5+1.5)+(1.5+1.5)]

Unit – VI

[Attempt any one] [1×6]

11. a) Write down any of the alternative statements of the Second Law of Thermodynamics .

b) Mention the condition for equilibrium under the following conditions :

1. Constant T, P
2. Constant T, V
3. Constant S, P
4. Constant S, V

c) Write down the thermodynamic defibition of entropy. [2+2+2]

12. a) If an engine works between two temperatures 25 and 75 degrre selsius what is the maximum possible value of the efficiency ?

b) Which of the following quantities is zero over a cycle?

i) Change of free energy (ii) Change of entropy (iii) work done (iv) heat withdrawn by the system.

c) What is the amount of internal energy change when an ideal gas expands isothermally?

What is the relation between heat and work done for the process ? Does this amount to a violation of second law? [2+2+2]

Unit – VII

[Attempt any two] [2×3]

13. a) Draw a rough structure of a represntative micelle clearly showing the polar head group and the hydrophobic tail.

b) Why do you think the arrangement be such (polar group outward, hydrophobic tail inwards)? [3]

14. a) Stability of colloid is kinetic not thermodynamic in nature . Explain

b) How could you phenomenologically distinguish a colloid from a true solution. [2+1]

15. a) How conductance varies with micelle concentration (in a range that includes the CMC) ?

b) What is meant by Gold number for a colloid? [1.5+1.5]

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