CARMEL COLLEGE OF ARTS, SCIENCE & COMMERCE FOR WOMEN, NUVEM
SEMESTER END EXAMINATION, JULY 2021
SEMESTER II of B.Sc
CHC-102 (Physical Chemistry & Organic Chemistry)

Time: 2 hrs (10.00am to 12.00 noon) **Date: 12/07/2021** **Marks: 40**

Instructions: 1) All the questions are compulsory
2) Figures to the right indicate full marks
3) Please avoid malpractices while answering. It is morally wrong

Q.1) Answer **ANY FIVE** of the following questions: **(2X5)**

a) Differentiate between open, closed and isolated systems with the help of suitable examples.

b) Arrange the following in the increasing value of their basicity.

Base	Ammonia	Aniline	Dimethylamine	Hydrazine	Methyl amine	Pyridine
pKb	4.75	9.13	3.27	5.9	3.34	8.77

c) A 10 g spherical ball of copper was heated by passing electrical current. If a transfer of 100 J of energy increased the temperature of the sphere by 22°C. Calculate the heat capacity of copper. Assume no heat was lost during the heating process.

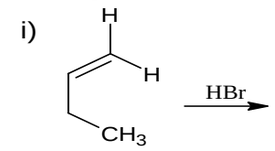
d) Calculate the $\Delta_r U$ for the following reaction at 298 K.

$$NH_3(g) \longrightarrow 1/2\ N_2(g) + 3/2\ H_2(g) \qquad \Delta_r H = 46.11\ KJ$$

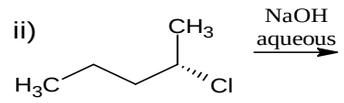
e) How will you prepare isopropyl benzene from benzoic acid?

f) Predict the product of the following reactions:

i)

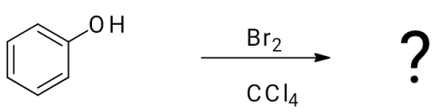


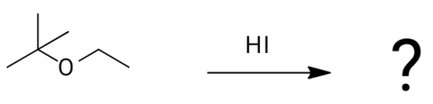
ii)



g) Identify A and B in the following reaction.

h) Predict the product for the following reactions:





Q.2) Answer **<u>ANY SIX</u>** of the following questions: **(5X6)**

(a) i) Calculate the heat of formation of H_2O (l) at 383 K if ΔH for the reaction **(3)**

$$H_2\,(g) \;+\; 1/_2\,O_2(g) \longrightarrow H_2O\,(l)$$

at 298K is -298.06 KJ. The heat capacities for H_2 (g), O_2 (g) and H_2O (l) are 27.61, 29.50 and 75.31 $JK^{-1}mol^{-1}$ respectively.

ii) State and explain zeroth law of thermodynamics with an example. **(2)**

(b) i) State the Le-Chatelier's Principle and explain any two of its factors with an example. **(3)**

ii) Calculate the free energy change at 27°C for the following reaction **(2)**

$$1/_2\,H_2(g) \;+\; 1/_2\,I_2(s) \longrightarrow HI(g) \qquad \Delta H = 25.95\ KJ$$

Given: $S_{HI\,(g)}$ = 206.27 J/K/mol, $S_{H_2\,(g)}$ = 130.60 J/K/mol, $S_{I_2\,(s)}$ = 116.73 J/K/mol

Predict the feasibility of the above reaction.

(c) i) At 25°C, the Ionization constant of Anilinium hydroxide is 4.6×10^{-10}. **(3)**

Calculate: 1) the hydrolysis constant of Anilinium chloride
2) the degree of hydrolysis
3) pH value in 0.02molar solution of the salt.

ii) Write the conjugate acid-base pairs of the following chemical reactions. **(2)**

1. $HNO_2 + H_2O \longrightarrow NO_2^- + H_3O^+$
2. $HCl + NH_3 \longrightarrow NH_4^+ + Cl^-$

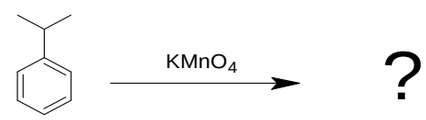
(d) i) Define solubility Product. **(3)**

Given the solubility product of $Fe(OH)_3$ is 1.1×10^{-36}. Calculate the solubility of the compound.

ii) What will be the hydrogen ion concentration of a solution obtained by mixing equal volumes of 0.05M acetic acid and 0.5M sodium acetate? Dissociation constant of acetic acid is 1.8×10^{-5}. **(2)**

(e) Identify and predict the missing product(s)/reagent(s) in the following synthetic schemes**:** **(5)**

i)



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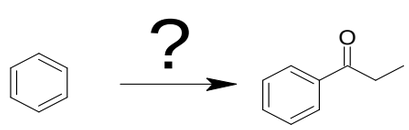

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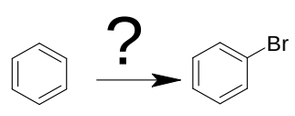

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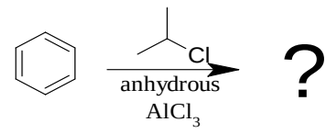

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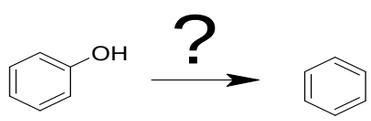
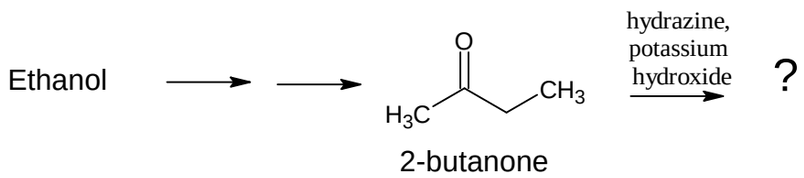
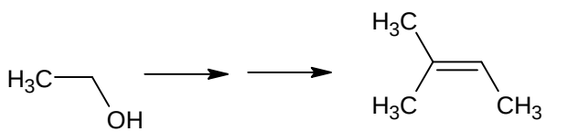


(f) How will you prepare 2-butanone from ethanol? What happens when 2-butanone is heated with hydrazine and potassium hydroxide? **(5)**



2-butanone

(g) How will you prepare 2-methyl-2-butene from ethanol **(5)**



ethanol 2-methyl-2-butene

(h) Explain the mechanism involved in the following transformation: **(5)**