

CARMEL COLLEGE OF ARTS, SCIENCE AND COMMERCE FOR WOMEN,
SEMESTER END EXAMINATION APRIL 2019

Semester: II of B.Sc. Course: CHC102 Physical Chemistry and Organic Chemistry
Total marks: 80 Date: 26/04/2019 Duration: 2 hours

Instructions: 1) Answers to the two sections should be written on separate books.
2) All questions are compulsory
3) Use of scientific calculator is permitted
4) Figures to the right indicate full marks

Section A: Physical Chemistry

Marks: 40

Q.1. Answer ANY FIVE from the following (2x5=10 marks)

- Define and explain Open System with a suitable example.
- What is the Le Chatelier's principle?
- Explain common ion effect.
- Define Zeroth Law of thermodynamics. What is its most important application?
- State the law of mass action.
- Explain anionic hydrolysis with a suitable example.
- The solubility of CuBr is found to be 2.0×10^{-2} mol/L at 25°C .

Calculate K_{sp} value of CuBr.

Q.2.A. Answer the following:

- Discuss the factors that govern Degree of Dissociation of an electrolyte. 4 marks
- The hydrogen ion concentration of a solution is 3.8×10^{-2} M. Find the pH and pOH of a solution. 3 marks

OR

- Obtain an expression of hydrolysis constant for the salt of weak acid and strong base. 4 marks
- Calculate the pH of a 0.015 M NaOH solution consider a complete dissociation. 3 marks

Q.2.B. Answer the following:

- Calculate the standard free energy change for the reaction 4 marks
$$\text{CO (g)} + \frac{1}{2} \text{O}_2 \text{ (g)} \longrightarrow \text{CO}_2 \text{ (g)} \quad \Delta H^\circ = 270 \text{ KJ}$$

Standard entropies of CO_2 , CO , O_2 are 205, 190 and 200 J/degree/mole respectively.
Predict whether the reaction is feasible or not.
- Derive the relationship between K_c and K_p 4 marks

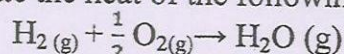
Q.3.A. Answer the following

- Derive the Kirchhoff's equation showing variation of enthalpy of a reaction with temperature. 4 marks
- Calculate ΔH° of the reaction Given that ΔH°_f for CO_2 (g), CO (g) and H_2O (g) are -393.5, -111.3 and -241.8 KJ mol⁻¹ respectively. 3 marks



OR

- What is Hess's Law? Explain with a suitable example. 4 marks
- Calculate the heat of the following reaction: 3 marks



Bond energy of H-H, O=O and O-H bonds are 104, 118 and 110 Kcal mol⁻¹ respectively.

Q.3.B. i. Apply Le-Chatelier principle to predict suitable conditions for getting maximum yield of the product in manufacture of ammonia by Haber's process. **4 marks**

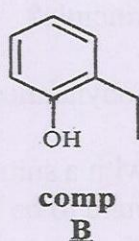
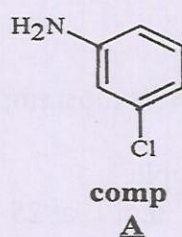
ii. Explain the buffer action of Acidic buffer with example. **4 marks**

Section B: Organic Chemistry

Marks: 40

Q.4. Answer **ANY FIVE** questions of the following. **(2 x 5 = 10 marks)**

i. State whether the following is para, meta, or ortho substituted and also give their respective IUPAC name.

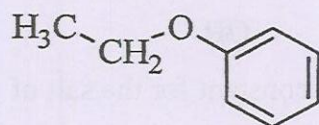


ii. Give **ANY ONE** method of preparation for the following compounds

a) Chlorobenzene

b) 2-methyl-2-bromo pentane

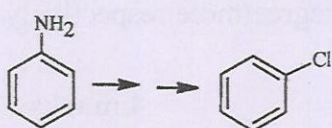
iii. Write the starting materials to prepare the following ether by Williamson synthesis.



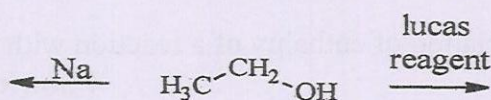
iv. Arrange the following compounds in order of their increasing boiling points. Justify.

n-pentane, 1-pentanol, 2-pentanone

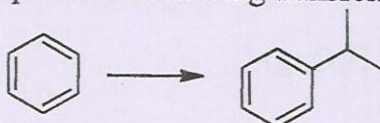
v. Complete the following sequence:



vi. Write the products formed in the following reactions:



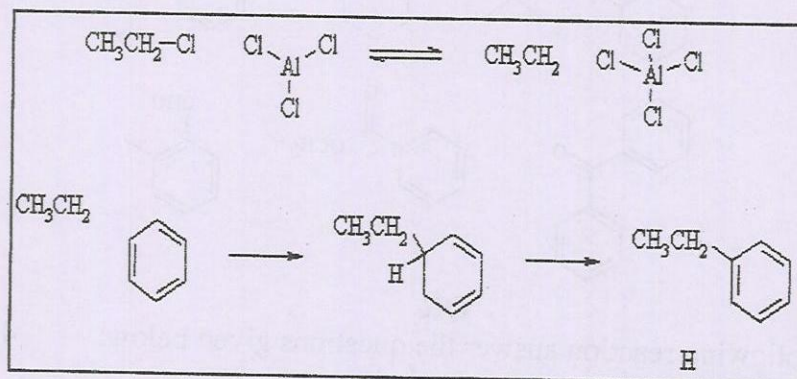
vii. Complete the following transformation



Q.5.A. i) Draw in all of the curved arrows and any required charges to complete the step-by-step mechanisms for each of the following reaction scheme. All the required bonds have been shown.

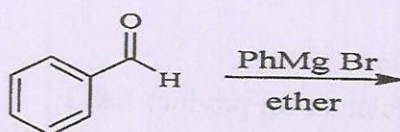
4 marks

Scheme (a)



ii) The following Grignard reaction will give an alcohol as the product. Write the structure of the product. Will the product undergo dehydration? Justify your answer.

3 marks



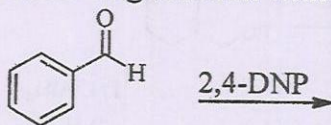
OR

iii) Explain the mechanism involved in sulphonation of benzene

4 marks

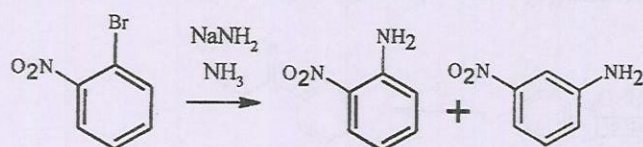
iv) Write the product formed in the following reaction with mechanism.

3 marks



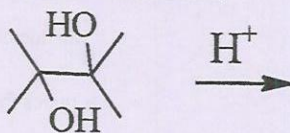
Q.5.B. i) Write an appropriate mechanism for the following reaction. (hint: it involves formation of benzyne intermediate)

4 marks



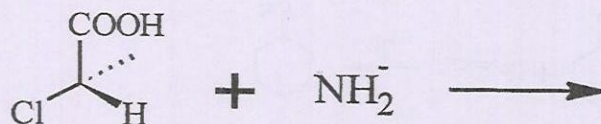
ii) What product will be obtained when the vicinal diol shown below undergoes pinacol-pinacolone rearrangement? Show with mechanism.

4 marks

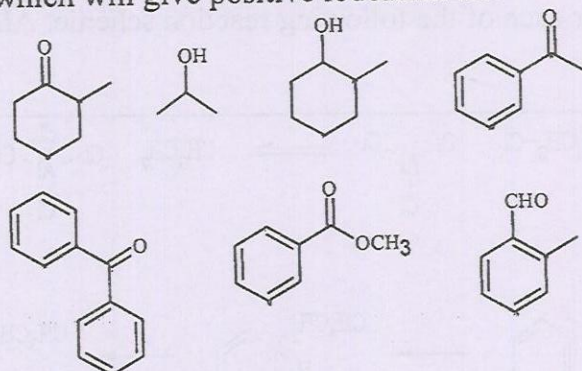


Q.6.A. i) Write the product obtained from the following reaction by $\text{S}_\text{N}2$. Explain the mechanism involved.

4 marks

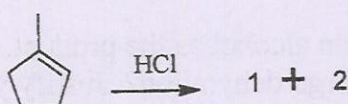


ii) Identify the compound which will give positive iodoform test **3 marks**



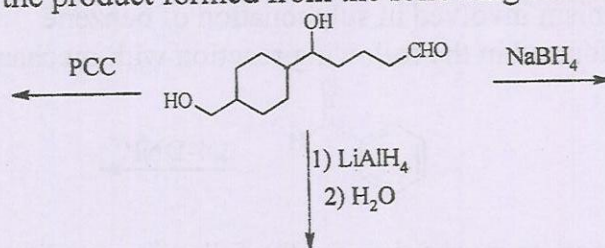
OR

iii) Consider the following reaction answer the questions given below: **4 marks**

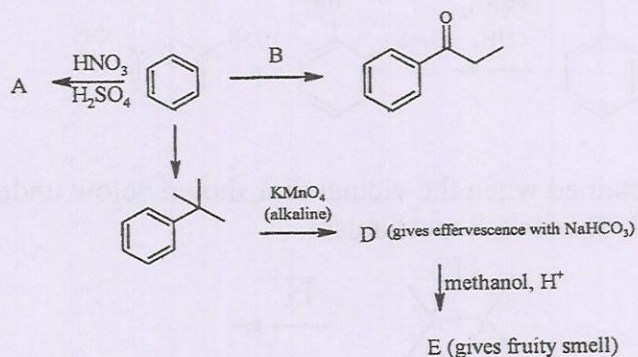


- Identify the product 1 & 2 (1)
- Give the IUPAC nomenclature for product 1 & 2 (1)
- Explain the mechanism involved in the above reaction (2)

iv) Write the structure of the product formed from the following reactions. **3 marks**



Q.6. B. i) Identify the product(s)/missing reagent(s), A, B, C & D, for the following scheme. **4 marks**



ii) Identify the name reaction involved in the following reactions. **4 marks**

