

The Royal University of Bhutan
Paro College of Education
Spring Semester Examination- 2012

B.Ed(S) IV - Gas Laws and Introduction to Organic Chemistry (CHE408)

Full Mark: 100

Pass Mark: 50

Time: 3 hours

Instruction:

1. *This question paper consists of two sections A & B. Section A is short answer type which is compulsory and section B has a choice.*
2. *In section B there are six questions out of which you have to choose any five, all questions carry equal marks.*
3. *You are allowed to use fx82 or fx100 scientific calculator.*
4. *This question paper consists of five printed pages.*

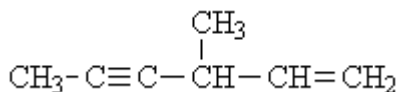
Section A (40 marks)

Instruction: Answer all questions in this section.

Question1

This question carries four possible answers. Choose the most appropriate answer from the given options. (2x10=20)

- a. Charles law says;
A. $P_1V_1 = P_2V_2$
B. $V_2T_1 = V_1T_2$
C. $P_1V_1/T_1 = P_2V_2/T_2$
D. $V_1T_1 = V_2T_2$
- b. What is the correct IUPAC name of the following compound?



- A. 4-methyl-2-hexyne
 - B. 4-methylhex-2-yne-5-ene
 - C. 3-methylhex-4-yne-1-ene
 - D. 3-methylhex-1-ene-5-yne
- c. The compound which gives the most stable carbonium ion on dehydration is;
A. $(\text{CH}_3)_2\text{CHCH}_2\text{OH}$
B. $(\text{CH}_3)_3\text{COH}$
C. $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{OH}$
D. $\text{CH}_3\text{CHOHCH}_2\text{CH}_3$

- d. In the given equation $PV = \frac{1}{3} m n u^2$, m stands for;
- Mass of a gas
 - Mass of a molecule
 - Mass of a mole
 - Mass of a single molecule of the gas
- e. When alkyl halide is treated with metallic sodium in presence of dry ether, the type of reaction is called
- Cannizzaro reaction
 - Tischenko reaction
 - Wurtz reaction
 - Rosenmunds reaction
- f. A vessel contains 132 g of carbon dioxide at normal STP, the total number of moles of carbon dioxide in a vessel will be; (C = 12, O = 16)
- 1 mole
 - 2 mole
 - 3 mole
 - 4 mole
- g. Which of the following compound does not undergo aldol condensation?
- $(\text{CH}_3)_2\text{CHCHO}$
 - CH_3COCH_3
 - $\text{CH}_3\text{CH}_2\text{CHO}$
 - $\text{C}_6\text{H}_5\text{CHO}$
- h. Which of the following is the strongest acid?
- CH_3COOH
 - CCl_3COOH
 - CHCl_2COOH
 - CH_2ClCOOH
- i. The + I effect is shown by;
- $-\text{CH}_3$
 - $-\text{OH}$
 - $-\text{F}$
 - $-\text{C}_6\text{H}_5$
- j. Which of the following is an electrophile?
- NH_3
 - OH^-
 - $\text{CH}_3-\text{O}-\text{CH}_3$
 - AlCl_3

Question 2

Give reasons for the following statements. (2 x 5 = 10)

- Ether acts as a nucleophile.
- Carboxylic acid has higher boiling point than alcohol.
- Ketones are unable to reduce Tollen's reagent and Fehling's solution.
- Acetaldehyde does not undergo Cannizzaro reaction.
- In Rosemund's reduction reaction barium sulphate and sulphur is used beside the catalyst palladium.

Question 3

State whether the following statements are True or False (1 x 5 = 5)

- Formaldehyde reacts with ammonia to form formaldehyde ammonia.
- In electromeric effect there is the complete transfer of the shared pair of pi electrons.
- $\text{CH}_3\text{-CH=CH-CH}_3$ is heavier than water.
- One molecule of gas contains 6.023×10^{23} moles.
- Markownikoff's rule is not followed in the presence of organic peroxide.

Question 4

Fill in the blanks (1 x 5 = 5)

- When Chlorine molecule is exposed to UV light it forms
- Deuterium is an example of electron group
- Generally reduction of aldehyde yields.....
- is a compound which contains two halogen atoms attached to nearby carbons.
- The IUPAC name of CH_3CN is

Section B (60 marks)

Instruction: Answer any five.

Question 5

(4 + 1 + 4 + 3)

- Derive an equation $E'_K = \frac{3}{2}KT$.
- Alcohol also behaves as an acid, write one reaction to support this statement.
- What would happen to methane if it is reacted with chlorine under certain conditions?
- Alkene due to presence of double bond undergo polymerization reaction quite easily, some of the polymers are polyethene, polyvinyl chloride and Teflon. Give a chemical reaction to show the formation of above three polymers.

Question 6

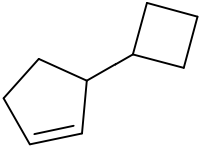
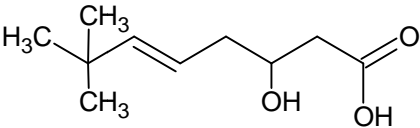
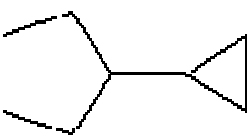
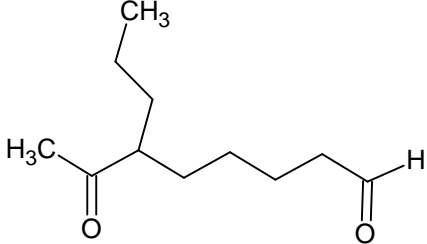
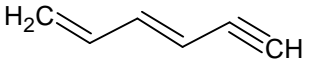
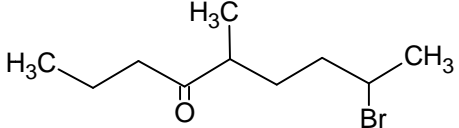
(3 + 3 + 2 + 2 + 2)

- 800cm^3 of a gas was collected at 650mm pressure. At what pressure would the volume of the gas be reduced by 40% of its original volume?
- What is HVZ reaction? Give a example of it.
- What is effusion? Give a relationship between effusion of gas and molecular mass.
- How will you convert primary alcohol into secondary alcohol?

- e. Arrange the following into decreasing acid strength.
 $\text{CH}_3\text{CH}_2\text{CHClCOOH}$, $\text{CH}_3\text{CH}_2\text{CH}_2\text{COOH}$, $\text{CH}_2\text{ClCH}_2\text{CH}_2\text{COOH}$
 $\text{CH}_3\text{CHClCH}_2\text{COOH}$

Question 7

(4 + 2 + 6)

- Calculate the weight of Ethane in a 8.0 liters cylinder at 16 atm. pressure and 27°C .
 ($R = 0.0821 \text{ litre atm.mol}^{-1} \text{ K}^{-1}$, $C = 12$, $H = 1$)
- State Markovnikov rule with an example.
- Give the IUPAC name of the following compounds;
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Question 8

(3 + 2 + 2 + 4 + 1)

- A vessel with small opening contained equal volumes of oxygen and an unknown gas. Oxygen effused through the opening 1.8 times faster than the unknown gas. If the atomic mass of oxygen is 16, calculate the molecular mass of the unknown gas.
- Show that $PV = nRT$.
- What is Cannizzaro reaction? Give an example of it.
- When excess of alcohol is heated with sulphuric acid at 413K, an ether is obtained. Show the detail mechanism how this reaction proceeds?
- What is alpha hydrogen? Show an example of alpha hydrogen.

Question 9

(3 + 2 + 3 + 2 + 2)

- What is Tischenko reaction? Give one example of this type of reaction.
- Give four characteristic difference between ketone and aldehyde.
- Nitrogen is present in a 2 litre flask at a pressure of 7.6×10^{-10} mm Hg. Calculate the number of nitrogen molecules in a flask at 23°C. ($R = 0.0821$ litre. Atm. K⁻¹ mol⁻¹)
- What are carbocations? Write the structure of primary, secondary and tertiary carbocations.
- Draw the graphical representation of Boyle's law and Charles law.

Question 10

(5 + 2 + 2 + 3)

- Write the structural formulae of the following compounds;
 - 2-propene-1-nitrile
 - 1,3-dimethyl cyclopentane
 - 2-methyl-pent-2-ene-1-al
 - 2-methyl-3-pentene-1-oic acid
 - Heptan-3,5-diol
- Calculate the average kinetic energy of a hydrogen molecule at 27°C. ($K = 1.3807 \times 10^{-23}$)
- Write the reaction of Ether with halogen acid in cold and hot conditions.
- When unsymmetrical alkene like $(CH_3)_3CCH=CH_2$ is treated with HCl, two products are formed one major and one minor, show how this two products are formed.

Question 11

(1 + 2 + 3 + 2 + 4)

- What is Lindlar's catalyst?
- How will you prepare Lewisite?
- It is desired to reduce the volume of 1000cm³ of a gas by 25%. To what temperature the gas is cooled if the initial temperature is 125°C and the pressure remains constant.
- Write four differences between SN¹ and SN² reaction.
- Carry out a conversion of higher alcohol into lower alcohol.