

**Bago University**  
**Department of Chemistry**  
**Second Semester Examination, September 2019**

**First Year BSc**  
**(Chemistry Specialization)**  
**Answer any six Questions**

**Chem 1102**  
**Fundamental Chemistry II**  
**Time Allowed: (3) hours**

1. (a) Fill in the blanks with the correct word(s), unit(s), and etc., as necessary.
  - (i) The polarity of a molecule by its \_\_\_\_\_ which measures the separation of charge within a molecule.
  - (ii) Most metal oxides are \_\_\_\_\_ that dissolve in water react to form metal hydroxides.
  - (iii) The flow of the solvent through a semipermeable membrane from pure solvent to solution is termed \_\_\_\_\_.
  - (iv) Oxidation is \_\_\_\_\_ of electrons by an atom or group of atoms.
  - (v) General molecular formula of ether is \_\_\_\_\_.
  - (vi) Aldehyde can be prepared by the oxidation of \_\_\_\_\_ alcohols.
- (b) Select the correct statement(s), word(s), unit(s) and etc., given in the followings.
  - (i) Diborane has (9, 6, 12) valence electrons.
  - (ii) Among the elements of any row of the periodic table, the ionization energy tends to (equal, decrease, increase ) as atomic number increase.
  - (iii) Sulphuric acid is a (monoprotic, diprotic, triprotic) acid.
  - (iv) Liquid mixtures which distil with a change in composition are called (azeotropic, zeotropic, azeotropic and zeotropic) mixtures.
  - (v) Ethers having the two same alkyl groups are known as (simple, asymmetrical, symmetrical) ethers.
  - (vi) Ketone can be prepared by the oxidation of ( $1^\circ$ ,  $2^\circ$ ,  $3^\circ$ ) alcohols.
2. (a) Define the bond energy. What is an ionic bond? What are the factors favouring an ionic bond formation?
- (b) Explain the following statements.
  - (i) Dipole moment of  $\text{CH}_4$  is zero.
  - (ii) Dipole moment of  $\text{CO}_2$  is zero.
3. (a) Discuss briefly on the metalloids with an example.
- (b) Explain why the use of hydrogen as fuel is environmentally friendly.
4. (a) (i) What is meant by the term molal depression constant?
- (ii) A solution containing  $2.44 \times 10^{-3}$  kg of a solute dissolved in  $75 \times 10^{-3}$  kg of water boiled at 373.413 K. Boiling temperature of water is 373 K.  
 Calculate the molar mass of the solute. ( $K_b$  for water =  $0.52 \text{ K kg mol}^{-1}$ )
- (b) Show that the relative lowering of vapour pressure is directly proportional to osmotic pressure.

5. (a) (i) Name the colligative properties which exhibit in dilute solution containing non-volatile solute.  
(ii) 53.94 g of a substance (molecular mass = 182 amu) is dissolved in 1000 g of water at 20°C. At this temperature the vapour pressure of water is 17.5 mmHg. Calculate the vapour pressure of this dilute solution.  
(H = 1, O = 16)
- (b) How do you understand the reverse osmosis? Explain briefly.
6. (a) How would you convert the following reactions?
- (i)  $\text{C}_2\text{H}_5\text{OH} \xrightarrow{?} \text{C}_2\text{H}_5\text{OC}_2\text{H}_5$
- (ii)  $\text{C}_6\text{H}_5\text{COCH}_3 \xrightarrow{?} \text{C}_6\text{H}_5\text{CHOHCH}_3$
- (iii)  $\text{CH}_3(\text{CH}_2)_5\text{CHO} \xrightarrow{?} \text{CH}_3(\text{CH}_2)_5\text{CH}_2\text{NH}_2$
- (iv)  $\text{CH}_3\text{COCH}_3 \xrightarrow{?} \text{CH}_3\text{COOH}$
- (b) Write equations for the following reactions.
- (i) Williamson synthesis  
(ii) Friedal-Craft acylation  
(iii) Aldol condensation
7. (a) Predict the products for the reactions of following sets of compounds.
- (i)  $\text{CH}_3\text{CHO}$  and  $\text{NH}_3$   
(ii)  $\text{C}_6\text{H}_5\text{COCl}$  and  $\text{C}_6\text{H}_6$   
(iii)  $\text{CH}_3\text{CH}_2\text{OCH}_2\text{CH}_3$  and  $\text{Al}_2\text{O}_3, 360^\circ\text{C}$
- (b) Write the example equations for the reactions of ketones that include the following reagent.
- (i) Sodium bisulphite      (ii) Hydrogen      (iii) Grignard reagent

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