**Bago University**
**Department of Chemistry**
**First Semester Examination, March 2019**

**Second Year B Sc** **Chem-2103**
**(Chemistry Specialization)** **Organic Chemistry I**
**Answer (*any six*) Questions** **Time allowed (3) hours**

1. (a) Fill in the blanks with the correct word(s), unit(s), and etc., as necessary.
   (i) Fats are -------- derived from long-straight chain carboxylic acid containing an even number of carbon atom.
   (ii) The basic character of amines is due to the presence of a lone pair of electrons on --------- atom.
   (iii) The commercial name of benzene is --------.
   (iv) Coal tar is a black -------- liquid having an obnoxious odour.
   (v) Dihydric alcohols or --------- are compounds containing two hydroxyl groups.
   (vi) Pyruvic acid is a viscous acid and -------- with water.

   (b) Select the correct statement(s), word(s), unit(s) and etc., given in the followings.
   (i) The IUPAC name of ($CH_3NH_2$, $CH_3CH_2NH_2$, $CH_3NHCH_3$) is methanamine.
   (ii) Solvent naphtha is a mixture of higher homologues of (toluene, benzene, xylene).
   (iii) Esters are compounds containing (-COOH, -COO-, -CHO) functional group.
   (iv) The separation of aromatic compounds from coal tar is done by (steam, fractional, water) distillation.
   (v) (Ethylene glycol, Glycerol, Propene glycol) is an important precursor to polyester, fibers and resins.
   (vi) Glycerol is the most important (polyhydric, dihydric, trihydric) alcohol.

2. (a) Give an acceptable IUPAC name for each of the aliphatic compounds given below.
   (i) $CH_3CH(OH)COOH$ (ii) $C_6H_5COOCH_2CH_3$ (iii) $CH_3CONH_2$
   (iv) $C_6H_5COOH$ (v) $CH_3CO\text{-}N(CH_3)_2$ (vi) $CH_3COOCH_2CH_3$

   (b) Illustrate the following reactions with equations.
   (i) Fischer esterification
   (ii) Saponification
   (iii) Adkin's method

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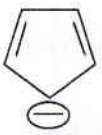
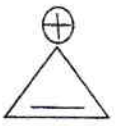
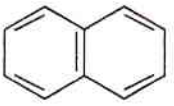
3. (a) Arrange each of the following compounds in order of increasing boiling point. Give reasons for your answer.
   (i) Acetamide, N-methyl acetamide, N-N dimethyl acetamide
   (ii) Methylamine, Dimethylamine, Trimethylamine
   (iii) Ethanoic acid, Benzoic acid, Pentanoic acid

   (b) How would you prepare - (i) pentanoic acid from pentanal?
   (ii) *p*-chlorobenzoic acid from *p*-chlorotoluene?
   (iii) isobutyric acid from isobutyl alcohol?

4. (a) Write down the structure for each of the following aromatic compounds.
   (i) phenol (ii) toluene (iii) acetophenone (iv) *m*-xylene
   (v) benzaldehyde (vi) *o*-cresol (vii) benzene sulphonic acid

   (b) Suggest a mechanism for each of the following reactions of benzene.
   (i) Bromination (ii) Nitration

5. (a) On the basis of the Huckel's rule, label the following molecules as aromatic or anti-aromatic. Give reasons for your answers.

   (i)  (ii)  (iii) 

   (b) How would you prepare toluene starting from the following compounds?
   (i) toluic acid (ii) benzene (iii) phenyl magnesium bromide

6. (a) Outline an example to illustrate each of the following reactions.
   (i) Hydroxylation of ethene (ii) Hydrolysis of epoxide
   (iii) Dehydration of glycerol (iv) Decarboxylation of pyruvic acid

   (b) How would you synthesize the following compounds from malonic ester?
   (i) acetic acid **(ii) n-butyric acid**

7. (a) Write down the equations for the preparation of following compounds.
   (i) succinic anhydride (ii) methyl pyruvate (iii) n-valeric acid

   (b) Perform the following conversions.
   (i) pyruvic acid $\longrightarrow$ acetic acid
   (ii) glycine $\longrightarrow$ α-hydroxyethanoic acid
   (iii) lactic acid $\longrightarrow$ propanoic acid

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