Bago University
Department of Chemistry
First Semester Examination, March 2019

First Year BSc
(Physics, Geology, Zoology, Botany Specialization)
Answer *any six* Questions

Chem-1001
General Chemistry I
Time Allowed: (3) hours

1. (a) Fill in the blanks with the correct word(s), unit(s), and etc., as necessary.
   (i) The radiations travelling from the cathode to the anode are termed ——.
   (ii) A *p* orbital has —— regions of high electron density.
   (iii) Electrical conductivities are usually measured in units of ——.
   (iv) Aldehydes can be prepared by the oxidation of —— alcohols.
   (v) The reaction of alcohol with organic acid result in the formation of ——.
   (vi) The general formula for the monohydric alcohols is ——.

   (b) Select the correct statement(s), word(s), unit(s) and etc., given in the followings.
   (i) Interaction of cathode rays with a magnetic field is constituents with (positive, negative, neutral) charge.
   (ii) Among the elements of any row of the periodic table, the ionization energy tends to (equal, decrease, increase) as atomic number increases.
   (iii) Lewis observed that many elements are most stable when they contain (two, eight, eighteen) electrons in their valence shell.
   (iv) Alkenes react with hypohalous acid to form (alkyl halide, halohydrin, hydrogen sulphate).
   (v) When the alcohols contain four or more hydroxyl groups, they are usually called (monohydric, dihydric, polyhydric) alcohols.
   (vi) Coal and petroleum are two most important substances obtained from (plant, animal, mineral) kingdom.

2. (a) Describe how Millikan determined the electronic charge.
   (b) What are canal rays? How do we know that canal rays have charges opposite in sign to cathode rays?
   (c) Naturally occurring chromium consists of four isotopes. It is 4.31% $^{50}_{24}Cr$, which has a mass of 49.94 amu and 83.76% $^{52}_{24}Cr$, which has a mass of 51.941 amu, 9.55% $^{53}_{24}Cr$, mass 52.941 amu and 2.38% $^{54}_{24}Cr$, mass 53.939 amu. Calculate the atomic weight of chromium.

3. (a) State (i) Aufbau principle(ii) Hund's rule and (iii) Pauli Exclusion principle.
   (b) Write an acceptable set of four quantum numbers for the last electron in the following atoms.
   $_{9}F$, $_{18}Ar$, $_{24}Cr$, $_{27}Co$

P.T.O

4. (a) Arrange the member of each of the following sets of cations in order of increasing ionic radii;
(i) K^+, Na^+, Li^+, Rb^+ (ii) Ca^{2+}, Sc^{2+},Ti^{2+}, V^{2+} (iii) Ga^{3+}, K^+, Ca^{2+}

(b) Explain the following statements.
(i) Dipole moment of BF_3 and CH_4 are zero.
(ii) SO_2 has dipole moment while CO_2 has not.
(iii) BF_3 has no dipole moment but NH_3 has.

5. (a) (i) Classify the natural sources of organic compounds.
(ii) Write down all possible isomers of C_6H_{14}. Give the IUPAC name of the isomers.

(b) Complete the following reactions. Give the names of the organic compounds.
(i) $CH_3CH_2\,CH_2OH \xrightarrow{P + I_2} ?$
(ii) $CH_3CH_2\,CH\,OH\,CH_3 \xrightarrow{KMnO_4} ?$
(iii) $CH_3CH_2CH(CH_3)CH_2OH \xrightarrow{PBr_3} ?$
(iv) $CH_3CH_2\,CH_2OH \xrightarrow{CrO_3} ? \xrightarrow{CrO_3} ?$

6. (a) Write down the equations for the following reactions of alkanes.
(i) Nitration (ii) Sulphonation (iii) Oxidation

(b) Draw the structures of the hemiacetals and acetals that can be formed from the following sets of compounds.
(i) HCHO and CH_3CH_2OH (ii) CH_3CH_2CHO and CH_3CH_2OH

7. How would you convert the following?
(i) $HCHO \rightarrow CH_3CH_2OH$
(ii) $CH_3CHO \rightarrow CH_3CHOHCH_2CH_3$
(iii) $CH_3CHO \rightarrow CH_3COOH$
(iv) $C_6H_5CHO \rightarrow C_6H_5COOH$
(v) $CH_3\,CH_2CHO \rightarrow CH_3\,CH_2CHOHCH_2CH_2CH_3$
(vi) $HCHO \rightarrow (CH_3)_2\,CH\,CH_2OH$

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