Bago University
Department of Chemistry
First Semester Examination, March 2019

Second Year BSc
(Geology Specialization)
Answer *any six* Questions

Chem-2001
Chemistry I
Time Allowed: (3) hours

1. Fill in the blanks with the correct word(s), unit(s), and etc., as necessary.
   (i) The metals arising from the filling of the 3d, 4d, 5d level are the —— elements.
   (ii) Each iron atom is surrounded —— by four oxygen atoms.
   (iii) Chromium and its compounds are extremely ——.
   (iv) When a system is uniform throughout, it is called a —— system.
   (v) Those process in which the temperature remains fixed, are termed—— process.
   (vi) The factor w/q_2 is called ——.
   (vii) The internal energy of a system is a —— function.
   (viii) Benzene and its homologues have the general formula ——
   (ix) The separation of aromatic compounds from coal tar is done by ——
   (x) Coal-tar is a black viscous liquid having an —— odour.
   (xi) Polymerization of acetylene in a red hot copper tube gives ——.
   (xii) Hydrogenation of benzene gives ——.

2. (a) Explain the term 'transition element' and give account of the characteristic properties of the transition elements.
   (b) Discuss the importance of nickel in modern civilization.

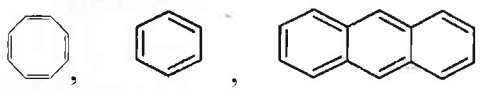
3. (a) Which color and properties are present in the following elements?
   Chromium, Manganese, Iron, Cobalt
   (b) (i) Define the following terms.
   System and Surroundings, Boundary, Phase
   (ii) Calculate the pressure volume work done when a system containing a gas expands from 1.0 dm^3 to 2.0 dm^3 against a constant external pressure of 10 atm. Express the answer in calories and joules.

4. (a) (i) State the zeroth law of thermodynamics.
   (ii) Describe the four operations of Carnot cycle.
   (b) If a Carnot engine operating between two heat reservoirs at 227°C and 27°C absorbs 1000 cal from the 227°C reservoir per cycle, how much heat is discharged into the 27°C reservoir and how much work is done per cycle? What is the efficiency of the cycle?

P.T.O

5. (a) Show that C_p is greater than C_v in SI units.
   (b) Calculate the value of ΔE and ΔH on heating 64.0 g of oxygen from 0°C to 100°C. C_v and C_p on an average are 5.0 and 7.0 cal mol^{-1} $degree^{-1}$.

6. (a) On the basis of Huckel's rule, label the following molecules as aromatic or antiaromatic. Give reasons for your answer.



   (b) Perform the following conversions:
   (i) Benzene ⟶ Benzoic acid
   (ii) Chlorobenzene ⟶ Toluene
   (iii) Benzene ⟶ Maleic acid

7. (a) How would you prepare toluene starting with the following compounds?
   (i) toluic acid (ii) o-cresol (iii) toluene sulphonic acid
   (b) Illustrate the following reasons with equations.
   (i) Nitration of benzene (iii) Friedel-Craft reaction of benzene
   (ii) Halogenation of toluene (iv) Oxidation reaction of toluene

****