KIBABII UNIVERSITY

UNIVERSITY EXAMINATIONS
2017/2018ACADEMIC YEAR

SECOND YEAR SECOND SEMESTER
MAIN EXAMINATIONS

FOR THE DEGREE OF B.ED (SCIENCE)

COURSE CODE: SCH 211

COURSE TITLE: INORGANIC CHEMISTRY

DATE: 31/7/2018 **TIME: 9- 11AM**

INSTRUCTIONS TO CANDIDATES

Answer question ONE and any other two questions

This paper consists of 2 printed pages. Please Turn over

1

QUESTION ONE (30 MARKS)

1a) Valence shell electron pair repulsion theory rests on 3 assumptions. State them.   (3 marks)

b) What is the shape (geometry) of the following molecules   (5 marks)

     a. Methane
     b. Phosphorous pentachloride
     c. Hydrogen cyanide
     d. Boron trichloride
     e. Ammonia

c) Define an acid and a base according to the following theories

     a. Arrheniuos theory   (2 marks)
     b. Bronsted-lory theory   (2 marks)
     c. Lewis theory   (2 marks)

di) Define a chemical bond   (1 mark)

ii. List three types of chemical bonds   (3 marks)

iii. Arrange the atoms in each of the series in order of increasing electronegativity.   (3 marks)
     a. C, F, H, N, O
     b. Al, H, Na, O, P
     c. Ba, H, N, O, As

e) Name the following complexes   (5 marks)

    i. $[Co(NH_3)_6]Cl_3$
    ii. $[Cr(H_2O)_4Cl_2]Cl$
   iii. $[Ag(NH_3)_2]^+$
   iv. $[Pt(NH_3)_4Cl_2]^{2+}$
    v. $[PtCl_6]^{2-}$

f) Give four uses of complexes   (4 marks)

QUESTION TWO (20 MARKS)

2a) Differentiate between amphiprotic and amphoteric substances and in each case give an examples.   (2 marks)

b. i) Define a strong acid and a weak base   (2 marks)

ii) Calculate the pH of 0.1 mol dm^{-3} hydrochloric acid.   (2 marks)

iii)Show how pure water has a pH of 7   (5 marks)

c)Findthe pH of 0.500 mol dm^{-3} sodium hydroxide solution   (3 marks)

2

d) The pH of a solution of HCl in water is found to be 2.50. What volume of water would you add to 1.00 L of this solution to raise the pH to 3.10? **(3 marks)**

e) Write a balanced equation for the dissociation of each of the following Brønsted-Lowry acids in water:

i.	H_2SO_4	**(1 marks)**
ii.	HSO_4^-	**(1 marks)**
iii.	H_3O^+	**(1 marks)**

QUESTION THREE (20 MARKS)

3 a)Predict the polarity of the following molecules. In each case show the geometry and the net dipole moments if any **(6 marks)**

    a. CO_2
    b. $CHCl_3$
    c. H_2O
    d. PCl_3
    e. SO_3
    f. HCN

b) The BCl_3 molecule has a trigonal planar shape. How is this explained in terms of valency bond theory? **(3 marks)**

c) Urea, $NH_2C(O)NH_2$ is a nitrogen fertilizer. What is the hybridization of the nitrogen, oxygen and carbon atoms in urea? **(3 marks)**

d) The concentration of hydrogen ions in wine was 4.1×10^{-4} M after the cap was removed. If half was consumed, the other half after standing pen for a month had a concentration of 2.3×10^{-3} M. Calculate the pH of the wine at the two occasions. Explain the results. **(3½ marks)**

e)State the assumptions Valence shell electron pair repulsion theory **(1½ marks)**

f) Give three factors that affect the strength of an acid **(3 marks)**

QUESTION FOUR (20 MARKS)

4 a) Define the term geometric isomers **(1 mark)**

b) Draw the geometric isomers of the following   **(3 marks)**

   i. $[Co(NH_3)_4Cl_2]^+$

   ii. $[Co(en)_2Cl_2]^+$

   iii. $Pt(NH_3)_2Cl_2$

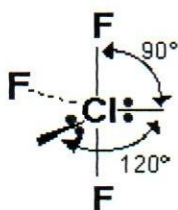c) $CH_3COOH + H_2O \rightleftharpoons CH_3COO^- + H_3O^+$

Write an expression for calculating the K_a and the pK_a of the above reaction   **(4 marks)**

d) In a NaOH solution the concentration of hydroxide ions is 7.2×10^{-3} M. Calculate the pH of the solution.   **(3 marks)**
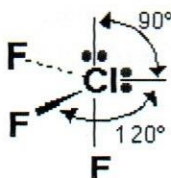
e) Which of the below structures is the most probable for ClF_3? Discuss   **(3 marks)**
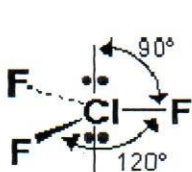
      A   B   C

f) Draw Lewis structures for the following   **(4 marks)**

   i. SiH_4

   ii. PO_2F_2

   iii. NO^+

   iv. PH_3

g) Differentiate between electronegativity and electron affinity   **(2 marks)**