



KIBABII UNIVERSITY

UNIVERSITY EXAMINATIONS
2017/2018 ACADEMIC YEAR

SECOND YEAR SECOND SEMESTER
SUPPLEMENTARY EXAMINATIONS

FOR THE DEGREE OF B.ED (SCIENCE)

COURSE CODE: SCH 211

COURSE TITLE: INORGANIC CHEMISTRY

DURATION: 2 HOURS

DATE: 11/10/2018 **TIME:** 8-10AM

INSTRUCTIONS TO CANDIDATES

- Answer **QUESTION ONE** (Compulsory) and any other two (2) Questions.
- Indicate **answered questions** on the front cover.
- Start every question on a new page and make sure question's number is written on each page.

This paper consists of 3 printed pages. Please Turn Over



KIBU observes ZERO tolerance to examination cheating

QUESTION ONE (30 MARKS)

1a) Define the following terms

(5 marks)

- i. Electronegativity
- ii. Lewis acid
- iii. Lewis base
- iv. Isoelectronic
- v. Chemical bond

b) State if the molecules are polar or non polar

(3 marks)

- i. SF₆ (½ mark)
- ii. SO₂ (½ mark)
- iii. BrCl (½ mark)
- iv. AsH₃ (½ mark)
- v. CF₂Cl₂ (½ mark)
- vi. H₂O (½ mark)

c) Draw the following complexes

(5 marks)

- i. Hexaamminecobalt(III) chloride (1 mark)
- ii. Diamminesilver(I) ion (1 mark)
- iii. Tetraamminedichloroplatinum(IV) ion (1 mark)
- iv. Hexachloroplatinate(IV) ion (1 mark)
- v. Tetraaquadichlorochromium(III) chloride (1 mark)

d) Name the following complexes

(5 marks)

- i. [Zn(NH₃)₂Cl₂] (1 mark)
- ii. K₃[Fe(CN)₆] (1 mark)
- iii. [Cu(NH₃)₄]²⁺ (1 mark)
- iv. [Cr(en)₃]³⁺ (1 mark)
- v. [Co(CO₃)₃]³⁻ (1 mark)

e) What is the molecular geometry of PO₂F²⁻

(1 mark)

(i) Predict the approximate size of the O-P-O angle

(3 marks)

(ii) Does PO₂F²⁻ have a dipole moment (Explain your answer using electronegativities and bond polarities) (½ mark).

(2 marks)

f) Differentiate between Amphiprotic and amphoteric substances and in each case give two examples.

(4 marks)

g) Explain the difference between a molecular dipole moment and the dipole moment of a polar bond.

(2 marks)

QUESTION TWO (20 MARKS)

- 2 a) Give two uses of complexes (2 marks)
- b) Define the following terms and in each case give an example (5 marks)
- Homoleptic complexes
 - Heteroleptic complexes
 - Ambidentate ligand
- c) Discuss the types of structural isomerism that occur in coordinate compounds (6 marks)
- d) Differentiate between a coordinate and a covalent bond (1 mark)
- e) Arrange the atoms in each of the series in order of decreasing electronegativity. (3 marks)
- Al, H, Na, O, P (1 mark)
 - C, F, H, N, O (1 mark)
 - Ba, H, N, O, As (1 mark)



Write an expression for calculating the K_a and the $\text{p}K_a$ of the above reaction (2 marks)

QUESTION THREE (20 MARKS)

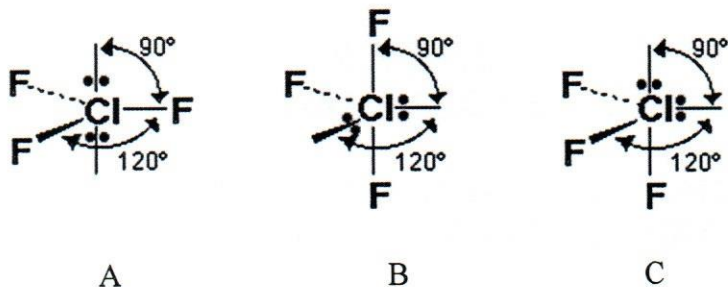
- 3 a) Define acid and base according to Arrhenius theory (2 marks)
- b) Arrhenius acids and bases react with each other in neutralization reactions. Give the net ionic equation for such reactions. (1 mark)
- c) Explain the limitation of Arrhenius theory and how it is solved using Bronsted-Lowry theory (8 marks)
- d) Indicate the acids and bases in the reaction below (2 marks)
- $$\text{HA} + \text{H}_2\text{O} \rightleftharpoons \text{H}_3\text{O}^+ + \text{A}^-$$
- e) In a NaOH solution the concentration of hydroxide ions is 7.2×10^{-3} M. Calculate the pH of the solution. (3 marks)
- f) 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 open 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. (4 marks)

QUESTION FOUR (20 MARKS)

4 a) Draw the structures of the following ions or molecules and give their shapes. (3 marks)

- i. Sulphate ion – tetrahedral (½ mark)
- ii. Sulphur dioxide – bent/v shaped (½ mark)
- iii. Phosphorus pentafluoride – trigonal bipyramidal (½ mark)

b) Which of the below structures is the most probable for ClF_3 ? Discuss (3 marks)



c) Indicate the partial charges for all atoms in the following molecules. (4½ marks)

- i) XeOF_2
- ii) ClO_4^-
- iii) NOF_2

d) Determine the oxidation states for all atoms in the following compounds by formally cleaving bonds according to the electronegativity differences. (4½ marks)

- i) CFCl_3
- ii) SOCl_2
- iii) FNO (central atom: nitrogen)

e) For each of the following pairs of acids, circle the stronger acid (3 marks)

- i) $[\text{V}(\text{H}_2\text{O})_6]^{3+}$ or $[\text{Nb}(\text{H}_2\text{O})_6]^{3+}$
- ii) $[\text{Cu}(\text{H}_2\text{O})_6]^{2+}$ or $[\text{Cu}(\text{H}_2\text{O})_6]^{3+}$
- iii) H_2SO_4 or H_2CO_3

f) Write the equilibrium for the one of the above aqua-acids in water (2 marks)

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