MURANG'A UNIVERSITY OF TECHNOLOGY

SCHOOL OF PURE AND APPLIED SCIENCE

DEPARTMENT OF APPLIED SCIENCE

UNIVERSITY ORDINARY EXAMINATION

2017/2018 ACADEMIC YEAR

RE-SIT/SPECIAL EXAMINATION FOR ~~BACHELOR OF EDUCATION (SCIENCE) AND BACHELOR OF SCIENCE IN ANALYTICAL CHEMISTRY~~

SCH2110: CHEMISTRY

DURATION: 2 HOURS

DATE: 17TH APRIL 2018

TIME: 2.00PM – 4.00PM

Instructions to Candidates:

1. Answer **Section A** and **Any Other Two** questions in **Section B**.
2. Mobile phones are not allowed in the examination room.
3. You are not allowed to write on this examination question paper.

SECTION A – ANSWER ALL QUESTIONS IN THIS SECTION (30 Marks)

QUESTION ONE

a) Explain why H^+ is referred to as a proton. (1 Mark)

b) State the three standard conditions under which cells potentials can be measured. (3 Marks)

c) Define the following terms

i. P^H (1 Mark)

ii. Cation (1 Mark)

iii. Cathode (1 Mark)

d) Calcium fluoride dissolves sparingly in water as presented in the equation

Calculate the K_{sp} (solubility product) for CaF_2 if the calcium ion concentration has been found to be $2.3 \times 10^{-4} Mol/L$. (3 Marks)

e) Using a diagram explain hydrogen bonding in ethanol. (3 Marks)

f) The molecular shape of water is bend and not linear. Explain with a diagram. (3 Marks)

g) Below is a table for the first ionization energies of four elements

Element	1st Ionization
Si	780
P	1060
S	1005
Cl	1255

i. Define the term 1st ionization energy (2 Marks)

ii. Briefly explain the trend. (3 Marks)

h) Compare the element B, Al, Cl and Si

i. Which one has the most metallic character? (1 Mark)

ii. Which one has the most negative electron attachment energy? (2 Marks)

i) Identify the element whose electron configuration is presented by $1s^2 2s^2 2p^4$. (2 Marks)

j) Write the electron configuration of copper in $spdf$ notation and orbital box notation and should be the ground state. (?? Marks)

SECTION B – ANSWER ANY TWO QUESTIONS IN THIS SECTION

QUESTION TWO (20 MARKS)

a) Define the term buffer solution. (2 Marks)

b) State any two polyatomic anons used as buffer in biological system. (2 Marks)

c) Acetic acid/acetate ions in a buffer system CH^3CO_2H/CH_3CO_2. Explain how this system resists P^H change when an acidic solution is added. (4 Marks)

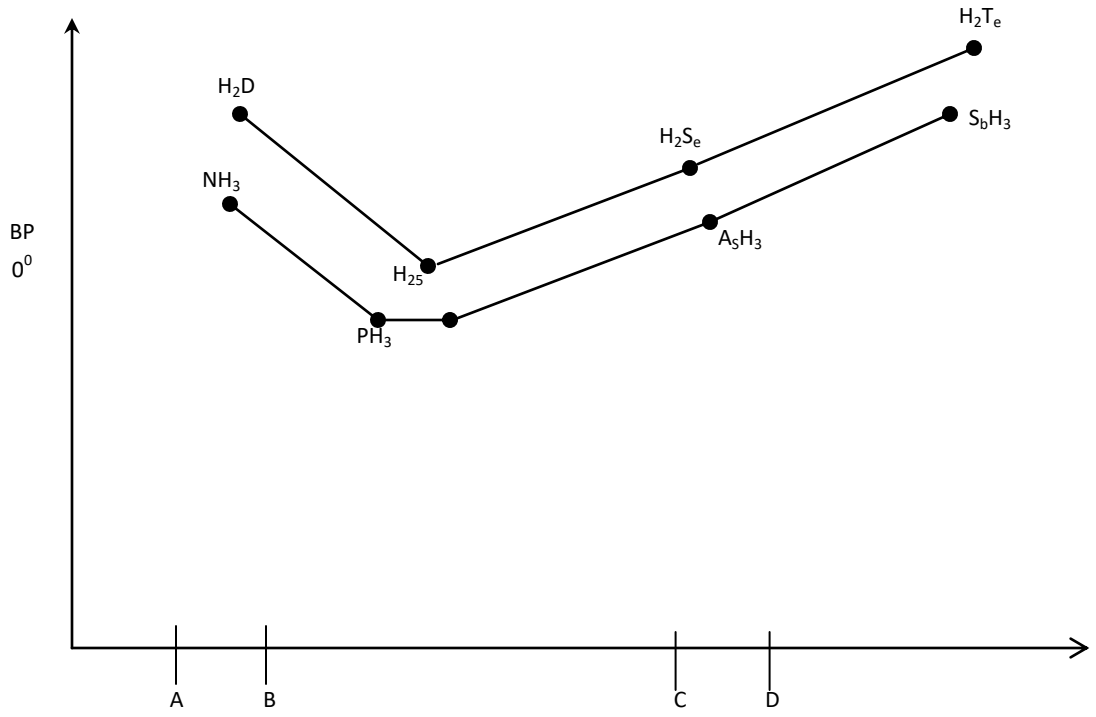
d) What is a redox process? (2 Marks)

e) Below is a redox process represented

i. Identify the oxidizing agent and the reducing agent. (2 Marks)

ii. Write any two balanced half equations showing electron donation or acceptance for the redox processes above. (3 Marks)

f) You are provided with data representing the boiling points of selected hybrids.



i. Identify periods A and C. (3 Marks)

ii. Explain why the Bp of water and ammonia are abnormally high than other hydrides (3 Marks)

QUESTION THREE (20 MARKS)

a) i) Define the term $POH^{\cdot}$ (2 Marks)

ii) 0.365 of HCL is dissolved in enough water to give $2.00 \times 10m^3$ of solution. (H=1.00, CL=35.5). Calculate the concentration of the solution in Mol/L. (3 Marks)

iii) Determine the P^H of the solution. (3 Marks)

iv) State any importance of P^H (1 Mark)

b) One compound found in alkaline batteries is NiOOH it contains Ni^{3+}, when the battery is discharged Ni^{3+} is reduced to Ni^{2+} ions.

i. Using the noble gas notation for inner orbitals electrons, show the electrons configuration of the two ions. (2 Marks)

ii. Write the half redox equation for the reduction process

iii. Calculate the standard cell potential at the cell represented by the equation below

QUESTION FOUR (20 MARKS)

a) Briefly describe what is the chemical periodic table ant its use to a chemist. (5 Marks)

b) Draw graph

The data above represents measurements obtained when 25ml of water is measures;

- By a pipette then transferred to a burette for confirmation
- By a measuring cylinder then transferring into a burette for confirmation

i. Which apparatus between the pipette and measuring cylinder is accurate and precise? Explain. (3 Marks)

ii. Name one apparatus that can be used to measure both liquid and gas. (2 Marks)

c) The diagram below represents a simplified mass spectrum of element X.

(draw diagram)

i. Calculate the RAM of the element. (5 Marks)

ii. How many isotopes does the element contain (2 Marks)

iii. What is an isotope (2 Marks)

iv. What is the name of the instrument used to generate the mass spectrum? (4 Marks)

QUESTION FIVE (20 MARKS)

a) Lead and copper were provided as electrodes. Using a suitable diagram and electrolytes, describe how a voltaic cell can be constructed for the two metals and calculate the emf or voltage of the cell. (10 Marks)

b) Balance the net ionic equation for the reaction measured below in an acidic solution. (10 Marks)