

**W1-2-60-1-6**

**JOMO KENYATTA UNIVERSITY OF AGRICULTURE AND TECHNOLOGY**

**UNIVERSITY EXAMINATIONS 2018/2019**

**YEAR I SEMESTER I EXAMINATION FOR THE DEGREE OF BACHELOR OF SCIENCE IN CONSTRUCTION MANAGEMENT/QUANTITY SURVEYING/REAL ESTATE**

**ABA 2103: CHEMISRY**

**DATE: DECEMBER 2018 TIME: 2 HOURS**

INSTRUCTIONS: Answer question one (compulsory) and any other two questions.

QUESTION ONE (30 MARKS)

a. i. Define the Molecular weight of a substance. (2 marks)

 ii. Calculate the molecular weight of acetone (C3H6O) [C=12, H=1, O=16)

 (2 marks)

b. i. What is meant by the percentage composition of a compound? (2 marks)

 ii. Calculate the percentage composition of calcium hydrogen carbonate.

 C=12, Ca=40, H=1, O=16. (5 marks)

c. Write the ionic equation for the reaction between sodium hydroxide solution and sulphuric acid. Show your working. (2 marks)

d. Define the following terms: (3 marks)

 i. Homopolymer

 ii. Standard solution.

 iii. Oxidizing agent (consider electron transfer)

e. Using s, p, d and f, write the ground state electron configuration of the elements with the following atomic numbers. (4 marks)

 i. 18

 ii. 9

f. Calculate the oxidation number of the element shown in the species given (3 marks)

 i. S in 

 ii. C in 

 iii. Mn in MnO4

g. Define the following terms:

 i. ionization energy

 ii. Atomization energy

 iii. Election affinity. (3 marks)

h. i. Draw each of the p-orbitals of an atom on separate axes. (3 marks)

 ii. Explain why the P-orbtals accommodate a maximum of 6 electrons.

 (1 mark)

QUESTION TWO (20 MARKS)

a. Explain the following:

 i. The 1st ionization energy of the alkali metals decreases from Li to K. (2 marks)

 ii. The successive ionization energies of the three outermost electrons of Mg are 496 KJ/mol, 1450 KJ/mol, and 7730 KJ/mol. (2 marks)

b. Define the following terms. (2 marks)

 i. Molar solution

 ii. Isotopes.

c. If Arogadro’s number, NA=6.02 x 1023, calculate the number of atoms in:

 i. 0.5 moles of glucose, C6H12O6 (C=12, H=1, O=16) (1 mark)

 ii. 0.02 moles of chlorine molecules (Cl=35.5) (1 mark)

d. Calculate the molarity of each of the following substances:

 i. 25g of CuSO4 5H2O in 2dm3 soluton (Cu=64, S=32, O=16 H=1) (2 marks)

 ii. 10.6 g of anhydrous Na2 CO3 in 1.5dm3 of solution (Na=23, C=12, O=16

 (2 marks)

e. Distinguish between the following terms:

 i. Addition and condensation polymers. (2 marks)

 ii. Permanent and temporary hard water. (2 marks)

f. i. State any four characteristics of an ionic substance. (2 marks)

 ii. State the difference between a normal covalent bond and a dative covalent bond. (2 marks)

QUESTION THREE

a. Consider the following reaction

 Mg(s)+CuSO4 (aq) →MgSO4(aq)+CU(s)

 i. Explain why the reaction is Redox. (3 marks)

 ii. Identify the oxidizing and reducing agent in the reaction. (4 marks)

 iii. What is observed as the reaction proceeds? (4 marks)

b. Explain the following:

 i. Water from a pond was found not to lather with soap but readily produced lather with soap after boiling. (3 marks)

 ii. The maximum number of electrons that can be accommodated by the 2nd Principal energy level in an atom is 8. (3 marks)

 iii. A solution of Sodium hydroxide contains 1og/dm3

 I. Calculate the concentration of this solution in mol/dm3(Na=23, H=1, O=16) (1 mark)

 II. What volume of this solution would be needed to neutralize 25cm3 of 0.10 M HCl? (2 marks)

QUESTION FOUR

a. Define the following terms.

 i. Bond energy

 ii. Lattice energy (4 marks)

b. i. State Hess’s law of constant heat summation. (1 mark)

 ii. Calculate the heat of formation of sodium (i) oxide from the data given.

 (5 marks)

 Na2O (s) + H2O(l)→2 NaOH (S) ∆H=-205KJ/mol

 2NaOH (s)+(aq)→2 NaOH (aq) ∆H=-56.6 KJ/mol

 Na(s)+H2O(l) +(aq)→NaOH (aq) +$\frac{1}{2}$ H2(g) ∆H=-410KJ/mol

 H2 (g)+$\frac{1}{2}$O2(g)→H2O(l) ∆H=-285KJ/mol

c. A voltaic cell is based on the following standard half reactions.

 Cd2+ (aq)+2e→Cd(s) Eθ=403V

 Sn2+ (aq) + 2e→sn(s) Eθ=-0.136 V

 i. Construct the voltic cell. (2 marks)

 ii. Which electrode is the anode and which electrode is the cathode? (2 marks)

 iii. Do electrons flow from cadmium to the tin electrode or from tin to the cadmium electrode. Explain. (2 marks)

 iv. Write the half-reactions that occur at the cathode and anode. (2 marks)

 v. Determine the e.m.f. of the cell. (2 marks)