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**University Examinations 2016/2017**

FIRST YEAR, FIRST SEMESTER EXAMINATION FOR CERTIFICATE IN AGRICULTURE

**SCS 1110 / CHE 0100: CHEMISTRY**

**DATE: December, 2016 TIME:1½ HOURS**

**INSTRUCTIONS:** *Answer questions* ***one*** *and any other* ***two*** *questions.*

**QUESTION ONE - (30 MARKS)**

1. Differentiate between atomic number and mass number. (2 Marks)
2. Silicon (Z=14) consists of three isotopes, silicon-28, 92.2%, silicon-29, 4.7% and silicon-30, 3.1%. Determine the relative atomic mass of silicon. (4 Marks)
3. The table below shows part of the periodic table. The letters do not represent actual symbols of elements. Use the letters to answer the questions that follow.

|  |  |  |
| --- | --- | --- |
|  |  |  |
|  | S |  |  |  | T | U | V | W |
|  | X |  |  |  |  | Y |  |  |
|  |  |  |  |  |  |  | Z |  |
|  |  |  |  |  |  |  |  |  |

1. Which element will form divalent cations? (2 Marks)
2. Which metallic elements will react more vigorously with hot water? (1 Mark)
3. Write down the formula of the compound formed between S and Y, S and Z(4 Marks)
4. Name the element that does not form compounds. (1 Mark)
5. Which elements have the greatest number of valency electrons? (2 Marks)
6. Compare the atomic radii of S and x and explain. (3 Marks)
7. How do the atomic and ionic radius of v compare? Explain. (3 Marks)
8. Which element has the lowest ionization energy? Explain. (3 Marks)
9. A sample of chalk contains 2.0g of Calcium, 0.6g of Carbon and 2.24g of Oxygen. Give the formula for chalk. (Ca= 40, C = 12, O= 16) (5 Marks)

**QUESTION TWO (15 MARKS)**

1. Define the term mole. (2 Marks)
2. How many moles are there in 4g of Oxygen gas? (O = 16) (2 Marks)
3. How many molecules of Oxygen gas are there in (b) above? (3 Marks)
4. What is the mass of 0.25 moles CaCO3 (Ca = 40, C = 12, O= 1 $L= 6.0 x 10^{23}$)(3 Marks)
5. A compound contains 59.0% of Sodium and 41.0% of Oxygen. Given that the formula mass of the compound is 78, determine its empirical formulae and its molecular formula. (5 Marks)

**QUESTION THREE (15 MARKS)**

1. Define the term molar solution. (1 Mark)
2. $25cm^{3}$ of 2M NaOH solution was diluted to 175$cm^{3}$. Find the new concentration

(3 Marks)

1. $10g of NaOH$ pellets were dissolved in $250cm^{3}$of distilled water. Find (i) the number of moles of NaOH dissolved, (ii) the concentration of NaOH in the resulting solution.

(5 Marks)

1. Find the percentage composition by mass of nitrogen in one mole of Ammonium nitrate (NH4NO3) (2 Marks)
2. What mass of anhydrous sodium hydrogen carbonate, NaHCO3 would be required to completely react with $20cm^{3}$ of 0.4M sulphuric acid solution. (Na = 23, H= 1, O=16)

(5 Marks)

**QUESTION FOUR (15 MARKS)**

1. Define the terms an acid and a base. (2 Marks)
2. Write and complete the following equations in ionic form;
3.  (2 Marks)
4.  (2 Marks)
5. A solution of hydrochloric acid solution has a concentration of 0.01m.
6. Give an expression for its pH (2 Marks)
7. What is the concentration of hydrogen ions in this acid? (3 Marks)
8. Calculate the pH of this solution. (4 Marks)

**QUESTION FIVE (15 MARKS)**

1. In terms of electron transfer, give the definition of;
2. Oxidation (1 Mark)
3. Reduction (1 Mark)
4. Study the following equation and answer the questions that follow.



1. State the substance that has been reduced and the one that has been oxidized.

(2 Marks)

1. Identify the reducing agent and the oxidizing agent (2 Marks
2. Define oxidation number and explain how it is applied in redox reactions. (3 Marks)
3. Calculate the oxidation numbers of;
4. Fe in Fe2(SO4)3 (2 Marks)
5. Mn in Mn$O^{1-}$ (2 Marks)
6. Cr in Cr$2O\_{7}^{2-}$(2 Marks)