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**University Examinations 2016/2017**

FIRST YEAR, FIRST SEMESTER EXAMINATION FOR DIPLOMA IN CIVIL AND ELECTRICAL ENGINEERING

**SCS 2106: INTRODUCTION TO CHEMISTRY**

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



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

**QUESTION ONE - (30 MARKS)**

1. Define the following terms;
2. Isotopes (1 Mark)
3. Malleable (1 Mark)
4. Ductility (1 Mark)
5. Standard solution (1 Mark)
6. Using s, p, d and f notation write down the electron configuration of chlorine (atomic number = 17) (1 Mark)
7. (i) Apart from having catalytic properties state three other chemical properties of transition elements. (3 Marks)

(ii) Name one transition element or a compound of transition metal that is used as a catalyst. (1 Mark)

1. Explain why stainless steel is used to make cutlery and surgical instruments(2 Marks)
2. State two industrial applications of radioactivity. (2 Marks)
3. State two factors that influence the stability of an isotope. (2 Marks)
4. A compound consists of 70% iron and 30% oxygen. Determine its empirical formula (3 Marks)
5. (i) What is a buffer? (1 Mark)

(ii) Identify an acid in the reaction below. (1 Mark)



1. Explain why the atomic radius decreases across the period from left to right. (3 Marks)
2. Determine the oxidation state of sulphur in SO3. (1 Mark)
3. (i) Give the formulae of ions present in concentrated sodium chloride solution.(2 Marks)

(ii) If graphite electrodes are used in electrolysis of concentrated sodium chloride solution, name products formed at the anode and cathode. (2 Marks)

Anode

Cathode

(iii) State two applications of electrolysis . (2 Marks)

**QUESTION TWO (15 MARKS)**

1. When silver chloride dissolves in water at 298K the following equilibrium is established;



1. Write an expression for solubility product () of silver chloride. (2 Marks)
2. Given that solubility product () of silver chloride is , determine the solubility of silver chloride at 298K. (3 Marks)
3. Study the nuclear equation below and answer the questions that follow;



Identify M (1 Mark)

1. State ;
2. One method of detecting radioactivity. (1 Mark)
3. One danger of nuclear radiations. (1 Mark)
4. Explain why molten sodium chloride conducts electricity while solid sodium chloride do not. (2 Marks)
5. Distinguish between exothermic reaction and endothermic reaction. (2 Marks)
6. A solution of sodium hydroxide was prepared by dissolving 4.0 grams of sodium hydroxide in water and diluting the resulting solution to 250cm3 by addition of water. Determine the molarity of the solution formed. (2 Marks)

(Na = 23, H = 1, O = 16)

1. The table below shows some compounds and their molecular formulae.

|  |  |
| --- | --- |
| Compound | Molecular Formula |
| Formaldehyde | O |
| Ethanol | O |
| Salicyclic acid |  |
| Glucose |  |

1. Choose two compounds with the same empirical formula. (1 Mark)
2. Write the empirical formula of the two compounds in (i) above. (1 Mark)

**QUESTION THREE (15 MARKS)**

1. The pH of human blood was found to be 7.41 at Calculate its;
2. (2 Marks)
3. Hydrogen ion concentration [ (2 Marks)
4. Hydroxide ion concentration [ ] (2 Marks)
5. When calcium carbonate is heated strongly the following reaction occurs;



Determine the volume of carbon (IV) oxide produced when 10.0 grams of calcium carbonate are heated strongly.

( Ca = 40, C=12, O= 16, molar gas volume = 24000 (2 Marks)

1. Below are orbital diagrams;
2. 
3. 
4. 
5. 

Choose an orbital diagram which is;

1. Correct (2 Marks)
2. Wrong according to Hund’s rule (2 Marks)
3. Wrong according to Pauli exclusion principle (2 Marks)
4. Identify a substance which is oxidized in the reaction below. (1 Mark)



**QUESTION FOUR (15 MARKS)**

1. Determine the for;

Sc, given that;

/Sc ,

(2 Marks)

1. Iron is protected from rusting by coating it with zinc.
2. What is the name given to this method of preventing rusting? (1 Mark)
3. Explain how coating iron with zinc prevents rusting. (3 Marks)
4. State two characteristics of a dynamic equilibrium. (2 Marks)
5. Hydrated cobalt (II) ions, which are pink react reversibly with a solution of chloride ions.



When the solution containing blue is cooled in iced water, the solution turns pink. Determine whether the forward reaction is exothermic or endothermic give a reason for your answer. (3 Marks)

1. What is the effect of a catalyst on the position of the equilibrium? (2 Marks)
2. What is the name given to different crystalline forms of the same element? (1 Mark)
3. Name the two crystalline forms of sulphur. (2 Marks)