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**GARISSA UNIVERSITY**

**UNIVERSITY EXAMINATION 2019/2020 ACADEMIC YEAR ONE**

**SECOND SEMESTER EXAMINATION**

**SCHOOL OF PURE AND APPLIED SCIENCES**

**FOR THE DEGREE OF BACHELOR OF EDUCATION**

**COURSE CODE: CHE 110**

**COURSE TITLE: FUNDAMENTALS OF CHEMISTRY/ BASIC CHEMISTRY 1**

**EXAMINATION DURATION: 2 HOURS**

**DATE: 12/02/2020 TIME: 2.00-4.00 PM**

**INSTRUCTION TO CANDIDATES**

* **The examination has FIVE (5) questions**
* **Question ONE (1) is COMPULSORY**
* **Choose any other TWO (2) questions from the remaining FOUR (4) questions**
* **Use sketch diagrams to illustrate your answer whenever necessary**
* **Do not carry mobile phones or any other written materials in examination room**
* **Do not write on this paper**

**This paper consists of FOUR (4) printed pages *please turn over***

**QUESTION ONE (COMPULSORY)**

1. Briefly describe the following models of atomic theory as postulated by the respective scientist
2. Dalton Particle theory of matter **[3 marks]**
3. Thomson model of Atomic theory **[2 marks]**
4. Bohr atomic model **[2 marks]**
5. Quantum Mechanical Atomic theory **[2 marks]**
6. Assume that the element with atomic number 113 has just been discovered in two different forms: one with 139 neutrons and one with 145 neutrons. If the first form occurs 75% of the time, what atomic mass should be listed on the periodic table for this element **[2 marks]**
7. What does each of the following rules that govern electron configurations states?
8. Aufbau Principle **[2 marks]**
9. Pauli Exclusion Principle [2 marks]
10. Hund’s Rule **[2 marks]**
11. Explain how the following factors affect chemical reaction?
12. Temperature **[2 marks]**
13. Surface area **[2 marks]**
14. Concentration of the reactants and products **[2 marks]**
15. 25 cm3 of a sample of vinegar (CH3COOH) was pipetted into a volumetric flask and the volume was made up to 250 cm3. This solution was placed in a burette and 13.9 cm3 were required to neutralise 25 cm3 of 0.1 moldm-3 NaOH. Calculate the molarity of the original vinegar solution and its concentration in gdm-3, given that it reacts with NaOH in a 1:1 ratio **[4 marks]**
16. Explain the trend of Effective nuclear charge across a period and down a group in the Periodic Table? **[3 marks]**

**QUESTION TWO**

1. Given the data:

|  |  |  |
| --- | --- | --- |
| Substance | H2O(l) | NH3(g) |
| Hf/kJmol-1 | -286 | -46 |

Calculate the enthalpy change of the following reaction:

4NH3(g) + 3O2(g) 🡪 2N2(g) + 6H2O(l) **[3 marks]**

1. What is the difference in the atomic model theory of Bohr and quantum mechanical model of schrodinger-Heisenberg theories **[3 marks]**
2. Explain what is meant by the term relative isotopic abundance  **[1 mark]**
3. Explain the difference between a positive electron affinity and a negative electron affinity. **[3 marks]**
4. Write the SPDF electron configurations of the following elements. Cu=29 Cl=17 Fe= 26 **[8 marks]**
5. Pb
6. Cu2+
7. Cl
8. Zn
9. Determine the pH of a 0.3M sulfuric acid solution **[2 marks]**

**QUESTION THREE**

1. State any two types of a chemical bond **[2 marks]**
2. Define the terms: **[4 marks]**
3. Oxidation & Reduction
4. Oxidising agent Reducing agent
5. What is the molarity of 1.06g of H2SO4 in 250 cm3 of solution? **[2 marks]**
6. Copper consists mainly of two isotopes, 63Cu and 65Cu, and its (average) atomic mass is 63.55. Calculate the relative abundance for each of the two isotopes **[4 marks]**
7. Analysis of a hydrocarbon showed that 7.8 g of the hydrocarbon contained 0.6 g of hydrogen and that the relative molecular mass was 78. Find the molecular formula of the hydrocarbon. **[4 marks]**
8. Explain how a catalyst lowers the activation energy for a reaction.  **[2 marks]**
9. Use your knowledge of the periodic trends to list the elements below in increasing order of first electron affinity. **[2 marks]**

S, Al, K, Mg, Sr

**QUESTION FOUR**

1. For the equilibrium 2N2O5(g) 2N2O4(g) + O2(g)

The equilibrium concentrations are [N2O5] = 1.0 moldm-3, [N2O4] = 0.11 moldm-3,

[O2] = 0.11 moldm-3.Calculate the value of KC **[3 marks]**

1. What does the following gas law state? **[6 marks]**
2. Charles law
3. Boyles law
4. le Chatelier’s principle
5. Explain the trend in the following periodic properties on the periodic table **[6 marks]**
   1. Ionization energy
   2. Atomic radius
   3. Electronegativity
6. A compound contains C=62.08%, H =10.34% and O=27.58% by mass. Find its empirical formula and its molecular formula given that its relative molecular mass is 58. **[2 marks]**
7. Identify three substances for which the enthalpy of combustion is zero **[3 marks]**

**QUESTION FIVE**

1. Using both shorthand orbital Box Notation and short form of SPDF write the electron configuration of the following species

(O =8, Co =27, Ca=20) **[10 marks]**

1. O
2. Co
3. Ca2+
4. Ag
5. Br
6. Zinc will displace copper from copper (II) sulphate solution according to the following equation:

CuSO4(aq) + Zn(s) Cu(s) + ZnSO4(aq)

If an excess of zinc powder is added to 50 cm3 of 1.0 moldm-3 copper (II) sulphate, the temperature increases by 6.3 oC. Calculate the enthalpy change for the reaction. **[2 marks]**

1. What is the difference between empirical and molecular formulae? **[2 marks]**
2. Draw Born-Haber cycle (with relevant equation for each step) for the formation of NaCl(s) from Na(s) and Cl2(g) **[6 marks]**