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**GARISSA UNIVERSITY**

**UNIVERSITY EXAMINATION 2020/2021 ACADEMIC YEAR THREE**

**SECOND SEMESTER EXAMINATION**

**SCHOOL OF SCHOOL OF PURE AND APPLIED SCIENCES**

**FOR THE DEGREE OF BACHELOR OF EDUCATION**

**COURSE CODE: CHE 304**

**COURSE TITLE: SURFACE AND COLLOIDAL CHEMISTRY**

**EXAMINATION DURATION: 2 HOURS**

**DATE: 09/10/2021 TIME: 12.00-2.00 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 THREE (3) printed pages *please turn over***

**QUESTION ONE (COMPULSORY)**

1. Define the following terms as used in Surface and Colloidal chemistry
   1. Peptization
   2. Measure of dispersion
   3. Adsorption
   4. Micro-heterogeneous systems
   5. Polydisperse or polydispersity  **(10 Marks)**
2. Outline at least **five** striking features between physisorption and chemisorption **(10 Marks)**
3. A sample of charcoal weighing 6.00 g was brought into contact with a gas contained in a vessel of one litre at a temperature of 27 0C. The pressure of the gas was found to drop from 700 mmHg to 400 mmHg. Calculate the volume of the gas that is adsorbed per weight (in grams) of the adsorbent under the conditions of the experiment. The density of charcoal was 1.5 gcm-3  **(10 Marks)**

**QUESTION TWO (20 Marks)**

Discuss with help of a diagram five adsorption isotherms of gases on a number of adsorbents at different temperatures. **(20 marks)**

**QUESTION THREE (20 Marks)**

1. Calculate how long hydrogen atom will remain on the surface of a solid at 298 K if its desorption activation energy is
2. 15 kJ mol-1
3. 150 kJ mol-1

Assuming that 0 = 10-13 seconds  **(10 marks)**

1. Show that when a diatomic gas adsorbs as atoms on the surface of a solid, the Langmuir adsorption isotherm becomes



Where the symbols have the usual meaning **(10 marks)**

**QUESTION FOUR (20 Marks)**

1. Distinguish **Reversible Colloidal Systems** from **Irreversible Colloidal Systems (5 marks)**
2. State three important characteristics of a colloidal system **(3 Marks)**
3. State **four** common colloidal systems we encounter in our day today’s life and explain why they are colloidal systems **(8 Marks)**
4. Adsorption phenomenon has extensive application. Give few of the examples **(4 Marks)**

**QUESTION FIVE (20 Marks)**

1. The time for which the oxygen atom remains adsorbed on a tungsten surface is 0.36 seconds at 2550 K and 3.49 seconds at 2360 K.
   1. Derive a relationship relating the retention time of adsorbate on adsorbent and temperature of experiment to help determine the activation energy of desorption **(8 marks)**
   2. Calculate the activation energy of activation of oxygen adsorbed on tungsten surface **(6 marks)**
2. Comment on the extent of adsorption on a solid surface when pressure is lowered as the temperature is lowered **(6 marks)**