KIBABII UNIVERSITY

UNIVERSITY EXAMINATIONS
2019/2020 ACADEMIC YEAR

THIRD YEAR SECOND SEMESTER
SPECIAL/SUPPLEMENTARY EXAMINATIONS

FOR THE DEGREE OF BACHELOR OF SCIENCE (CHEMISTRY)

COURSE CODE: SCH 341

COURSE TITLE: SURFACE AND COLLOIDAL CHEMISTRY

4/02/21 8-10 Pm

INSTRUCTIONS TO CANDIDATES

- Answer **QUESTION ONE** (Compulsory) and any other two (2) Questions.
- Indicate **answered questions** on the front cover.
- Start every question on a new page and make sure question's number is written on each page.

This paper consists of **2** printed pages. Please Turn Over

Question One (30 marks)

a) Explain what is meant by adsorption. **[2mks]**
b) State the difference between adsorption and absorption. **[3mks]**
c) What do you understand by activation of adsorbent? How is it achieved? **[4mks]**
d) Derive Langmuir adsorption isotherm equation, given the gas pressure at equilibrium is P and the equilibrium fraction of the surface covered by adsorbate is θ. **[5marks]**
e) Discuss the role played by adsorption in heterogeneous catalysis **[5mks]**
f) Adsorption is always exothermic. Explain. **[4mks]**
g) State three limitations of Langmuir Adsorption Equation **[3mks]**
h) Explain five applications of adsorption. **[5mks]**

Question Two (20 marks)

a) State two types of emulsions. **[2mks]**
b) Classify the following as aerosols or foam;-
Smoke, froth, dust, fog.**[4mks]**
c) Emulsification and micelle formation determines the action of soap. Explain. **[4mks]**
d) Mention any three applications of foam. **[3mks]**
e) Briefly describe Ostwald Ripening and Coalescence as methods of breaking emulsions **(4 marks)**.
f) What causes stabilization of foam **[3mks]**

Question Three (20 marks)

The pressure of nitrogen gas in equilibrium with a layer of nitrogen adsorbed on rutile (TiO_2) with a fractional coverage of $q = 0.10$ varied with temperature as follows:
T/K 220 240 260 280 300
p/kPa 2.8 7.7 17.0 38.0 68.0
a) Determine the isosteric enthalpy of adsorption at $q = 0.10$. **(10 marks)**

b) Show that the Langmuir isotherm takes the form $\theta = \frac{(KP)^{½}}{1+(KP)^{½}}$ due to effect of substrate dissociation **(10 marks)**

Question Four (20 marks)

(a) State four ways on how coagulation can be brought about? **(4 marks)**
(b) Mention the four factors in which rheological behaviour of colloidal dispersions depends on **(4 marks)**
(c) What is light scattering?**(2 marks)**
(d) Using Vant Hoff's equation, *C*alculate the molecular mass of glycol if a solution of glycol containing 1.821 g per litre has an osmotic pressure of 51.8 cm of mercury at 10°C? **(3 marks)**
(e) Distinguish between streaming current and streaming potential **(4 marks)**

(f) In the determination of surface tension of a liquid by the drop-number method, it gives 55 drops while water gave 25 drops for the same volume. The densities of the liquid and water are 0.996 and 0.800 g/cm^3 respectively. Find the surface tension of the liquid if that of water is 72.0 dynes/cm **(3 marks)**