THE CATHOLIC UNIVERSITY OF EASTERN AFRICA

A. M. E. C. E. A

MAIN EXAMINATION

SEPTEMBER –DECEMBER 2021

FACULTY OF SCIENCE

DEPARTMENT OF CHEMISTRY

REGULAR PROGRAMME

PHY 304: STATISTICAL MECHANICS 1

Date: DECEMBER 2021	Duration: 2 Hours
INSTRUCTIONS: Answer Question ONE and any TWO Questions	

Q1. a) Define the following terms   **(4marks)**
  I.   Thermodynamical system

  II.   Ensemble

  III.   Statistical weight

  IV.   Entropy

b) (i State the fundamental postulate of equilibrium statistical mechanics   **(2marks)**

   (ii) Differentiate between reversible and irreversible processes   **(2marks)**

c) Explain entropy with regards to statistical mechanics   **(2marks)**

ii) Describe an isolated system in statistical mechanics point of view   **(4marks)**

d) (i) Distinguish between macrostate and microstate   **(2marks)**

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ii) Explain three types of ensembles. **(6marks)**

e) Outline properties of an ideal gas **(4 marks)**

Q2.a) State the equipartition theorem

(2marks)

b) Explain the four statisticaldistribution types of particles **(8marks)**

b) State the postulate of equal a priori probabilities **(2marks)**

ii) Outline the three statistical distribution laws **(3marks)**

iii) Show that the equipartition energy is given by $U = \frac{1}{2}KT$ **(5marks)**

Q3) iStart from the macrostate (N,V,E) of the given system Show that temperature can be written in terms of E,V and N from the statistical definition of entropy and the first law of thermodynamics **(8marks)**

ii)Determine the number of all possible microstate accessible to the system, W(N,V,E). **(3marks)**

b) State the three gas laws and hence derive the ideal gas law equation. **(6marks)**

Q4. a i) Differentiate between a fermon and a boson **(2marks)**

ii) Derive the statistical distribution counts **(8marks)**

ii) Outline the properties of an ensemble **(4marks)**

iii) Explain any three degrees of freedom **(6marks)**

END

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