



NATIONAL OPEN UNIVERSITY OF NIGERIA
PLOT 91, CADASTRAL ZONE, NNAMDI AZIKIWE EXPRESSWAY, JABI - ABUJA
FACULTY OF SCIENCES

DEPARTMENT OF PHYSICS

2024 1 EXAMINATION

COURSE CODE: PHY 311
COURSE TITLE: KINETIC THEORY AND STATISTICAL MECHANICS
CREDIT UNIT: 2
TIME ALLOWED: (2 HRS)

INSTRUCTION: *Answer question 1 and any other 2 questions*

- (a). Two coins are tossed, what is the probability that

 - Two heads appear
 - At least, one tail appears
 - At least one head appears
 - Probability of getting at least one head and one tail.

b (i) Differentiate between microcanonical, canonical and Grand canonical ensemble.

(ii) Using the dumb-bell model of diatomic molecules, write down the formula for momentum Inertia of the diatomic molecule
- Using the statistical equation of the partition function and equation of entropy explain and derive Gibb's paradox.
- The total energy of a photon as describe using Planck's radiation law is given as

$$u = \int_0^{\infty} u_{\nu} d\nu = \frac{8\pi h}{c^3} \int_0^{\infty} \frac{\nu^3 d\nu}{e^{h\nu/kT} - 1}$$

- Obtain Rayleigh law and Wein displacement law
- Show that the relationship between the total energy u and Stefan's constant α is given as