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**NATIONAL OPEN UNIVERSITY OF NIGERIA**

**PLOT 91, CADASTRAL ZONE, NNAMDI AZIKIWE EXPRESSWAY, JABI - ABUJA**

**FACULTY OF SCIENCES**

**DEPARTMENT OF PURE AND APPLIED SCIENCE**

**2018\_2 SEMESTER EXAMINATION**

**COURSE CODE: PHY 311**

**COURSE TITLE: MATHEMATICAL METHODS FOR PHYSICS II**

**CREDIT UNIT 2**

**TIME ALLOWED (2 HRS)**

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

**QUESTION 1**

(a) Two coins are tossed. What is the probability that:

(i) two head appears? [3marks]

(ii) at least one tail appears. [3 marks]

(b) Describe an experiment that explains the unusual properties of liquid in

helium superfluidity. [6 marks]

(c) Prove that for a system with f degrees of freedom, γ decreases as f

increases. [10 marks]

(d) What does Maxwell velocity distribution do? [3 marks]

**QUESTION 2**

(a) Define the following terms associated with statistical ensemble:

(i) Micro canonical Ensemble [2 marks]

(ii) Grand Canonical [2 marks]

(iii) Canonical Community [2 marks]

(b)Obtain Maxwell’s law of distribution of velocities (Hint: ).

[9 marks]

**QUESTION 3**

(a) Derive the classical expression for the entropy of an ideal monoatomic gas

( Hint : internal energy of a N-particle gaseous system is given by

[10 marks]

1. (b)Discuss quantum statistics. [5 marks]

**QUESTION 4**

(a) Use the Maxwell Boltzmann distribution of molecular speeds to

determine the average kinetic energy of partition in a gas. [10 marks]

(b) Write short note on electronic heat capacity. [5 marks]

**QUESTION 5**

a) Derive Sackur-Tetrode equation (Hint: [10 marks

(b) State the assumptions in the ideal gas theory. [5 marks]