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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

APRIL/MAY, 2019 EXAMINATIONS

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 three questions

QUESTION 1

a) Define the following terms:	
(i) Statistical Mechanics	(3 marks)
(ii) Events	(3 marks)
(iii) Sample space	(3 marks)
b) State the single particle partition function for an ideal mon	oatomic gas consisting of N
particles, each of mass m and occupying a volume V .	(4 marks)
c) Give the mathematical equation generated by the following	g laws for energy density
i) Rayleigh Jean law	(2 marks)
ii) Bose derivation of Planck's law	(2 marks)
iii) Wien's law	(2 marks)
d) Define the distribution function for Bose-Einstein and Ferr	ni-Dirac. Also in each case define
the function for the continuous distribution.	(6 marks)

QUESTION 2

a) Given a universal set $E = \{E_1, E_2\}$, draw the Venn diagram with a shaded portion indicating i) $E_1 \cap E_2$ (3 marks)

ii) $E_1 \cup E_2$	(4 marks)
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b) An unbiased die is rolled write down the sample space for the experiment. If two coins are tossed, what is the probability that:

i)	two tail appears	(4 marks)
ii)	ii) at least one head appears.	(4 marks)

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QUESTION 3

a) Define the terms: i) Permutation	(3 marks)
ii) Combination	(3 marks)
b) Give the mathematical expression for Permutation and Combination.	(4 marks)
c) Nine Physicists assembled for a meeting shake hands with one anothe	er. How many
handshakes take place?	(5 marks)
QUESTION 4	
 a) State the function of the following terms under Statistical Ensembles i) Micro Canonica Ensemble ii) Canonical Community iii) Grand Canonical b) Derive the qualitative theoretical explanation provided by Einstein to determine the heat capacity of a solid. 	(3 marks) (3 marks) (3 marks) (3 marks) (6 marks)
QUESTION 5 a) State the equation that defined the partition function for all systems in 	
thermal equilibrium with a heat bath	(3 marks)
b) Derive the probability to show that when a system is placed in a hear bath it will be in a particular state E_i .	t (12 marks)