NATIONAL OPEN UNVERSITY OF NIGERIA

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

FACULTY OF SCIENCESDEPARTMENT OF PURE & APPLIED SCIENCES

2021_1 EXAMINATION 1234

COURSE CODE: CHM 301 **CREDIT: 3 Units**

COURSE TITLE: PHYSICAL CHEMISTRY III **TIME ALLOWED: 3 Hours**

INSTRUCTION: Answer Question ONE (1) and any other Four (4) Questions

1a) List and explain the classification of a system based on the exchange of matter and energy. **(3Marks)**

b) Explain what you understand by state of a system. **(2Mark)**

c) Explain the following terms: isothermal, adiabatic and isobaric processes. **(5 Marks)**

d) Use a derived equation to express irreversible adiabatic expansion for work done **(3 Marks)**

e) l.00 × 10^2 Mol. of an ideal gas at 3.00 × 10^2 K temperature and 6.00 x 10^6 Pa pressure occupies 4.16 × 10^{-2} m^3 space initially. Calculate the work done on the gas and the heat absorbed by the gas if it undergoes expansion under isothermal reversible conditions such that the final volume and pressure are 0.832 m^3 and 3.00 × 10^5 Pa. **(4Marks)**

f) State the three statements for the second law of thermodynamics. **(3Marks)**

g) Discuss the colligative properties under the depression of the vapour pressure of solvent **(2Marks)**

2a) explain <u>any one</u> of the followings: **(4 marks)**

i) Phase equilibria
ii) Component
iii) Degree of freedom

b) Find the number of degrees of freedom for a closed one component system, for a fixed amount of material, when only one phase and two phases exist in equilibrium **(4 marks)**

i) What is one- component system giving an examples **(2 Marks)**
ii) What is statistical thermodynamics, give an example **(1Mark)**

iii) What is statistical thermodynamics, give an example **(1 Mark)**

3a) What is a system? **(3Marks)**

b) When is a system said to be homogeneous **(2.5 Marks)**

c) When is a system said to be heterogeneous **(2.5 Marks)**

d) Identify the type of system in each of the following cases:

i) A flask covered with a lid

ii) A Closed thermos flask

iii) A flask without lid.

iv) Plant ecosystem **(4Marks)**

4a) State the Zeroth law of thermodynamics and illustrate with an example **(6Marks)**

b) Explain the following terms

i) Isochoric process **(2Marks)**

ii) Reversible process **(2Marks)**

iii) Cyclic process **(2Marks)**

5a) Explain the meaning work giving its formula **(2Marks)**

b) Discuss the variety of ways that work can be done **(3Marks)**

c) Explain heat capacity and with respect to constant volume and pressure **(3Marks)**

d) Establish a difference between enthalpy of vaporization, enthalpy of fusion and enthalpy of reaction **(4Marks)**

6a) State first law of thermodynamics **(2Marks)**

b) Explain the term, an internal energy of the system **(3Marks)**

c) A gas expands from 10 m^3 to 12 m^3 against a constant [pressure of 1 bar at 298 K. What is the work done on the gas? **(3Marks)**

6d). Write short notes on:

i) Closed system ii) Open system **(5Marks)**