NATIONAL OPEN UNIVERSITY OF NIGERIA
14-16 AHMADU BELLO WAY, VICTORIA ISLAND LAGOS
SEPTEMBER/OCTOBER 2015 EXAMINATION

SCHOOL OF SCIENCE AND TECHNOLOGY

COURSE CODE: CHM 301

COURSE TITLE: PHYSICAL CHEMISTRY III

TIME ALLOWED: 21/2 HOURS

(Answer question one and any other four)

R = 8.314 J $mol^{-1}k^{-1}$;

Question one compulsory (22marks)

1a Explain the terms i. System (1 1/2mks) ii. Surrounding (1 ½ mks) iii. State of a system(1mk) iv The zeroth law of thermodynamics (1mk)
b) Calculate the heat necessary to raise the temperature of 5.00 mol of butane from 298 K to 593 at constant pressure. where C_P (19.41 + 0.233T)Jmol^{-1} K^{-1} .
C.) State the first law of thermodynamics in its three major ways. 6mks

Question 2 (12 marks)

a. Mention and discuss the three variety of ways work can be done. 6mks
bi. Define the term Heat capacity in relation with the following terms : constant volume, constant pressure, one mole of a substance at constant conditions.4mks
ii. What do you understand by this statement "The heat capacities change with temperature."2mks

Question 3 (12 marks)

An ideal gas initially at 3.00 × 10^{2}K and 4.00 ×10^5 Pa pressure occupies 0.831 m^3 space. What is the minimum amount of work required to compress the gas isothermally and reversibly so that the final pressure is 7.00 × l0^6 Pa?

Question 4 (12marks)

Write short notes on the following:

a. Bond enthalpy
b. Enthalpy of atomization
c. Joule-Thomson effect.
d. Spontaneous process
e. Decrease in Gibbs free energy (-dG)
f. Fugacity

Question 5(12 marks)

a. Outline Carnot analyses for functioning of an engine. 5marks
b. Mention the three statement of second law of thermodynamics.7marks

Question 6(12 marks)

a.1.00mol of a monoatomic gas initially at 3.00×10^2 K and occupying $2.00 \times 10^{-3} m^3$ is heated to 3.25×10^2 K and the final volume is $4.00 \times 10^{-3} m^3$. Assuming ideal behaviour, calculate the entropy change for the process.10mks

b. Define an idea solution in the light of a solid.2mks

Question 7 (12marks)

a. 1.00 mol of an ideal gas is compressed isothermally and reversibly from $1.00 \times 10^{-2} m^3$ to $1.00 \times 10^{-3} m^3$. Calculate the entropy change. (6 marks)
b. State the applications of Clausius-Clapeyron equation.(6marks)