

DEPARTMENT OF CHEMISTRY, MICHAEL OKPARA UNIVERSITY OF AGRICULTURE, UMUDIKE.
FIRST SEMESTER EXAMINATION 2015/2016; COURSE CODE: CHM 111; COURSE TITLE:
PHYSICAL CHEMISTRY; TIME: 1½ HRS. INSTRUCTION; ATTEMPT ANY TWO QUESTIONS IN ALL

- 1(a) Write down the names, charges and masses of the sub-atomic units
(b) Calculate the number of moles as well as the elementary particles in the followings:
(i) 32 g of O₂ (ii) 4 g of H₂ (iii) 7.2 g of Cl₂
(c) What is the percentage composition of silver (Ag) in silver chloride (AgCl). [Ag = 108, Cl = 35.5]
(d) How do metals and ions form solids?
(e) Write down the mathematical expressions of
(i) Boyle's law, (ii) Charle's law (iii) Ideal gas equation and as well as (iv) Real gas equation
(f) What is the pressure exerted by a mixture of 1 g of hydrogen gas and 5 g of helium when confined to a volume of 50 litre and at a temperature of 20°C [R= 0.082 litre atm. mol⁻¹k⁻¹, H=1, He=4]

- 2(a) Define the first law of thermodynamics under the following cases:
(i) A cyclic process involving isothermal expansion of ideal gas (ii) Under an adiabatic process
(iii) For an isochoric process (iv) For an isobaric process
(b) Distinguish between the following:
(i) State function and path function giving an example of each?
(ii) Reversible and irreversible process
(iii) Intensive and extensive variable properties of a system, giving three examples of each
(c) A gas contained in a cylinder fitted with a frictionless piston expands against a constant external pressure of $1.013 \times 10^5 \text{ Nm}^{-2}$ from a volume of 0.005 m³ to a volume of 0.010m³. In doing so it absorbs 400 J thermal energy from its surroundings. Determine ΔE for the process

3 Define the following:

- (ai) Open, close and isolated systems.
(ii) Extensive and intensive properties with five examples of each.
(b) An electric motor produces 15 KJ of energy each second as mechanical work and lost 2 KJ as heat to the surroundings. Calculate the change in internal energy, ΔU , of the motor per second.
(c) If a current of 10.0 A was passed from a 12 V supply for 300 s in a calorimeter. Calculate the calorimeter constant, C, if the observed change in temperature, ΔT , was 5.5 K.