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**GARISSA UNIVERSITY**

**UNIVERSITY EXAMINATION 2019/2020 ACADEMIC YEAR TWO**

**SECOND SEMESTER EXAMINATION**

**SCHOOL OF SCHOOL OF PURE AND APPLIED SCIENCES**

**FOR THE DEGREE OF BACHELOR OF EDUCATION**

**COURSE CODE: CHE 213**

**COURSE TITLE: BASIC KINETICS AND THERMODYNAMICS**

**EXAMINATION DURATION: 2 HOURS**

**DATE: 17/12/2020 TIME: 09.00-11.00 AM**

**INSTRUCTION TO CANDIDATES**

* **The examination has FIVE (5) questions**
* **Question ONE (1) is COMPULSORY**
* **Choose any other TWO (2) questions from the remaining FOUR (4) questions**
* **Use sketch diagrams to illustrate your answer whenever necessary**
* **Do not carry mobile phones or any other written materials in examination room**
* **Do not write on this paper**

**This paper consists of FOUR (4) printed pages *please turn over***

**QUESTION ONE (COMPULSORY)**

1. Define the following terms in Thermodynamics **[5 marks]**
   1. Universe
   2. Isobaric process
   3. Internal energy
   4. Path function
   5. Thermodynamic System
2. State the first law of Thermodynamics **[2 marks]**
3. One mole of an ideal gas at 300k is allowed to expand Isothermally against a constant external pressure of 1atm from a volume of 1.0 litres to a volume of 5.0 litres. Calculate the work done by the gas **[5 marks]**
4. Starting from a weightless, frictionless piston, show that the work done in expansion of a gas is given by W = - P Δ V **[5 marks]**
5. Differentiate between reversible and irreversible processes **[2 marks]**
6. State any three postulates made by kinetic theory of gases **[6 marks]**
7. (i) Define the term heat capacity [**1 mark]**
8. List the two types of heat capacity normally used in thermodynamics and give their mathematical expressions **[4 marks]**

**QUESTIONS 2**

1. Name and define the three Thermodynamics systems [**9 marks]**
2. Calculate the work done when 50g of iron reacts with dilute hydrochloric acid in an open beaker at 25oc (R= 8.314 JK-1mol-1 Fe = 55.85gmol-1) **[4 marks]**
3. Given that H = E + PV

Derive the expression Cp-Cv = R

Apply the ideal gas equation for one mole of gas **[7 marks]**

**QUESTIONS 3**

1. State Hess1 Law **[2 marks]**
2. From the following equation and Enthalpy changes

Reaction equation Ho reaction kJ

C (graphite) + O2 (g) CO2(g) -393.5

H2(g) + ½ O2(g) H2O (1) - 285.8

2C2H2 (g) + 5O2(g) 4CO2(g) + 2H2O(1) - 2598.9

Calculate the standard enthalpy of formation of acetylene (C2H2) from its elements

2C(graphite) + H2 (g) C2 H2 (g)  **[8 marks]**

1. A 0.242g of sample is burned in a bomb calorimeter containing 1025g of water.

The molecular mass of the sample is given as 128gmol. Calculate the rise in temperature given that: **[10 marks]**

Heat capacity of the calorimeter = 802J/0C

Heat of combustion of the sample = -5.15 x 103KJ/mol

Specific heat of water = 4.184J/g0

**QUESTIONS 4**

1. What are the physical significance of ‘a’ and ‘b’ in van der waals equation. **[4 marks]**
2. Comment on the statement ‘the van der waals equation’ is an improvement over the ideal gas equation **[2 marks]**
3. (i) Two van der waals gases have the same value of ‘b’ but different ‘a’ values which of these would occupy greater volume under identical conditions? **[2 marks]**

(ii) If the gases have same ‘a’ values different values of ‘b’which would be more compressible? **[2 marks]**

1. Calculate the pressure in atmospheres exerted by 2.0mole of chlorobenzene vapours confirmed to 10.0 litres vessel at 298k using:-
2. The ideal gas equation **[5 marks]**
3. The van der waals equation a = 25.43L2 atmmol-2 b = 0.1453Lmol-1 **[5 marks]**

**QUESTIONS 5**

1. Explain the technique “cooling by Joule – Thomson method” as used in liquefaction of gases **[2 marks]**
2. Other than cooling by Joule – Thomson method – describe any other three technique used in liquefaction of gases **[6 marks]**
3. Deduce the law of corresponding states from the van der waals equation **[12 marks]**