Ex/FTBE/Chem/T/113/2019(old)

BACHELOR OF ENGINEERING (FTBE) FIRST YEAR FIRST SEMESTER / EXAMINATION, 2019(OLD)

(1^{ST} Year,1^{ST} Semestar)

PHYSICAL CHEMISTRY

Time : Three Hours Full Marks : 100

(50 marks for each part)

Use a separate Answer-Script for each part

PART – I

Answer Question number 1 and any three from the rest

1. Define the following terms (any three) 3x4.5

(i) Entropy and its physical significance

(ii) Isomorphism in crystals

(iii) Enthalpy and its physical significance

iv) Bravais lattice

(v) Internal energy and its physical significance

vi) Gibbs free energy and its physical significance

(Vii) Ideal and non ideal solution

2.a) No engine can be more efficient than a Carnot heat engine – justify. 7

b)Find the work done for isothermal reversible expansion of five mole of an ideal gas at 300 K from 5 litres to 25 litres. 5

[Turn over

3.a)Define thermodynamic systems with examples . 7

b) The boiling point of a liquid at 1 atm is 373K and heat of vaporization is 15 $KJmol^{-1}$. Calculate the pressure of vaporization of liquid at 298K. 5

4. a) Deduce Gibbs-Duhem relations for a non-volatile solute dissolved in a solvent at constant temperature and pressure. 7

b) A heat engine operating between 100^0C (source) and 75^0C(sink). What is the efficiency of the engine? 5

5. a)Derive Duhem-Margules equation for two component system. 7

b) A sample of gas initially at 25^0C is compressed from 20 litres to 5 litres adiabatically and reversibly. Calculate the final temperature (C_v = 2 cal mol^{-1}).5

6. a) Distinguish crystalline solids and amorphous solids? 7

b) Define atomic heat of solids with example. 3

d) If the Weiss indices of a plane be 100, what are its Miller indices? 2

½ marks for neatness

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B.E. FOOD TECHNOLOGY AND BIO-CHEMICAL ENGINEERING FIRST YEAR FIRST SEMESTER – 2019(OLD)

PHYSICAL CHEMISTRY

Time: Three Hours | Full Marks: 100

Use Separate Answer scripts for each part

Different parts of the same question should be answered together

Part-II

Full Marks-50

Answer question 1 and any two from the rest

1. Explain the terms: (any six) 6x3

i) Joule-Thomson Effect

ii) Critical Micellar Concentration

iii) Van 't Hoff's Factor "i"

iv) Compressibility factor

v) Gold Number

vi) Beckmann Thermometer

vii) Tyndall Effect

viii) Mean Free Path

2. a) Derive the kinetic equation $PV = 1/3\ mnc^2$ where the symbols have their usual meanings.

b) State the laws of Elevation of Boiling Point and Depression of Freezing Point.

c) Calculate the molecular weight of a substance that gave rise to an osmotic pressure of 9.65 atm. When 7.2 gm of the substance was dissolved in 100 gm of water at 22^0C.

d) Calculate the pressure exerted by one mole of acetylene at 27^0C occupying a volume of 0.800 litres and behaving as a real gas. The values of the constants a and b are 4.17 and 0.0371 respectively.

e) State and explain Hardy – Schulze Rule 4+4+3+3+2

3 a) What corrections did Van der Waals introduce in the ideal gas equation and why?

b) Describe a suitable method for the determination of surface tension of a liquid.

c) Calculate the kinetic energy of 2 moles of CO_2 gas at 27^0C.

d) Write a short note on Protective Colloids.

e) State the law of Rectilinear Diameters. How is the critical volume of a gas determined using the law?

4+3+2+2+(2+3)

4a) From the Van der Waals Equation at the critical point, determine the value of the critical coefficient RT_C / P_cV_c.

b) Describe an efficient method for the liquefaction of gases.

c) Calculate the Freezing Point of a solution made by dissolving 42gm of monoheptose, $C_7H_{12}O_7$, in 100 gm of water. K_f for water is 1.86

d) A liquid of density 0.7 flows through a viscometer in 63 secs while the same volume of water requires 108 secs at 20^0C. Calculate the viscosity of the liquid if the viscosity of water be 0.01005 poise.

e) How does the distribution of molecular velocities vary with temperature, as shown by Maxwell ?

4+4+3+2+3