



CHE 111 Physical Chemistry

Mid-Term - 1

Name : _____

Total Marks-15

I.D: No. _____

Time : 50 minutes

Date: 11/10/2018 (01/02/1440 H)

Examiner: Lecturer- Mohammed Imran

Qn. No.1 (a) Write down the all the basic unit with symbol and their physical quantity. (Marks 1)

Qn. No.1 (b) Write any 5 derived units with the name of their physical quantity. (Marks 1)

Qn. No.1 (c) Convert the followings- (Marks 3)

- (a) 14.6 pm to nm
- (b) 250 μg to Kg
- (c) 1.61 km to cm
- (d) 15.6 nm to dm
- (e) 313 inch to mm
- (f) 0 K to $^{\circ}\text{C}$

Qn. No.2: (a) Write down the statement of Boyle's law and write its formula. 5.00 L of a gas is at 1.08 atm. What pressure is obtained when the volume is 10.0 L? (Marks 2)

Qn. No.2: (b) State the Charle's law and write its formula. A gas is collected and found to fill 2.85 L at 25.0 $^{\circ}\text{C}$. What will be its volume at standard temperature? (Marks 2)

Qn. No.3: (a) A cylinder with a movable piston contains 2.00 g of helium (He), at room temperature. More helium was added to the cylinder and the volume was adjusted so that the gas pressure remained the same. How many grams of Helium were added to the cylinder if the volume was changed from 2.00 L to 2.70 L at constant temperature? (Marks 2)

Qn. No.3: (b) The volume of hydrogen collected over water is 200 mL at 20° C and 760 mm Hg. What is its dry volume at STP? Vapor pressure of water at 20° C is 19.8 mmHg. (Marks 2)

Qn. No.3: (c) Calculate the partial pressure of oxygen, O₂, in a sample of air whose composition as weight percentage is given as: CO₂=0.035%, O₂=21.49, N₂=76.69% and H₂O=1.6%. If the pressure of air is given as 760 mm Hg (Marks 2)



Qn. No.3: (b). Prove that $C_p - C_v = R$.

(Marks 2)



(d) Write down the any two spontaneous reactions.

(e) Define triple point.

Qn. No.2 (a) Write down the first law of thermodynamics. Write its formula also. **(Marks 2)**

Qn. No.2 (b) One mole of ideal gas (monoatomic) at 27 °C expands adiabatically against a constant pressure of 1 atmosphere from a volume of 20 dm³ to a volume of 40 dm³. Calculate (i) q, (ii) W, (iii) ΔE and (iv) ΔH for this process. Assume that $C_v = 5/3 R$. **(Marks 3)**

Qn. No.1 (a) Determine degree of freedom F, for the following-

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(Marks 2.5)

a) Liquid water with its vapor at equilibrium

$$C = 1 \quad P = 2$$

b) All phase of Sulphur

$$P = 4 \quad C = 1$$

c) $\text{Fe}_{(s)} + \text{H}_2\text{O}_{(g)} \longrightarrow \text{FeO}_{(s)} + \text{H}_2_{(g)}$

$$P = 3 \quad C = 3$$

d) Aqueous solution of Sucrose and NaCl

$$C = 3 \quad P = 1$$

e) CCl_4 and H_2O

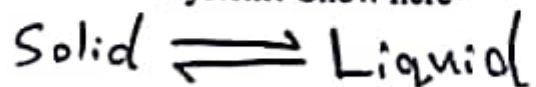
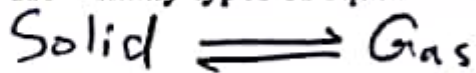
$$P = 2 \quad C = 2$$

Qn. No.1 (b) Answer the following-

(Marks 2.5)

(a) Write down the relationship between enthalpy at constant pressure Q_p and enthalpy at constant volume Q_v .

(b) How many types of equilibrium are possible for water system? Show here-



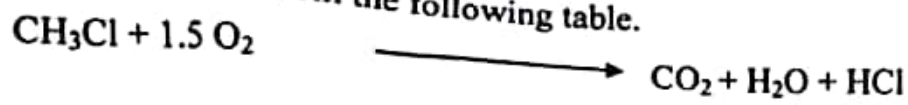
Gas, Vapor

(c) Write down the Clausius Claypeyron equation.

$$\frac{dP}{dT} = \frac{\Delta H_{\text{vap}}}{T (V_g - V_l)}$$



Qn. No.3: (a) Calculate ΔG_r° for the following reaction at 25 °C via (a) ΔG_r° and (b) ΔH_r° and ΔS_r°
Using the value from the following table.



(Max. Marks 3)

Compound	State	ΔG_f° Kcal/mole	ΔH_f° Kcal/mole	ΔS_f° cal/deg.mole
CO ₂	g	-94.05	-94.26	51.06
O ₂	g	0	0	49.00
H ₂ O	L	-68.31	-56.69	16.71
HCl	g	-22.06	-22.76	44.61
CH ₃ Cl	g	-19.60	-14.00	55.97



CHE 111 Physical Chemistry

Mid-Term - 3

Name : _____

Total Marks-15

I.D. No. _____

Time : 50 minutes

Date: 02/12/2018 (24/03/1440 H)

Examiner: Lecturer- Mohammed Imran

Qn. No.1 (a) Fill in the blanks-

(Marks 2.5)

- a) If two solutions of identical osmotic pressure are separated by a semi-permeable membrane, no will occur.
- b) The vapor pressure of all volatile solvents with a solute is less than that of the pure solvent. This is called
- c) Two dissimilar substances that can not form ideal solutions areand
- d) Normality is the no. of gram –equivalent ofin per litre of the solution.
- e) Smoke of Anthracene in air is the example ofsolution

Qn. No.1 (b) Answer the following-

(Marks 2.5)

(a) Calculate the molarity of 18 gram of NaOH in 1500 ml of the solution

(b) Calculate the equivalent weight of H_2SO_4 , HNO_3 and $Mg(OH)_2$.

(c) Write down any 5 types of solutions with examples-



Qn. No.3: (b). Assuming ethanol, (C_2H_5OH), and iso-propanol, (C_3H_7OH) form an ideal solution. Estimate the total vapor pressure and the composition of vapor at $30^\circ C$ above a solution composed of 30.57 cm^3 of ethanol and 75 cm^3 iso-propanol, if the following data for ethanol and iso-propanol are given at $30^\circ C$.

Compound	Density, (gm/cm^3)	Vapor pressure, (torr.)
C_2H_5OH	0.79	79.10
iso- C_3H_7OH	0.78	30.00

(Marks 3)



Qn. No.2 (b) Calculate the freezing point and the boiling point of a solution of 100 g of ethylene glycol ($C_2H_6O_2$) in 900 g of H_2O . Given that $\Delta H_{fus} = 1436.42$ cal/mole and $\Delta H_{vap} = 9530$ cal/mole.

(Marks 3)

Qn. No.3: (a) The osmotic pressure of 0.2 g of hemoglobin in 20 mL of solution is 2.88 mm Hg at $25^\circ C$. Calculate the molecular weight of hemoglobin

(Max. Marks 2)



(d) Calculate the mole fraction of solute if the 5 gram of toluene is dissolved in 225 gram of benzene.

(e) What are the colligative properties?

Qn. No.2 (a) A solution of benzene and toluene is in equilibrium at 30°C. Calculate the composition of the vapor by the following two situations:

Situation (a) mole fraction of benzene (X_b)=0.300 and

Situation (b) mole fraction of benzene (X_b)= 0.700

Consider at 30°C. P° benzene = 118.9 torr & P° toluene = 37.2 torr. (Marks 2)