

**CHE 111 Physical Chemistry****Mid-Term - 2**

Name : \_\_\_\_\_

Total Marks-15

I.D. No. \_\_\_\_\_

Time : 50 minutes

Date: 21/03/2019 (--/07/1440 H)

Examiner: Lecturer- Mohammed Imran

**Qn. No.1 (a) Determine degree of freedom F, for the following-****(Marks 2.5)**

a) Aqueous solution of acetic acid

b) All three phase of water namely, solid, liquid and vapor

c)  $\text{Fe}_{(s)} + \text{H}_2\text{O}_{(g)} \longrightarrow \text{FeO}_{(s)} + \text{H}_{2(g)}$ 

d) Aqueous solution of Sucrose and NaCl

e)  $\text{CCl}_4$  and  $\text{H}_2\text{O}$ **Qn. No.1 (b) Answer the following-****(Marks 2.5)**

(a) How many types of system are there? Write down the name of all.

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

(c) Write down the Clausius Clapeyron equation.



(d) Write down the any two spontaneous reactions.

(e) Define triple point.

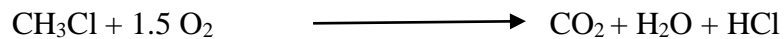
**Qn. No.2 (a)** Write down the first law of thermodynamics. Write its formula also. **(Marks 2)**

**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 dm<sup>3</sup> to a volume of 40 dm<sup>3</sup>. Calculate (i) q, (ii) W, (iii)  $\Delta E$  and (iv)  $\Delta H$  for this process. Assume that  $C_v = 5/3 R$ . **(Marks 3)**



**Qn. No.3:** (a) Calculate  $\Delta G_r^\circ$  for the following reaction at 25 °C via (a)  $\Delta G_f^\circ$  and (b)  $\Delta H^\circ$  and  $\Delta S^\circ$

Using the value from the following table.



(Max. Marks 3)

| Compound           | State | $\Delta G_f^\circ$ Kcal/mole | $\Delta H_f^\circ$ Kcal/mole | $\Delta S^\circ$ cal/deg.mole |
|--------------------|-------|------------------------------|------------------------------|-------------------------------|
| CO <sub>2</sub>    | g     | -94.05                       | -94.26                       | 51.06                         |
| O <sub>2</sub>     | g     | 0                            | 0                            | 49.00                         |
| H <sub>2</sub> O   | L     | -68.31                       | -56.69                       | 16.71                         |
| HCl                | g     | -22.06                       | -22.76                       | 44.61                         |
| CH <sub>3</sub> Cl | g     | -19.60                       | -14.00                       | 55.97                         |

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**Qn. No.3: (b).** State the Hess's Law and explain with the help of an example.

(Marks 2)