**B.Sc. CHEMISTRY
SECOND SEMESTER
PHYSICAL CHEMISTRY-I
BSC - 921 IDMJ**
[USE OMR FOR OBJECTIVE PART]

**SET
A**

Duration: 1:30 hrs.

Full Marks: 35

(**Objective**)

Time: 15 mins.

Marks: 10

Choose the correct answer from the following:

$1 \times 10 = 10$

1. Which of the following phase changes is an example of sublimation?
   a. Melting
   b. Freezing
   c. Condensation
   d. Deposition

2. The state of matter in which particles are highly energetic and ionized is called
   a. Gaseous State
   b. Liquid State
   c. Solid State
   d. Plasma State

3. Which of the following statements about the gaseous state is true?
   a. Gases have weak intermolecular forces.
   b. Gases have a fixed shape.
   c. Gases cannot be compressed.
   d. Gases have low diffusion rates.

4. Which of the following statements about surface tension is true?
   a. It decreases with increasing temperature.
   b. It is independent of temperature.
   c. It increases with increasing temperature.
   d. It is the same for all liquids

5. Which phenomenon explains the rise of liquid in a thin tube?
   a. Capillary action
   b. Viscosity
   c. Surface tension
   d. Buoyancy

6. No process is possible in which the sole result is the absorption of heat from a reservoir and its complete conversion into work. This is the statement of and it is given by
   a. 1st law of thermodynamics and stated by Kelvin.
   b. 2nd law of thermodynamics and stated by Kelvin.
   c. 1st law of thermodynamics and stated by Nernst.
   d. 2nd law of thermodynamics and stated by Nernst.

7. The entropy change can be calculated by using the expression $\Delta S = \frac{dq_{rev}}{T}$. When water freezes in a glass beaker, choose the correct statement amongst the following:
   a. ΔS (system) decreases but ΔS (surroundings) remains the same
   b. ΔS (system) increases but ΔS (surroundings) decreases.
   c. ΔS (system) decreases but ΔS (surroundings) increases.
   d. ΔS (system) decreases and ΔS (surroundings) also decreases.

8. Which is not an extensive property
   a. mass
   b. volume
   c. energy
   d. Internal Energy

9. Choose the correct option for free expansion of an ideal gas under adiabatic condition from the following.
   a. $q = 0, \Delta T \neq 0, w = 0$
   b. $q \neq 0, \Delta T = 0, w = 0$
   c. $q = 0, \Delta T = 0, w = 0$
   d. $q = 0, \Delta T < 0, w \neq 0$

10. Which is not a state function
    a. Internal energy
    b. Enthalpy
    c. Temperature
    d. Work

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(Descriptive)

[Answer question no.1 & any two (2) from the rest]

1. a. Write the statement of first law of thermodynamics. Explain   2+1+2
      with the help of mathematical relation.   =5

   b. What is an isolated system? Explain.

   c. Write four postulates of Kinetic gas theory.

2. a. Explain Maxwell distribution law from the plot of probability   3+2+3+
      and Molecular velocity.   2=10

   b. What do you mean by viscosity coefficient? Write the
      expression of viscosity coefficient and find its unit?

   c. What are the factors that affect the vapor pressure, surface
      tension and viscosity of a liquid?

   d. Explain Bragg's law?

3. a. What do you mean by critical temperature, critical pressure and   5+5=10
      critical volume of a gas? How we can determine these critical
      constants. Explain?

   b. Explain the different symmetry operations observed in crystals.

4. a. Write the basic differences between Isothermal and adiabatic   1+1+2+
      system?   2+2+2
                                                                      =10

   b. Calculate the work done when 50 g of iron reacts with
      hydrochloric acid in (a) a closed vessel of fixed volume.

   c. Explain the terms with examples - state function and path
      function.

   d. Write the statement of Zeroth Law of Thermodynamics. Explain
      its importance.

e. Derive the work done expression for a reversible isothermal expansion of a perfect gas.

f. For an ideal gas, the work of reversible expansion under isothermal condition can be calculated by using the expression $w = -nRT\ln(v_f/v_i)$ A sample containing 1.0 mol of an ideal gas is expanded isothermally and reversibly to ten times of its original volume at 300 K. Calculate the Work done.

5. a. Write the statement of 2nd Law of thermodynamics in terms of entropy and write the thermodynamic definition of entropy?

   2+2+2+
   1+1+2
   =10

   b. Derive the relation, $C_P - C_V = nR$

   c. The difference between C_P and C_V can be derived using the empirical relation $H = U + pV$. Calculate the difference between C_P and C_V for 10 moles of an ideal gas.

   d. Write the limitations of First law of thermodynamics.

   e. What is the Efficiency of a Carnot engine?

   f. Write the statement of Nernst heat theorem in terms of third Law of thermodynamics. Explain.

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