

**B.Sc. CHEMISTRY**  
**SECOND SEMESTER**  
**PHYSICAL CHEMISTRY-I**  
**BSC – 202**  
[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:*

*1×10=10*

- The process of a substance changing from a solid state directly to a gaseous state is called
  - Sublimation
  - Evaporation
  - Condensation
  - Freezing
- Which state of matter has the highest kinetic energy?
  - Gas
  - Solid
  - Liquid
  - Plasma
- Which of the following gases deviates the most from ideal behavior under high pressure and low temperature conditions?
  - Helium
  - Hydrogen
  - Nitrogen
  - Carbon dioxide
- At constant temperature, if the pressure of a gas is doubled, what happens to its volume?
  - It doubles
  - It halves
  - It remains constant
  - It becomes zero
- Which property of liquids is directly related to intermolecular forces?
  - Boiling point
  - Density
  - Viscosity
  - All of the above
- 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
  - 1<sup>st</sup> law of thermodynamics and stated by Kelvin.
  - 2<sup>nd</sup> law of thermodynamics and stated by Kelvin.
  - 1<sup>st</sup> law of thermodynamics and stated by Nernst.
  - 2<sup>nd</sup> 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.  $\Delta S$  (system) decreases but  $\Delta S$  (surroundings) remains the same
  - b.  $\Delta S$  (system) increases but  $\Delta S$  (surroundings) decreases.
  - c.  $\Delta S$  (system) decreases but  $\Delta S$  (surroundings) increases.
  - d.  $\Delta S$  (system) decreases and  $\Delta S$  (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. The unit of Specific heat Capacity is
- a.  $J K^{-1}$ .
  - b.  $JK^{-1} kg^{-1}$
  - c. JK
  - d. None of the above
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**( Descriptive )**

Time : 1 hrs. 15 mins.

Marks : 25

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

1. a. Write the statement of first law of thermodynamics. Explain with the help of mathematical relation. 2+1+2  
=5
- b. Calculate the work done when 50 g of iron reacts with hydrochloric acid in (a) a closed vessel of fixed volume.
- c. How does the kinetic gas theory explain the behavior of gases?
2. a. Discuss the concept of point groups and space groups in crystallography. What is Bragg's law? What are the lattice parameters in crystal structures, such as cubic and tetragonal? 5+3+2  
=10
- b. Explain Maxwell distribution law from the plot of probability and Molecular velocity.
- c. What do you mean by viscosity coefficient? Write the expression of viscosity coefficient and find its unit?
3. a. What are the five elements of symmetry? Explain briefly. 5+5=10
- b. What are the factors that affect the vapor pressure of a liquid? What will be the effect of temperature on viscosity and surface tension of a liquid? What are the SI unit of surface tension and viscosity coefficient?
4. a. Write the basic differences between Isothermal and adiabatic system? 1+1+2+  
2+2+2  
=10
- b. Density is extensive or intensive property. Explain.
- 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. A sample containing 1.0 mol of an ideal gas is expanded isothermally and reversibly to four times of its original volume, The expansion is carried out at 300 K. Calculate the work done for the reversible isothermal expansion. ( $\log 2 = 0.3010$ )
5. a. Write the statement of 2<sup>nd</sup> 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,  $C_p - C_v = n R$
- 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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