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

1X10=10

1. Which of the following statements about gases is true?
   a. Gases have a definite shape
   b. Gases have high density.
   c. Gases can be easily compressed.
   d. Gases have low kinetic energy.

2. The process of a substance changing from a gaseous state to a liquid state is called
   a. Sublimation
   b. Condensation
   c. Evaporation
   d. Freezing .

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

4. 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

5. 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.

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. 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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[2]

(**Descriptive**)

Time : 1 hr. 15 mins.   Marks : 25

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

1. a. Discuss the concept of point groups and space groups in crystallography.   2+2+1 =5

    b. Write the Zeroth law of Thermodynamics. Explain its Applications.

    c. Define isothermal and Isolated system.

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

    b. What are the factors that affect the vapor pressure, surface tension and viscosity of a liquid? Explain how can we measure the vapor pressure of a liquid by Barometric method?

3. a. Explain the different symmetry operations observed in crystals.   5+5=10

    b. Describe the different types of crystal structures, such as cubic, hexagonal, and tetragonal with their lattice parameters. Explain Bragg's law?

4. a. What is Extensive and Intensive property? Give examples.   2+2+1+ 1+2+2=

    b. Explain the term with examples - state function and path function.   10

    c. What is an adiabatic system? Explain.

    d. Write the statement of First Law of Thermodynamics. Explain with the help of mathematical relation.

    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. What is Specific heat Capacity and Molar heat capacity? Write their S.I. units.

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

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

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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