Grade: XII

SUBJECT: CHEMISTRY

UNIT TEST – SURFACE CHEMISTRY

Answer the following Questions:

1. Explain as to what happens when:
   i) Persistent dialysis of a colloidal sol is carried out. (2)
   ii) A beam of light is passed through colloidal sol. (1)
   iii) A dilute solution of FeCl₃ is added to freshly prepared Fe(OH)₃ sol. (2)
   iv) Gelatine is added to gold sol. (2)

2. Why silica gel is used as dehumidizer? (2)

3. What is the significance of a gold number? (2)

4. Ferric hydroxide sol coagulates on addition of aqueous solution of sodium sulphate? (2)

5. Why gelatin is generally added to ice creams? (2)

6. Explain the following in brief: (3)
   i) Sun looks red at the time of sun set.
   ii) Physisorption is multimolecular while chemisorption is monomolecular.

7. What do you understand by the terms (3)
   i) CMC
   ii) Kraft’s temperature
   iii) McBain micelle.

8. Explain as to why SnO₂ forms a positively charged sol in solutions with pH < 7 (2) and negatively charged sol in solutions with pH > 7. (2)

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### Answer the following Questions:

#### 1. Explain as to what happens when;

- **i)** Persistent dialysis of a colloidal sol is carried out.
  
  A small amount of electrolyte is required for the stability of the colloidal sol. On persistent dialysis, the electrolyte is almost completely removed which leads to coagulation of sol.

- **ii)** A beam of light is passed through colloidal sol.
  
  The path of the beam is illuminated due to scattering of light by the colloidal particles. This is called Tyndall effect.

- **iii)** A dilute solution of FeCl₃ is added to freshly prepared Fe(OH)₃ sol.
  
  The addition of dilute solution of FeCl₃ causes coagulation of Fe(OH)₃ sol.

- **iv)** Gelatine is added to gold sol.
  
  Gelatine stabilises the gold sol and it starts behaving like a lyophilic sol.

#### 2. Why silica gel is used as dehumidizer?

Silica gel is a strong adsorber of moisture present in air. That is why, it is used as dehumidizer.

#### 3. What is the significance of a gold number?

Gold number is a measure of protactive power of the colloids. Smaller the value of gold number larger will be the protactive power of the colloids.

#### 4. Ferric hydroxide sol coagulates on addition of aqueous solution of sodium sulphate?

Ferric hydroxide is a positively charged sol and it gets coagulated by the SO₄²⁻ ions provided by K₂SO₄.
5. Why gelatin is generally added to ice creams?

Ice cream is the emulsion of milk or cream in water (oil in water type). Gelatin acts as emulsifier and stabilizes the emulsion.

6. Explain the following in brief:

   i) **Sun looks red at the time of sun set.**

      The sun is at horizon at the time of sun set. The light emitted by the sun has to travel a relatively longer distance through the atmosphere. As a consequence the blue part of the light is scattered away by the particulate matter to the atmosphere causing red part to be visible.

   ii) **Physiosorption is multimolecular while chemisorption is monomolecular.**

      Chemisorption occurs as a result of the reaction between adsorbent is covered with one layer, no further reaction can takes place. Physical adsorption involves van der Waal’s forces. So any number of layers may be formed one over the other on the surface of the adsorbent.

7. What do you understand by the terms

   i) **CMC**

      CMC is Critical Micelle Concentration and is defined as minimum concentration above which micelle formation takes place. Below the CMC, the substance forming micelle behave as electrolyte. For example, CMC for soaps is $10^{-3} – 10^{-4}$ mol L$^{-1}$.

   ii) **Kraft’s temperature**

      It is a temperature ($T_h$) above which micelle formation takes place.

   iii) **McBain micelle.**

      The micelle generally contain at least 100 surfactant molecules. At CMC, the
micelles are almost spherical, but at concentration slightly greater than CMC, micells form flattened spheres. At still higher concentrations they form extended parallel sheets (the thickness of sheet is about twice the diameter of one molecule). They are called Lamellar micelle or McBain micelle because existence of plate like micelles of soaps was first studied by McBain (1913).

8. **Explain as to why SnO₂ forms a positively charged sol in solutions with pH < 7 and negatively charged sol in solutions with pH > 7.**

SnO₂ is amphoteric in nature.

   i) In acidic medium (HCl) it form SnCl₄. The common ion Sn⁴⁺ is adsorbed on the surface of SnO₂ particles thereby developing positive charge.

\[ \text{SnO}_2 + 4 \text{HCl} \rightarrow \text{SnCl}_4 + 2 \text{H}_2\text{O} \]

\[ \text{SnO}_2 + \text{Sn}^{4+} \rightarrow \text{SnO}_2 \cdot \text{Sn}^{4+} \text{ (positively charged sol particle)} \]

   ii) In basic medium (pH > 7), SnO₂ form stannate ion SnO₃²⁻ which on adsorption at the surface of SnO₂ gives negative charge to it.

\[ \text{SnO}_2 + 2 \text{NaOH} \rightarrow 2\text{Na}^+ + \text{SnO}_3^{2-} + 2 \text{H}_2\text{O} \]

\[ \text{SnO}_2 + \text{SnO}_3^{2-} \rightarrow \text{SnO}_2 \cdot \text{SnO}_3^{2-} \text{ (negatively charged sol)} \]