Chemistry Worksheets Class 12 on Chapter 5 Surface Chemistry with Answers - Set 3

Q1. The formation of micelles takes place only above-

a.) Inversion temperature
b.) Boyle's temperature
c.) Critical temperature
d.) Kraft temperature

Correct Answer– (d.) Kraft temperature
Micelle formation occurs only above a certain temperature known as the Kraft temperature (T_k) and a certain concentration known as the critical micelle concentration (CMC).

Q2. The protecting power of lyophilic colloidal sol is expressed in terms of–

a.) coagulation value
b.) gold number
c.) CMC (Critical Micelle Concentration)
d.) oxidation numbers

Correct Answer– (b.) gold numberLyophobic sols are unstable, so they are re-stabilised by adding some lyophilic colloids which protect them from precipitation. Thus, lyophilic colloids are called protecting colloids whose protecting power is expressed in terms of gold number.

Q3. Tyndall effect is due to-

a.) electric charge
b.) scattering of light
c.) absorption of light
d.) None of these

Correct Answer– (b.) scattering of light

Q4. Out of the given options, choose the one which is not a property of physical adsorption?

a.) The lower the temperature, the more the adsorption
b.) Greater the surface area, the more the adsorption.
c.) Higher the pressure, the more the adsorption.
d.) Unilayer adsorption occurs.

Correct Answer– (d.) Unilayer adsorption occurs.

Physical adsorption forms multiple layers of adsorption.

Q5. The process of passing a precipitate into a colloidal solution, by adding an electrolyte is called:

a.) dialysis
b.) peptization
c.) electrophoresis
d.) electrosmosis

Correct Answer– (b.) peptization

Q6. Which type of adsorption involves high energy activation?

Answer. Chemisorption is a type of adsorption in which a chemical reaction occurs between the surface and the adsorbate. At the adsorbent surface, new chemical bonds are formed.
Chemical bonds can be either covalent or ionic in nature. Chemisorption requires a lot of energy to activate, so it's also known as activated adsorption.

Q7. What do you mean by adsorption isotherm?

Answer. At constant temperature, the adsorption isotherm is the relationship between the adsorbate in the liquid phase and the adsorbate adsorbed on the surface of the adsorbent.
Different adsorption isotherms have been proposed by different scientists namely,

- Langmuir isotherm
- Freundlich isotherm
- BET theory

Q8. What is the mechanism of adsorption?

Answer. Adsorption occurs when the particle on the surface and the particle in the adsorbent's bulk are not in the same environment.
Unbalanced forces, also known as residual attractive forces, act on the particle on the surface.
Due to these forces, the adsorbent's surface particles attract the adsorbate particles.
Adsorption always results in a decrease in the surface's residual attractive forces. That is, the surface's energy decreases, and this is expressed as heat. This is known as the heat of adsorption. The enthalpy change is denoted as negative, because when adsorbate molecules are adsorbed on the surface, their freedom of movement is restricted, resulting in a decrease in entropy.

Q9. What happens when dialysis is prolonged?

Answer. When dialysis is prolonged the traces of electrolyte which stabilise the colloids are removed completely. This makes the colloid unstable and therefore, coagulation takes place.

Q10. Give the difference between chemisorption and physisorption?

Answer. The difference between physisorption and chemisorption is explained below.

Physisorption	Chemisorption
Physisorption is due to the formation of van der Waals forces.	Chemisorption is due to the formation of chemical bonds.
It is reversible in nature.	It is irreversible in nature.
Physisorption is not specific in nature.	It is very specific in nature.
It favours low temperature and low activation energy.	It favours high temperature and high activation energy.
In Physisorption, the enthalpy change is low which is nearly 20 to 40 kJ/mol.	In Chemisorption, the enthalpy change is high which is nearly 80 to 240 kJ/mol.

Q11. What happens:
a.) By persistent dialysis of a sol.
b.) When river water meets the seawater.
c.) When alum is applied to cuts during bleeding.

Answer.
a.) The electrolyte is completely removed during persistent dialysis. As a result, the colloidal sol becomes unstable and coagulates.
b.) When river water meets sea water, the electrolytes in the seawater coagulate the colloidal solution of clay, causing its deposition and the formation of the delta.
c.) A clot is formed as a result of blood coagulation, which prevents further bleeding.

Q12. Write the difference between:
a.) Catalysts and enzymes
b.) promoters and poisons

Answer.
a.) Catalysts are substances that change the rate of a chemical reaction while remaining unchanged. Positive and negative catalysts are the two types of catalysts.
Enzymes are proteins that speed up chemical reactions by converting the substrate into the product. Enzymes are classified into two types: activating enzymes and inhibitory enzymes.

b.) A promoter enhances or increases a catalyst's efficiency, whereas a poison inhibits or decreases the catalyst's activity.

Q13. Answer the following:
a.) Which property of colloids is responsible for the sun to look red at the time of setting?
b.) C_2H_2 on addition with H_2 forms ethane in presence of palladium catalyst, but if the reaction is carried in the presence of barium sulphate and quinoline, the product is ethene and not ethane. Why?

Answer.
a.) The sun is at the horizon when it sets. The sun's light must travel relatively a longer distance through the atmosphere. As a result, the blue part of the light is scattered away by the particulate in the atmosphere, leaving only the red part visible.

b.) $CH \equiv CH + H_2 \xrightarrow{Pd} CH_2 \xrightarrow{Pd} CH_3 - CH_3$

$$CH \equiv CH + H_2 \xrightarrow[BaSO_4, quinoline]{Pd} CH_2 = CH_2$$

$BaSO_4$ in the presence of quinoline acts as a poison. Therefore, the catalyst, in this case, is not effective for further reduction.

Q14. Write the steps of 'Modern Adsorption Theory of Heterogeneous Catalysis'.

Answer. It consists of the following steps:

- Diffusion of reactants to the catalyst's surface.
- Adsorption of the reactant molecules at the active sites.
- The occurrence of chemical reactions on the catalyst's surface via the formation of an intermediate.
- Desorption of product molecules from the surface, making the surface available for further reactions.

Diffusion of products away from the surface of the catalyst.

Q15. Comment on the statement that "colloid is not a substance but a state of substance".

Answer. The colloid is not a substance but a state of substance" is a true statement. This is because there are some substances which are crystalloid under certain conditions but colloid under the other, e.g., NaCl is such substance which is called a crystalloid and behaves as a crystalloid in an aqueous medium, but when mixed with benzene, it behaves as a colloid. So, the above statement is correct. Moreover, the diameter of colloidal particles ranges from 1 to 1000 nm. If the particle diameter is lesser than 1nm, the solution is a true solution and if it is more than 1000 nm, the solution is a suspension. The colloidal state is an intermediate state between these two.

Q16. How does a solid catalyst enhance the rate of combination of gaseous molecules?

Answer. When gaseous molecules come into contact with the surface of a solid catalyst, a weak chemical reaction occurs between the catalyst surface and the gaseous molecules, increasing the

concentration of reactants on the surface. Different molecules that are adsorbed next to each other have a better chance of reacting and forming new molecules. This accelerates the reaction. Adsorption is also an exothermic process. The heat released during the adsorption process is used to speed up the reaction.

Q17. Define the terms:
a.) Helmholtz electrical double layer.
b.) Zeta potential.

Answer.
a.) By selective adsorption on the surface, colloids acquire a positive or negative charge. The layer attracts a counter ion from the medium to form a second layer.
The combination of the two layers of opposite charges around the colloidal particle is known as Helmholtz's electrical double layer.
Here, the first layer of ions is firmly held and the second layer of ions is diffused layer and it is mobile.

b.) The separation of charge results in potential, the charge of opposite sign on fixed and diffused part of double layer results in a potential difference known as Electrokinetic potential or zeta potential.
The presence of equal and similar charges on colloidal particles is largely responsible for providing stability to the colloidal solution.
The repulsive forces between charged particles prevent them from aggregation.
Examples:
(i) When $FeCl_3$ is added to an excess of hot water, a positively charged sol of hydrated ferric oxide is formed.
(ii) When $FeCl_3$ is added to NaOH solution, a negatively charged sol is obtained with adsorption of OH^- ions.

Q18. How does an emulsifying agent work? Give an example of emulsifying agent.

Answer. To prevent emulsions from breaking, a small amount of a third substance known as an emulsifying agent or emulsifier is added to the emulsion during the preparation process. Soaps, detergents, long-chain sulphonic acids, lyophilic colloids, alkyl sulphates, and other emulsifying agents are commonly used. They form a protective layer around the disperse phase, preventing particles from getting too close and thus reducing the tendency of particles to coagulate. Casein (an emulsifying agent) is a protein with phosphate groups that helps to stabilise milk (an emulsion of liquid fats in water).

Q19. How is a colloidal solution purified by dialysis?

Answer. The colloidal solution is the solution that has a particle size ranging from true solutions and suspensions. The range of the diameter of the dispersed particle is from 10 Angstrom to 2000 Angstrom.
The colloidal solution can be purified by Dialysis:

The process in which the ions are removed from the solution by the phenomenon of diffusion through a permeable membrane is known as dialysis. In this process, a sol consisting of ions or molecules is filled in a permeable membrane bag and dipped in the water. The ion from the solution diffuses through the permeable membrane. Because of the continuous flow of water, the concentration of electrolytes outside the membrane is neutralized.
For example– Ferric hydroxide sol is purified by using this method.

Q20. Write a short note on emulsions?

Answer. An emulsion can be defined as a colloid consisting of two or more non-homogenous types of liquids wherein one of the liquids contains the dispersion of the different forms of liquids.

Properties Of Emulsions

- Emulsions contain both a continuous and the dispersed with the boundary coming between the phases that are called “interface”.
- Emulsions have a cloudy appearance due to many phase interfaces scattering light passing through the emulsions.
- Emulsions appear in white colour when the light is dispersed in equal proportions.
- If the emulsion is dilute, then higher-frequency and low-wavelength type of light will be scattered in more fractions, and this kind of emulsion will appear blue in colour. This is also referred to as the Tyndall effect.

Types of Emulsion

Emulsions can be classified on the basis of the properties of the dispersed phase and the dispersion medium.

- Oil in water (O/W):
    - In this type of emulsion, the oil will be the dispersed phase and water will be the dispersion medium. The best example for o/w emulsion is milk. In milk, the fat globules (which act as the dispersed phase) are suspended in water (which acts as the dispersion medium).
- Water in oil (w/o):
    - In this type, water will be the dispersed phase and oil will be the dispersion medium. Margarine (a spread used for flavouring, baking and working) is an example of water in oil emulsion.

Emulsion Examples

DISPERSED PHASE	DISPERSION MEDIUM	TYPE OF COLLOID	EXAMPLE
Solid	Solid	Solid	Some Coloured Glasses And Gemstones
Solid	Liquid	Solid	Paints, Cell Fluids
Solid	Gas	Aerosol	Smoke, Dust

Liquid	Solid	Gel	Cheese, Butter, Jellies
Liquid	Liquid	Emulsion	Milk, Hair Cream
Liquid	Gas	Aerosol	Fog, Mist, Cloud, Insecticide Sprays
Gas	Solid	Solid	Pumice Stone, Foam Rubber
Gas	Liquid	Foam	Froth, Whipped Cream, Soap Lather