

Chemistry Worksheets Class 12 on Chapter 5 Surface Chemistry with Answers - Set 2

Q1. The enzyme which hydrolyses to fatty acids and glycerol is called-

- a.) maltase
- b.) lipase
- c.) zymase
- d.) pepsin

Correct Answer- (b.) lipase

Q2. A colloidal system has particles of which of the following size?

- a.) 10^{-9} m to 10^{-12} m
- b.) 10^{-6} m to 10^{-9} m
- c.) 10^{-4} m to 10^{-1} m
- d.) 10^{-5} m to 10^{-7} m

Correct Answer- (b.) 10^{-6} m to 10^{-9} m

Q3. On which of the following properties does the coagulation power of an ion depend?

- a.) The magnitude of the charge on the ion alone.
- b.) Size of the ion alone.
- c.) Both magnitude and sign if the charge of the ion.
- d.) The sign of the charge on the ion alone.

Correct Answer- (c.) Both magnitude and sign if the charge of the ion.

Q4. Fog is a colloidal solution of-

- a.) solid in gas
- b.) gas in gas
- c.) gas in liquid
- d.) liquid in gas

Correct Answer- (d.) liquid in gas

Q5. Measuring zeta potential is useful in determining which property of colloidal solution?

- a.) Stability of the colloidal particles
- b.) Size of the colloidal particles
- c.) Solubility
- d.) Viscosity

Correct Answer– (a.) Stability of the colloidal particles.

Q6. Why are finely divided substances more effective as an absorbent?

Answer. Finely divided substances are more effective as an absorbent because a finely divided substance has a larger surface area and hence, more adsorption occurs.

Q7. What is meant by shape selective catalysis?

Answer. Shape selective catalysis refers to a catalytic reaction that is affected by the pore structure of the catalyst, as well as the size of the reactant and product molecules.

For example, catalysis by zeolites is called shape selective catalysis. Zeolites have pores with sizes ranging from 260 – 740 pm. As a result, molecules with pore sizes greater than this cannot enter the zeolite and undergo the reaction.

Q8. What is Kraft temperature?

Answer. The minimum temperature above which the formation of micelles takes place is called Kraft temperature. It is also called Kraft point.

Q9. What are two types of emulsions?

Answer. Emulsions are the colloidal solutions in which both the dispersed phase and the dispersion medium are liquids. The two types of emulsions are as follows-

(i) Oil in water (O/W type) – In this type, oil acts as a dispersed phase and water as the dispersion medium.

(ii) Water in oil (W/O type) – In this type, water acts as a dispersed phase while the oil behaves as the dispersion medium.

Q10. What is the activation of an adsorbent? How can it be achieved?

Answer. Activation of an adsorbent means, increasing the adsorbing power of an adsorbent. This can be one by increasing the surface area of the adsorbent, which can be achieved in any of the following ways :

(i) By removing the gases adsorbed i.e., wood charcoal can be activated by heating it between 650 K and 1330 K in the vacuum or in superheated steam.

(ii) By breaking the adsorbent into small pieces.

(iii) By making the surface of the adsorbent rough.

Q11. Differentiate between colloids and emulsions?

Answer. The difference between colloids and emulsions are as follows-

- A colloid is a stable two-phase system in which one phase is dispersed in the other in the form of very small particles or droplets, whereas an emulsion is a stable suspension of small droplets of one liquid in another with which it is immiscible.
- The colloid exhibits scatter light (Tyndall effect), whereas the emulsion does not.
- A colloid is formed when any state of a substance combines with a liquid, whereas an emulsion is made up of two immiscible liquid components.
- A colloid is a non-crystalline homogeneous substance made up of large droplets, whereas an emulsion is a fine dispersion of minute droplets.
- The colloids do not separate on standing, whereas the emulsion does not settle when standing.
- Colloids have particle sizes ranging from 1-1000 nm, whereas emulsion particles typically range from 10 nm to 100 m.

Q12. What are the criteria of the colloids?

Answer. A colloid is primarily a heterogeneous mixture in which the minute particles of one substance are dispersed in another substance, called the dispersion medium.

The minute particles are of 1 to 1000 nanometers in diameter but they still remain suspended and do not settle at the bottom of the mixture. They are visible under an optical or an electron (smaller particles) microscope.

Colloids can be classified according to different properties of the dispersed phase and medium.

- Based on the types of particles of the dispersed phase:
 - Multimolecular colloids
 - Macromolecular colloids
 - Associated colloids
- Based on the nature of the interaction between the dispersion medium and the dispersed phase, colloids can be classified into lyophilic and lyophobic.

Q13. On what factors is the extent of adsorption of a gas on a solid surface is affected by?

Answer. The extent of adsorption of a gas on a solid surface is affected by the following factors-

- i.) Nature of the gas
- ii.) Nature of adsorbent
- iii.) Specific area of the adsorbent
- iv.) Effect of pressure
- v.) Effect of temperature
- vi.) Activation of adsorbent

Q14. What are the applications of enzymes?

Answer. Some of the applications of enzymes are as follows-

1. Industrial Application- The enzymes are widely used in industrial processes. For example, enzymes are used-
 - a. In breweries for the manufacture of beer, wine, etc., by fermentation of carbohydrates.
 - b. In food processing industries for preparing sweet syrup, etc.
 - c. In the production of cheese by coagulation of milk.
2. Enzyme deficiencies and prevention of diseases- The deficiencies of enzymes in the living system cause many diseases. Some of these are-
 - a. The deficiency of phenylalanine hydroxylase enzyme causes the congenital disease called phenylketone urea. The disease causes an accumulation of compounds in the body which results in severe brain damage and retardation in children. This can be prevented by a diet with low phenylalanine content.
 - b. The deficiency of enzyme tyrosinase causes albinism. These diseases can be prevented by the supply of enzymes through diet.
3. Curing diseases- Certain enzymes are also useful for treating heart diseases. An enzyme streptokinase is used to dissolve blood clots.

Q15. Cottrell's smoke precipitator is fitted at the mouth of chimneys used in factories. Give reasons.

Answer. Smoke coming out of the chimney of a factory is a colloidal solution of solid carbon particles which are charged in nature. The mouth of the chimneys used in factories is fitted with a Cottrell smoke precipitator. This is because, in this method, the smoke is allowed to pass through a chamber having a series of plates charged to a very high potential (20,000 to 70,000 V). Charged particles of smoke get attracted by charged plates, get precipitated and the gases coming out of the chimney become free of charged carbon and dust particles.

Q16. Define the terms-

- (i) Brownian movement
- (ii) Electrophoresis

Answer.

(i) The continuous random zig-zag motion of colloid particles in the colloidal solution, when observed under an ultramicroscope is called Brownian movement/motion.

(ii) It is the movement of electrically charged colloidal particles in one direction caused by an electric field. Colloidal particles are negatively charged when they move towards a positive electrode and positively charged when they move away from a negative electrode. The rate of migration of sol particles is measured using electrophoresis.

Q17. 1 g of charcoal adsorbs 100mL of 0.5 M CH_3COOH to form a monolayer and thereby molarity of acetic acid is reduced to 0.49 M. Calculate the surface area of the charcoal adsorbed by each molecule of acetic acid.

The surface area of charcoal = $3.01 \times 10^2 \text{ m}^2/\text{g}$

Answer. No. of moles of acetic acid present initially is $= \frac{0.5}{1000} \times 100 = 0.5 \text{ mol}$

No. of moles of acetic acid left after adsorption $= \frac{0.49}{1000} \times 100 = 0.49 \text{ mol}$

Moles of acetic acid adsorbed = $0.05 - 0.49 = 0.001 \text{ mol}$ or $1 \times 10^{-3} \text{ mol}$.

No. of molecules of acetic acid adsorbed will be-

$$1 \times 10^{-3} \times 6.022 \times 10^{23} \\ = 6.022 \times 10^{20} \text{ molecules}$$

Area of 1 g of charcoal = $3.01 \times 10^2 \text{ m}^2$

Therefore, 6.022×10^{20} molecules of acetic acid get adsorbed on the surface area = $3.01 \times 10^2 \text{ m}^2$

\therefore 1 molecule of acetic acid gets adsorbed on surface area will be

$$\frac{3.01 \times 10^2}{6.022 \times 10^{20}} = 5.0 \times 10^{-19} \text{ m}^2$$

Hence, the surface area of the charcoal adsorbed by each molecule of acetic acid is $5.0 \times 10^{-19} \text{ m}^2$.

Q18. What are the applications of colloids?

Answer. The applications of colloids are as follows-

- A colloid is used as a thickening agent in industrial products such as lubricants, lotions, toothpaste, coatings, etc.
- In the manufacture of paints and inks, colloids are useful. In ball-point pens, the ink used is a gel (liquid-solid colloid).
- The suspended impurities contained in the natural water are removed by adding sulfates of aluminium (alum) and of iron which coagulates them.
- Most of the medicines are colloidal. Colloidal gold and calcium are injected into the human body for the vitality of the muscles. Argyrol (silver sol) is used as an eye lotion. Albumin, Hetastarch, and Dextran are a few other colloids used in medicine

Q19. Account for the following:

- (i) Artificial rain can be caused by spraying electrified sand on the clouds.
- (ii) Electrical precipitation of smoke.

Answer.

(i) Clouds are the colloidal dispersion of water particles in the atmosphere. These water particles have a charge on them. Spraying oppositely charged colloidal dust or sand particles over a cloud from an

aeroplane neutralises the colloidal water particles in the cloud, causing them to come closer and grow in size to form larger water drops, which eventually coagulate or precipitate, causing the artificial rain.

(ii) Electrostatic smoke precipitators work by forcing dirty flue gas (the gas escaping from a smokestack) past two electrodes (electrical terminals) located inside a pipe or smokestack. The first electrode has a very high negative voltage applied to it. The dirt particles pick up a negative charge as they move past it. A second electrode made of metal plates charged to a high positive voltage is located higher up the pipe (or further along if it is a horizontal pipe). Because opposite charges attract, negatively charged soot particles are drawn to and adhere to positively charged plates. The collecting plates must be shaken from time to time to empty the soot; this can be done either manually or automatically.

Q20. What happens when-

- a.) Electric current is passed through a colloidal solution.
- b.) Solution of NaCl is added to a colloidal solution of $\text{Fe}(\text{OH})_3$.
- c.) An emulsion is subjected to centrifugation.

Answer.

a.) The movement of colloidal particles under an applied current is called electrophoresis. Positively charged particles move towards the cathode while negatively charged particles move towards the anode.

b.) When NaCl is added to ferric oxide sol, it dissociates into Na^+ and Cl^- ions. The ferric oxide sol particles are positively charged. As a result, in the presence of negatively charged Cl^- ions, they coagulate.

c.) When an emulsion is centrifuged, demulsification takes place, i.e., the emulsion is broken into constituent liquids.