Surface Chemistry

Question1

Which one is an example of heterogenous catalysis?

[NEET 2023]

Options:

A.

Hydrolysis of sugar catalysed by H^+ions

B.

Decomposition of ozone in presence of nitrogen monoxide

C.

Combination between dinitrogen and dihydrogen to form ammonia in the presence of finely divided iron

D.

Oxidation of sulphur dioxide into sulphur trioxide in the presence of oxides of nitrogen

Answer: C

Solution:

Combination of N^2 and H^2 to form NH^3 in presence of finely divided Fe is an example of heterogeneous catalysis.

$$N_2(g) + 3H_2(g) \xrightarrow{Fe(s)} 2NH_3(g)$$

All other are examples of homogeneous catalysis.

$$C_{12}H_{22}O_{11}(aq) + H_2O(l) \xrightarrow{H_2SO_4(l)} \text{Glucose (aq)} + \text{Fructose (aq)}$$

$$2SO_2(g) + O_2(g) \xrightarrow{NO(g)} 2SO_3(g)$$

Question2

Pumice stone is an example of

[NEET 2023]

Options:

A.

Gel

B.

Solid sol

C.

Foam

D.

Sol

Answer: B

Solution:

Pumice stone is a solid sol.
Dispersed phase: Gas
Dispersed medium : Solid

Question3

Which of the following is a positively charged sol ?

[NEET 2023 mpr]

Options:

A.

Methylene blue sol

B.

Congo red sol

C.

Silver sol

D.

Sb_2S_3 sol

Answer: A

Solution:

Methylene blue solution

Question4

Given below are two statements

Statement I:
In the coagulation of a negative sol, the flocculating power of the three given ions is in the order
$Al^{3+} > Ba^{2+} > Na^{+}$
Statement II:
In the coagulation of a positive sol, the flocculating power of the three given salts is in the order
$NaCl > Na_2SO_4 > Na_3PO_4$
In the light of the above statements, choose the most appropriate answer from the options given below
[NEET-2022]

Options:

A. Both Statement I and Statement II are correct.

B. Both Statement I and Statement II are incorrect.

C. Statement I is correct but Statement II is incorrect.

D. Statement I is incorrect but Statement II is correct.

Answer: C

Solution:

According to hardy Schulze rule

- Flocculating power of cation increases with increases in charge on cation of electrolyte in case of negatively charge colloid,

hence order is

$$Al^{3+} > Ba^{2+} > Na^{+}$$

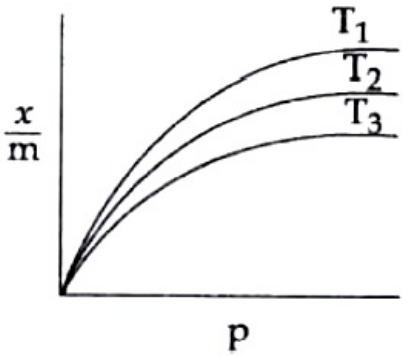
- Flocculating power of anion increases with increases in charge on anion of electrolyte in case of positively charge colloids

Hence order is

$$NaCl < Na_2SO_4 < Na_3PO_4$$

Question5

Shown below are adsorption isotherms for a gas ' X ' at temperatures T_1, T_2 and T_3 :



p and $\frac{x}{m}$ represent pressure and extent of adsorption, respectively. The correct order of temperatures for the given, adsorption is:
[NEET Re-2022]

Options:

A. $T_1 = T_2 > T_3$

B. $T_1 > T_2 > T_3$

C. $T_3 > T_2 > T_1$

D. $T_1 = T_2 = T_3$

Answer: C

Solution:

Solution:

As the temperature increases the extent of adsorption of a gas on solid surfaces decreases.

$(T_3 > T_2 > T_1)$

Question6

The right option for the statement "Tyndall effect is exhibited by", is : [NEET 2021]

Options:

A. NaCl solution

B. Glucose solution

C. Starch solution

D. Urea solution

Answer: C

Solution:

● Tyndall effect is exhibited by colloidal solution only.
● Among the given options, Urea, NaCl and Glucose solutions are true solutions, so cannot show Tyndall effect.
● Starch solution is a colloidal solution therefore can show Tyndall effect.

Question7

Measuring Zeta potential is useful in determining which property of colloidal solution?
[2020]

Options:

A. Solubility

B. Stability of the colloidal particles

C. Size of the colloidal particles

D. Viscosity

Answer: B

Solution:

In colloidal solution, the potential difference between the fixed layer and the diffused layer of opposite charge is known as Zeta potential.
Greater the Zeta potential more will be the stability of colloidal particle.

Question8

Which mixture of the solutions will lead to the formation of negatively charged colloidal $[AgI]I^-$ sol?
(NEET 2019)

Options:

A. 50 mL of 0.1M $AgNO_3$ + 50 mL of 0.1M KI

B. 50 mL of 1M $AgNO_3$ + 50 mL of 1.5M KI

C. 50 mL of 1M $AgNO_3$ + 50 mL of 2M KI

D. 50 mL of 2M $AgNO_3$ + 50 mL of 1.5M KI

Answer: C

Solution:

Generally charge present on the colloid is due to adsorption of common ion from dispersion medium.
Millimole of KI is maximum in option (2) $(50 \times 2 = 100)$
so act as solvent and anion I^- is adsorbed by the colloid AgI formed

$$\underset{\text{D.P}}{AgNO_3} + \underset{\text{D.M excess}}{KI} \longrightarrow \underset{\text{Negatively charged colloid}}{AgI} + KNO_3$$

Question9

The correct option representing a Freundlich adsorption isotherm is (Odisha NEET 2019)

Options:

A. $\frac{x}{m} = kp^{0.3}$

B. $\frac{x}{m} = kp^{2.5}$

C. $\frac{x}{m} = kp^{-0.5}$

D. $\frac{x}{m} = kp^{-1}$

Answer: A

Solution:

Freundlich adsorption isotherm equation is $\frac{x}{m} = kp^{\frac{1}{n}} (n > 1)$

Question10

On which of the following properties does the coagulating power of an ion depend? (NEET 2018)

Options:

A. The magnitude of the charge on the ion alone.

B. Size of the ion alone.

C. Both magnitude and sign of the charge on the ion.

D. The sign of charge on the ion alone.

Answer: C

Solution:

According to Hardy-Schulze rule, the coagulating power of an electrolyte depends on both magnitude and sign of the charge of the effective ion or electrolyte.

Question11

Which one of the following statements is not correct? (NEET 2017)

Options:

A. The value of equilibrium constant is changed in the presence of a catalyst in the reaction at equilibrium.

B. Enzymes catalyse mainly biochemical reactions.

C. Coenzymes increase the catalytic activity of enzyme.

D. Catalyst does not initiate any reaction.

Answer: A

Solution:

Solution:
Catalyst does not change the value of equilibrium constant as they affect forward as well as backward reactions equally.

Question12

The coagulation values in millimoles per litre of the electrolytes used for the coagulation of As_2S_3 are given below :

I. (NaCl) = 52,
II. ($BaCl_2$) = 0.69,
III. ($MgSO_4$) = 0.22

The correct order of their coagulating power is (NEET-II 2016)

Options:

A. I > II > III

B. II > I > III

C. III > II > I

D. III > I > II

Answer: C

Solution:

Coagulating power $\propto \frac{1}{\text{Coagulation value}}$

Lower the coagulation value, higher is the coagulating power so, the correct order is : III > II > I

Question13

Fog is a colloidal solution of
(NEET-I 2016)

Options:

A. solid in gas

B. gas in gas

C. liquid in gas

D. gas in liquid

Answer: C

Solution:

Fog is an example of aerosol in which dispersed phase is liquid and dispersion medium is gas.

Question14

Which one of the following characteristics is associated with adsorption?
(NEET-I 2016)

Options:

A. ΔG and ΔH are negative but ΔS is positive.

B. ΔG and ΔS are negative but Delta H is positive.

C. ΔG is negative but ΔH and ΔS are positive.

D. ΔG, ΔH and ΔS all are negative.

Answer: D

Solution:

As the molecules of the adsorbate are held on the surface of the solid adsorbent, entropy decreases i.e., $\Delta S = -$ ve.
As $\Delta G = \Delta H - T\Delta S$
For the adsorption to occur, $\Delta G = -$ve and it is possible only if $\Delta H = -$ve.

Question15

Which property of colloidal solution is independent of charge on the colloidal particles?
(2015 Cancelled)

Options:

A. Electro-osmosis

B. Tyndall - effect

C. Coagulation

D. Electrophoresis

Answer: B

Solution:

Tyndall effect is scattering of light by colloidal particles. which is independent of charge on them.

Question16

Which property of colloids is not dependent on the charge on colloidal particles?
(2014)

Options:

A. Coagulation

B. Electrophoresis

C. Electro-osmosis

D. Tyndall effect

Answer: D

Solution:

Tyndall effect is due to the scattering of light by colloidal particles and not due to the charge.

Question17

In Freundlich adsorption isotherm, the value of l/n is (2012)

Options:

A. between 0 and 1 in all cases

B. between 2 and 4 in all cases

C. 1 in case of physical absorption

D. 1 in case of chemisorption

Answer: A

Solution:

Freundlich adsorption isotherm:

$$\frac{x}{m} = k \cdot p^{\frac{1}{n}};\ 0 \leq \frac{1}{n} \leq 1$$

Question18

Which one of the following statements is incorrect about enzyme catalysis? (2012)

Options:

A. Enzymes are mostly protcinous in nature.

B. Enzyme action is specific.

C. Enzymes are denatured by ultraviolet rays and at high temperature.

D. Enzymes are least reactive at optimum temperature.

Answer: D

Solution:

he enzyme activity rises rapidly with temperature and becomes maximum at definite temperature, called optimum

temperature.

Question19

The protecting power of lyophilic colloidal sol is expressed in terms of (2012)

Options:

A. coagulation value

B. gold number

C. critical miscelle concentration

D. oxidation number

Answer: B

Question20

If x is amount of adsorbate and m is amount of adsorbent, which of the following relations is not related to adsorption process? (2011)

Options:

A. x/m = f(p) at consatnt T

B. x/m = f(T) at constant p

C. p = f(T) at constant(x/m)

D. $\frac{x}{m} = p \times T$

Answer: D

Solution:

Solution:

$\frac{x}{m} = p \times T$

Question21

The Langmuir adsorption isotherm is deduced using the assumption (2007)

Options:

A. the adsorption sites are equivalent in their ability to adsorb the particles

B. the heat of adsorption varies with coverage

C. the adsorbed molecules interact with each other

D. the adsorption takes place in multilayers

Answer: A

Solution:

Solution:
Langmuir adsorption isotherm is based on the assumption that every adsorption site is equivalent and that the ability of a particle to bind there is independent of whether nearby sites are occupied or not occupied.

Question22

A plot of log(x/m) versus log p for the adsorption of a gas on a solid gives a straight line with slope equal to (2006, 1994)

Options:

A. log K

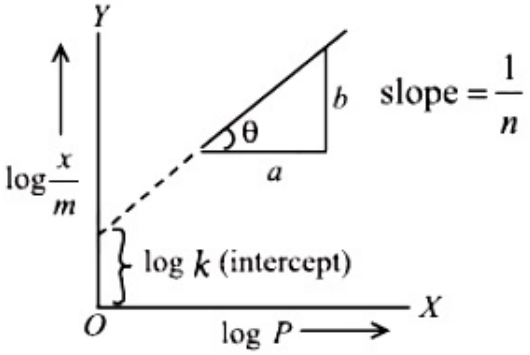
B. - log K

C. n

D. 1/n

Answer: D

Solution:



This according to Freundlich adsorption isotherm.

Question23

Which one of the following forms micelles in aqueous solution above certain concentration?
(2005)

Options:

A. Dodecyl trimethyl ammonium chloride

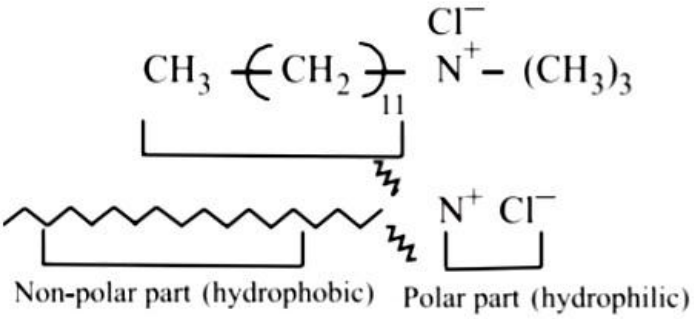
B. Glucose

C. Urea

D. Pyridinium chloride

Answer: A

Solution:



Question24

The enzyme which hydrolyses triglycerides to fatty acids and glycerol is called
(2004)

Options:

A. maltase

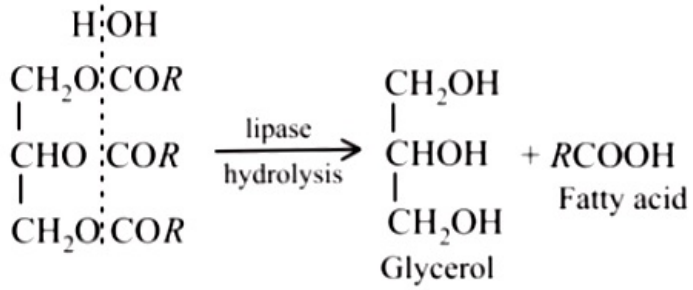
B. lipase

C. zymase

D. pepsin.

Answer: B

Solution:



Question25

According to the adsorption theory of catalysis, the speed of the reaction increases because
(2003)

Options:

A. the concentration of reactant molecules at the active centres of the catalyst becomes high due to adsorption

B. in the process of adsorption, the activation energy of the molecules becomes large

C. adsorption produces heat which increases the speed of the reaction

D. adsorption lowers the activation energy of the reaction.

Answer: D

Solution:

Adsorption causes decrease in surface energy which appears as heat. Thus, adsorption is an exothermic process and hence lowers the activation energy of the reaction.

Question26

Position of non polar and polar part in micelle
(2002)

Options:

A. polar at outer surface but non polar at inner surface

B. polar at inner surface non polar at outer surface

C. distributed over all the surface

D. are present in the surface only.

Answer: A

Solution:

Micelles are the clusters or aggregates formed in solution by association of colloids.
Usually such molecules have a lyophobic group and a lyophilic group. The long hydrocarbon is the lyophobic portion which tries to recede away from the solvent water and the ionisable lyophilic group which tends to go into water resulting into ions. As the concentration is increased the lyophobic parts receding away from the solvent approach each other and form a cluster, the lyophobic ends are in the interior lyophilic groups projecting outward in contact with the solvent.

Question27

Which is not correct regarding the adsorption of a gas on surface of a solid?
(2001)

Options:

A. On increasing temperature adsorption increases continuously.

B. Enthalpy and entropy change is negative.

C. Adsorption is more for some specific substance.

D. It is a reversible reaction.

Answer: A

Solution:

Adsorption is the ability of a substance to concentrate or hold gases, liquids or dissolved substances upon its surface. Solids adsorb greater amounts of substances at lower temperature. In general, adsorption decreases with increase in temperature.

Question28

Which one of the following method is commonly used method for destruction of colloid?
(2000)

Options:

A. Dialysis

B. Condensation

C. Filteration by animal membrane

D. By adding electrolyte

Answer: D

Solution:

By adding electrolytes the colloidal particles are precipitated. The electrolytes neutralise the charge of colloids leading to their coagulation and thus destroy the colloid.

Question29

At the critical micelle concentration (CMC) the surfactant molecules (1998)

Options:

A. associate

B. dissociate

C. decompose

D. become completely soluble

Answer: A

Solution:

The soap conc. at which micelles (spherical colloid molecules) first appear is called as critical micelle concentration (CMC). At this condition the surfactant molecules associate with each other.

Question30

The ability of anion, to bring about coagulation of a given colloid, depends upon (1997)

Options:

A. magnitude of the charge

B. both magnitude and charge

C. its charge only

D. sign of the charge alone.

Answer: B

Solution:

Both magnitude of charge and nature of charge effect coagulation of a given colloid. Greater the magnitude of the charge, quicker will be the coagulation.

Question31

A colloidal system has particles of which of the following size? (1996)

Options:

A. 10^{-9}m to 10^{-12}m

B. 10^{-6}m to 10^{-9}m

C. 10^{-4}m to 10^{-10}m

D. 10^{-5}m to 10^{-7}m

Answer: B

Solution:

Particle size lies in the range of 10^{-6}m to 10^{-9}m. Particles themselves are invisible even under the most powerful microscope.

Question32

When a few typical solutes are separated by a particular selective membrane such as protein particles, blood corpuscles, this process is called (1996)

Options:

A. transpiration

B. endosmosis

C. dialysis

D. diffusion.

Answer: C

Solution:

Dialysis is the process of separating the particles of colloids from the particles of crystalloids by means of diffusion through a selective membrane placed in water.
