1. Match List I with List II

	LIST I – Enzymatic reaction		**LIST II - Enzyme**
A	Sucrose→ Glucose and Fructose	I	Zymase
B	Glucose → ethyl alcohol and CO_2	II	Pepsin
C	Starch → Maltose	III	Invertase
D	Proteins → Amino acids	IV	Diastase

Choose the correct answer from the options given below.

[2023 (06 Apr Shift 1)]

(1) A – I, B – II, C – IV, D – III

(2) A – III, B – I, C – IV, D – II

(3) A – III, B – I, C – II, D – IV

(4) A – I, B – IV, C – III, D – II

2. The number of colloidal systems from the following, which will have 'liquid' as the dispersion medium, is _____.

Gem stones, paints, smoke, cheese, milk, hair cream, insecticide sprays, froth, soap lather

[2023 (06 Apr Shift 2)]

3. The water gas on reacting with cobalt as a catalyst forms

[2023 (08 Apr Shift 1)]

(1) Methanal

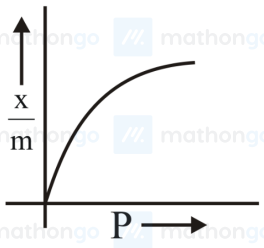
(2) Methanoic acid

(3) Ethanol

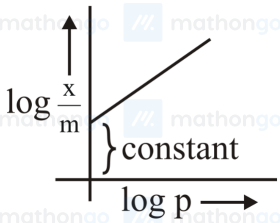
(4) Methanol

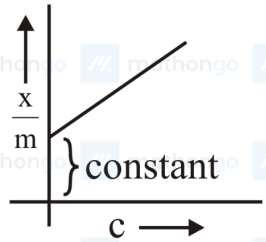
4. Which of the following represents the Freundlich adsorption isotherms?

(A)

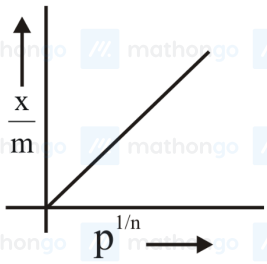


(B)





(C)



(D)

Choose the correct answer from the options given below:

[2023 (08 Apr Shift 1)]

(1) A, C, D only

(2) A, B only

(3) B, C, D only

(4) A, B, D only

5. The statement/s which are true about antagonists from the following is/are:

A. They bind to the receptor site.

B. Get transferred inside the cell for their action.

C. Inhibit the natural communication of the body.

D. Mimic the natural messenger.

Choose the correct answer from the options given below:

[2023 (08 Apr Shift 2)]

(1) B only

(2) A, C and D

(3) A and C

(4) A and B

6. Coagulating value of the electrolytes $AlCl_3$ and NaCl tor $As_2\ S_3$ are 0.09 and 50.04 respectively. The coagulating power of $AlCl_3$ is x times the coagulating power of NaCl. The value of x is

[2023 (08 Apr Shift 2)]

7. Ferric chloride is applied to stop bleeding because

[2023 (10 Apr Shift 2)]

(1) Blood absorbs $FeCl_3$ and forms a complex.

(2) Cl^- ions cause coagulation of blood.

(3) Fe^{3+} ions coagulate blood which is a negatively charged sol.

(4) $FeCl_3$ reacts with the constituents of blood which is a positively charged sol.

8. The number of correct statements about modern adsorption theory of heterogeneous catalysis from the following is .....

A. The catalyst is diffused over the surface of reactants.

B. Reactants are adsorbed on the surface of the catalyst.

C. Occurrence of chemical reaction on the catalyst's surface through formation of an intermediate.

D. It is a combination of intermediate compound formation theory and the old adsorption theory.

E. It explains the action of the catalyst as well as those of catalytic promoters and poisons.

[2023 (11 Apr Shift 2)]

9. Four gases, $A,\ B,\ C$ and D have critical temperatures $5.3,\ 33.2,\ 126.0$ and $154.3K$ respectively

For their adsorption on a fixed amount of charcoal, the correct order is :

[2023 (12 Apr Shift 1)]

(1) $C > D > B > A$

(2) $C > B > D > A$

(3) $D > C > B > A$

(4) $D > C > A > B$

10. What happens when a lyophilic sol is added to a lyophobic sol?

[2023 (13 Apr Shift 1)]

(1) Film of lyophilic sol is formed over lyophobic sol

(2) Lyophilic sol is dispersed in lyophobic sol

(3) Film of lyophobic sol is formed over lyophilic sol

(4) Lyophobic sol is coagulated

11. Given below are two statements, one is labelled as Assertion A and the other is labelled as Reason R.

Assertion A : The diameter of colloidal particles in solution should not be much smaller than wavelength of light to show Tyndall effect.

Reason R : The light scatters in all directions when the size of particles is large enough.

In the light of the above statements, choose the correct answer from the options given below :

[2023 (13 Apr Shift 2)]

(1) Both A and R are correct but R is NOT the correct explanation of A

(2) A is true but R is false

(3) A is false but R is true

(4) Both A and R are correct and R is the correct explanation of A

12. $20\ mL$ of $0.5\ M\ NaCl$ is required to coagulate $200\ mL$ of $As_2\ S_3$ solution in 2 hours. The coagulating value of NaCl is _____.

[2023 (15 Apr Shift 1)]

ANSWER KEYS

1. (2)	**2.** (5)	**3.** (4)	**4.** (4)	**5.** (3)	**6.** (556)	**7.** (3)	**8.** (3)
9. (3)	**10.** (1)	**11.** (4)	**12.** (50)				

1. (2)

The Zymase enzyme converts glucose and fructose into ethanol and carbon dioxide. And the Invertase enzyme is used to convert sucrose or cane sugar into glucose and fructose. The enzyme diastase converts starch to maltose. The enzyme pepsin converts proteins to amino acids.

2. (5)

The phase that is scattered or present in the form of colloidal particles is called dispersed phase and the medium in which the colloidal particles are dispersed is called the dispersion medium.

Coloured gemstones are solid sols, colloids in which solid particles are dispersed in solid medium. In paints, small amount of solid pigments are dispersed in a large amount of liquid solvent. So, it is an example of a solid in liquid mixture. Smoke is a solid aerosol-type colloid consisting of the solid dispersed phase in the gaseous dispersed medium. Cheese is an example of gel in the colloidal systems, in which the dispersed phase is a liquid while the dispersion medium is a solid. Milk is a type of 'liquid in liquid' colloid, also known as emulsion. Hair cream is an example of a colloidal system where dispersed Phase is Liquid and dispersion Medium is also Liquid. Insecticide sprays is an example of a colloidal solution in which liquid particles are dispersed in the gaseous phase. Froth is a colloidal solution of gas in liquid. Soap lather is an example of colloidal system foam in which the dispersed phase is gas and the dispersion medium is liquid.

Paints, milk, froth, soap lather and hair cream have liquid as dispersion medium.

3. (4)

Methanol can be produced from syn gas (a mixture of carbon monoxide and hydrogen) through a different process, mainly through synthesis reaction. In this process, syn gas is passed over a heterogeneous catalyst, at high temperatures and pressures.

$$\underbrace{CO(g)+2H_2(g)}_{\text{Water gas}} \xrightarrow[\text{catalyst}]{\text{Cobalt}} \underset{\text{Methanol}}{CH_3OH(l)}$$

4. (4)

The equation $\frac{x}{m} = KP^{1/n}$ represents Freundlich adsorption isotherm. It is an empirical relationship between the amount of gas adsorbed by a given amount of solid adsorbent surface and pressure of the gas at a particular temperature.

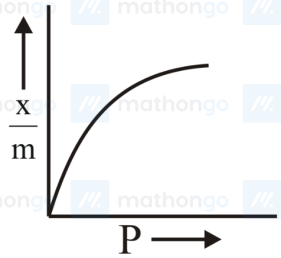
So, Freundlich adsorption isotherm equation is

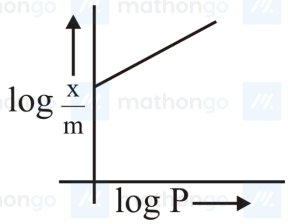
$\frac{x}{m} = KP^{1/n}$

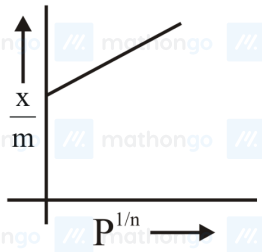
$\Rightarrow \log \frac{x}{m} = \log K + \frac{1}{n}\log P$

Extent of adsorption $\left(\frac{x}{m}\right)$ decreases with increase in temperature.

With the help of the above two equation, following plots are obtained







5. (3)

Drugs that bind to the receptor site and inhibit its natural function are called antagonists. Antagonists are molecules that bind to receptors but do not activate them. Instead, they block the action of other molecules, including natural ligands and agonists, that normally bind to the receptor and activate it. Antagonists inhibit the natural communication of the body by preventing the binding of the natural ligands, which can result in physiological effects such as decreased heart rate, blood pressure, and inflammation.

6. (556)

The coagulating power of an electrolyte is a measure of its ability to cause the coagulation or precipitation of a colloidal solution.

$\text{Coagulation power } \alpha \frac{1}{\text{Coagulation value}}$

Coagulating value of $AlCl_3$ for $As_2S_3 = 0.09$

Coagulating value of NaCl for $As_2S_3 = 50.04$

Then,

$$\frac{(C.V)_{AlCl_3}}{(C.V)_{NaCl}} = \frac{(C.P)_{NaCl}}{(C.P)_{AlCl_3}}$$

$$\frac{0.09}{50.04} = \frac{(C.P)_{NaCl}}{(C.P)_{AlCl_3}}$$

$$\left(C.P\right)_{AlCl_3} = 556\left(C.P\right)_{NaCl}$$

So the answer is 556.

7. (3)

Ferric chloride is a hemostatic agent, which means that it can be used to stop bleeding by promoting the coagulation of blood. Blood is a colloidal solution of an albuminoid substance and can be coagulated to form clot by applying Fe^{3+} ion on the open wound. Thus, bleeding caused by a razor during shaving can be treated by rubbing potash alum against the cut which helps in the coagulation of the blood by sealing the blood vessels.

8. (3) Adsorption theory of Heterogeneous catalysis involves five steps-

1. Diffusion of reactants to the surface of the catalyst.
2. Adsorption of reactant molecules on the surface of the catalyst. (Occurrence of chemical reaction on the catalyst's surface through formation of an intermediate.
3. Desorption of reaction products from the catalyst surface
4. Making the surface available again for more reaction to occur.
5. Diffusion of reaction products away from the catalyst's surface.

So, we can deduce from Adsorption theory of catalysis that as the concentration of reactants at active centres increases due to adsorption and thus the rate of the reaction is also increased.

9. (3)

Critical temperature of a gas is the temperature at or above which vapor of the gas cannot be liquefied, no matter how much pressure is applied. The extent of adsorption is directly proportional to the critical temperature of the gas. Higher is the critical temperature of the gas, greater is the extent of adsorption.

Order of T_c $D > C > B > A$

Order of adsorption $D > C > B > A$

10. (1) Film of lyophilic sol is formed over lyophobic sol as lyophilic sol acts as a protective colloid. Lyophobic solutions are unstable in nature. When a lyophilic sol is added to lyophobic sol, stability of lyophobic sol increases due to a protective film of lyophilic sol present over the lyophobic sol.

11. (4)

Conditions for Tyndall effect:

(i) Diameter of colloidal particles in solution is not much smaller than wavelength of the light used.

(ii) The refractive indices of the dispersed phase and dispersion medium differ greatly in magnitude. If size of particles is large enough than light scatters in all directions.

So Both A and R are correct and R is the correct explanation of A.

12. (50)

$\text{Coagulating value} = \frac{\text{Millimoles of electrolyte}}{\text{Volume of sol in litre}}$

$20 \text{ ml of } 0.5 \text{ M NaCl contains NaCl} = 20 \times 0.5 = 10 \text{ milli moles}$

$200 \text{ ml of } As_2S_3 \text{ required NaCl for the coagulation} = 10 \text{ milli moles}$

$\therefore 1000 \text{ ml of } As_2S_3 \text{ required NaCl for the coagulation} = 10 \times 1000/200 = 50 \text{ milli moles.}$