

Short Answer Questions-I

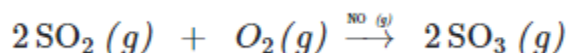
Short Answer Questions-I (PYQ)

Q.1. Name the two groups into which phenomenon of catalysis can be divided. Give an example of each group with the chemical equation involved.

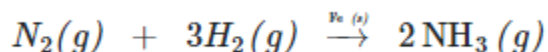
[CBSE Delhi 2012]

Ans. The two groups into which phenomenon of catalysis can be divided are:

(i) Homogeneous catalysis: When the reactants and the catalyst are in the same phase, the catalysis is said to be homogeneous catalysis. For example, SO_2 is oxidised to SO_3 in the presence of nitric oxide, NO as catalyst.



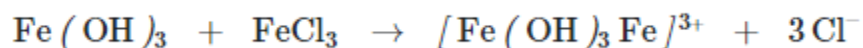
(ii) Heterogeneous catalysis: When the reactants are in a different phase than the catalyst, the catalysis is said to be heterogeneous. For example, the combination of dinitrogen and dihydrogen to form ammonia in the presence of finely divided iron as a catalyst.



Q.2. Answer the following questions.

Q. What happens when a freshly precipitated $\text{Fe}(\text{OH})_3$ is shaken with water containing a small quantity of FeCl_3 ?

Ans. It is converted into colloidal state.



Q. Why is a finely divided substance more effective as an adsorbent?

[CBSE (F) 2013]

Ans. Powdered substances have greater surface area as compared to their crystalline forms. Greater the surface area, greater is the adsorption.

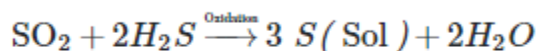
Q.3. How are the following colloidal solutions prepared?

- i. Sulphur in water
- ii. Gold in water

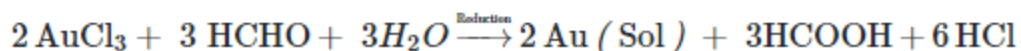
[CBSE Delhi 2013]

Ans.

i. Sulphur sol is prepared by the oxidation of H_2S with SO_2 .



ii. Gold sol is prepared by the reduction of $AuCl_3$ with formaldehyde.



Q.4. Write the differences between physisorption and chemisorption with respect to the following:

- i. **Specificity**
- ii. **Temperature dependence**
- iii. **Reversibility and**
- iv. **Enthalpy change**

[CBSE Delhi 2013]

Ans.

	Physisorption	Chemisorption
(i) Specificity	It is not specific in nature.	It is highly specific in nature.
(ii) Temperature dependence	Low temperature is favourable for adsorption. It decreases with increase of temperature.	High temperature is favourable for adsorption. It increases with the increase of temperature.
(iii) Reversibility	It is reversible in nature.	It is irreversible.
(iv) Enthalpy change	Enthalpy of adsorption is low (20–40 kJ) in this case.	Enthalpy of adsorption is high (80-240 kJ mol) in this case.

Q.5. What is meant by coagulation of a colloidal solution? Describe briefly any three methods by which coagulation of lyophobic sols can be carried out.

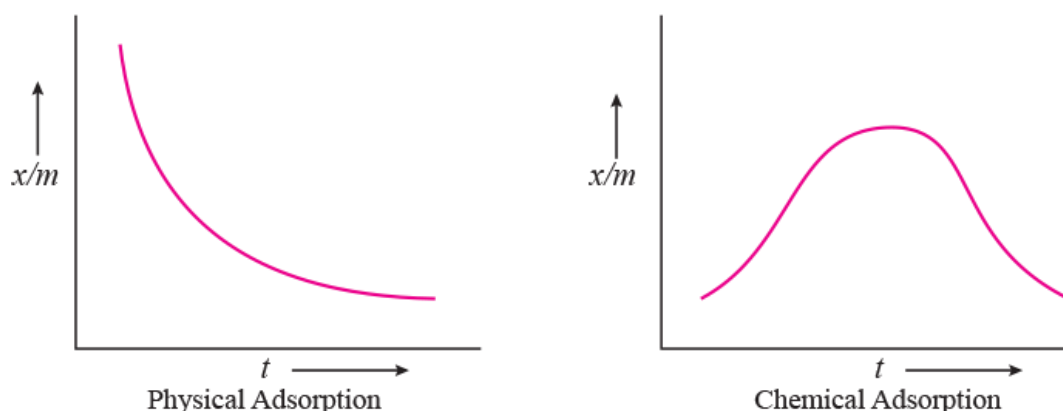
[CBSE Delhi 2012]

Ans. The process of settling of colloidal particles through induced aggregation by the addition of some suitable electrolyte is known as coagulation. Three methods by which coagulation of lyophobic sols can be carried out are:

- i. **Electrophoresis:** During electrophoresis the colloidal particles move towards oppositely charged electrodes, get discharged and coagulated.
- ii. **Boiling:** On boiling a sol, the adsorbed layer is disturbed due to increased collision with the molecules of dispersion medium. This reduces the charge on the particles which ultimately settle down in the form of a precipitate.
- iii. **Addition of Electrolytes:** When excess of an electrolyte is added to a colloidal solution, the colloids interact with ions carrying charge opposite to that present on themselves. This causes neutralisation leading to their coagulation.

Short Answer Questions-I (OIQ)

Q.1. Physical and chemical adsorption respond differently with a rise in temperature. What is this difference and why is it so?



Ans. Adsorption isobar for physical adsorption shows that the extent of adsorption decreases with the increase in temperature. The adsorption isobar of chemical adsorption shows that the extent of adsorption first increases and then decreases with the increase in temperature. The initial unexpected increase in the extent of adsorption with temperature is due to the fact that the heat supplied acts as activation energy required for chemical adsorption which is much more than that of physical adsorption.

Q.2. Give an example where physisorption changes to chemisorption with rise in temperature. Explain the reason for change.

Ans. The process of physisorption, for example that of H_2 on finely divided nickel, involves weak van der Waals' forces. With increase in temperature, hydrogen molecules dissociate into hydrogen atoms which are held on the surface by chemisorption.

Q.3. Answer the following questions.

Q. How does BF_3 act as a catalyst in industrial process?

[NCERT Exemplar]

Ans. It is because BF_3 is an electron deficient compound and helps to generate electrophile.

Q. Give an example of shape-selective catalysis.

Ans. ZSM-5 (Zeolite Sieve with molecular porosity 5).

Q. 4. Do the vital functions of the body such as digestion get affected during fever? Explain your answer.

[NCERT Exemplar]

Ans. The optimum temperature range for the activity of enzymes is 298–310 K. On either side of this temperature range, enzymatic activity gets affected. Thus, during fever, when temperature rises above 310 K, the activity of enzymes may be affected.

Q.5. In which of the following does adsorption take place and why?

- Silica gel placed in the atmosphere saturated with water.**
- Anhydrous CaCl_2 placed in the atmosphere saturated with water.**

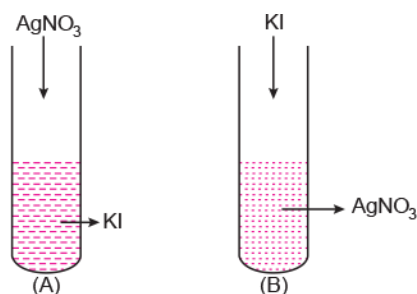
[HOTS]

Ans. i. In silica gel, adsorption takes place due to attraction and retention of water molecules on the surface.

ii. Anhydrous CaCl_2 undergoes absorption because it combines with water molecules to form hydrated calcium chloride, $\text{CaCl}_2 \cdot 2\text{H}_2\text{O}$.

Q.6. A colloidal solution of AgI is prepared by two different methods as shown in figure below.

[HOTS]

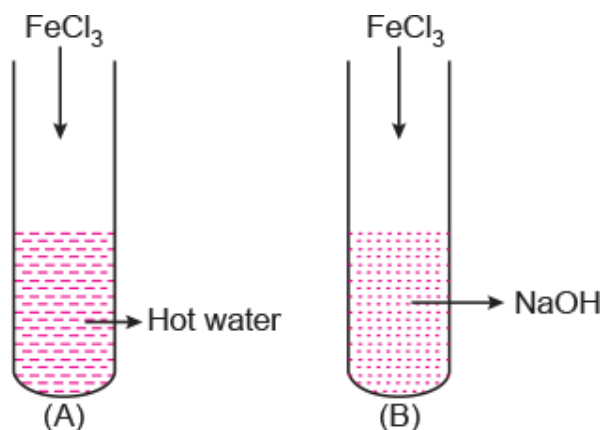


- What is the charge of AgI colloidal particles in the two test tubes (A) and (B)?**
- Give reasons for the origin of charge.**

Ans.

- Test tube (A) has negative charge whereas test tube (B) has positive charge on the colloidal particles.
- In test tube (A), I^- is adsorbed on precipitate AgI [or AgI/I^- is formed] and in test tube (B), Ag^+ is adsorbed on precipitate AgI [or AgI/Ag^+ is formed]

Q.7. A colloidal solution of ferric oxide is prepared by two different methods as shown below. [HOTS]



- What is the charge on colloidal particles in two test tubes (A) and (B)?
- Give reasons for the origin of charge.

Ans. i. Colloidal particles of test tube (A) are positively charged whereas colloidal particles of test tube (B) are negatively charged.

ii. In test tube (A), Fe^{3+} is adsorbed on the precipitate $\text{Fe}_2\text{O}_3 \cdot x\text{H}_2\text{O}$ [or $\text{Fe}_2\text{O}_3 \cdot x\text{H}_2\text{O}/\text{Fe}^{3+}$ is formed].

In test tube (B), OH^- ion is adsorbed on the precipitate $\text{Fe}_2\text{O}_3 \cdot x\text{H}_2\text{O}$ [or $\text{Fe}_2\text{O}_3 \cdot x\text{H}_2\text{O}/\text{OH}^-$ is formed].

Q.8. Which one of the following electrolytes is the most effective for the coagulation of $\text{Fe}(\text{OH})_3$ sol and why?

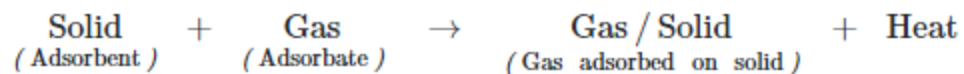
NaCl , Na_2SO_4 , Na_3PO_4

Ans. $\text{Fe}(\text{OH})_3$ is a positively charged sol. According to Hardy–Schulze rule, greater the charge on the oppositely charged ion of the electrolyte added, more effective it is in bringing about the coagulation. Hence, Na_3PO_4 (containing PO_4^{3-} ions) is the most effective.

Q.9. Give reasons:

Q. Physisorption decrease with increase of temperature.

Ans. As physisorption is an exothermic process:



According to Le Chatelier's principle, if we increase the temperature, equilibrium will shift in the backward direction, i.e., gas is released from the adsorbed surface.

Q. Gelatin which is a peptide is added in ice-creams.

[NCERT Exemplar]

Ans. Ice-creams are emulsions which get stabilised by emulsifying agents like gelatin.