Surface Chemistry

Question1

The most effective coagulating agent for antimony sulphide sol is

TG EAPCET 2025 (Online) 2nd May Evening Shift

Options:

A.

Na_2SO_4

B.

$CaCl_2$

C.

NH_4Cl

D.

$Al_2(SO_4)_3$

Answer: D

Solution:

Most effective coagulating agent for Sb_2S_3 sol is $Al_2(SO_4)_3$. This is because Sb_2S_3 forms a negative charge sol, and according to the Hardy-Schulze rule, the coagulating power increases with oppositely charged ions.

Question2

Which of the following is not correct about Freundlich adsorption isotherm?

TG EAPCET 2025 (Online) 2nd May Morning Shift

Options:

A.

$\frac{x}{m} = k_p^{1/n} (n > 1)$

B.

Extent of adsorption of gas is more at high temperature than at low temperature

C.

$\frac{1}{n}$ represents the slope of the isotherm

D.

$\log \frac{x}{m} = \log k + \frac{1}{n} \log p$ holds good over a limited range of pressures

Answer: B

Solution:

Freundlich adsorption isotherm equation:

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

where

- $\frac{x}{m}$ = mass of gas adsorbed per unit mass of adsorbent,
- p = equilibrium pressure,
- k and n = empirical constants,
- $n > 1$.

Or, taking logarithms,

$\log \frac{x}{m} = \log k + \frac{1}{n} \log p$

Option A:

$\frac{x}{m} = k p^{1/n} \quad (n > 1)$

✅ **Correct.**

Option B:

Extent of adsorption of gas is more at high temperature than at low temperature.

Adsorption is an **exothermic process**.

Hence, increasing temperature **decreases** adsorption (Le Chatelier's principle).

❌ **Incorrect statement.**

Option C:

$\frac{1}{n}$ represents the slope of the isotherm (in log–log plot)

Since $\log \frac{x}{m} = \log k + \frac{1}{n}\log p$,

✅ **Correct.**

Option D:

$\log \frac{x}{m} = \log k + \frac{1}{n}\log p$ holds good over a limited range of pressures.

At very high or very low pressures, Freundlich isotherm deviates.

✅ **Correct.**

✅ **Final Answer:**

Option B — *Extent of adsorption of gas is more at high temperature than at low temperature* — is **not correct** about Freundlich adsorption isotherm.

Question3

In Haber's process of manufacture of ammonia, the 'catalyst' the 'promoter' and 'poison for the catalyst' are respectively

TG EAPCET 2024 (Online) 10th May Evening Shift

Options:

A. Fe, W, CO

B. Co, Mo, CO

C. Fe, Mo, CO_2

D. Fe, Mo, CO

Answer: D

Solution:

Promoters are those substance which do not themselves acts a catalyst but increases the activity of catalyst. Iron (Fe) is used as catalyst in Haber's process. If small amount of Mo is mixed with iron then catalytic power of Fe increases.

Catalytic poison are substance which decreases the activity of catalyst.

CO is used as catalytic poison in Haber's process.

Question4

10 mL of 0.5 M NaCl is required to coagulate 1 L of $Sb_2 S_3$sol in 2 hours time. The flocculating value of NaCl (in millimoles) is

TG EAPCET 2024 (Online) 10th May Morning Shift

Options:

A. 20

B. 10

C. 5

D. 15

Answer: C

Solution:

Given, 10 mL of 0.5 M NaCl

Molarity

$$= \frac{\text{Number of moles of solute (in mL)}}{\text{Volume of solution}}$$

$$0.5 = \frac{x}{10}$$

$$x = 5 \text{ millimoles}$$

Flocculating value is given by

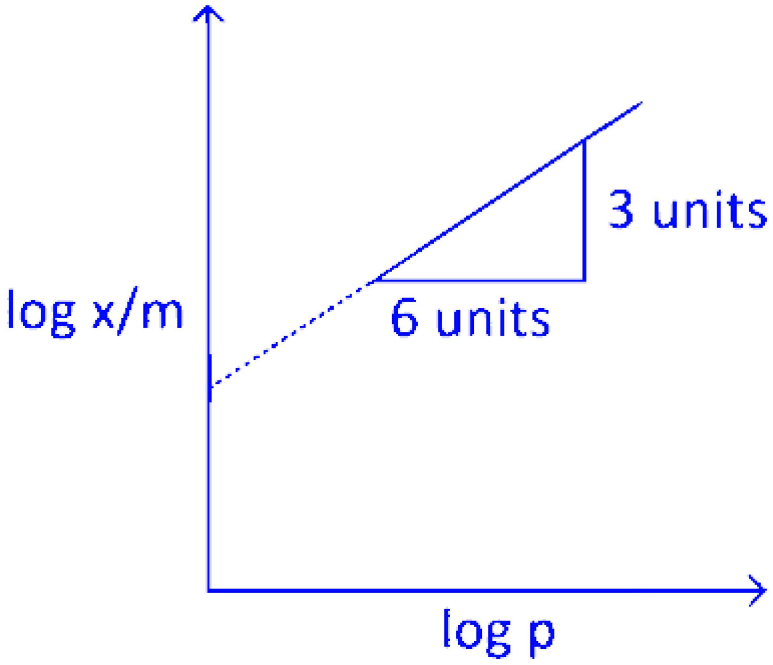
$= \frac{\text{Millimoles of electrolytes}}{\text{Volume of solution (in L)}}$

Volume of solution is given is 1 L So, Flocculating value $= \frac{5}{1} = 5$ m mol

---

Question5

Adsorption of a gas a solid adsorbent follows. Freundlich adsorption isotherm. If x is the mass of the gas adsorbed on mass ' m ' of the adsorbent at pressure p. From the graph given extent of adsorption is proportional to



TG EAPCET 2024 (Online) 9th May Evening Shift

Options:

A. $p^{1/2}$

B. p^2

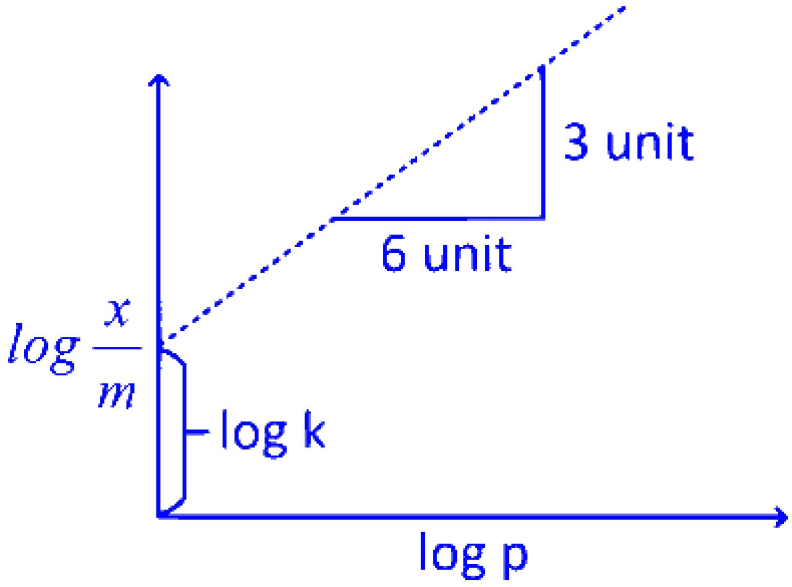
C. p

D. $p^{1/4}$

Answer: A

Solution:

According to Freundlich adsorption isotherm,



$\frac{x}{m} = kp^{1/n} \quad \ldots$ (i)

Taking log on both side,

$\log\left(\frac{x}{m}\right) = \log k + \frac{1}{n}\log p \ldots$ (ii)

$\text{Slope} = \frac{1}{n} \quad \ldots$ (iii)

From graph slope $= \frac{3}{6} = \frac{1}{2}$

$\therefore \quad \frac{x}{m} = kp^{1/2}$ or $\frac{x}{m} \propto p^{1/2}$

Question6

Adsorption of a gas (A) on an adsorbent follows Freundlich adsorption isotherm. The slope and intercept (on Y-axis) of the isotherm are $0:5$ and 1.0 respectively. What is the value of $\frac{x}{m}$, when the pressure of the gas (A) is 100 atm ?

TG EAPCET 2024 (Online) 9th May Morning Shift

Options:

A. 10

B. 1

C. 100

D. 1000

Answer: C

Solution:

According to Freundlich adsorption isotherm,

$\frac{x}{m} = kp^{1/n}$ ... (i)

Taking log on both side,

$\log \frac{x}{m} = \log k + \frac{1}{n}\log p$

Intercept, $\log k = 1$

So, $k = 10$ ... (ii)

Put the values of $k = 10, n = 0.5$ (given as slope)

$$\frac{x}{m} = 10 \times (100)^{0.5} [\text{ Also } p = 100 \text{ atm}]$$

$$\Rightarrow \frac{x}{m} = 100$$

Question7

Consider the following about the tyndall effect.

(I) It is used to distinguish between a true and colloidal solution.

(II) It is possible only when the dispersed medium and dispersed phase differ much in their refraction indices.

(III) It is observed only when the size of colloidal particles is much smaller than the wavelength of the light used.

The correct statements are

TS EAMCET 2023 (Online) 12th May Evening Shift

Options:

A. I and III only

B. II and III only

C. I, II and III

D. I and II only

Answer: D

Solution:

Tyndall effect is scattering of a beam of light by a colloidal medium containing suspended particle. True solution doesn't show tyndall effect. Therefore, it is used to distinguish between true and colloidal solution. It is possible when the dispersed medium and disperssed phase differ much in their refraction indices. This effect is seen when size of colloidal particle is smaller than wavelength of light used. Thus, correct statements are given in I and II only.

Question8

Identify the factors which favour the physical adsorption from the following

(I) High surface area

(II) Low temperatures

(III) High temperatures

(IV) Low pressures

(V) High pressures

TS EAMCET 2023 (Online) 12th May Morning Shift

Options:

A. I, III and IV only

B. I, II and V only

C. III and V only

D. I, II and IV only

Answer: B

Solution:

Let's analyze the factors step by step:

High surface area (I)

More surface area means more sites available for the adsorbate molecules to stick to, which favors adsorption.

Low temperatures (II)

Physical adsorption is generally an exothermic process. At lower temperatures, the kinetic energy of the adsorbate molecules is reduced, allowing the weak van der Waals forces to effectively hold them onto the surface.

High pressures (V)

Increasing the pressure increases the number of gas molecules hitting the surface, which enhances the likelihood of adsorption.

On the other hand:

High temperatures (III) actually decrease physisorption because the higher kinetic energy of the molecules makes it harder for the weak forces to capture them.

Low pressures (IV) reduce the number of collisions with the surface, thereby not favoring adsorption.

Thus, the factors that favor physical adsorption are I, II, and V.

The correct answer is Option B: I, II and V only.
