Surface Chemistry

Question1

Which of the following is NOT a characterstic of chemisorption?

MHT CET 2025 5th May Evening Shift

Options:

A.

It is specific.

B.

Heat released is in the range of $40 - 200$ kJ/mol

C.

Formation of multimolecular layer of adsorbate.

D.

It is irreversible.

Answer: C

Solution:

Key facts about chemisorption (chemical adsorption):

- It is **highly specific** because it depends on chemical bond formation. ✅
- It involves **high enthalpy of adsorption** (approximately **40–200 kJ/mol**). ✅
- Generally **irreversible** (since chemical bonds are formed). ✅
- Usually forms a **monolayer only** (not multimolecular layers). ❌

Options:

- **A:** It is specific → Correct characteristic.
- **B:** Heat released is 40–200 kJ/mol → Correct characteristic.
- **C:** Formation of multimolecular layer of adsorbate → This is true for **physisorption**, not chemisorption. ❌
- **D:** It is irreversible → Correct characteristic.

✅ **Answer: Option C — Formation of multimolecular layer of adsorbate**

Question2

Which instrument is used for determination of particle size?

MHT CET 2025 26th April Evening Shift

Options:

A.

SEM

B.

TEM

C.

FTIR

D.

UV visible spectroscopy

Answer: B

Solution:

Transmission Emission Microscopy (TEM) is the technique used for characterization of particle size in nanomaterials.

Question3

Which among the following gases is least adsorbed on solid at similar conditions of temperature and pressure?

MHT CET 2025 26th April Morning Shift

Options:

A. Cl_2

B. NH_3

C. SO_2

D. H_2

Answer: D

Solution:

Critical temperature $\propto$ Ease of liquefaction of a gas $\propto$ Extent of adsorption of the gas.

H_2 has the lowest critical temperature among the given options. Hence, it is adsorbed in minimum amount on a solid surface at similar conditions of temperature and pressure.

Question4

Identify the technique used to know binding nature of nanomaterials?

MHT CET 2025 26th April Morning Shift

Options:

A. SEM

B. TEM

C. XRD

D. FTIR

Answer: D

Solution:

Fourier Transform Infrared Spectroscopy (FTIR) is the analysis or characterization of nanomaterials. The information obtained from this technique is absorption of functional groups and binding nature of nanomaterials.

Question5

Which from following substances is classified as macromolecular colloid?

MHT CET 2025 25th April Evening Shift

Options:

A. Soap

B. Detergent

C. S_8 sulphur molecules

D. Nylon

Answer: D

Solution:

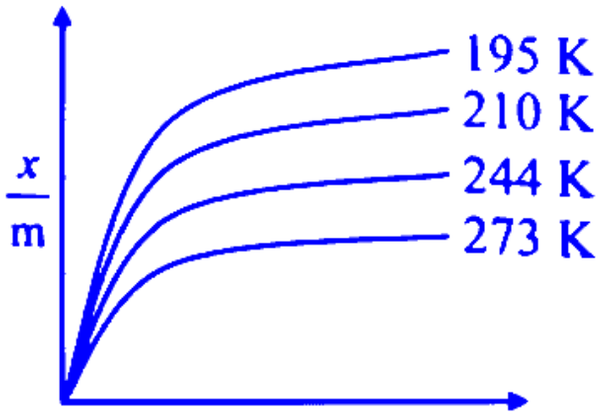
Multimolecular colloid - S_8 sulphur molecules

Macromolecular colloids - Nylon

Associated colloid-Soap, detergent

Question6

Find the temperature from following graph so that highest amount of a gas is adsorbed



MHT CET 2025 25th April Morning Shift

Options:

A. 195 K

B. 210 K

C. 244 K

D. 273 K

Answer: A

Solution:

Adsorption is an exothermic process. According to Le-Chatelier's principle it is favoured at low temperature. The amount of gas adsorbed is, thus, inversely proportional to temperature.

∴ For a given pressure (P) the extent of adsorption is highest at 195 K .

Question7

What type of colloid is fog?

MHT CET 2025 23rd April Evening Shift

Options:

A. Aerosol

B. Foam

C. Gel

D. Emulsion

Answer: A

Solution:

Fog is a **colloid of liquid droplets dispersed in a gas (air)**.

- **Aerosol**: Colloid with solid or liquid particles dispersed in a gas → ✅ fits fog.
- **Foam**: Gas dispersed in liquid.
- **Gel**: Liquid dispersed in solid.
- **Emulsion**: Liquid dispersed in liquid.

✅ **Correct Answer: Option A — Aerosol**

Question8

Which from following metal nanoparticle is used for coating the filter material that acts as effective bacterial disinfectant?

MHT CET 2025 23rd April Evening Shift

Options:

A. Nickel

B. Silver

C. Gold

D. Copper

Answer: B

Solution:

The correct answer is:

Option B: Silver ✅

Silver nanoparticles are widely used for coating filter materials because of their strong antimicrobial and disinfectant properties. They can effectively inactivate bacteria, viruses, and fungi, making them ideal for water purification and healthcare applications.

Nickel, gold, and copper also have some antimicrobial properties, but **silver nanoparticles are the most effective and commonly employed.**

Question9

Which from following metal nanoparticle is used for coating the filter material that acts as effective bacterial disinfectant?

MHT CET 2025 23rd April Evening Shift

Options:

A. Nickel

B. Silver

C. Gold

D. Copper

Answer: B

Solution:

Correct answer: B — Silver

Explanation:
Silver nanoparticles are widely used to coat filter materials because they act as an **effective bacterial disinfectant** . They have strong **antimicrobial properties** , damage bacterial cell membranes, and inhibit microbial growth. Hence, they are commonly used in **water purification filters** .

Options check:

- Nickel ❌

- **Silver ✅ (Correct)**
- Gold ❌
- Copper ❌

Final answer: Silver (Option B)

Question10

Which from following is classified multimolecular colloid?

MHT CET 2025 23rd April Morning Shift

Options:

A. Starch

B. Cellulose

C. S_8 sulphur molecules

D. Plastics

Answer: C

Solution:

Step 1: Recall types of colloids

1. **Multimolecular colloids**

- Formed by aggregation of many smaller molecules (atoms or molecules aggregate to form particles of colloidal dimensions).
- Example: Sulphur sol (from S_8 molecules), gold sol, etc.

1. **Macromolecular colloids**

- Large macromolecules individually have colloidal dimensions.
- Examples: starch, cellulose, proteins, plastics.

Step 2: Analyze options

- **Starch** → a macromolecular colloid (large polymer).

- **Cellulose** → also a macromolecular colloid.
- **S_8 molecules (sulphur sol)** → multimolecular colloid.
- **Plastics** → macromolecular colloid.

✅ **Correct option:**

Option C: S_8 sulphur molecules

Final Answer:

The multimolecular colloid among the given options is **S_8 sulphur molecules (Option C).**

Question11

Which of the following ion exihibits maximum power of coagulation for positively charged Sol ?

MHT CET 2025 22nd April Evening Shift

Options:

A. SO_4^{2-}

B. PO_4^{3-}

C. Cl^-

D. $[Fe(CN)_6]^{4-}$

Answer: D

Solution:

In the coagulation of positive sol, greater the negative charge of the flocculating ion added, greater is its power to cause precipitation. Hence, $[Fe(CN)_6]^{4-}$ has maximum power of coagulation among the following ions.

Question12

Which from following process does NOT results in coagulation?

MHT CET 2025 22nd April Morning Shift

Options:

A. electrophoresis

B. by adding excess solvent

C. by mixing two oppositely charged sols

D. by boiling

Answer: B

Solution:

- **Option A: Electrophoresis**

  In electrophoresis, particles with a charge move under the influence of an electric field toward the oppositely charged electrode. On reaching the electrode, they lose their charge and coagulate.

  → *Results in coagulation.*

- **Option B: By adding excess solvent**

  Adding excess solvent just dilutes the sol; it reduces collisions and does not destabilize colloidal particles. It does not usually cause coagulation.

  → *Does NOT result in coagulation.*

- **Option C: By mixing two oppositely charged sols**

  Oppositely charged sols neutralize each other's charge, leading to coagulation/precipitation.

  → *Results in coagulation.*

- **Option D: By boiling**

  Boiling increases collisions and reduces stability by removing the dispersion medium, leading to coagulation.

  → *Results in coagulation.*

✅ **Correct Answer: Option B (by adding excess solvent)**

Question13

Identify the catalyst used in following reaction at $500^{\circ}C$?

$$CO + H_2O \rightleftharpoons CO_2 + H_2$$

MHT CET 2025 22nd April Morning Shift

Options:

A. $Fe - Cr$

B. Ni

C. $Co - Th$

D. Platinised asbestos

Answer: A

Solution:

- The reaction is exothermic ($\Delta H < 0$).
- At **lower temperature (~200–250 °C)**, a **Cu–ZnO–Al_2O_3** catalyst is used (low-temperature shift).
- At **higher temperature (~400–500 °C)**, an **iron–chromium oxide (Fe–Cr)** catalyst is used (high-temperature shift).

Other catalysts like Ni, Co–Th, platinised asbestos are related to other processes (e.g. methanation, Fischer–Tropsch, or H_2–O_2 reactions) but not the industrial water–gas shift at 500 °C.

✅ **Correct Answer:**

Option A. Fe–Cr catalyst

👉 The water–gas shift reaction at ~500 °C uses Fe–Cr oxide as the industrial catalyst.

Question14

Which from following represents the Freundlich's empirical equation for adsorption of gas on solid (for $n > 1$)?

MHT CET 2025 21st April Evening Shift

Options:

A. $\frac{x}{\mathrm{m}} = \mathrm{kp}^{\frac{1}{n}}$

B. $\frac{\mathrm{m}}{x} = \mathrm{kp}^{\frac{1}{\mathrm{n}}}$

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

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

Answer: A

Solution:

We want the **Freundlich adsorption isotherm**, which is an **empirical relation** for adsorption of gases on solids.

It is given by:

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

where:

- $\frac{x}{m}$ = amount of adsorbate adsorbed per gram of adsorbent,
- p = equilibrium pressure of gas,
- k and n are constants, with $n > 1$.

✅ Correct option: **A.** $\frac{x}{m} = kp^{1/n}$

Question15

Identify sequential reactions involved in Sol-Gel process.

MHT CET 2025 21st April Evening Shift

Options:

A. Poly condensation and hydrolysis

B. Hydrolysis and poly condensation

C. Poly condensation and oxidation

D. Oxidation and hydrolysis

Answer: B

Solution:

The Sol-Gel process generally involves **two main reactions** in sequence:

1. **Hydrolysis** of metal alkoxides (or other precursors).
2. **Polycondensation** of the hydrolyzed species to form a 3D network (gel).

So the correct sequence is:

👉 **Option B: Hydrolysis and poly condensation** ✅

Question16

Identify the property of colloidal solutions so that colloidal particles move freely towards respective electrodes under an applied electrical potential.

MHT CET 2025 21st April Morning Shift

Options:

A. Brownian motion

B. Electrophoresis

C. Electroosmosis

D. Dialysis

Answer: B

Solution:

The property of colloidal solutions that causes colloidal particles to move freely towards respective electrodes under an applied electrical potential is called **Electrophoresis**.

Explanation:

- **Brownian motion** is the random movement of particles due to kinetic energy, not due to an electric field.
- **Electrophoresis** is the movement of colloidal particles toward the oppositely charged electrode under the influence of an electric field.
- **Electroosmosis** is the movement of the dispersion medium (not the particles) under the influence of an electric field.
- **Dialysis** is the process of removing impurities from colloidal solutions using a semipermeable membrane.

Correct answer:

Option B: Electrophoresis

Question17

Which from following gases is adsorbed to greater extent if adsorbent remains same at similar conditions of temperature and pressure?

MHT CET 2025 20th April Evening Shift

Options:

A. O_2

B. SO_2

C. N_2

D. H_2

Answer: B

Solution:

Gases having high critical temperature liquify easily and can readily be adsorbed.

Gas	Critical Temperature
O_2	154.3 K
SO_2	430.0 K
N_2	126.0 K
H_2	33.2 K

Question18

Which of the following is not negatively charged sol?

MHT CET 2025 20th April Morning Shift

Options:

A. $As_2 S_3$

B. Haemoglobin

C. Clay

D. Congo Red

Answer: B

Solution:

We have to identify which among the given is **not a negatively charged sol**.

Step 1: Recall examples of charge on sols (as per NCERT).

- **Negatively charged sols:**
- Arsenic sulphide sol (As_2S_3)
- Gold sol
- Silver sol
- Clay sol
- **Positively charged sols:**
- Ferric hydroxide sol ($Fe(OH)_3$)
- Aluminium hydroxide sol ($Al(OH)_3$)

- Haemoglobin sol
- **Dyestuff sols (like Congo Red):**
- These are generally **negatively charged**.

Step 2: Match with options.

- Option A: As_2S_3 → negatively charged
- Option B: Haemoglobin → **positively charged**
- Option C: Clay → negatively charged
- Option D: Congo Red → negatively charged

Final Answer:

Haemoglobin (Option B) is **not negatively charged**. ✅

Question19

Identify example of sorption from following.

MHT CET 2025 19th April Evening Shift

Options:

A. Charcoal is added to methylene blue solution.

B. Chalk is dipped in ink.

C. Hydrogen gas is passed over platinum

D. Oxygen gas is passed over finely divided nickel.

Answer: B

Solution:

Step 1: Recall the meaning of sorption.

- **Adsorption**: The accumulation of molecules on the surface.
- **Absorption**: The penetration of molecules into the bulk of material.
- **Sorption**: A general term which includes both adsorption and absorption, i.e. when it is not clear whether particles are only on surface or inside bulk, both may happen simultaneously.

Step 2: Analyze each option.

Option A: Charcoal is added to methylene blue solution

- Here, the dye particles accumulate only on the surface of charcoal.
- This is **adsorption**, not sorption.

Option B: Chalk is dipped in ink

- Ink has two components: (i) dye, (ii) water.
- Water is absorbed by chalk (goes inside bulk).
- Dye is adsorbed on the surface of chalk.
- So, both adsorption and absorption occur **together**.
- This is an example of **sorption**.

Option C: Hydrogen gas is passed over platinum

- Hydrogen molecules are accumulated on the surface of platinum.
- This is **adsorption**.

Option D: Oxygen gas is passed over finely divided nickel

- Oxygen molecules get adsorbed on the surface.
- This is **adsorption**.

Final Answer: Option B (Chalk is dipped in ink) is the example of sorption.

Question20

Match column I (process) with column II (application)

	Column I		Column II
i.	Dialysis	a.	Cleansing action of soap
ii.	Peptization	b.	Coagulation
iii.	Emulsificatioin	c.	Colloidal solution preparation
iv.	Electrophoresis	d.	Purification of colloidal solution

MHT CET 2025 19th April Morning Shift

Options:

A. i - d, ii - a, iii - c, iv - b

B. i - d, ii - c, iii - a, iv - b

C. i - c, ii - b, iii - d, iv - a

D. i - b, ii - c, iii - a, iv - d

Answer: B

Solution:

Let's match each process from Column I with its correct application from Column II according to NCERT:

1. **Dialysis**: This is used for the **purification of colloidal solution** (removal of dissolved substances from a colloid).

   So, $i \rightarrow d$

2. **Peptization**: This is the process of converting a precipitate into a colloidal solution by shaking it with a suitable electrolyte. It is used in **colloidal solution preparation**.

   So, $ii \rightarrow c$

3. **Emulsification**: This is the process by which two immiscible liquids are mixed to form an emulsion. This is related to the **cleansing action of soap** (because soap forms an emulsion with oil and water).

   So, $iii \rightarrow a$

4. **Electrophoresis**: This is the movement of colloidal particles under an electric field, used in **coagulation**.

   So, $iv \rightarrow b$

The correct answer is:

Option B:

i – d, ii – c, iii – a, iv – b

Question21

Identify positively charged sol from the following.

MHT CET 2024 16th May Evening Shift

Options:

A. Haemoglobin

B. Gum

C. Gelatin

D. Cadmium sulfide

Answer: A

Solution:

In many standard references, colloids are often classified (at a given pH) as having predominantly positive or negative charges. Typical examples are:

Positively charged sols: Ferric hydroxide $\left(Fe(OH)_3\right)$, aluminium hydroxide $\left(Al(OH)_3\right)$, **haemoglobin**, etc.

Negatively charged sols: Arsenic sulfide $\left(As_2S_3\right)$, gold sol, gum, **cadmium sulfide**, etc.

Although proteins (like haemoglobin or gelatin) can be amphoteric (and thus may change charge depending on pH), classical examples in many textbooks list **haemoglobin** as a *positively charged* colloid under typical reference conditions.

Let's see why the other options are not the standard examples of a positively charged sol:

Gum – Commonly cited as a *negatively* charged colloid.

Gelatin – Can be positive or negative depending on pH, but is more often grouped with negative sols in standard lists (unless in strongly acidic conditions).

Cadmium sulfide (CdS**)** – Typically forms a *negatively* charged sol.

Hence, from the given choices, the standard answer for a *positively charged sol* is:

Option A: Haemoglobin.

Question22

Which from following is a largest size nanomaterial?

MHT CET 2024 16th May Evening Shift

Options:

A. Water (molecular level)

B. Glucose (molecular level)

C. Virus

D. Bacteria

Answer: D

Solution:

The largest size among the options provided is **Option D: Bacteria**.

To understand why bacteria are the largest, let's examine the typical sizes of each:

Water (molecular level): A molecule of water has a very small size, typically around 0.27 nanometers (nm) in diameter.

Glucose (molecular level): A glucose molecule is larger than a water molecule, with a size of about 1 nanometer (nm).

Virus: Viruses vary in size but generally range from about 20 nanometers to 300 nanometers. While they are larger than individual molecules like water and glucose, they are typically smaller than bacteria.

Bacteria: Bacteria are significantly larger than viruses, with sizes generally ranging from about 200 nanometers to several micrometers (micron = 1000 nanometers). Common bacterial dimensions are in the range of 1 to 10 micrometers.

Thus, bacteria, which can be several micrometers in size, are the largest when compared to water, glucose, and viruses at the nanoscale.

Question23

Identify one dimensional nanostructure from following.

MHT CET 2024 16th May Morning Shift

Options:

A. Nanowires

B. Nanoparticles

C. Thin films

D. Quantum dots

Answer: A

Solution:

A one-dimensional nanostructure from the given options is **Nanowires**.

Explanation:

Nanowires: These are structures with a diameter in the nanometer scale, typically a few nanometers to hundreds of nanometers, and an unconstrained length, making them one-dimensional at the nanoscale. They have applications in electronics, photonics, and energy devices due to their high aspect ratio and unique electronic, mechanical, and thermal properties.

Nanoparticles: These are zero-dimensional nanostructures where all three dimensions are at the nanoscale. This means the particles are often spherical or near-spherical in shape.

Thin films: These structures are two-dimensional, having a limited thickness at the nanoscale or microscale, but extending infinitely in the other two dimensions.

Quantum dots: These are another type of zero-dimensional nanostructure where electrons are confined in all three spatial dimensions, leading to discrete energy levels and applications in quantum computing and display technologies.

Nanowires correctly fit the definition of being one-dimensional as their nanoscale dimensionality primarily extends in one direction.

Question24

What is the value of slope in Freundlich adsorption isotherm $\log \frac{x}{m}$ against $\log C$?

MHT CET 2024 16th May Morning Shift

Options:

A. $\frac{1}{n}$

B. n

C. K

D. $\log K$

Answer: A

Solution:

According to Freundlich's adsorption isotherm $\log \frac{\mathrm{x}}{\mathrm{m}} = \log \mathrm{k} + \frac{1}{\mathrm{n}} \log \mathrm{C}$

On plotting a graph of $\log \frac{x}{m}$ against $\log C$, a straight line is obtained. The slope of the straight line is $\frac{1}{n}$.

Question25

Identify dispersed phase and dispersion medium in fog respectively.

MHT CET 2024 15th May Morning Shift

Options:

A. liquid and gas.

B. gas and liquid.

C. solid and gas.

D. gas and solid.

Answer: A

Solution:

In fog, the dispersed phase is the liquid, and the dispersion medium is the gas. This makes the correct choice:

Option A: liquid and gas.

Fog is essentially a colloidal system where tiny water droplets (liquid) are dispersed within air (gas), creating a misty appearance. This dispersion is classified as an aerosol, which is characterized by having a liquid dispersed phase and a gaseous dispersion medium.

Question26

Which among the following is an example of emulsion?

MHT CET 2024 11th May Evening Shift

Options:

A. Foam rubber

B. Froth

C. Gelatin

D. Hair cream

Answer: D

Solution:

Hair cream is an example of an emulsion.

An emulsion is a mixture of two immiscible liquids, where one liquid contains a dispersion of the other liquid. In the case of hair cream, it typically consists of water and oils or waxes that are emulsified into a creamy texture. Emulsions are often stabilized with an emulsifying agent to prevent separation.

Question27

Which from following statements is NOT true about absorption?

MHT CET 2024 10th May Evening Shift

Options:

A. Concentration of absorbate is uniform throughout the bulk of the absorbent.

B. It is independent of temperature and pressure.

C. It is not accompanied by evolution or absorption of heat.

D. It depends on surface area.

Answer: D

Solution:

Answer: It depends on surface area (Option D)

Detailed Reasoning:

Absorption is the process in which one substance (absorbate) is taken up uniformly throughout the bulk of another substance (absorbent). Let's analyze the given statements in the context of absorption:

Option A: "Concentration of absorbate is uniform throughout the bulk of the absorbent."

This is a defining characteristic of absorption. Unlike adsorption (which happens only at the surface), in absorption the absorbate penetrates into the bulk, resulting in a uniform concentration. Thus, this statement is true about absorption.

Option B: "It is independent of temperature and pressure."

Absorption often depends on temperature and pressure. For example, the amount of gas absorbed by a liquid generally varies with changes in temperature and pressure. Thus, absorption is not independent of these factors; this statement is not true.

Option C: "It is not accompanied by evolution or absorption of heat."

Most physical and chemical processes, including absorption, involve some enthalpy change. Dissolving a gas in a liquid or a liquid in another liquid can be either exothermic or endothermic. So stating that there is no heat change is generally not correct. This statement is also not true.

Option D: "It depends on surface area."

Absorption involves the entire volume of the absorbent, not just the surface. The extent of absorption does not significantly depend on the surface area, unlike adsorption which is a surface phenomenon. Therefore, stating that absorption depends on surface area is not true.

Among the given options, the question is asking for which is NOT true about absorption. While both B and C are also not accurate, the most clearly established incorrect statement (and commonly taught difference) is that absorption does not depend on surface area. That is a key distinction from adsorption.

Correct Answer: D

Question28

What type of colloid is the soap lather?

MHT CET 2024 10th May Morning Shift

Options:

A. Solid sol

B. Emulsion

C. Foam

D. Aerosol

Answer: C

Solution:

Soap lather is a type of colloid known as **foam**. In this type of colloid, gas particles are dispersed in a liquid. The formation of soap lather occurs when gas, typically air, is trapped within the soap solution, creating bubbles that are stabilized by the soap molecules. This results in a mass of bubbles that resembles foam.

Option C: Foam

Question29

Identify the instrument used to find the structure of surface of material.

MHT CET 2024 10th May Morning Shift

Options:

A. Scanning electron microscope

B. X ray difractometer

C. Transmission electron microscope

D. UV-visible spectrophotometer

Answer: A

Solution:

Scanning Electron Microscope (SEM):

SEM uses a focused beam of high-energy electrons to scan the surface of a material. These electrons interact with the surface atoms, producing signals that provide detailed images of the material's surface topography and composition. This technique is well-suited for examining the surface structure.

X-ray Diffractometer (XRD):

XRD is used to determine the crystal structure, lattice parameters, and phase identification of a material by analyzing the diffraction pattern of X-rays passing through the bulk crystal. It's not primarily focused on surface structure; it gives information about the bulk crystalline structure.

Transmission Electron Microscope (TEM):

TEM involves transmitting electrons through a very thin sample and gives information about the internal microstructure, crystal structure, and composition at high magnification. While it can give detailed structural information at the atomic level, it is not primarily for surface structure imaging.

UV-Visible Spectrophotometer:

This instrument measures the absorption and transmission of UV-visible light by a sample. It's used for analyzing optical properties and concentrations of solutions, not for obtaining surface structure images.

Conclusion:

The instrument best suited for examining the structure of a material's surface is the **Scanning Electron Microscope (SEM)**.

Final Answer:

Option A: Scanning Electron Microscope

Question30

Which from following anions has maximum coagulating power for precipitation of positive sol?

MHT CET 2024 9th May Evening Shift

Options:

A. $[Fe(CN)_6]^{4-}$

B. Cl^-

C. SO_4^{--}

D. PO_4^{--}

Answer: A

Solution:

The coagulating power of an anion in precipitating a positive sol is determined by the anion's charge and accordance with the Schulze-Hardy rule, which states that the effectiveness of an ion in coagulating a sol is directly proportional to the sixth power of its valency.

Among the given options, the valencies of the anions are as follows:

$[Fe(CN)_6]^{4-}$ has a charge of 4-.

Cl^- has a charge of 1-.

SO_4^{2-} has a charge of 2-.

PO_4^{3-} has a charge of 3-.

Thus, according to the Schulze-Hardy rule, the coagulating power increases with increasing charge on the anions. Hence, the anion with the maximum charge will have the maximum coagulating power.

Therefore, the anion $[Fe(CN)_6]^{4-}$ has the maximum coagulating power for the precipitation of a positive sol due to its highest charge of 4-.

Question31

What type of colloid is milk?

MHT CET 2024 9th May Morning Shift

Options:

A. Solid in liquid

B. Liquid in solid

C. Liquid in Liquid

D. Gas in liquid

Answer: C

Solution:

Milk is a colloid known as an emulsion, which falls under the category of "Liquid in Liquid."

In this type of colloid, tiny droplets of one liquid are dispersed in another liquid. In the case of milk, fat droplets are dispersed throughout an aqueous (water-based) solution. The droplets of fat (oil) are the dispersed phase, while the water solution in which they are distributed acts as the continuous phase. Milk appears homogeneous due to the small size of its dispersed particles, which are stabilized by proteins and other emulsifying agents present in milk.

Thus, the correct option is:

Option C: Liquid in Liquid

Question32

Which from following anions has lowest coagulating power for precipitation of positive sol?

MHT CET 2024 4th May Evening Shift

Options:

A. $[Fe(CN)_6]^4$

B. PO_4^{3-}

C. SO_4^{2-}

D. Cl^-

Answer: D

Solution:

According to Schulze-Hardy rules, the ions having opposite charge to sol particles cause coagulation and greater the valency of oppositely charged ion, more is the coagulating power. Hence, the decreasing order of coagulating power for precipitation of positive sol is $Fe\left(CN_6^4\right)_6^{4-} > PO_4^{3-} > SO_4^{2-} > Cl^-$

Question33

Identify a zero dimensional nano structure from following

MHT CET 2024 4th May Evening Shift

Options:

A. Nanorods

B. Nanoparticles

C. Thin films

D. Fibres

Answer: B

Solution:

Nanoparticles are a zero-dimensional nanostructure. Zero-dimensional structures are those whose dimensions are confined to a small scale in all three spatial dimensions, meaning they have nanoscale dimensions in every direction. Nanoparticles typically exhibit this property, and because of their spherical or near-spherical forms, they exhibit quantized energy levels leading to unique optical, electronic, and chemical properties not observed in bulk materials.

On the other hand:

Nanorods are one-dimensional structures with a significant aspect ratio.

Thin films are two-dimensional structures with a large area but minimal thickness.

Fibres generally refer to one-dimensional structures with significant length in comparison to their cross-sectional dimension.

Question34

Which from following statements is NOT true about lyophilic colloids?

MHT CET 2024 4th May Morning Shift

Options:

A. The particles of dispersed phase have greater affinity for the dispersion medium.

B. These are reversible.

C. These are self stabilized.

D. Coagulation occurs even by adding very small amount of electrolytes.

Answer: D

Solution:

In lyophilic colloids, the particles of dispersed phase have a great affinity for the dispersion medium. They are reversible and self-stabilized colloids. Addition of large amount of electrolytes causes precipitation or coagulation of lyophilic sols.

Question35

Which is NOT an example of macromolecular colloid?

MHT CET 2024 3rd May Evening Shift

Options:

A. Protein

B. Polythene

C. Nylon

D. Soap

Answer: D

Solution:

Option D: Soap

Macromolecular colloids are typically formed when large molecules (macromolecules) dissolve and form a stable colloidal system in a suitable solvent. Examples of macromolecular colloids include natural biopolymers like proteins and synthetic polymers like polythene and nylon.

Proteins are large biological molecules that can form colloidal systems due to their size and structure, making them macromolecular colloids.

Polythene is a synthetic polymer, which can form colloidal dispersions due to its macromolecular nature.

Nylon is another synthetic polymer, and when dissolved, can form colloidal systems.

Soap, however, typically forms micellar colloids rather than macromolecular colloids. When in solution, soap molecules form micelles, which are aggregates of soap molecules. These micelles act as colloids but are not considered macromolecular as they are not individual large molecules.

Therefore, soap is not an example of a macromolecular colloid.

Question36

Which from following is an example of multimolecular colloids?

MHT CET 2024 3rd May Morning Shift

Options:

A. Soap

B. Polythene

C. Sulfur molecule (S_8)

D. Nylon

Answer: C

Solution:

Option C, sulfur molecules (S_8), is an example of multimolecular colloids.

Multimolecular colloids are formed when a large number of atoms or small molecules, such as sulfur molecules, aggregate to form particles of colloidal dimensions. These aggregates consist of numerous smaller molecules that join together in a specific arrangement to form larger entities with high surface area and specific properties characteristic of colloids.

In contrast, polymeric colloids, such as polythene and nylon, are formed by large molecules made up of repeating sub-units or monomers, while soap forms micelles that are not characteristic of multimolecular colloids.

Question37

Identify dispersed phase and dispersion medium in cheese.

	Dispersed Phase	Dispersion medium
1	liquid	solid
2	liquid	liquid
3	solid	liquid
4	solid	solid

MHT CET 2024 2nd May Evening Shift

Options:

A. 1

B. 2

C. 3

D. 4

Answer: A

Solution:

Cheese can be considered a solid emulsion where the dispersed phase is a liquid and the dispersion medium is a solid. This is consistent with the properties of cheese, where liquid fats and water are dispersed in a solid network of proteins.

Option A:

Dispersed Phase: Liquid

Dispersion Medium: Solid

Question38

Which of the following is an example of heterogenous catalysis?

MHT CET 2024 2nd May Morning Shift

Options:

A. Oxidation of $SO_{2(g)}$ in presence of $NO_{(g)}$.

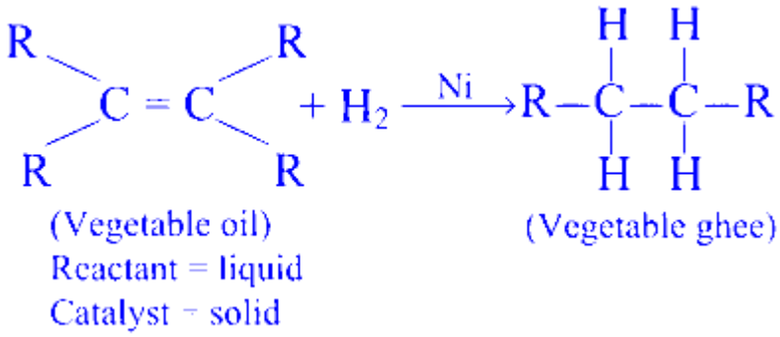
B. Decomposition of aqueous H_2O_2 in presence of $I^-_{(aq)}$.

C. Hydrolysis of sugar in presence of aq. H_2SO_4.

D. Hydrogenation of vegetable oil in presence of $Ni_{(s)}$.

Answer: D

Solution:



Question39

Which from following techniques is used for preliminary confirmation of nanoparticles?

MHT CET 2024 2nd May Morning Shift

Options:

A. UV-visible spectroscopy

B. X ray diffraction

C. Scanning electron microscopy

D. Transmission electron microscopy

Answer: A

Solution:

Option A: UV-visible spectroscopy.

UV-visible spectroscopy is a common technique used for the preliminary confirmation of nanoparticles. This method is particularly effective because nanoparticles often exhibit unique optical properties, such as surface plasmon resonance (SPR), that can be detected in the UV-visible spectrum. When nanoparticles are dispersed in a solution, they absorb and scatter light at specific wavelengths, creating a characteristic absorption spectrum. The position and shape of the absorption peaks can provide valuable information about the size, concentration, and stability of the nanoparticles.

Here's a simple explanation of some common features observed using UV-visible spectroscopy for nanoparticles:

Surface Plasmon Resonance (SPR): Metallic nanoparticles, for instance, gold and silver, exhibit SPR, resulting in distinctive absorption bands in the UV-visible region. The precise position of the SPR peak depends on the size, shape, and environment of the nanoparticles.

Band Gap Analysis: For semiconductor nanoparticles, the UV-visible spectrum can help determine the band gap energy. Shifts in absorption edge can indicate quantum size effects, often observed as shifts towards higher energies (blue shift) as the size of nanoparticles decreases.

UV-visible spectroscopy is thus an easy and non-destructive method allowing researchers to quickly gather information about nanoparticle characteristics before moving on to more detailed analyses such as using techniques like X-ray diffraction (XRD), scanning electron microscopy (SEM), or transmission electron microscopy (TEM).

Question40

Which of the following gases is readily adsorbed by solid adsorbent?

MHT CET 2023 14th May Evening Shift

Options:

A. Cl_2

B. N_2

C. O_2

D. H_2

Answer: A

Solution:

Gases having high critical temperature liquefy easily and can be readily adsorbed. Examples: SO_2, Cl_2, NH_3

Question41

Which of the following ion has greater coagulating power for negatively charged sol?

MHT CET 2023 14th May Morning Shift

Options:

A. $Fe(CN)_6^4$

B. PO_4^{3-}

C. Ba^{2+}

D. Al^{3+}

Answer: D

Solution:

In the coagulation of negative sol, greater the positive charge of the flocculating ion added, greater is its power to cause precipitation.

To precipitate negatively charged sol, positively charged ions are required.

Question42

Which from following catalyst is used in decomposition of KCl_3 ?

MHT CET 2023 14th May Morning Shift

Options:

A. Platinized asbestos

B. Fe-Cr catalyst

C. Ni

D. MnO_2

Answer: D

Solution:

The correct answer is Option D, MnO_2 (manganese dioxide).

Manganese dioxide (MnO_2) is commonly used as a catalyst in the decomposition of potassium chlorate ($KClO_3$) to release oxygen gas (O_2) and form potassium chloride (KCl). The reaction can be represented by the following chemical equation:

$$2KClO_3 \xrightarrow{MnO_2} 2KCl + 3O_2$$

Upon heating, the presence of MnO_2 lowers the activation energy of the decomposition reaction, thus enhancing the rate at which O_2 is produced without the catalyst itself being consumed in the reaction. This catalytic decomposition is of particular importance in applications where a ready source of O_2 is needed, such as in oxygen candles for submarines or aircraft, and in safety matches.

Question43

Identify FALSE statement regarding adsorption from following.

MHT CET 2023 13th May Morning Shift

Options:

A. It takes place due to unbalanced forces acting on the surface of solid or liquid.

B. During adsorption surface energy of adsorbent increases.

C. It is caused by van der Waals forces.

D. It is an exothermic process.

Answer: B

Solution:

During adsorption, surface energy (surface tension) of the adsorbent decreases.

Question44

Which from following nanomaterial has one dimension less than 100 nm ?

MHT CET 2023 13th May Morning Shift

Options:

A. Fibres

B. Nanoparticles

C. Thin films

D. Microcapsules

Answer: C

Solution:

'One dimension less than 100 nm' implies that the nanomaterial is a two-dimensional nanostructure. Among the given options, thin films are two-dimensional nanostructures.

Question45

Which from following nanoparticle catalysts is used in photocatalysis?

MHT CET 2023 12th May Evening Shift

Options:

A. TiO_2

B. Pd

C. Pt

D. Au

Answer: A

Solution:

Among the options provided, Option A TiO_2 (titanium dioxide) is commonly used as a nanoparticle catalyst in photocatalysis. Titanium dioxide is a well-known photocatalyst due to its strong oxidizing power, high photocatalytic efficiency, chemical stability, non-toxicity, and low cost. When it is irradiated with light at or above its band-gap energy (usually UV light), it can create electron-hole pairs, leading to the formation of reactive oxygen species capable of breaking down organic pollutants and disinfecting water.

While Options B (Pd, palladium), C (Pt, platinum), and D (Au, gold) can all be used as catalysts in various chemical reactions, they are not typically used for photocatalysis in the same way that TiO_2 is. These noble metals are more commonly associated with applications in oxidation, hydrogenation reactions, and as catalysts in fuel cells where they facilitate redox reactions without necessarily utilizing light as a reagent.

Question46

Which from following phenomena is inversely proportional with adsorption?

MHT CET 2023 12th May Morning Shift

Options:

A. Critical temperature of gas

B. Surface area of adsorbent

C. Temperature of process

D. Pressure of gas

Answer: C

Solution:

Adsorption is the process where molecules or atoms adhere to a surface. The extent of adsorption depends on various factors, but when considering its relationship with other phenomena, we look at how changes in these factors influence the amount of adsorption.

- **Critical Temperature of Gas** : The critical temperature of a gas is the temperature above which it cannot be liquefied, regardless of the pressure applied. Generally, gases which can be easily liquefied (i.e., gases with higher critical temperatures) are adsorbed to a greater extent because they are easier to condense on surfaces. However, this isn't an inverse relationship.

- **Surface Area of Adsorbent** : The greater the surface area of the adsorbent, the more sites are available for adsorption, leading to increased adsorption. This is a direct, not inverse, relationship.

- **Temperature of Process** : Generally, adsorption is exothermic (releases heat). According to Le Chatelier's principle, increasing the temperature of an exothermic process will decrease the extent of the reaction. Therefore, as temperature increases, adsorption typically decreases, indicating an inverse relationship.

- **Pressure of Gas** : For gases, increasing pressure generally increases adsorption because more gas molecules are forced into proximity with the adsorbent surface. This is a direct relationship.

Based on these considerations, the correct option is :

Option C : Temperature of process (as it has an inverse relationship with adsorption).

Question47

Which of the following is positively charged sol?

MHT CET 2023 11th May Evening Shift

Options:

A. Haemoglobin in blood

B. Sol of starch

C. Gelatin

D. 'Ag' sol

Answer: A

Solution:

Haemoglobin in blood is a positively charged sol whereas sol of starch, gelatin sol and silver sol are negatively charged sols.

Question48

Identify physisorption from following.

MHT CET 2023 11th May Morning Shift

Options:

A. O_2 gas deposited on tungsten

B. H_2 gas deposited on nickel

C. N_2 gas deposited on iron

D. All gases deposited on charcoal

Answer: D

Solution:

Answer: **(D) All gases deposited on charcoal.**

Physisorption, or physical adsorption, involves weak van der Waals forces between the adsorbate (gas) and the adsorbent (solid surface). It is a general phenomenon that is not specific to any particular gas or surface.

- Gases like **hydrogen, nitrogen, and oxygen are commonly physisorbed** onto the surface of porous adsorbents like charcoal at lower temperatures.
- The options involving specific gases deposited on specific metals (tungsten, nickel, iron) typically refer to situations where the process might involve chemisorption (chemical adsorption) under certain conditions, which is highly specific and involves the formation of chemical bonds.
- Since physisorption is a non-specific process that occurs with most gases on a suitable surface like charcoal, option D is the most accurate general answer for identifying physisorption.

Question49

Identify the catalyst (A) used in following reaction.

$$CO + H_2O \overset{A}{\rightleftharpoons} CO_2 + H_2$$

MHT CET 2023 11th May Morning Shift

Options:

A. Platinised asbestos

B. MnO_2

C. Co-Th alloy

D. Fe – Cr

Answer: D

Solution:

Carbon dioxide and hydrogen are formed by reaction of the carbon monoxide and steam at about 500°C with Fe – Cr catalyst.

Question50

Identify the last step in wet chemical synthesis of nanomaterial.

MHT CET 2023 10th May Evening Shift

Options:

A. Formation of oxide or alcohol-bridged network

B. Dehydration

C. Aging of the gel

D. Drying of the gel

Answer: B

Solution:

The **last step in wet chemical synthesis of nanomaterials** is:

B. Dehydration

Explanation (brief):
In wet chemical (sol–gel) synthesis, the typical sequence is:

1. Formation of oxide or alcohol-bridged network (sol formation)
2. Gelation
3. Aging of the gel

4. Drying of the gel
5. **Dehydration** (often during calcination), where residual solvents, water, and hydroxyl groups are removed to obtain the final nanomaterial structure.

So, the correct answer is **Dehydration** .

Question51

Which of the following is character of lyophilic colloid?

MHT CET 2023 10th May Morning Shift

Options:

A. Particles of dispersed phase have no affinity for dispersion medium.

B. Particles easily detected under ultramicroscope.

C. Addition of large amount of electrolyte causes precipitation.

D. These are irreversible colloids.

Answer: C

Solution:

The **correct answer is:**

C. Addition of large amount of electrolyte causes precipitation

Explanation:

- **Lyophilic colloids** (e.g., starch, gelatin, proteins) have **strong affinity** for the dispersion medium.
- Because of this strong solvation, they are **highly stable** .
- As a result, **a large amount of electrolyte** is required to cause precipitation.

Why the other options are incorrect:

- **A** ❌ No affinity for dispersion medium → this describes *lyophobic* colloids.
- **B** ❌ Easily detected under ultramicroscope → more typical of *lyophobic* colloids.
- **D** ❌ Irreversible colloids → lyophilic colloids are generally **reversible** .

Hence, **Option C** correctly describes a characteristic of lyophilic colloids.

Question52

Which of the following colloids is NOT a gel?

MHT CET 2023 9th May Evening Shift

Options:

A. Cheese

B. Milk

C. Butter

D. Jellies

Answer: B

Solution:

Milk is an emulsion.

Question53

What type of information is collected using scanning electron microscopy?

MHT CET 2023 9th May Morning Shift

Options:

A. Structure of material surface

B. Crystal structure

C. Binding nature

D. Particle size

Answer: A

Solution:

Scanning Electron Microscopy (SEM) is a powerful technique used in various scientific fields for analyzing the surface characteristics of materials.

- **Option A - Structure of Material Surface :** This is a primary use of SEM. It allows for high-resolution imaging of the surface topography and morphology of materials. SEM can provide detailed images of the surface structures, revealing features like cracks, pores, and the arrangement of particles on a surface.
- **Option B - Crystal Structure :** SEM itself is not typically used for determining crystal structure. This aspect is more directly studied using techniques like X-ray diffraction (XRD). However, SEM can be combined with diffraction techniques, such as electron backscatter diffraction (EBSD), to study crystallographic information in materials.
- **Option C - Binding Nature :** SEM does not directly provide information about the binding nature of atoms or molecules in a material. However, when combined with other techniques like Energy-dispersive X-ray spectroscopy (EDX or EDS), it can be used to analyze the elemental composition and infer binding information.
- **Option D - Particle Size :** SEM is highly effective for determining particle size and distribution. It is commonly used in materials science, nanotechnology, and other fields to measure and analyze the size of particles, including nanoparticles.

In summary, the most direct application of SEM among options is the study of the structure of material surfaces (Option A), though it can also contribute to understanding aspects of crystal structure and particle size when combined with other techniques.

Question54

What type of following phenomena is NOT exhibited by adsorption?

MHT CET 2022 11th August Evening Shift

Options:

A. Irreversible

B. Bulk

C. Exothermic

D. Endothermic

Answer: B

Solution:

Among the listed options, Option B: "Bulk" is NOT a phenomenon that is typically exhibited by adsorption. To understand why let's examine all the options:

Option A: Irreversible - Adsorption can be either reversible or irreversible. Irreversible adsorption means that once the adsorbate molecules attach to the adsorbent surface, they are not easily detached; this is common with chemisorption, where strong chemical bonds are formed. Reversible adsorption is more characteristic of physisorption, where the forces involved are weaker (like van der Waals forces), allowing the adsorbate to be released from the adsorbent surface under certain conditions. So, adsorption can indeed be irreversible, but it's not exclusively so.

Option B: Bulk - Adsorption is a surface phenomenon. It involves the accumulation of substances at the interface between two phases, such as between a solid surface and a gas or liquid. "Bulk" refers to the volume of a material or a phenomenon that occurs throughout the volume, which is contrary to the localized nature of adsorption at surfaces or interfaces. Therefore, adsorption is not a bulk phenomenon.

Option C: Exothermic - Adsorption is typically an exothermic process. When adsorbate molecules attach to the adsorbent surface, they release energy in the form of heat. This is because the adsorbate molecules usually go to a lower energy state when they adhere to the adsorbent, leading to a release of energy. The enthalpy change (ΔH) of adsorption is negative, which is indicative of an exothermic reaction.

Option D: Endothermic - Adsorption is generally exothermic, but there are instances where adsorption can be endothermic. For example, when the adsorbate is bound with relatively stronger intermolecular forces in the bulk phase compared to the forces it experiences at the adsorbent surface, the process may end up absorbing energy from the surroundings to allow adsorption. However, these cases are the exception rather than the rule.

Therefore, the correct answer is Option B: "Bulk," as adsorption does not exhibit bulk characteristics; it is a surface-based phenomenon.

Question55

Which of the following is a first step in mechanism of heterogenous catalysis?

MHT CET 2021 24th September Evening Shift

Options:

A. Desorption of reaction product from catalyst surface

B. Adsorption of reactant molecules on catalyst

C. Occurrence of chemical reaction on catalyst surface to form an intermediate

D. Diffusion of reactants towards catalyst surface

Answer: D

Solution:

The **correct answer is:**

✅ **D. Diffusion of reactants towards catalyst surface**

Explanation:
In **heterogeneous catalysis** , the mechanism occurs in a definite sequence:

1. **Diffusion of reactants towards the catalyst surface** ⟵ *first step*
2. Adsorption of reactant molecules on the catalyst surface
3. Chemical reaction on the catalyst surface forming intermediates
4. Desorption of products from the catalyst surface
5. Diffusion of products away from the surface

Since reactant molecules must first **reach the catalyst surface** , diffusion is the initial step.

Therefore, the correct answer is **Diffusion of reactants towards catalyst surface** .

Question56

Which of the following statements is true for adsorption?

MHT CET 2021 23rd September Evening Shift

Options:

A. It is accompanied by evolution of heat.

B. It is a bulk phenomenon.

C. It is independent of surface area.

D. It is independent of temperature.

Answer: A

Solution:

The correct statement for adsorption is:

Option A: It is accompanied by evolution of heat.

Explanation:

Adsorption is the process in which molecules from a substance (such as a gas, liquid, or dissolved solid) adhere to a surface. It is a surface phenomenon rather than a bulk phenomenon, while absorption is a bulk phenomenon. The process of adsorption is generally exothermic, meaning it releases heat. This happens because attractive forces between the adsorbate (the substance being adsorbed) and the surface atoms of the adsorbent (the material on which adsorption occurs) result in the release of energy. Let's break down the other options to explain why they are incorrect:

Option B: It is a bulk phenomenon.

This statement is incorrect because adsorption is specifically a surface phenomenon, not a bulk phenomenon. In contrast, absorption involves the entire volume of the material.

Option C: It is independent of surface area.

This statement is incorrect because adsorption is highly dependent on surface area. The greater the surface area of the adsorbent, the more adsorption sites are available, and hence, more molecules can be adsorbed.

Option D: It is independent of temperature.

This statement is incorrect because adsorption is generally influenced by temperature. While adsorption is typically an exothermic process (releases heat), increasing the temperature often decreases the extent of adsorption because higher temperatures provide energy to the adsorbed molecules, making them more likely to desorb. However, in specific cases like chemisorption (chemical adsorption), the effect of temperature can be more complex.

Thus, the true statement is that adsorption is accompanied by the evolution of heat, making Option A the correct answer.

Question57

What is the value of intercept on y-axis when $\log \frac{x}{m}$ is plotted against $\log P$ in Freundlich isotherm?

MHT CET 2021 23th September Morning Shift

Options:

A. $\frac{1}{n}$

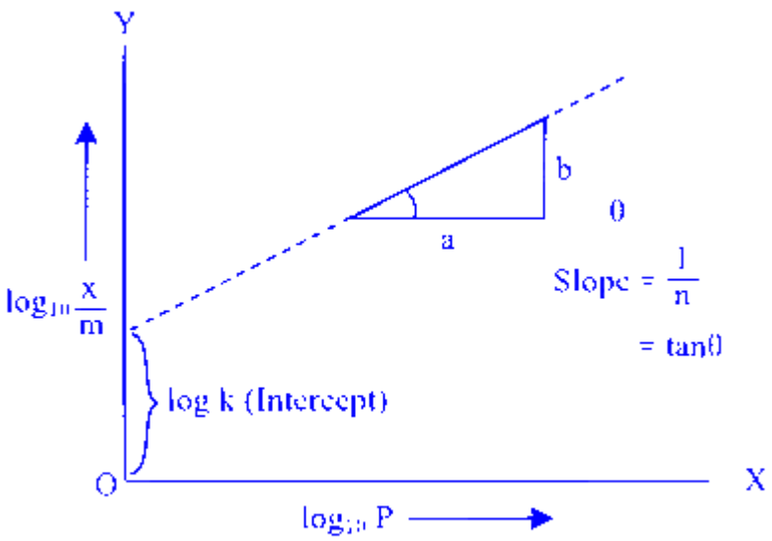
B. $\log k$

C. n

D. k

Answer: B

Solution:



Variation of $\log_{10} x/m$ with $\log_{10} P$ according to Freundlich equation

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Question58

Identify the correct decreasing order of precipitation power of flocculating ion added, from following.

MHT CET 2021 22th September Evening Shift

Options:

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

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

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

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

Answer: C

Solution:

The correct order for the precipitation power of flocculating ions is based on the Hardy-Schulze law, which states that the greater the valence of the counter-ions (flocculating ions) added to a colloidal solution, the greater their power to cause precipitation or flocculation of the colloidal particles. This rule essentially means that ions with a higher charge will more effectively neutralize the charge on colloidal particles, leading to their aggregation and eventual precipitation out of the solution.

Given this principle, the correct order for the precipitation power of the ions listed would be based on their charges:

- Al^{3+} (aluminum ion with a +3 charge)
- Ba^{2+} (barium ion with a +2 charge)
- Na^{+} (sodium ion with a +1 charge)

Hence, ions with higher charges have a stronger effect in precipitating colloidal particles from solution. In this context, aluminium ions (Al^{3+}) with a +3 charge are the most powerful, followed by barium ions (Ba^{2+}) with a +2 charge, and then sodium ions (Na^{+}) with a +1 charge.

Therefore, the correct answer is:

Option C: $Al^{3+} > Ba^{2+} > Na^{+}$

Question59

Which among the following is true for chemisorption?

MHT CET 2021 22th September Morning Shift

Options:

A. Heat of adsorption is in the range of 20-40 kJ mol^{-1}.

B. It is multimolecular layered.

C. van der Waals forces are involved.

D. It is favoured at high temperature up to certain limit.

Answer: D

Solution:

The correct answer is **Option D**. Here's why:

Chemisorption is a type of adsorption where a chemical bond forms between the adsorbate (the substance being adsorbed) and the adsorbent (the surface onto which it's adsorbed). This bonding involves the sharing or transfer of electrons, making it a much stronger interaction than physical adsorption (physisorption).

Let's break down why the other options are incorrect:

Option A: Heat of adsorption is in the range of 20-40 kJ mol^{-1}.

This is characteristic of **physisorption**, not chemisorption. Chemisorption involves much stronger bonds, resulting in a significantly higher heat of adsorption (typically in the range of 80-240 kJ mol^{-1}).

Option B: It is multimolecular layered.

This describes **physisorption**, where multiple layers of adsorbate molecules can form on the surface. Chemisorption is typically a **monolayer** process, meaning only one layer of adsorbate molecules forms due to the strong chemical bonding.

Option C: van der Waals forces are involved.

van der Waals forces are the primary forces responsible for **physisorption**. Chemisorption involves **covalent or ionic bonds**, which are much stronger than van der Waals forces.

Option D: It is favored at high temperature up to certain limit.

This is true for chemisorption. While chemisorption is an **activated process** (requiring energy to overcome an activation barrier), it becomes more favorable at higher temperatures. However, there is a limit to this, as extremely high temperatures can lead to the desorption of the adsorbate due to the breaking of the chemical bonds.

In summary, chemisorption is characterized by strong chemical bonds, high heat of adsorption, monolayer formation, and a preference for higher temperatures (up to a certain limit).

Question60

Which among the following is NOT an example of one-dimensional nanostructure?

MHT CET 2021 21th September Evening Shift

Options:

A. Nano shells

B. Nanowires

C. Nanotubes

D. Fibres

Answer: A

Solution:

The **correct answer is:**

A. Nano shells

Explanation:

- **One-dimensional (1D) nanostructures** have two dimensions in the nanoscale and one extended dimension.
    - Examples: **nanowires, nanotubes, fibres**
- **Nano shells** are typically **zero-dimensional (0D)** or **quasi-spherical nanostructures** , not 1D.

Therefore:
Nano shells are **NOT** one-dimensional nanostructures.

Question61

Which among the following gases is adsorbed to greater extent at similar conditions of temperature and pressure if the adsorbent remains same?

MHT CET 2021 21th September Evening Shift

Options:

A. N_2

B. Cl_2

C. H_2

D. O_2

Answer: B

Solution:

Cl_2 is easily liquefiable gas a compared to N_2, O_2 and H_2. Hence, it adsorbed to greater extent at similar conditions of temperature and pressure if the adsorbent remains same.

Question62

Which of following statements is correct for physisorption?

MHT CET 2021 21th September Morning Shift

Options:

A. It involves formation of covalent or ionic bonds.

B. It is favoured at high temperature.

C. It is reversible.

D. It is very specific.

Answer: C

Solution:

Physisorption is reversible. Option A, B and D are characteristics of chemisorption.

Question63

Identify negatively charged sol from following.

MHT CET 2021 20th September Evening Shift

Options:

A. sol of clay

B. $Fe_2O_3 \cdot xH_2O$

C. TiO_2 sol

D. Haemoglobin

Answer: A

Solution:

The **correct answer is:**

✅ **A. Sol of clay**

Explanation:

- **Negatively charged sols** are those in which colloidal particles carry a **negative charge** .
- **Clay sol** is a classic example of a **negatively charged colloid** , due to adsorption of OH^- ions on the particle surface.

Question64

Which among the following is a multi-molecular colloid?

MHT CET 2021 20th September Morning Shift

Options:

A. Nylon

B. Gold sol

C. Cellulose

D. Soap

Answer: B

Solution:

Multimolecular colloid – Gold sol

Macromolecular colloid – Nylon, Cellulose

Associated colloid – Soap.

Question65

Which of the following is multimolecular colloid?

MHT CET 2020 16th October Evening Shift

Options:

A. Aqueous solution of protein

B. Solution of rubber in organic solvent

C. Silver solution

D. Aqueous polyvinyl alcohol

Answer: C

Solution:

Silver solution is an example of multimolecular colloid. In this type of colloid a large number of atoms or small molecules (having diameters of less than 1 nm) of a substance combine together in a dispersion medium to form aggregates having size in the colloidal range.
