



ARIHANTAM ACADEMY

Faith Strength Education

CLASS 12 CHEMISTRY — BIHAR BOARD (BSEB)

SURFACE CHEMISTRY — DPP 25 TO 29

Student Workbook + Teacher Answer Key

Arihantam Academy • Faith Strength Education

Bihar Board Class 12 Chemistry: board-oriented daily practice for Surface Chemistry.

Coverage: DPP 25 adsorption; DPP 26 catalysis; DPP 27 colloid classification/preparation; DPP 28 colloid properties; DPP 29 full chapter test.



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CLASS 12 CHEMISTRY — BIHAR BOARD (BSEB)

DAILY PRACTICE PROBLEM — DPP 25

Surface Chemistry | Adsorption, physisorption and chemisorption

Student Name: _____	Roll No.: _____
DPP No.: 25 Chapter: Surface Chemistry	Date: _____
Topic: Adsorption, physisorption and chemisorption	Score: ____ / 30

Instructions: Answer all objective questions. Attempt any 3 short-answer questions and any 1 long-answer question.

Section A — Objective Questions (15 × 1 = 15)

- Accumulation of a substance on surface is called:
(A) absorption (B) adsorption (C) occlusion (D) coagulation
- Substance adsorbed on surface is:
(A) adsorbent (B) adsorbate (C) catalyst (D) dispersed phase
- Substance providing surface is:
(A) adsorbate (B) adsorbent (C) coagulant (D) electrolyte
- Physisorption involves:
(A) chemical bond (B) van der Waals force (C) ionic bond only (D) covalent bond
- Chemisorption is generally:
(A) non-specific (B) specific (C) reversible always (D) multilayer always
- Physisorption is generally:
(A) irreversible (B) reversible (C) requires high activation energy (D) monolayer only
- Physisorption has enthalpy approximately:
(A) 20–40 kJ mol⁻¹ (B) 200–400 kJ mol⁻¹ (C) zero (D) 1000 kJ mol⁻¹
- Chemisorption usually forms:
(A) multilayer (B) monolayer (C) no layer (D) infinite layers
- Adsorption generally increases with:
(A) increase in temperature always (B) increase in surface area (C) decrease in pressure always (D) increase in particle size
- At constant temperature, gas adsorption increases with:
(A) decrease in pressure (B) increase in pressure (C) no pressure effect (D) only colour change
- Freundlich equation is:
(A) $x/m = kP^{1/n}$ (B) $PV = nRT$ (C) $k = Ae^{(-E_a/RT)}$ (D) $\pi = CRT$
- At high pressure, Freundlich adsorption tends to:
(A) become independent of pressure (B) increase infinitely (C) become zero (D) reverse
- Physical adsorption is favoured by:
(A) high temperature (B) low temperature (C) high activation energy (D) strong chemical bond
- Activated charcoal is used because it has:
(A) low surface area (B) large surface area (C) no pores (D) high density only
- Adsorption is generally:
(A) endothermic (B) exothermic (C) always zero enthalpy (D) nuclear

Section B — Short Answer (Attempt any 3) (3 × 2 = 6)

- Define adsorption, adsorbent and adsorbate.
- Differentiate absorption and adsorption.
- Give four differences between physisorption and chemisorption.
- State Freundlich adsorption isotherm.
- Why does adsorption decrease with rise in temperature?

Section C — Long Answer (Attempt any 1) (1 × 5 = 5)

- Explain Freundlich adsorption isotherm and its limitations.
- Compare physisorption and chemisorption in detail.

Teacher record: MCQ ____/15 | Short ____/6 | Long ____/5 | Presentation/Homework ____/4 | **Total** ____/30



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CLASS 12 CHEMISTRY — BIHAR BOARD (BSEB)

TEACHER ANSWER KEY — DPP 25

Surface Chemistry | Adsorption, physisorption and chemisorption

MCQ answers: 1-B, 2-B, 3-B, 4-B, 5-B, 6-B, 7-A, 8-B, 9-B, 10-B, 11-A, 12-A, 13-B, 14-B, 15-B

Short-answer marking points

16. Adsorption is accumulation at surface; adsorbent provides surface; adsorbate is the substance accumulated.

17. Absorption is uniform throughout bulk; adsorption is surface phenomenon.

18. Physisorption: weak van der Waals, low ΔH , non-specific, reversible, multilayer. Chemisorption: chemical bond, high ΔH , specific, usually irreversible, monolayer.

19. $x/m = kP^{(1/n)}$, where x is mass adsorbed, m adsorbent mass.

20. Adsorption is exothermic; higher temperature favours desorption.

Long-answer marking points

21. At constant T , $x/m = kP^{(1/n)}$; $\log(x/m) = \log k + (1/n)\log P$. It is valid over limited pressure range; fails at very high pressure.

22. Compare forces, enthalpy, specificity, reversibility, layers, temperature/pressure effects and activation energy.

Remedial rule: Score below 15/26: revise definitions and diagrams, rewrite errors and take a 10-MCQ re-test in the next class.



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CLASS 12 CHEMISTRY — BIHAR BOARD (BSEB)

DAILY PRACTICE PROBLEM — DPP 26

Surface Chemistry | Catalysis, enzyme catalysis and shape-selective catalysis

Student Name: _____	Roll No.: _____
DPP No.: 26 Chapter: Surface Chemistry	Date: _____
Topic: Catalysis, enzyme catalysis and shape-selective catalysis	Score: ____ / 30

Instructions: Answer all objective questions. Attempt any 3 short-answer questions and any 1 long-answer question.

Section A — Objective Questions (15 × 1 = 15)

- A catalyst changes:
(A) equilibrium constant (B) rate of reaction (C) enthalpy of reaction (D) Gibbs energy only
- A catalyst works by:
(A) increasing activation energy (B) lowering activation energy (C) increasing equilibrium constant (D) being consumed completely
- Homogeneous catalyst is in:
(A) same phase as reactants (B) different phase only (C) solid phase only (D) gas phase only
- Heterogeneous catalyst is in:
(A) same phase (B) different phase (C) liquid phase only (D) solution only
- Enzymes are:
(A) inorganic catalysts (B) biocatalysts (C) poisons (D) adsorbates
- Enzyme catalysis is highly:
(A) non-specific (B) specific (C) irreversible only (D) slow always
- Promoter is substance that:
(A) decreases catalyst activity (B) enhances catalyst activity (C) is always poison (D) stops reaction
- Catalyst poison:
(A) increases activity (B) reduces activity (C) does not affect catalyst (D) changes products only
- Shape-selective catalysis depends on:
(A) colour of catalyst (B) pore size and shape (C) only temperature (D) pressure only
- Zeolites are used as:
(A) homogeneous catalysts (B) shape-selective catalysts (C) electrolytes (D) emulsifiers
- Finely divided Ni catalyses:
(A) hydrogenation (B) photosynthesis (C) neutralisation only (D) polymerisation only
- Contact process uses catalyst:
(A) Fe (B) V₂O₅ (C) Pt only (D) Ni
- Haber process uses catalyst:
(A) Ni (B) Fe (C) V₂O₅ (D) Cu
- Enzyme active site binds:
(A) any molecule randomly (B) specific substrate (C) only solvent (D) only product
- Catalyst changes rate of:
(A) forward only (B) reverse only (C) both forward and reverse (D) neither

Section B — Short Answer (Attempt any 3) (3 × 2 = 6)

- What is catalysis?
- Differentiate homogeneous and heterogeneous catalysis.
- What are promoters and catalyst poisons?
- Why are enzymes highly specific?
- What is shape-selective catalysis?

Section C — Long Answer (Attempt any 1) (1 × 5 = 5)

- Explain mechanism of heterogeneous catalysis using adsorption theory.
- Describe enzyme catalysis and factors affecting enzyme activity.

Teacher record: MCQ ____/15 | Short ____/6 | Long ____/5 | Presentation/Homework ____/4 | Total ____/30



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TEACHER ANSWER KEY — DPP 26

Surface Chemistry | Catalysis, enzyme catalysis and shape-selective catalysis

MCQ answers: 1-B, 2-B, 3-A, 4-B, 5-B, 6-B, 7-B, 8-B, 9-B, 10-B, 11-A, 12-B, 13-B, 14-B, 15-C

Short-answer marking points

- 16. A catalyst alters rate without permanent chemical change.
- 17. Homogeneous: same phase; heterogeneous: different phases.
- 18. Promoters enhance activity; poisons decrease activity by blocking active sites.
- 19. Active site has complementary shape/chemical environment for a particular substrate.
- 20. Catalysis controlled by molecular size/shape relative to catalyst pores, e.g. zeolites.

Long-answer marking points

- 21. Reactant diffusion to surface, adsorption, activated complex formation/reaction, desorption and product diffusion; catalyst lowers activation energy.
- 22. Enzymes form enzyme-substrate complex; activity depends on temperature, pH, substrate concentration and inhibitors.

Remedial rule: Score below 15/26: revise definitions and diagrams, rewrite errors and take a 10-MCQ re-test in the next class.



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CLASS 12 CHEMISTRY — BIHAR BOARD (BSEB)

DAILY PRACTICE PROBLEM — DPP 27

Surface Chemistry | Colloids: classification and preparation

Student Name: _____	Roll No.: _____
DPP No.: 27 Chapter: Surface Chemistry	Date: _____
Topic: Colloids: classification and preparation	Score: ____ / 30

Instructions: Answer all objective questions. Attempt any 3 short-answer questions and any 1 long-answer question.

Section A — Objective Questions (15 × 1 = 15)

- A colloidal system has particle size approximately:
(A) less than 1 nm (B) 1–1000 nm (C) more than 1 mm (D) exactly 1 cm
- Medium in which particles are dispersed is:
(A) dispersed phase (B) dispersion medium (C) coagulant (D) adsorbate
- Milk is an example of:
(A) sol (B) gel (C) emulsion (D) aerosol
- Fog is example of:
(A) solid in gas (B) liquid in gas (C) gas in liquid (D) solid in liquid
- Smoke is example of:
(A) liquid in gas (B) solid in gas (C) gas in liquid (D) solid in liquid
- Butter is example of:
(A) water in oil emulsion (B) oil in water emulsion (C) sol (D) aerosol
- Milk is generally:
(A) water in oil (B) oil in water (C) solid sol (D) foam
- Lyophilic colloids are:
(A) solvent loving (B) solvent hating (C) always charged zero (D) only metallic
- Lyophobic sols are generally:
(A) easily reversible (B) irreversible (C) always stable without charge (D) solutions
- Gold sol is generally:
(A) lyophilic (B) lyophobic (C) true solution (D) gel
- Peptisation converts:
(A) sol to precipitate (B) precipitate to colloidal sol (C) gel to gas (D) gas to liquid
- Bredig's arc method prepares:
(A) metal sols (B) emulsions only (C) true solutions (D) foam only
- Condensation method forms colloids by:
(A) breaking large particles (B) joining small particles (C) filtration only (D) centrifugation only
- Dispersion method forms colloids by:
(A) joining small molecules (B) breaking larger particles (C) evaporation only (D) distillation
- Purification of sol by semipermeable membrane is:
(A) dialysis (B) peptisation (C) coagulation (D) electrophoresis

Section B — Short Answer (Attempt any 3) (3 × 2 = 6)

- Define colloid, dispersed phase and dispersion medium.
- Classify colloids based on physical states with examples.
- Differentiate lyophilic and lyophobic sols.
- What is peptisation? Give an example.
- Name methods of preparation of colloids.

Section C — Long Answer (Attempt any 1) (1 × 5 = 5)

- Explain preparation and purification of colloidal solutions.
- Describe classification of colloids with suitable examples.

Teacher record: MCQ ____/15 | Short ____/6 | Long ____/5 | Presentation/Homework ____/4 | **Total** ____/30



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TEACHER ANSWER KEY — DPP 27

Surface Chemistry | Colloids: classification and preparation

MCQ answers: 1-B, 2-B, 3-C, 4-B, 5-B, 6-A, 7-B, 8-A, 9-B, 10-B, 11-B, 12-A, 13-B, 14-B, 15-A

Short-answer marking points

- 16.** Colloid has particles about 1–1000 nm; dispersed phase is distributed substance, medium is continuous phase.
- 17.** Examples: sol—paint (solid/liquid); gel—jelly (liquid/solid); emulsion—milk (liquid/liquid); aerosol—fog/smoke (liquid or solid/gas); foam—soap lather (gas/liquid).
- 18.** Lyophilic: solvent-loving, stable, reversible, easy preparation; lyophobic: solvent-hating, less stable, irreversible, need stabilisation.
- 19.** Conversion of precipitate into colloidal sol using small amount of electrolyte, e.g. $\text{Fe}(\text{OH})_3$ precipitate with FeCl_3 .
- 20.** Dispersion methods, condensation methods, peptisation.

Long-answer marking points

- 21.** Discuss dispersion (mechanical, electrical/Bredig arc, peptisation) and condensation (oxidation, reduction, hydrolysis, double decomposition); purification by dialysis/electrodialysis/ultrafiltration.
- 22.** Classify by dispersed phase and medium; list sol, gel, emulsion, aerosol, foam and examples.

Remedial rule: Score below 15/26: revise definitions and diagrams, rewrite errors and take a 10-MCQ re-test in the next class.



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CLASS 12 CHEMISTRY — BIHAR BOARD (BSEB)

DAILY PRACTICE PROBLEM — DPP 28

Surface Chemistry | Properties of colloids: Tyndall effect, charge, coagulation and emulsions

Student Name: _____	Roll No.: _____
DPP No.: 28 Chapter: Surface Chemistry	Date: _____
Topic: Properties of colloids: Tyndall effect, charge, coagulation and emulsions	Score: ____ / 30

Instructions: Answer all objective questions. Attempt any 3 short-answer questions and any 1 long-answer question.

Section A — Objective Questions (15 × 1 = 15)

- Scattering of light by colloidal particles is:
(A) Brownian movement (B) Tyndall effect (C) electrophoresis (D) dialysis
- Random zig-zag movement of colloidal particles is:
(A) Tyndall effect (B) Brownian movement (C) coagulation (D) peptisation
- Movement of colloidal particles in electric field is:
(A) dialysis (B) electrophoresis (C) adsorption (D) diffusion
- Charge on colloidal particles helps in:
(A) coagulation (B) stability (C) sedimentation (D) crystallisation
- Coagulation means:
(A) formation of sol (B) precipitation of colloidal particles (C) purification through membrane (D) scattering of light
- Hardy-Schulze rule states coagulating power depends on:
(A) mass of ion (B) charge of oppositely charged ion (C) colour of ion (D) size of beaker
- For negative sol, most effective coagulant is:
(A) Na⁺ (B) Ba²⁺ (C) Al³⁺ (D) Cl⁻
- Gold number measures:
(A) mass of gold (B) protective power of lyophilic colloid (C) particle size (D) charge only
- Smaller gold number means:
(A) lower protective power (B) higher protective power (C) no protection (D) higher density
- Emulsifying agent stabilises:
(A) true solution (B) emulsion (C) crystal lattice (D) gas only
- Soap stabilises:
(A) solids only (B) emulsions (C) metals (D) ionic crystals
- Removal of ions from sol using membrane is:
(A) dialysis (B) electrophoresis (C) coagulation (D) adsorption
- Coagulation by mixing oppositely charged sols is:
(A) mutual coagulation (B) peptisation (C) condensation (D) dispersion
- Cottrell precipitator works on:
(A) Tyndall effect (B) electrophoresis (C) Brownian movement (D) dialysis
- Protective colloid is usually:
(A) lyophobic (B) lyophilic (C) gas (D) metal only

Section B — Short Answer (Attempt any 3) (3 × 2 = 6)

- Define Tyndall effect and Brownian movement.
- What is electrophoresis?
- State Hardy-Schulze rule.
- Why are colloidal sols stable?
- What is gold number?

Section C — Long Answer (Attempt any 1) (1 × 5 = 5)

- Explain coagulation of colloids and methods to cause coagulation.
- Describe emulsions, emulsifying agents and applications.

Teacher record: MCQ ____/15 | Short ____/6 | Long ____/5 | Presentation/Homework ____/4 | Total ____/30



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Surface Chemistry | Properties of colloids: Tyndall effect, charge, coagulation and emulsions

MCQ answers: 1-B, 2-B, 3-B, 4-B, 5-B, 6-B, 7-C, 8-B, 9-B, 10-B, 11-B, 12-A, 13-A, 14-B, 15-B

Short-answer marking points

- 16. Tyndall effect is scattering of light; Brownian movement is continuous random motion due to unequal solvent collisions.
- 17. Migration of charged colloidal particles towards oppositely charged electrode under electric field.
- 18. Greater the charge on oppositely charged ion, greater is its coagulating power.
- 19. Like charge repels particles and prevents aggregation.
- 20. Minimum mass in mg of protective colloid preventing coagulation of 10 mL standard gold sol by 1 mL 10% NaCl.

Long-answer marking points

- 21. Coagulation occurs by addition of electrolyte, mixing oppositely charged sols, electrophoresis, or prolonged dialysis. Apply Hardy-Schulze rule.
- 22. Emulsions are liquid-liquid colloids; oil-in-water and water-in-oil types; soaps/detergents as emulsifiers; uses in medicines, foods, cosmetics.

Remedial rule: Score below 15/26: revise definitions and diagrams, rewrite errors and take a 10-MCQ re-test in the next class.



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CLASS 12 CHEMISTRY — BIHAR BOARD (BSEB)

DAILY PRACTICE PROBLEM — DPP 29

Surface Chemistry | Surface Chemistry: full chapter important-question test

Student Name: _____	Roll No.: _____
DPP No.: 29 Chapter: Surface Chemistry	Date: _____
Topic: Surface Chemistry: full chapter important-question test	Score: ____ / 30

Instructions: Answer all objective questions. Attempt any 3 short-answer questions and any 1 long-answer question.

Section A — Objective Questions (15 × 1 = 15)

- Surface accumulation is:
(A) absorption (B) adsorption (C) coagulation (D) dialysis
- Adsorbate is:
(A) surface provider (B) substance adsorbed (C) catalyst (D) solvent
- Chemisorption is:
(A) non-specific (B) specific (C) multilayer always (D) weak van der Waals
- Freundlich equation is:
(A) $x/m = kP^{1/n}$ (B) $PV = nRT$ (C) $\pi = CRT$ (D) $k = Ae^{(-E_a/RT)}$
- Catalyst lowers:
(A) activation energy (B) equilibrium constant (C) enthalpy only (D) molar mass
- Enzymes are:
(A) biocatalysts (B) poisons (C) adsorbates (D) coagulants
- Milk is:
(A) sol (B) emulsion (C) aerosol (D) foam
- Fog is:
(A) solid in gas (B) liquid in gas (C) gas in liquid (D) liquid in solid
- Gold sol is:
(A) lyophilic (B) lyophobic (C) true solution (D) emulsion
- Tyndall effect is due to:
(A) scattering of light (B) random movement (C) electrical migration (D) osmosis
- Movement in electric field is:
(A) dialysis (B) electrophoresis (C) coagulation (D) peptisation
- Coagulation means:
(A) stabilisation (B) precipitation of sol (C) purification (D) adsorption
- For negative sol, strongest coagulant is:
(A) Na^+ (B) Ba^{2+} (C) Al^{3+} (D) Cl^-
- Small gold number indicates:
(A) weak protection (B) strong protection (C) no charge (D) large particles
- Zeolites are:
(A) shape-selective catalysts (B) emulsifiers (C) coagulants (D) adsorbates

Section B — Short Answer (Attempt any 3) (3 × 2 = 6)

- Differentiate adsorption and absorption.
- Give four differences between physisorption and chemisorption.
- State Freundlich isotherm.
- What is Tyndall effect?
- State Hardy-Schulze rule.

Section C — Long Answer (Attempt any 1) (1 × 5 = 5)

- Explain heterogeneous catalysis by adsorption theory.
- Classify colloids with examples and discuss any three properties of colloids.

Teacher record: MCQ ____/15 | Short ____/6 | Long ____/5 | Presentation/Homework ____/4 | **Total** ____/30



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TEACHER ANSWER KEY — DPP 29

Surface Chemistry | Surface Chemistry: full chapter important-question test

MCQ answers: 1-B, 2-B, 3-B, 4-A, 5-A, 6-A, 7-B, 8-B, 9-B, 10-A, 11-B, 12-B, 13-C, 14-B, 15-A

Short-answer marking points

16. Absorption is bulk phenomenon; adsorption is surface phenomenon.

17. Physisorption: van der Waals, low heat, non-specific, reversible/multilayer; chemisorption: chemical bond, high heat, specific, irreversible/monolayer.

18. $x/m = kP^{1/n}$; $\log(x/m) = \log k + (1/n)\log P$.

19. Scattering of light by colloidal particles.

20. Coagulating power increases with charge/valency of oppositely charged ion.

Long-answer marking points

21. Cover diffusion, adsorption, reaction/activated complex, desorption, and lower activation energy.

22. Classify sols, gels, emulsions, aerosols, foams; explain Tyndall effect, Brownian movement, electrophoresis, charge/stability and coagulation.

Remedial rule: Score below 15/26: revise definitions and diagrams, rewrite errors and take a 10-MCQ re-test in the next class.