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CHAPTER NOTES

Chemistry in Everyday Life Class 12 Notes — CBSE Chemistry Chapter 16

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Chemistry in Everyday Life Class 12 Notes — CBSE

Chemistry Chapter 16

Chapter 16 — **Chemistry in Everyday Life** — is the easiest and most relatable chapter! It covers how chemistry impacts our daily lives through drugs, soaps, detergents, and food additives. This chapter carries **3-4 marks** in Board exams and is purely factual. Just memorise the classifications, examples, and mechanisms — no numericals!

Key Concepts

Drugs and Their Classification

Classification Based on Pharmacological Effect

Category	Function	Examples
Analgesics	Relieve pain	Aspirin, Paracetamol, Morphine
Antipyretics	Reduce fever	Aspirin, Paracetamol
Antiseptics	Kill/prevent growth of microorganisms (on living tissue)	Dettol, Bithionol, Iodine tincture
Disinfectants	Kill microorganisms (on non-living surfaces)	Chlorine, SO ₂ , phenol (1% solution)
Antibiotics	Kill or inhibit bacteria	Penicillin, Amoxicillin, Tetracycline
Antacids	Neutralise excess stomach acid	Ranitidine, Omeprazole, Eno (NaHCO ₃)
Antihistamines	Block histamine action (allergies)	Brompheniramine, Terfenadine
Tranquilizers	Reduce anxiety/tension	Valium, Chlordiazepoxide
Antimicrobials	Kill/inhibit microorganisms	Antibiotics, antiseptics, disinfectants

Drug-Target Interaction

Drugs work by interacting with biomolecular targets:

1. Enzymes as drug targets:

- Competitive inhibitor: drug competes with substrate for active site
- Non-competitive inhibitor: drug binds at different site, changes enzyme shape

2. Receptors as drug targets:

- Agonist: mimics natural messenger, activates receptor (e.g., morphine)
- Antagonist: blocks receptor, prevents natural messenger from binding (e.g., antihistamines)

Important Drug Categories — Details

Analgesics:

Type	Mechanism	Examples
Non-narcotic (Non-addictive)	Inhibit prostaglandin synthesis	Aspirin, Ibuprofen, Paracetamol
Narcotic (Opioids)	Bind to opioid receptors in brain	Morphine, Codeine, Heroin

Aspirin: Acetylsalicylic acid — analgesic + antipyretic + anti-inflammatory + blood thinner (prevents heart attacks in low doses). One of the most versatile drugs ever!

Antibiotics:

- **Bactericidal:** Kill bacteria (e.g., Penicillin, Ofloxacin, Aminoglycosides)
- **Bacteriostatic:** Inhibit growth (e.g., Erythromycin, Tetracycline, Chloramphenicol)
- **Broad spectrum:** Effective against many types (Tetracycline, Chloramphenicol)
- **Narrow spectrum:** Effective against specific types (Penicillin G)

Antacids:

- **H₂ receptor blockers:** Block histamine from stimulating acid secretion (Ranitidine, Cimetidine)
- **Proton pump inhibitors:** Block H⁺/K⁺ ATPase (Omeprazole — “Losec”)
- **Simple antacids:** Neutralise acid directly (NaHCO₃, Mg(OH)₂, Al(OH)₃)

Antiseptics vs Disinfectants

Property	Antiseptic	Disinfectant
Applied on	Living tissue (wounds, skin)	Non-living surfaces (floor, instruments)
Concentration	Dilute/mild	Concentrated/strong
Examples	Dettol, Savlon, Tincture of iodine (2-3% I ₂ in alcohol), Bithionol (in soaps)	1% phenol, 0.2% chlorine in water, SO ₂ in low conc.

Note: Same chemical can be antiseptic or disinfectant depending on concentration. 0.2% phenol = antiseptic; 1% phenol = disinfectant.

Chemicals in Food

Food Additives

Type	Purpose	Examples
Artificial Sweeteners	Provide sweetness without calories	Saccharin (550× sweeter), Aspartame (100×), Sucralose (600×), Alitame (2000×)
Preservatives	Prevent spoilage by bacteria/fungi	Sodium benzoate (C ₆ H ₅ COONa), Sodium metabisulphite, Sorbic acid
Antioxidants	Prevent oxidative rancidity of fats	BHT (butylated hydroxytoluene), BHA, Sulphur dioxide

Aspartame: Used in cold foods/drinks only. Decomposes on heating. Not suitable for cooking. Restricted for people with phenylketonuria (PKU) as it contains phenylalanine.

Cleansing Agents

Soaps

Soap = Sodium/Potassium salt of long-chain fatty acid

Example: CH₃(CH₂)₁₆COONa (sodium stearate)

Saponification: Fat/Oil + NaOH → Soap + Glycerol



Soap Structure — Micelle Formation

Soap molecule has two parts:

- **Hydrophilic head:** $\text{-COO}^-\text{Na}^+$ (ionic, water-loving $\rightarrow$ dissolves in water)
- **Hydrophobic tail:** Long hydrocarbon chain (non-polar, water-hating $\rightarrow$ dissolves in grease)

When soap is added to dirty water, the hydrophobic tails embed in grease, while hydrophilic heads stay in water. This forms a **micelle** — a spherical cluster with grease trapped inside. The micelle is soluble in water $\rightarrow$ grease washes away!

Why soap fails in hard water: Hard water contains Ca^{2+} and Mg^{2+} ions. These react with soap to form insoluble **scum** (calcium/magnesium stearate) $\rightarrow$ soap is wasted, no lather.

Synthetic Detergents

Detergents work in hard water because their calcium/magnesium salts are soluble!

Types:

1. **Anionic:** $\text{-SO}_3^-\text{Na}^+$ or $\text{-OSO}_3^-\text{Na}^+$ (sodium lauryl sulphate — in shampoos)
2. **Cationic:** Quaternary ammonium salt (cetyl trimethyl ammonium bromide — in hair conditioner)
3. **Non-ionic:** No charge (polyethylene glycol stearate — in liquid dish soap)

Biodegradability

- **Biodegradable:** Linear hydrocarbon chain $\rightarrow$ easily broken by bacteria (e.g., linear alkylbenzene sulphonates)
- **Non-biodegradable:** Branched chain $\rightarrow$ resistant to bacterial action $\rightarrow$ pollutes water (e.g., branched alkylbenzene sulphonates — now banned in many places)

Important Definitions

Term	Definition
Drug	Chemical substance that modifies body function for therapeutic benefit
Antibiotic	Chemical substance produced by microorganisms that kills/inhibits other microorganisms
Analgesic	Drug that relieves pain without causing unconsciousness
Antiseptic	Chemical that kills/prevents growth of microorganisms on living tissue
Antioxidant	Substance that prevents oxidation of food (rancidity)
Micelle	Spherical cluster of soap molecules with grease trapped in hydrophobic core

Solved Examples — NCERT Based

Example 1: Drug Classification

Q: Classify the following drugs: (a) Ranitidine (b) Penicillin (c) Chloramphenicol (d) Aspirin

Solution:

- (a) Ranitidine — **Antacid** (H_2 receptor blocker)
- (b) Penicillin — **Antibiotic** (bactericidal, narrow spectrum)
- (c) Chloramphenicol — **Antibiotic** (bacteriostatic, broad spectrum)
- (d) Aspirin — **Analgesic + Antipyretic + Anti-inflammatory** (non-narcotic)

Example 2: Soap vs Detergent

Q: Why do detergents work in hard water but soaps don't?

Solution: Soaps are sodium salts of fatty acids. In hard water, Ca^{2+}/Mg^{2+} ions replace Na^+ to form **insoluble calcium/magnesium stearate (scum)** → no cleaning action.

Detergents are sodium salts of sulphonic acids or sulphates. Their $\text{Ca}^{2+}/\text{Mg}^{2+}$ salts are **soluble** → no scum → effective cleaning even in hard water.

Example 3: Antiseptic vs Disinfectant

Q: What is the difference between an antiseptic and a disinfectant? Can the same substance be both?

Solution: Antiseptics are applied on **living tissue** (wounds, skin). Disinfectants are used on **non-living surfaces** (floors, surgical instruments). Yes, the same substance can be both — at different concentrations. Example: **0.2% phenol** is an antiseptic; **1% phenol** is a disinfectant.

Example 4: Micelle Formation

Q: Explain how soap cleans dirty clothes.

Solution: Soap molecules have a **hydrophobic tail** (dissolves in grease) and a **hydrophilic head** (dissolves in water). When added to dirty water:

1. Hydrophobic tails penetrate into grease/oil on fabric
2. Hydrophilic heads remain in water
3. This forms **micelles** — spherical clusters with grease trapped in the centre
4. Micelles are soluble in water → grease is emulsified and washed away with rinsing

Important Questions for Board Exams

1 Mark Questions

1. What is the difference between antiseptic and disinfectant?
2. Name one broad-spectrum antibiotic.
3. What are antioxidants? Give one example.
4. Why does soap not work in hard water?

2 Mark Questions

1. What are analgesics? Distinguish between narcotic and non-narcotic analgesics.

2. Explain the cleansing action of soap (micelle formation).
3. What is the difference between bactericidal and bacteriostatic antibiotics?
4. Why is aspartame not used in cooking?

3 Mark Questions

1. What are drugs? How do they interact with enzyme targets? Explain competitive and non-competitive inhibition.
2. Describe the types of detergents: anionic, cationic, and non-ionic with examples.
3. What are food preservatives? Name three and explain their role.

5 Mark Questions

1. What are antibiotics? How are they classified? Discuss broad-spectrum vs narrow-spectrum and bactericidal vs bacteriostatic with examples.
2. Explain soaps and detergents. How do they differ? Describe the cleansing action of soap with a diagram of micelle. Why do detergents cause water pollution?

Quick Revision Points

- Analgesics: non-narcotic (aspirin, paracetamol) and narcotic (morphine)
- Antibiotics: bactericidal (kill) vs bacteriostatic (inhibit); broad vs narrow spectrum
- Antacids: simple (NaHCO_3), H_2 blockers (ranitidine), PPIs (omeprazole)
- Antiseptic: living tissue (dettol, iodine); Disinfectant: surfaces (1% phenol, Cl_2)
- Artificial sweeteners: saccharin (550 $\times$), aspartame (100 $\times$, no heat), alitame (2000 $\times$)
- Soap = RCOONa (fails in hard water $\rightarrow$ scum)
- Detergent = RSO_3Na (works in hard water $\rightarrow$ soluble Ca/Mg salts)
- Micelle: hydrophobic tail in grease + hydrophilic head in water $\rightarrow$ emulsification
- Biodegradable: linear chain; Non-biodegradable: branched chain
- Cationic detergents: germicidal $\rightarrow$ used in hair conditioners

← Previous: Polymers

Last Chapter — Well Done!



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