

Chemistry Basics

Elements · Acids · Bases · Salts

This study guide covers:

- Elements — classification, atomic structure, periodic table basics
- Acids — properties, types, everyday uses
- Bases — properties, types, the pH scale
- Salts — formation, types, key salts and their uses
- Exam-important points and quick-revision facts

Chapter 1 — Elements

1.1 What is an Element?

A pure substance made up of only one type of atom, which cannot be broken down into simpler substances by chemical means, is called an **element**. Every element has a unique atomic number.

Classification of Elements

Type	Properties	Examples
Metals	Conduct electricity and heat; shiny; malleable and ductile	Iron, Copper, Gold, Aluminium
Non-metals	Generally do not conduct electricity or heat; brittle	Oxygen, Nitrogen, Carbon, Sulphur
Metalloids	Show properties of both metals and non-metals	Silicon, Germanium, Boron

1.2 Basics of Atomic Structure

Particle	Charge	Location
Proton	Positive (+)	Inside the nucleus
Neutron	No charge	Inside the nucleus
Electron	Negative (-)	Orbits around the nucleus

- **Atomic Number (Z)** = number of protons in the nucleus
- **Mass Number (A)** = number of protons + number of neutrons

Exam Tip: "Atomic number = number of protons" is a frequently asked direct question. Electron discovered by — J.J. Thomson; Proton discovered by — Ernest Rutherford; Neutron discovered by — James Chadwick.

1.3 The Periodic Table

The table that arranges elements based on their atomic number is called the **Periodic Table**. It was introduced by **Dmitri Mendeleev** in 1869; the modern periodic table is arranged by atomic number (Moseley's Law).

- The periodic table has **7 Periods** and **18 Groups**.
- **118 elements** are known today (94 occur naturally, the rest are synthetically produced).

Elements Important in Everyday Life

Element	Symbol	Use
Oxygen	O	Respiration, combustion
Hydrogen	H	Fuel, ammonia production
Carbon	C	The fundamental element of living organisms
Iron	Fe	Construction, machinery
Copper	Cu	Electrical wiring
Sodium	Na	Salt formation, physiological function

Chapter 1 — Summary

- An element is a pure substance made of only one type of atom.
- Atomic number = number of protons; Mass number = protons + neutrons.
- Mendeleev introduced the periodic table; the modern table has 7 periods and 18 groups.

Chapter 2 — Acids

2.1 What is an Acid?

Substances that release hydrogen ions (H^+) when dissolved in water are called **acids**. They taste sour and turn blue litmus paper red.

General Properties of Acids

- Taste sour
- Turn blue litmus red
- React with metals to release hydrogen gas
- React with bases to form salt and water (neutralization reaction)
- Have a pH value less than 7

Types of Acids

Type	Description	Examples
Organic Acid	Obtained from living organisms/plants	Citric acid (lemon), Acetic acid (vinegar)
Mineral (Inorganic) Acid	Prepared from minerals	Sulphuric acid, Hydrochloric acid
Strong Acid	Ionizes completely in water	HCl, H_2SO_4 , HNO_3
Weak Acid	Ionizes only partially	Acetic acid, Citric acid

Acids in Everyday Life

Acid	Chemical Formula	Found In
Citric acid	$C_6H_8O_7$	Lemon, orange
Acetic acid	CH_3COOH	Vinegar
Lactic acid	$C_3H_6O_3$	Curd/yogurt
Tartaric acid	$C_4H_6O_6$	Grapes, tamarind
Hydrochloric acid	HCl	Gastric juice in the stomach
Ascorbic acid (Vitamin C)	$C_6H_8O_6$	Gooseberry (amla), citrus fruits

Exam Tip: "Acid in lemon — Citric acid", "Acid in vinegar — Acetic acid", "Acid in the stomach — Hydrochloric acid" are among the most frequently asked direct questions in TNPSC.

Chapter 3 — Bases

3.1 What is a Base?

Substances that release hydroxide ions (OH^-) when dissolved in water are called **bases**. Bases that dissolve in water are called **alkalis**.

General Properties of Bases

- Taste bitter and feel soapy/slippery
- Turn red litmus blue
- React with acids to form salt and water
- Have a pH value greater than 7

Important Bases and Their Uses

Base	Chemical Formula	Use
Sodium hydroxide (Caustic soda)	NaOH	Soap manufacturing
Potassium hydroxide (Caustic potash)	KOH	Liquid soap manufacturing
Calcium hydroxide (Lime water)	$\text{Ca}(\text{OH})_2$	Whitewashing walls, correcting soil acidity
Ammonium hydroxide	NH_4OH	Cleaning solutions
Magnesium hydroxide (Milk of magnesia)	$\text{Mg}(\text{OH})_2$	Antacid medicine

3.2 The pH Scale

The scale used to measure how acidic or basic a solution is, is called the **pH scale**. It ranges from 0 to 14.

pH < 7 → Acid | pH = 7 → Neutral | pH > 7 → Base

- Pure water has pH = 7 (neutral)
- The pH scale was devised by **Søren P. L. Sørensen**, in 1909

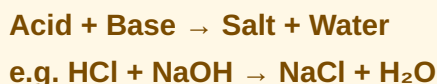
Everyday examples: Stomach acid pH $\approx$ 1.5–3.5; lemon juice pH $\approx$ 2; pure water pH = 7; soap solution pH $\approx$ 9–10; caustic soda pH $\approx$ 13–14.

Exam Tip: "The pH scale ranges from 0 to 14", "pH 7 indicates neutral water" — these are frequently asked questions.

Chapter 4 — Salts

4.1 What is a Salt?

The chemical compound formed when an acid reacts with a base, together with water, is called a **salt**. This reaction is called a **neutralization reaction**.



Types of Salts

Type	Description	Example
Normal Salt	Strong acid + strong base; $\text{pH} = 7$	NaCl (common salt)
Acidic Salt	Strong acid + weak base; $\text{pH} < 7$	Ammonium chloride (NH_4Cl)
Basic Salt	Weak acid + strong base; $\text{pH} > 7$	Sodium carbonate (Na_2CO_3)
Double Salt	Formed by combining two simple salts	Potassium aluminium sulphate (Alum)

Important Salts and Their Uses

Salt	Chemical Formula	Use
Sodium chloride (Common salt)	NaCl	Cooking, preservation
Sodium bicarbonate (Baking soda)	NaHCO_3	Cooking, antacid
Sodium carbonate (Washing soda)	Na_2CO_3	Washing clothes, glass manufacturing
Calcium sulphate (Plaster of Paris)	$\text{CaSO}_4 \cdot \frac{1}{2}\text{H}_2\text{O}$	Bone-fracture casts, sculptures
Potassium nitrate (Saltpetre)	KNO_3	Fertilizer, gunpowder production
Copper sulphate (Blue vitriol)	$\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$	Fungicide, electroplating

Exam Tip: "Chemical name of baking soda — Sodium bicarbonate (NaHCO_3)", "Chemical name of Plaster of Paris — Calcium sulphate hemihydrate" — common-name-to-chemical-name matching questions are very common in TNPSC.

Chapters 2–4 — Summary

- Acid → releases H^+ ; turns blue litmus red; $\text{pH} < 7$.
- Base → releases OH^- ; turns red litmus blue; $\text{pH} > 7$.

- Acid + Base → Salt + Water (neutralization reaction).
- pH scale: 0–14; pH 7 is neutral.

Quick Revision — Key Facts

Discovery / Person	Detail
Electron	J.J. Thomson (1897)
Proton	Ernest Rutherford (1919)
Neutron	James Chadwick (1932)
Periodic Table	Dmitri Mendeleev (1869)
pH Scale	Søren Sørensen (1909)

Everyday Item	Acid/Base
Lemon	Citric acid
Vinegar	Acetic acid
Curd	Lactic acid
Soap	Base (NaOH/KOH based)
Baking soda	Sodium bicarbonate (NaHCO_3)