

Alloys

These notes are your ultimate revision weapon to revise Alloys. We've distilled years of previous exam questions (PYQs) into one powerful, concise resource. Everything you need to know, nothing you don't.

- **PYQs, Decoded:** All key concepts from past exams, organized and simplified.
- **Revise in Record Time:** Short, precise, and designed for last-minute review.
- **Focus on What Matters:** Master high-probability topics and boost your confidence.

Alloys - Compositions and Uses

Iron-Based Alloys

Alloy	Composition	Uses
Steel	Primarily Iron (Fe) and Carbon (C), often with Manganese (Mn), Chromium (Cr), etc.	Construction, machinery, automotive industry, tools, infrastructure.
Stainless Steel	Iron (Fe), Chromium (Cr), Nickel (Ni), and Carbon (C).	Kitchen utensils, medical instruments, cutlery, construction.
Invar	Iron (Fe) and Nickel (Ni).	Precision instruments, clocks, scientific equipment (due to very low thermal expansion).

Copper-Based Alloys

Alloy	Composition	Uses
Brass	Copper (Cu) and Zinc (Zn).	Musical instruments, decorative items, plumbing, electrical fittings.
Bronze	Copper (Cu) and Tin (Sn).	Statues, medals, coins, marine applications (due to corrosion resistance).
Gunmetal	Copper (Cu), Tin (Sn), Zinc (Zn), and sometimes Lead (Pb).	Making guns, valves, bearings.
Phosphor Bronze	Copper (Cu), Tin (Sn), and Phosphorus (P).	Springs, bearings, electrical contacts.
Bell Metal (a type of Bronze)	Copper (Cu) and Tin (Sn).	Making bells and musical instruments.

Aluminum-Based Alloys

Alloy	Composition	Uses
Duralumin	Aluminum (Al), Copper (Cu), Magnesium (Mg), and Manganese (Mn).	Aircraft manufacturing, automotive parts, structural applications.
Magnalium	Aluminum (Al) and Magnesium (Mg).	Aircraft parts, lightweight instruments, balance beams.

Nickel-Based Alloys

Alloy	Composition	Uses
Nichrome	Nickel (Ni), Chromium (Cr), and Iron (Fe).	Heating elements in appliances (e.g., toasters, electric heaters).
Monel Metal	Nickel (Ni) and Copper (Cu), with small amounts of Iron (Fe) and Manganese (Mn).	Marine engineering, chemical industries, aerospace.
Constantan	Copper (Cu) and Nickel (Ni).	Thermocouples and electrical resistance wires.

Low-Melting-Point Alloys (Fusible Alloys)

Alloy	Composition	Uses
Solder	Traditionally Tin (Sn) and Lead (Pb).	Joining electrical components and plumbing.
Amalgam	Mercury (Hg) mixed with other metals like Silver (Ag), Tin (Sn), or Copper (Cu).	Dental fillings and mining.
Rose Metal	Bismuth (Bi), Lead (Pb), and Tin (Sn).	Fire sprinklers and fusible plugs.
Wood's Metal	Bismuth (Bi), Lead (Pb), Tin (Sn), and Cadmium (Cd).	Fire alarms and safety devices.

Other Specialized Alloys

Alloy	Composition	Uses
Pewter	Tin (Sn), Copper (Cu), Antimony (Sb), and sometimes Bismuth (Bi).	Decorative items, tableware, jewelry.
Alnico	Aluminum (Al), Nickel (Ni), Cobalt (Co), and Iron (Fe).	Permanent magnets in motors, sensors, speakers.
German Silver (Nickel Silver)	Copper (Cu), Zinc (Zn), and Nickel (Ni). (Contains 0% Silver).	Silverware, musical instruments, decorative items.

Properties and Behavior of Metals & Alloys

Corrosion



- **Iron Rusting:**
 - Essential requirements are **Oxygen** and **Moisture**.
 - During rusting, the **weight of iron increases** because iron combines with oxygen to form iron oxide (rust).
- **Galvanization:**
 - **Galvanized iron** (coated with Zinc) does not rust easily.
 - The reason is that **Zinc oxidizes first**, forming a protective layer that prevents the iron underneath from rusting.
- **Preventing Copper Contamination:**
 - Brass utensils are often **coated with Tin** to prevent copper contamination.

Surface Treatments

- **Anodizing:** A process for aluminum where a layer of **Aluminum Oxide** is deposited on the surface to improve corrosion resistance and durability.

Magnetic Properties

- The addition of **Nickel** to stainless steel can make it **non-magnetic**.

Key Facts and Distinctions

Pure Metals vs. Alloys

- **Copper** is a **pure metal**, not an alloy.
- **Steel, Brass, and Bronze** are **alloys**.

Amalgams

- An **amalgam** is a **mercury-metal mixture**.
- **Iron** is a metal that **does not form an amalgam** with mercury.

Hardness and Strength

- The **hardness of steel is increased** by increasing the quantity of **Carbon**.
- **Tungsten** is added to steel to produce alloys that can **resist high temperatures** and have high hardness and abrasion resistance.

Uses of By-products

- **Steel slag** can be used for:
 1. Construction of base roads.
 2. Production of cement.

Know More About Alloys:

- [Alloys – Old Year Questions](#)
- [Alloys One Liner Questions & Answers](#)