D.PHARM • FIRST YEAR

Pharmaceutical Chemistry

CHAPTER 3

Inorganic Pharmaceuticals



ENGLISH CHAPTER NOTES

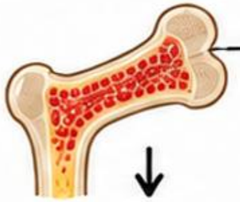
DIPLOMA IN PHARMACY

HAEMATINICS & TYPES OF ANAEMIA

DEFINITION

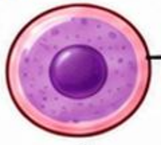
Haematinics are agents used to prevent or treat anaemia by supplying nutrients needed for red-blood-cell and haemoglobin formation. Haemoglobin carries oxygen; deficiency may cause fatigue, weakness, breathlessness and dizziness.

ERYTHROPOIESIS (IN BONE MARROW)



Haematopoietic stem cell (in bone marrow)

↓



Erythroid precursor (proerythroblast)

↓



Mature red blood cell (RBC)

ACTION

Nutrients supplied → proliferation and maturation of erythroid precursors in bone marrow → normal RBCs and haemoglobin. This process is erythropoiesis.

KEY HAEMATINICS

Iron

essential for haemoglobin synthesis; oral and parenteral preparations are available.

Fe^{2+}

Vitamin B_{12} (Cobalamin)

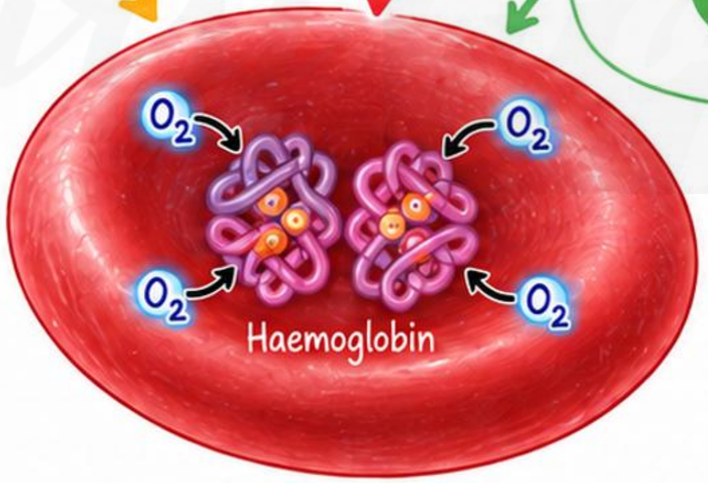
required for normal RBC formation and nervous-system function; deficiency may cause megaloblastic or pernicious anaemia.



Folic acid (Vitamin B_9)

required for DNA synthesis and RBC maturation; deficiency causes megaloblastic anaemia and adequate intake is important in pregnancy.





Red blood cell (RBC) carrying O_2

COMMON TYPES OF ANAEMIA

1. **Iron-deficiency**
   inadequate iron, poor absorption, blood loss or increased demand.
2. **Vitamin-deficiency**
   lack of vitamin B_{12} or folate; pernicious anaemia involves impaired B_{12} absorption due to intrinsic-factor deficiency.
3. **Haemolytic**
   RBC destruction is faster than production.
4. **Aplastic**
   bone marrow fails to produce enough blood cells.
5. **Anaemia of chronic disease**
   long-term inflammation, kidney disease or cancer impairs RBC production or survival.
6. **Haemorrhagic**
   acute or chronic blood loss depletes RBCs and iron.

INDICATIONS: iron deficiency, vitamin B_{12} deficiency and folate deficiency after identifying the cause.

FERROUS SULPHATE & FERROUS FUMARATE

FERROUS SULPHATE

- **Synonyms:** iron(II) sulphate, green vitriol, copperas.
- **Formula:** $FeSO_4 \cdot 7H_2O$ (heptahydrate).
- Pale-green, odourless crystals; soluble in water and insoluble in alcohol; metallic, astringent taste. It is hygroscopic and Fe^{2+} is readily oxidised by air to Fe^{3+}.
- **With alkali:**

$$FeSO_4 + 2NaOH \longrightarrow Fe(OH)_2\downarrow + Na_2SO_4$$

- **Forms:** tablets, capsules, syrups and drops.
- **Uses:** prevention and treatment of iron-deficiency anaemia, including increased need in pregnancy and chronic blood loss.
- **Storage:** tightly closed container; protect from air and moisture; cool, dry place.



Pale-green crystals



FERROUS FUMARATE

- **Synonym:** iron(II) fumarate.
- **Formula:** $C_4H_2FeO_4$.
- Reddish-orange, odourless powder; poorly soluble in water; more stable and generally less irritating than ferrous sulphate. It dissolves in gastric acid to provide Fe^{2+}.
- **Forms:** tablets, capsules, syrups and extended-release preparations.
- **Uses:** iron-deficiency anaemia and iron supplementation during pregnancy or lactation.
- **Storage:** well-closed container; protect from light and moisture.

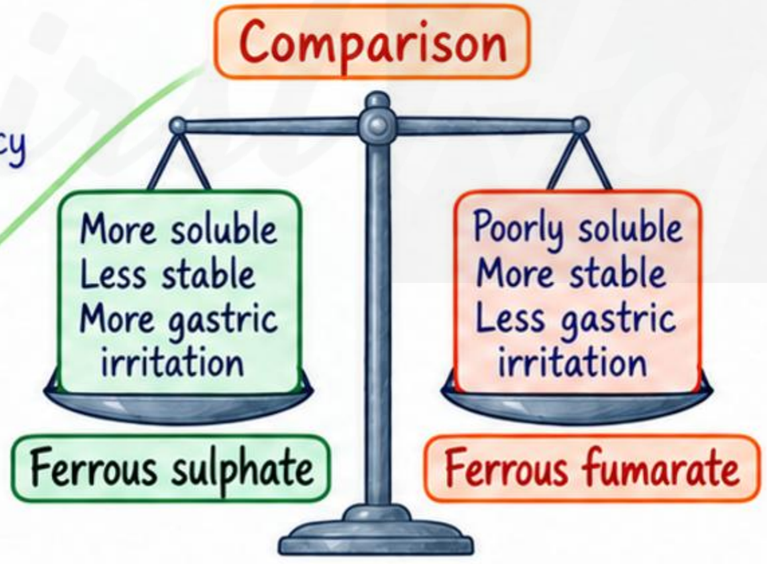


Reddish-orange powder





Tablets Capsules Syrups Drops



COMMON POINT:

Both supply absorbable ferrous iron for haemoglobin synthesis; gastrointestinal intolerance and dark stools may occur with oral iron.

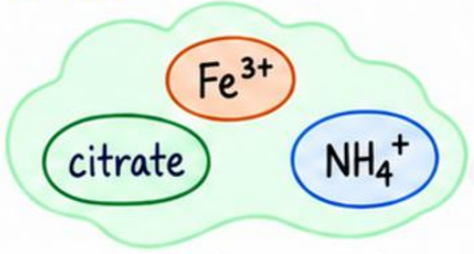


Tablets Capsules Syrups Extended-release preparations

OTHER IMPORTANT IRON PREPARATIONS

FERRIC AMMONIUM CITRATE

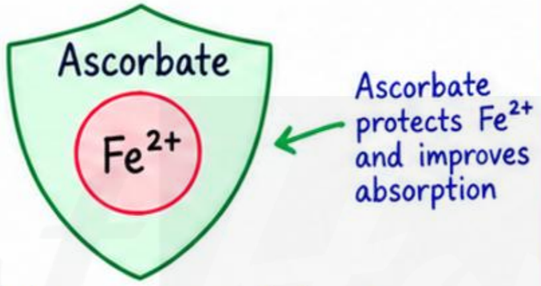
- A water-soluble ferric-citrate complex of variable composition; contains Fe^{3+} bound with citrate and ammonium ions.
- Brownish-red or greenish powder; stable in air.



- **Forms:** syrups, tablets and tonics.
- **Uses:** iron supplementation when a soluble ferric preparation is required.
- Store airtight and protect from light and excessive moisture.

FERROUS ASCORBATE

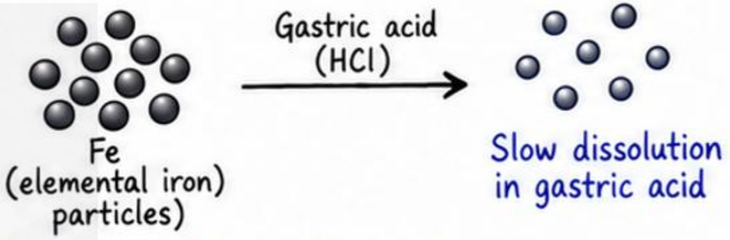
- A complex of Fe^{2+} with ascorbate.
- Ascorbate helps keep iron in the ferrous state and improves solubility and absorption.
- Light-brown, water-soluble powder; sensitive to moisture and heat.



- **Forms:** tablets, syrups and drops.
- **Uses:** iron-deficiency anaemia, especially when improved oral absorption is desired.
- Store in a moisture-proof container away from heat and sunlight.

CARBONYL IRON

- Formula: Fe (elemental iron).
- Very fine black or grey particles, insoluble in water, stable and slowly dissolved by gastric acid.
- Slow dissolution usually causes less gastric irritation and lowers the amount of immediately available free iron.



- **Forms:** tablets and capsules.
- **Uses:** long-term iron supplementation and iron-deficiency anaemia when conventional salts are poorly tolerated.
- Store dry in an airtight container and keep safely away from children.

IRON ABSORPTION

COMPARISON

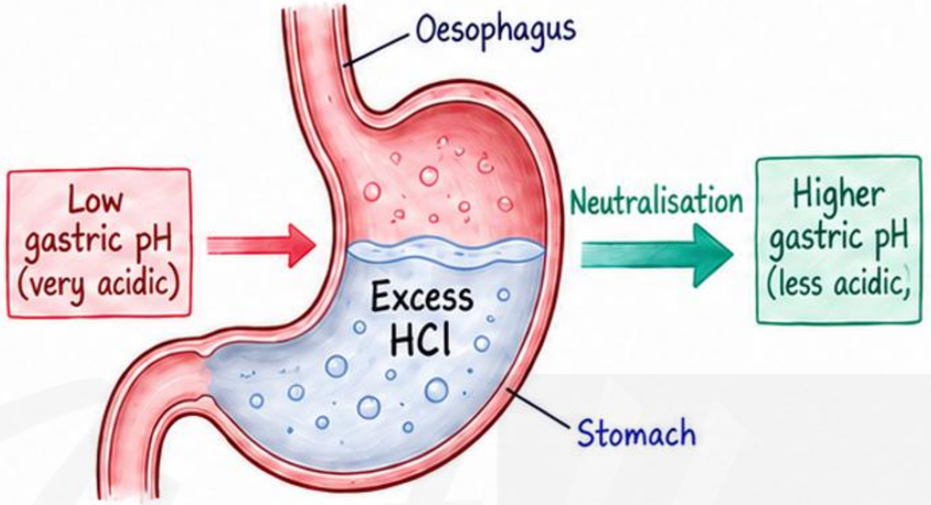
Preparation	Oxidation state	Solubility	Tolerance	Forms	Storage
Ferric ammonium citrate	Fe^{3+}	highly water-soluble complex	–	syrups, tablets and tonics	Store airtight and protect from light and excessive moisture.
Ferrous ascorbate	Fe^{2+}	water-soluble and protected from oxidation by ascorbate	–	tablets, syrups and drops	Store in a moisture-proof container away from heat and sunlight.
Carbonyl iron	elemental Fe	insoluble in water and slowly released in the stomach	–	tablets and capsules	Store dry in an airtight container and keep safely away from children.

ANTACIDS: PRINCIPLE & CLASSIFICATION

DEFINITION

Antacids are alkaline substances that neutralise excess gastric hydrochloric acid and raise gastric pH, giving relief from heartburn, acid indigestion and hyperacidity.

Acid + antacid → salt + water; carbonate antacids also release CO_2.



CLASSIFICATION

SYSTEMIC ANTACIDS

- soluble and absorbed; can affect whole-body acid-base balance.
- Example: sodium bicarbonate.
- Excessive use may cause metabolic alkalosis and sodium load.

NON-SYSTEMIC ANTACIDS

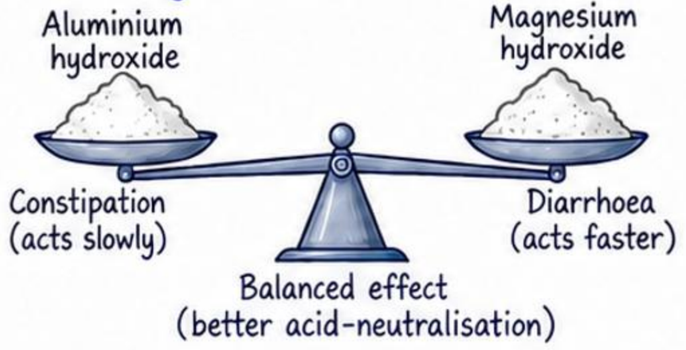
- act mainly in the gastrointestinal tract with little absorption.
- Examples: aluminium hydroxide, magnesium hydroxide and calcium carbonate.

IDEAL PROPERTIES



COMBINATIONS

Aluminium hydroxide tends to cause constipation and acts slowly. Magnesium hydroxide acts faster and may cause diarrhoea. Combining them balances bowel effects and improves acid-neutralising action.



USES

- Symptomatic relief in acid-peptic disorders, heartburn and gastro-oesophageal reflux.
- Antacids can alter absorption of other medicines, so administration times may need separation.

First Hope

FREE PREVIEW

Click here to visit our website

PHARMACY PREMIUM NOTES

Complete subject and semesters are available on FirstHope app only.

Scan or click here

Click here to get the app >

Available on Google Play

JOIN THE FIRSTHOPE COMMUNITY

Join our Telegram channel

Click here to join Telegram >

Scan or click here

@FirstHopeNotes

Instagram

@firsthope.official

Click here to follow >

YouTube channel

FirstHope-Pharmacy / Live streams

Click here to watch >

WhatsApp channel

Follow FirstHope on WhatsApp

Click here to join >

FirstHope website

firsthope.co.in

Click here to visit >

B.Pharm / D.Pharm / M.Pharm / Pharm.D

Preview notes. Complete subjects and semesters in the FirstHope app.