INORGANIC PHARMACEUTICALS

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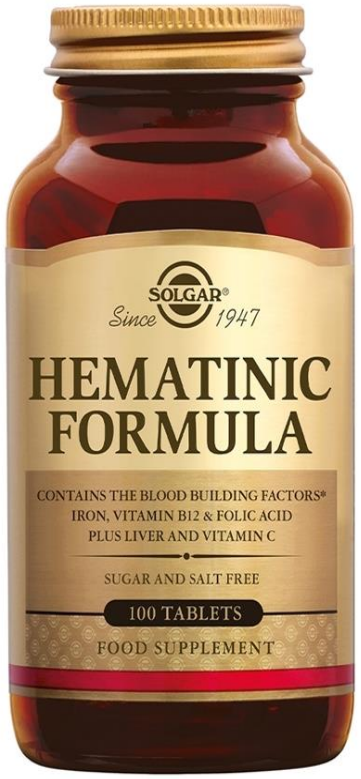
Hematinic

- A **Hematinic** is any substance or medication that helps to increase the production of red blood cells or improves the quality of blood, typically by raising hemoglobin or iron levels. Hematinics are commonly used to treat or prevent **anemia**, a condition where the body has insufficient red blood cells or hemoglobin.



There are various types of hematinics, including:

1. **Iron Supplements** are the most common hematinics used to treat iron-deficiency anemia. Iron is crucial for the production of hemoglobin in red blood cells.
   - Examples: **Ferrous sulfate**, **ferrous gluconate**, and **ferrous fumarate**.
2. **Vitamin B12**: Essential for red blood cell production. A deficiency in vitamin B12 can lead to a type of anemia called **pernicious anemia**.
   - Example: **Cyanocobalamin**, **methylcobalamin**.
3. **Folic Acid (Vitamin B9)**: This is important for the production and maturation of red blood cells. Folate deficiency can lead to **megaloblastic anemia**.
   - Example: **Folic acid supplements**.

Ferrous Sulphate

(FeSO4. 7H2O)
Mol. Wt.
278.0gm/mol

- **Ferrous sulfate** is a commonly used **iron supplement** and one of the most frequently prescribed **hematinic** agents. It is mainly used to treat or prevent **iron deficiency anemia**, a condition where there is insufficient iron to produce adequate amounts of **hemoglobin**, the protein in red blood cells that carries oxygen throughout the body.

- **Storage:** Store in air-tight containers to prevent decomposition.
- **Uses:**

1. It is one of the most widely used salts used as a hematinic.
2. Inadequate dietary intake of iron
3. Blood loss (e.g., gastrointestinal bleeding, heavy menstruation)
4. Increased iron demands (e.g., pregnancy, growth spurts in children)
5. It is sometimes used to prevent iron deficiency in people who are at high risk, such as pregnant women or those with certain chronic conditions.

- **Pharmaceutical preparations:**
  - 1. Ferrous Sulphate Tablet U.S.P.
  - 2. Ferrous Sulphate syrup
  - 3. Ferrous Sulphate Tablet I.P.
  - Dried ferrous sulphate
- **Marketed Preparation:** Feosol

Ferrous Fumarate C4H2FeO4 Mol. Wt. 169.9

- Ferrous fumarate is an iron salt that contains **iron in its ferrous (Fe2+) form**, combined with **fumaric acid**. The fumarate form allows it to be more easily absorbed by the body compared to other non-heme (plant-based) iron sources, though less efficiently than heme iron from animal sources.
- **Elemental Iron Content**: Ferrous fumarate contains about **33% elemental iron** by weight. This makes it less concentrated than ferrous sulfate, which contains around 20% elemental iron, but it still provides an effective dose for treating iron deficiency.

- **Storage:** Store in air-tight containers to prevent decomposition.
- **Uses**: it finds use as hematinic and other iron salts.
- **Pharmaceutical preparations:** Ferrous Fumarate Tablet
- **Marketed preparations:** Tandem, Ferion, Ferrocite, FERROMAX tablet 200mg, Ferro-Sequels.

Ferric Ammonium Citrate

$C_6H_8FeNO_7$
(Mol. Wt. 261.98gm/mol)

➢ **Properties:**

•Ferric ammonium citrate is typically found as a dark brown or black powder.

•The compound is water-soluble, which makes it useful in certain industrial and biological applications.

•It contains **iron (III)**, which is the ferric ion, making it a potential source of iron for use in various reactions.

➢ **Pharmaceutical Formulations:**

- Suspension
- Syrup
- Capsule

➢ **Marketed preparations:** Intavital syrup, Dexorange syrup and soft gel capsule.

➢ **Storage:** Store in air-tight containers to prevent decomposition.

➢ **Uses:** Ferric ammonium citrate is used as an **iron supplement** to treat or prevent iron deficiency anemia. The iron in the compound is absorbed by the body and contributes to the production of red blood cells.

Carbonyl Iron

➢ **Properties:**

- Carbonyl iron is made by chemical decomposition of purified iron pentacarbonyl and is extremely pure.
- Nitrogen, Oxygen and carbon may be present as impurities.
- It typically appears as grey to black free flowing powder made up of spherical microparticles.
- It is insoluble in water and organic solvents.

➢**Pharmaceutical Formulations:**

- Tablet
- Powder

➢**Marketed preparations:** Adcob-CF, Feosol, Icar-C, Afroz Tablets

➢**Storage:** It Should be kept at room Temperature.

➢**Uses:** Carbonyl iron is an iron replacement product and is used to treat or prevent iron deficiency and iron deficiency anaemia.

- It also increases oxygen transport in the body by correcting the anaemia.

Gastrointestinal Agents

- **Gastrointestinal agents** are a broad category of medications and substances used to treat various disorders of the digestive system. These agents can help manage a wide range of symptoms and conditions affecting the stomach, intestines, and related organs. They may work by modifying digestive processes, reducing symptoms like pain and bloating,

➢Classification of Gastrointestinal Agents

1. **Antacid:** Aluminium Hydroxide Gel, Magnesium Hydroxide, Precipitated chalk
2. **Acidifying agents:** Dilute Hydrochloric acid,Dicarbonate, Salicylic Acid, Ammonium Chloride
3. **Adsorbents and Protectives** :Bismuthsubcarbonate, Kaolin, Activated charcoal
4. **Cathartics :** Isapgol, Methylcellulose, Senna,Cascara, Rhubarb extract, Castor oil etc

Antacids

- **Antacids** are a class of medications used to **neutralize stomach acid** and provide relief from symptoms related to acid indigestion, heartburn, and **gastroesophageal reflux disease (GERD)**. They are available over-the-counter (OTC) and are commonly used for short-term relief of upper digestive tract discomfort.

- Antacids work by **neutralizing excess stomach acid**, thereby raising the pH level in the stomach, which can help alleviate the burning sensation caused by acid reflux or heartburn. They do this by chemically reacting with hydrochloric acid (HCl) to form water and other neutral compounds. The main aim is to decrease the acidity in the stomach, reducing irritation of the esophagus and stomach lining.

Aluminum Hydroxide Gel

$Al(OH)_3$

(77.99gm/mol)

Aluminum Hydroxide is a chemical compound commonly used as an active ingredient in **antacids** and **phosphate binders**. It has various medical applications, particularly for neutralizing stomach acid and treating conditions related to gastrointestinal (GI) disturbances.

➢Mechanism of Action

•Aluminum hydroxide neutralizes stomach acid by a simple acid-base reaction.

•When aluminum hydroxide reacts with hydrochloric acid (HCl), it forms water and aluminum chloride,

• effectively reducing the acidity in the stomach.

•The reaction is as follows:

$$Al(OH)_3+3HCl \rightarrow AlCl_3+3H_2O$$

•This neutralization provides relief from the discomfort associated with excess stomach acid.

Combination of antacid preparations

- Aluminium hydroxide gel-magnesium hydroxide combination: This mixture has characteristic relief of reflux oesophagitis.
- Aluminium trisilicate hydroxide gel-magnesium combination (E.g. Gelusil, Triosgel): Such mixtures of antacid are most common combination and exert constipative, laxative and protective effects.

- Aluminium hydroxide gel-calcium carbonate containing antacids mixture: This combination is having rapid onset of action with prolonged action.Aluminium hydroxide gel, calcium carbonate and magnesium hydroxide containing antacids mixture (E.g. Camalox)

➢ Pharmaceutical Formulations:

- Aluminium hydroxide gel IP.
- Aluminium, magnesium and simethicone oral suspension I.P.
- Aluminium, magnesium and simethicone chewable tablet I.P

➢ Storage Condition:

- Store in air tight containers and do not keep in the refrigerator.

➢ Uses:

- It is used to treat peptic ulcer and gastro- oesophageal reflux.
- To treat heartburn.
- To treat overeating. uncomfortable feelings from. It is a slow acting antacid.
- It gives symptomatic relief in gastric and duodenal ulcers and reflux oesophagitis and is used in the treatment of hyperchlorhydria.
- It is used to reduce the absorption of phosphates and thus reduce blood phosphate concentrations in patients with bone disorders associated with chronic renal failure.
- It is also given in the management of urinary phosphate calculi.

Magnesium hydroxide

Mg(OH)2

(58.31gm/mol)

➢ **Properties:**

1. Magnesium hydroxide is an compound which is low in water. Inorganic
2. It is also called as milk of magnesia.
3. It is a bulky white powder.
4. It is practically insoluble in alcohol.
5. Naturally it occurs in the form of a mineral brucite.

➢ **Pharmaceutical Formulations:**

- Magnesium Tablets, U.S.P.
- Magnesia and Alumina Oral Suspension U.S.P.
- Magnesia and Alumina Tablets, U.S.P.
- Milk of Magnesia, U.S.P
- Oral suspension I.P.

➢ **Market preparation:**

Milk of Magnesia, Phillips Milk of Magnesia

➢ **Storage condition:** Store in air-tight containers and do not kept in refrigerator

➢ **Uses:**

- It is used in suspensions as laxative or antacid.
- When used as an antacid, it is usually found in combination with calcium antacids.
- Used as a food additive
- It is extensively used in waste-water treatment
- It is also used as fire retardant, gold mining etc.

Magaldrate (86.30gm/mol)

- **Properties:**
- It is a hydrated magnesium aluminate
- Chemically it is a combination of magnesium hydroxide and aluminium hydroxide.
- This preparation contains the equivalent of 28 - 39% magnesium oxide and 17-25% aluminium oxide.
- It occurs as a white, odourless, crystalline powder which is insoluble in water and alcohol

➢ **Pharmaceutical Formulations:**

- Oral suspension
- Tablet
- Magaldrate and Simethicone chewable tablet

➢ **Market Preparations:**

- Riopan, Ron acid plus,Ri-mag Tablet

➢ **Storage condition:** Store in air-tight containers and do not kept in refrigerator

➢ **Uses:**

- Magaldrate is used in the treatment of heartburn, upset stomach

Acidifying Agent

- Gastrointestinal acidifying agents are substances that increase the acidity of the stomach or the gastrointestinal tract. These agents are often used to treat certain digestive issues or to facilitate digestion. They typically work by directly lowering the stomach’s pH or stimulating the production of stomach acid.

➢ Uses:

- These are drugs or agents which are able to increase acidity in GIT.
- Some of the drugs are used to increase metabolic acidosis whereas some of these are used to increase the gastric hydrochloric acid.
- They are also known as acidifying reagents or acidifiers.
- **Gastric acidifiers:** These are drugs which are used to temporarily restore the acidity of the stomach in patients suffering achlorhydria or hypochlorhydria.
- **Urinary acidifiers:** These are the drugs which are used to render acidic urine to enable treatment of some types of urinary tract disorders.

- **Systemic acidifiers:** These are the drugs which are able to neutralize the alkaline body fluids, particularly blood, in patients who are suffering from systemic alkalosis.
- **Acids:** Acids are used as pharmaceutical aids in the preparation, laboratory quality control etc.

Dilute Hydrochloric Acid HCl (36.5 gm/mol)

- **Properties:**

➢ It is a clear, colourless liquid with an acidic taste and no odour.

➢ It is soluble in ethanol, methanol and diethyl ether.

➢ **Pharmaceutical formulations:**

- Dilute Hydrochloric Acid Liquid

➢ **Storage condition:** At a temperature of no more than 30°C, store in stoppered glass containers.

➢ **Uses:** It is used to treat achlorhydria as an acidifying agent

- It is used to extract basic drugs and determine whether they are alkaline.
- It is a common reagent in laboratories.

Aluminium Chloride AlCl3 (133.34gm/mol)

➢ **Properties:**

- It is a white or pale yellow Solid, hygroscopic in nature.
- It is soluble in water, also freely soluble in many organic solvents, such as benzophenone, nitrobenzene.

➢ **Storage Condition:**

- At a temperature of no more than 30°C, store in stoppered glass containers.

➢ **Uses:** It is used to treat achlorhydria as an acidifying agent

Adsorbents & Protective

- The substances which protect the mucosal linings of GIT are called as adsorbents and protective. This group of gastrointestinal agents is commonly used for the treatment of mild diarrhea. Diarrhea is an aabnormal frequent passage of loose stool or abnormal passage of stools with increased frequency, fluidity, and weight, or with increased stool water excretion. Mechanism of Action of adsorbents coat the walls of the Gl tract and bind to the causative bacteria or toxin, which is then eliminated through the stool. Examples are Bismuth subcarbonate, Kaolin, Activated charcoal.

Characteristics

- They are chemically inert and soluble substances. This reduces their interaction with tissues and limits their absorption through the skin, making them difficult to wash off.
- They can adsorb bacteria, viruses, toxins, and gases, among other things.
- They provide mechanical protection by forming a protective coating on the mucosa of the intestine. Many of these protectives are also adsorbents.

Uses

- Protectives and adsorbents are frequently used to treat gastrointestinal disorders such as diarrhoea and dysentery, among other things Mild.
- To form a protective layer on a painful ulcer in the GIT, protectives or protectants are used.
- Bacteria, viruses, toxins, and gases are adsorbents.

Kaolin

$Al_2O_3.2SiO_2.2H_2O$
(258.09gm/Mol)

- It is soft white clay that is an essential ingredient in the manufacture of china and porcelain. It is a pure, natural, hydrated aluminium silicate with a wide range of compositions. It is made up of feldspar from granitic rocks that have decomposed. Kaolin is primarily made up of aluminium silicate, with traces of magnesium, calcium, and iron compounds. It is categorized as heavy kaolin, Light kaolin

➢ **Properties:**

- It is a powder, colourless, odourless, and tasteless.
- It is insoluble in water.

➢ **Pharmaceutical Formulation: Suspension**

➢ **Market Formulations:** Kapectolin, Kaodene NN Suspension, K-C Suspension

➢ **Storage Condition:** Store in a airtight containers.

➢ **Uses:**

- Heavy kaolin is used to make a kaolin poultice, which is applied to reduce inflammation and pain.
- Light kaolin is used as an adsorbent and anti- diarrhea.
- It is also used to treat cholera and colitis.
- It is also used as dusting powder.

Cathartics

- Cathartics are drugs used to relieve constipation or bring out defecation. The term laxative is used for mild cathartic whereas purgative is used for strong cathartics. Constipation can also be caused by many factors like weakness of intestine, intestinal injury and use of certain drugs and diet etc. In constipation, faecal matter becomes dry and hard. Use of laxative or purgative (lubricants) gives relief in constipation by elimination of bowel contents. Examples of mild cathartics are isabgol, agar-agar, and methylcellulose, for strong cathartics are senna, aloe, cascara, rhubarb extract, castor oil etc.

Characteristics

- These work by increasing the amount of content in the intestine
- Soften and lubricate the faeces in the colon and rectum
- Cause gastrointestinal irritation
- Make the faeces bulkier

Magnesium Sulphate

$MgSO_4.7H_2O$ (246.47gm/mol)

- **Properties:** It is a crystalline powder, colourless, odourless, with a cool and bitter flavour.It is soluble in water.
- **Pharmceutical Formulation:** Magnesium Sulphate Tablet
- **Market Formulation:** Sulfamag
- **Storage condition:** Store in a airtight containers.
- **Uses:**

- It is used to treat magnesium deficiency.
- Also used as an anticonvulsant.
- Magnesium sulphate is used as cathartic and anti-hypertensive.

Topical Agents

- The term topical is related to a particular spot. Topical compounds are applied on body surfaces and show their pharmacological effect primarily at the surface to which they are applied. Diffusion of such compounds into the tissues under the exposed area of a wound. Topical agents may be applied to the body cavities to exert systemic effect, e.g., buccal tablets, suppositories, etc. Topical agents are broadly categorized as Antimicrobial and Protective compounds. Topical agents can be broadly classified into two categories based their usual on action use: antimicrobial and astringent compounds (E.g. Hydrogen Peroxide Solution, Boric acid).

Antimicrobials

- These are agents or chemicals which facilitate in dropping of preventing infection by killing of reducing growth of pathogenic microorganism.
- Mechanism of action of topical antimicrobial agents as follows.
  - Oxidation of microbial protoplasm
  - Denaturation of microbial protein or enzyme
  - Interfere in permeability of microbial membrane
- Different terms are used to explain antimicrobial activity like; Disinfectant, Antiseptic, Antibacterial covering, Bactericide and bacteriostatic, Germicide, Fungicide, etc.

- (a) Disinfectant Agents which are used to destroy microorganism on non living objects and materials (examples-equipments, instruments, rooms etc) 'Disinfectants' are widely used in home and hospital sanitation.
- (b) Antiseptic Agent which are used to either kills or inhibit the growth of microorganism on living tissue are called antiseptics
- (c) Bactericide: It is a chemical agent which kills the bacteria, but not essentially bacterial spores.
- (d) Bacteriostatic: It is a chemical agent that inhibits the growth of bacteria.
- (e) Germicide: It is a chemical agent that kills pathogenic microorganisms.
- (f) Sterilization: It is the process of destroying all microorganisms and their pathogenic products.

Chlorhexidine Gluconate

- Chlorhexidine belongs to the class of antiseptic and germicides and used as mouth and throat products. It occurs as an odourless, bitter in taste, white crystalline powder. It is slightly soluble in water.
- **Pharmaceutical preparation:** Chlorhexidine Gluconate Mouthwash I.P.
- **Market preparations:** Paroex, Peridex, Periogard
- **Storage condition:** Store in cool place, to avoid contact from sunlight.

Uses

- Used as a mouthwash or oral rinse (topical oral solution) for treatment of gingivitis.
- It is found in disinfectants (for skin and hand infections), cosmetics (as a component in creams, toothpaste, deodorants).
- It is also used in dentistry and as an antiseptic.

Astringents

- Astringent is a compound which exhibits protein precipitation action of microorganisms when applied to imaged skin. Astringent action is a phenomenon elated to the surface whereas these compounds do not cause destruction of host tissues. It act by contraction and stops discharges. They solidify the skin.

Hydrogen peroxide Solution

(H_2O_2) 34.02gm/mol

➢ **Properties:**

- Hydrogen peroxide solution is an aqueous solution containing 29 to 31% w/w of hydrogen peroxide but hydrogen peroxide is a solution containing not less than 6% of hydrogen peroxide corresponding to about 20 volume strength.
- It is slightly more viscous than water. It is a weak acid. It is acidic to litmus paper. It is a colourless, odourless, transparent liquid.

➢ **Pharmaceutical formulation:**

Hydrogen peroxide Solution I.P. 20 Volume

➢ **Market preparations:**

Listerine Mouthwash, Hydroxyl Mouthwash.

Storage condition

- Hydrogen peroxide solution stored in partially filled containers having a stabilizing agent and a small vent in the closure, protected from sunlight.
- Stored in a well closed light resistant container.

Uses:

- It is used externally as an antiseptic. Its antiseptic effect is due to its oxidizing properties. When applied to a wound, hydrogen peroxide comes in contact with abraded skin.
- It is used as antiseptic, disinfectant, deodorant and strong oxidizing agent due to formation of nascent oxygen.

Dental Products

- Tooth consists of Enamel, Cementum, and Dentine. Dentine consist 75% of mineral. It is hard and solid whereas enamel consistiting of 98% mineral, is even more solid. It is the hardest substance present in the body.
- The organic matrix of dentine and cementum is bone like. Vitamin A, C and D are all essential for the appropriate tooth development.
- Dental caries is the disease that terminates the enamel and the dentine of the tooth. It starts with loss of minerals from the enamel surface. Caries are prepared due to the action of acids, mostly lactic acid, formed by action of microorganisms on carbohydrates in the diet.
- The inorganic compounds which are used to keep the oral and dental cleanliness are called dental products. Dental Products include Abrasive Anticaries Agent, Polishing Agent, and Desensitizing Agent

- 3% hydrogen peroxide is used against typhoid, bacilli, E. coli. The effervescent (Evolution of oxygen) is valuable for the removal of dirt, dead organic matter and bacteria from the surface of wounds.
- A 1.5% solution of hydrogen peroxide is used as mouthwash in the treatment of acute stomatitis.
- Its ear-drops have been used for removal of wax.
- Hydrogen peroxide (3% and 12%) is used to bleach human hair when mixed with ammonia.

Cleaning agent (Polishing agent or Dentifrices)

- Dentifrices are used to clean the teeth and polish the surface of teeth. Materials/substances which are used to clean the accessible surface of the teeth by using a toothbrush are called dentifrices. Commercially, they are available in the form of pastes and powders. Many dentifrices contain flavouring, colours (to improve acceptance) and soap or detergent. A good dentifrice must remove stains from teeth and to achieve this suitable abrasiveness is essential. E.g. Calcium carbonate

Calcium Carbonate $CaCO_3$ (100gm/mol)

- **Properties**

Natural Source calcium carbonate is chalk, marble, calcite aragonite, limestone, shells of marine organisms, snails, pearls and eggshells.

- **Pharmaceutical preparation:** Calcium Carbonate is available in tablets or oral suspension
  - Calcium carbonate tablet I.P.
- **Market Preparation:** calcitriol is available as injection (Calcijex)
  - Oral Solution (Rocaltrol), Titralac, Calci-mix
- **Storage condition:** Store in well closed containers.

➢ Uses:

- It is widely effective as a dietary calcium supplement, as a food additive, phosphate binder, or base material for medicinal tablets.
- It is used as an antacid.
- It is also used as antacid, antidiarrheal agent, insecticides, dentifrices and in cosmetics.
- Is used as a chalk and also in the treatment of diarrhoea.
- Due to its alkali nature, it is used in agriculture for neutralizing soil which is too acidic to harbour crops.
- It is also used as a polishing agent in tooth powders.

Anticaries Agent

- Compounds which are used for the treatment/ inhibition of tooth deterioration (or dental caries) are called anticaries agents. Most usually used anti- caries agent is fluoride containing drugs.
- Fluoride is an essential element in the composition of enamel of teeth. When fluoride containing medicine is taken, it is easily absorbed, transported and deposited in bone or teeth (in enamel surface) and remaining is excreted by the kidney. Examples of anti-caries agents are sodium fluoride, stannous fluoride, sodium monofluoro phosphate.

Sodium Fluoride NaF (41.99gm/mol)

➢ **Properties:**

- It is colourless crystalline powder, odourless.
- Soluble in water and insoluble in ethanol.

➢ **Market preparations:** chewable tablet

➢ **Pharmaceutical formulation:** Tablet, Gel

➢ **Storage condition:** Store in well closed containers.

➢ **Uses:**

- Sodium fluoride is used as anticaries agent.
- Also used as insecticide, rodenticides.
- Used in the fluoridation of drinking water.

Denture Cleaners

- When dentures are removed from the mouth, a denture cleaner (also known as a denture cleanser) is used to clean them. The main purpose is to prevent denture-related stomatitis by controlling the growth of bacteria on the dentures, particularly Candida albicans. Denture cleansers are also used to remove stains and other debris generated by a variety of factors such as diet, tobacco usage, coffee, tea, and other beverages. Chemical denture cleansers are available in both cream and liquid form. Others are available as a powder, paste, or tablet. Chemical denture cleaners can be effervescent or non-effervescent.

- Denture Derbrushes and ultrasonic denture cleaners are mechanical denture cleaners that use ultrasonic cleaning, some of which are combined with UV radiation.
- The principal ingredient in several varieties of denture cleaner is dilute sodium hypochlorite (a weak bleach).Other ingredients include the following chemicals :
- **Sodium bicarbonate:** Sometimes known as baking soda, is an alkalizing agent that cleans dentures by alkalinizing the water.
- **Citric acid:** Removes spots.
- **Potassium monopersulphate:** Cleaning and bleaching agent.

Denture Adhesives

- Denture adhesive is a paste, powder or strip made from a non-toxic, water-soluble material that goes between the denture and the gum-line. Adhesive helps enhance the natural forces that hold your dentures in place and helps stop any movement between the denture and the gum, so you can eat, talk, smile, and live with more confidence.

Types of Denture Adhesives

Denture adhesive are of different forms, like

- **Denture adhesive cream:** Denture adhesive cream is the most common kind of adhesive.
- **Denture adhesive powder:** This type of adhesive comes in a powder form and works by soaking up water to attach denture to your gum just like a cream does.
- **Denture adhesive strips:** Strips work by applying them directly on your dentures before you put them in your mouth, but these can be expensive
- Composition: The composition of Denture Adhesives is Zinc, Mineral oil, Cellulose gum, Silica, Red 27 Lake: (colouring agent).

Uses

- Dentures are used by people who have had all or some of their teeth removed.
- Another time to use denture adhesive is if your gums are sensitive and you want to avoid getting denture sores.
- Denture adhesive can also help give you more confidence since you know your dentures are held firmly in place.

Mouthwashes

- Antiseptic and anti-plaque mouth rinse claims to kill the germs that cause plaque, gingivitis, and bad breath. Anti-cavity mouth rinse uses fluoride to protect against tooth decay. They are medicated liquids (mainly antiseptics) used for cleansing the mouth or treating affected mucous membranes including during operative procedures and postoperatively. Mouthwashes contain antibacterial agent, alcohol, glycerine, sweetening agent, flavouring agent and colouring agents.

➢ **Pharmaceutical formulation**

Oral solution

➢ **Marketed preparation :** Chlorhexidine mouthwash, Colgate plax

➢ **Uses:**

- They are used as antiseptic to treat oral infection and maintain the oral hygiene.
- They might be given for other reasons also such as analgesic, anti-inflammatory or antifungal action.
- In dry mouth, rinses are given to neutralize the saliva and keep the mouth moist.
- As because of its pleasant taste and control the bad breath, it is used in cosmetics

Medicinal Gases

- Drugs or substances which are used in gas or vapour form are inhaled or directly inhaled by the nasal or oral respiratory tract in the body for local or systemic effect. Carbon dioxide, nitrous oxide are the gases used as inhalants.

Carbon Dioxide

- Carbon dioxide plays an important biological part in vital plant and animal process, such as photosynthesis and respiration. Plants and animals, in turn, convert the food compounds by combining it with oxygen to release energy for growth and other life activities. This is the respiration process, the reverse of photosynthesis.

- **Chemical formula:** CO_2
- **Molecular weight:** 44.01 g/mol
- **Properties:**

  - It is colourless, odourless gas.
  - It is about 1.5 times as heavy as air.
  - It does not support combustion.
  - It is prepared by the reaction of acids or by treating acids or by heating carbonates of heavy metals or bicarbonates of alkali metals
- **Storage condition:** The metallic cylinder should be stored in a room which should be cooled and free from inflammatory materials.

  - The shoulder of the cylinder is painted grey or green.
  - Name and symbol of 'CO2' is painted on shoulder of cylinder

Precaution :

- Patients with respiratory depression do not respond to carbon dioxide.
- In the anaesthetised or narcotised patients, coma may follow inhalation of carbon dioxide having concentration as low as 5% in oxygen.
- **Uses:**
- It is used as respiratory stimulant and cardiovascular centre stimulant at low concentration (up to 10%),
- It is generally administered by inhalation in concentrations of 5% to 7.5% mixed with oxygen
- Carbon dioxide 5 to 7% in oxygen has been used in the treatment of carbon monoxide poisoning
- Carbon dioxide, when given by mouth in solution form or as carbonates or bicarbonates, promotes the absorption of liquids by the mucous membrane.

Nitrous Oxide

- **Chemical formula:** N_2O
- **Molecular weight:** 44.013 g/mol
- **Properties:** It is colourless, odourless gas, sweet in taste.
  - Soluble in alcohols, solvent ether, and sulfuric acid.
  - Nitrous oxide is known as "laughing gas" due an exhilarating effect when inhaled.
  - Pure nitrous oxide causes hypoxia very rapidly. Hence, it is almost always administrated mixed with 20 to 50% of oxygen.

- **Storage condition:** It is stored in metal cylinders at a temperature not exceeding 36°C, in a special room, free from inflammable materials.
  - The cylinder should be painted blue.
  - The name or the chemical symbol "N_2O" should be stencilled in paint on the shoulder of the cylinder.
- **Precaution:**
  - Hypoxic anaesthesia is dangerous and nitrous oxide should always be administered with oxygen.
  - Nitrous oxide diffuses into gas-filled body cavities and therefore, it should be used cautiously in patients

➢ Uses:

- Nitrous oxide 50% with oxygen is widely used for analgesia especially in obstetrics.
- It is used as a general anaesthetic (inhalant).
- It is a weak anaesthetic, but has strong analgesic action.
- It is used as an anaesthetic in minor dental and surgical operations.
- It is usually employed only for induction and as a vehicle for, or as an adjuvant to other anaesthetics.
- It is also used as propellant in aerosol packs.

Oxygen

- The cellular respiration is a complex biological process that breaks down sugars, fat and proteins and transforms these materials into energy for the functioning of the organism. Oxygen is needed at the end of this process, when electrons liberated in the respiration are transported through the inner membranes of the cells, and the oxygen "attracts" these electrons and makes possible the production of great quantities of chemical energy in the said membranes.

- **Chemical formula**: O_2
- **Molecular weight:** 32 g
- **Properties**

- It is odourless, colourless, tasteless, and neutral gas.
- It is an important constituent of air, water and constitutes about 21% by volume of atmosphere.
- It is made available and supplied in compressed form in metallic cylinder.
- Oxygen gas can be liquified at low temperatures (critical temperature -118.8°C) and under high pressures.

Storage Condition:

- Store under compression in a metal cylinder.
- Cylinders should be stored in a special room which should be cool and free from inflammable materials. The shoulder of the metal cylinder is painted white.

Uses:

- Oxygen is essential for the breathing of human beings.
- It is used as a therapeutic and medicinal gas in patients suffering from respiratory diseases and gas poisoning
- It is also used in circulatory failure associated with conditions such as myocardial infarction or after cardiac arrest.
- It is valuable in the treatment of carbon monoxide poisoning.It is used as a diluent of volatile and gaseous anaesthetics.