B.PHARMA
1ST SEMESTER

PHARMACEUTICAL INORGANIC CHEMISTRY

(BP104T)

PHARMACEUTICAL INORGANIC CHEMISTRY MODEL PAPER

SECTION A

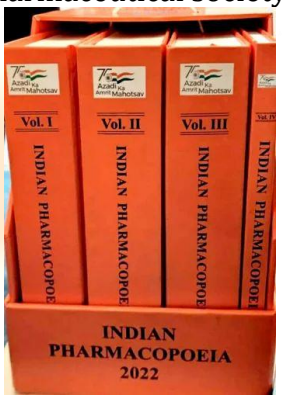
VERY SHORT ANSWERS TYPE QUESTIONS (10 × 2 = 20)

1. What is pharmacopoeia? Enlist the different Pharmacopoeia.

Answer

Pharmacopoeia

- Pharmacopoeia is a book containing directions for the identification of samples and the preparation of compound medicines, and published by the authority of a government or a medical or pharmaceutical society.



Different Pharmacopoeia

1. Indian Pharmacopoeia
2. British Pharmacopoeia
3. US Pharmacopoeia
4. European Pharmacopoeia

2. State the principle involved in limit test of chloride.

Answer

Steps involved in Limit Test of Chloride

Test sample	Standard compound
Specific weight of compound is dissolved in water or solution is prepared as directed in the pharmacopoeia and transferred in Nessler cylinder	Take 1 ml of 0.05845 % W/V solution of sodium chloride in Nessler cylinder
Add 1 ml of nitric acid	Add 1 ml of nitric acid
Dilute to 50 ml in Nessler cylinder	Dilute to 50 ml in Nessler cylinder
Add 1 ml of $AgNO_3$ solution	Add 1 ml of $AgNO_3$ solution
Keep aside for 5 min	Keep aside for 5 min
Observe the Opalescence/Turbidity	Observe the Opalescence/Turbidity

3. Discuss the limitation of Arrhenius theory.

Answer

Limitations of Arrhenius Theory

1. The definition of acid or bases are only in terms of aqueous solutions and not in terms of substance.

2. This theory is not able to explain acidic or basic in non-aqueous solvents. For ExAmmonium nitrate in liquid ammonia acts as an acid, but it does not give H^+ ions.
3. This theory is not able to explain for the basic substances which does not containOH^- ions, For Ex, Ammonia is a basic.
4. It cannot be explained acidic character of salts like $AlCl_3$ in aqueous solutions.

4. State the ideal properties of buffer solutions.

Answer

Ideal Properties of Buffer Solutions

- The pH of buffer solution remains constant.
- The pH of buffer solution does not change on dilution
- The pH does not change after addition of small quantity of acid or base
- The pH of buffer solution does not change on keeping for long time.

5. What is achlorhydria?

Answer

Achlorhydria

- Achlorhydria is an absence of hydrochloric acid in the gastric juices produced in the stomach.

6. Give function of ORS.

Answer

Functions of ORS

- Drinking ORS can help replenish fluids lost due to diarrhoea, vomiting and thus prevents dehydration.
- Restores electrolyte balance: The salt and sugar mixture in ORS helps restore the body's electrolyte balance.

7. Define Expectorants with suitable examples.

Answer

Expectorants

- Expectorants (from the Latin expectorare, to expel from the chest) are drugs which enhance the secretion of the sputum by the air passages so that it is easier to remove the phlegm through coughing.
- **Example –** Ipecac, Eucalyptus, Ammonium citrate

8. Illustrate Astringents along with suitable examples.

Answer

Astringent

- These are the compounds which bring about protein precipitation.
- They are usually applied to damaged skin topically or to the mucous membrane of the GIT including the mouth.
- **Examples –** Zinc sulphate, Potash alum

9. What is radioactivity? Give the unit of radioactivity.

Answer

Radioactivity

- Radioactivity is the release of energy from the decay of the nuclei of certain kinds of atoms and isotopes. Atomic nuclei consist of protons and neutrons bound together in tiny bundles at the center of atoms.

Unit of radioactivity

- The SI unit of radioactivity is becquerel (Bq).

10. What is half-life of radioactive elements?

Answer

Half-life of Radioactive elements

- Half-Life is normally defined as the time needed by a radioactive substance (or one half the atoms) to disintegrate or transform into a different substance.
- Half-lives for various radionuclides vary considerably.

e.g., Polonium 212 has half life of 3 x 10 seconds.
lodine 131 has 8 days.
Zn 65-150 days.
Na 22 - 26 years.
Uranium 238 has 4.5×10^{1} years.

SECTION B

LONG ANSWERS TYPE QUESTIONS (2 × 10 = 20)

1. Define the term impurity. Discuss about various sources of impurities in pharmaceutical substances.

Answer

Impurity

- An impurity in a drug substance as defined by the International Conference on Harmonisation (ICH) Guidelines is any component of the drug substance that is not the chemical entity defined as the drug substance and affects the purity of active ingredient or drug substances.

Sources of Impurities in Pharmaceutical Substances

1) Raw material used in manufacture
2) Reagents used in manufacturing process
3) Method/ process used in manufacture or method of manufacturing
4) Chemical processes used in the manufacture
5) Atmospheric contamination during the manufacturing process

6) Intermediate products in the manufacturing process
7) Defects in the manufacturing process
8) Manufacturing hazards
9) Inadequate Storage conditions
10) Decomposition of the product during storage
11) Accidental substitution or deliberate adulteration with spurious or useless materials

1)Raw materials employed in manufacture

- Impurities known to be associated with these chemicals may be carried through the manufacturing process and contaminate the final product.
- Example
- Rock salt → Calcium Sulphate (CaSO4) + Magnesium Chloride (MgCl2) = NaCl prepare
- Rock salt contains small amounts of Calcium sulphate and Magnesium chloride.
- Thus Sodium chloride prepared from this source will contain traces of Calcium and Magnesium compounds.

2) Reagents used in the manufacturing process:

- If reagents used in the manufacturing process are not completely removed by washing, these may find entry into the final products.
- Example:
- Ammoniated mercury may be prepared by adding a solution of Mercuric chloride to dilute ammonia solution.

$$HgCl_2 + 2NH_4OH \rightarrow NH_2HgCl + NH_4Cl + 2H_2O$$

- The precipitate of Ammoniated mercury (Final Product) contains ammonium hydroxide. Thus, this precipitate is washed with cold water to remove ammonium hydroxide.

3) Method or the process used in the manufacture:

- Many drugs and chemicals (usually organic) are manufactured from different raw materials, by using different methods or processes.
- Some impurities are incorporated into the materials during the manufacturing process.
- The type and amount of impurity present in the drug/ chemical varies.
- In certain drugs, a multiple-step-synthesis procedure is used, which produces intermediate compounds.
- The purification of intermediates is also important, otherwise the impurities present in the intermediate will get incorporated in the final product.
- Usually, side reactions occur during the synthesis.
- Impurities of the product side reactions also occur in the substances. This may introduce new impurities due to contamination by reagents and solvents at various stages of the process as described below:
    - Reagents employed in the process
    - Reagents added to remove other impurities
    - Solvents
    - Action of solvents and reagents on reaction vessels.

4) Chemical process used in the manufacture:

- For the synthesis of drugs, many chemical reactions such as Nitration, Halogenation, Oxidation, reduction, hydrolysis are involved.
- In these chemical processes, different chemicals are used.
- Tap water is generally used in the various processes and it is often having Cl^-, Mg^{+2}, Ca^{+2} ions, which are generally found in the substance which is being manufactured.

5) Atmospheric contamination during the manufacturing process

- In the industrial areas, the atmosphere is contaminated with dust particles and some gases like Hydrogen sulphide, Sulphur dioxide, and black smoke.
- During the manufacture or purification of the pharmaceutical products, these impurities enter the final products.
- There are many pharmaceutical products which when manufactured are contaminated with atmospheric CO_2 and water vapour. E.g., NaOH absorbs atmospheric CO_2.

$$2NaOH + CO_2 \rightarrow Na_2CO_3 + H_2O$$

- Due to this reaction, NaOH should not be kept open for a longer time during its manufacture.
- Therefore, IP has prescribed that Sodium hydroxide should not contain more than 3% of sodium carbonate

6) Defects in the manufacturing process:

- In many manufacturing processes, there are defects like imperfect mixing, incompleteness, non-adherence to proper temperature, pressure, pH or reaction conditions, which may give chemical compounds with impurities in them.
- Example:
- Zinc oxide may be prepared by heating metallic zinc to bright redness in a current of air. The vapours of Zinc burn to form Zinc oxide which is collected as a fine white powder.
- But if there is less heat or air or both, zinc metal is not completely converted to zinc oxide.
- Thus, the final product, Zinc oxide may still contain metallic zinc as impurity.
- So, IP has prescribed a test for Zinc metal in zinc oxide.

2. Discuss in detail about Arsenic limit test along with apparatus used in arsenic limit test.

Answer

Limit Test for Arsenic

- Arsenic is a well known undesirable and harmful impurity which is present in medicinal substances.
- All pharmacopoeias prescribe a limit test for it.
- Pharmacopoeial method is based on the Gutzeit test.
- All the special reagents used in the limit test for Arsenic are marked and distinguished by letter 'As T', which means that they all should be Arsenic free and should themselves conform to the test for Arsenic.

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Principle:

- Limit test of Arsenic is based on the reaction of arsenic gas with hydrogen ion to form yellow stain on mercuric chloride paper in presence of reducing agents like potassium iodide. It is also called as Gutzeit test and requires special apparatus.
- Arsenic, present as arsenic acid (H_3AsO_4) in the sample is reduced to arsenious acid (H_3AsO_3) by reducing agents like potassium iodide, stannous acid, zinc, hydrochloric acid, etc. Arsenious acid is further reduced to arsine (gas) (AsH_3) by hydrogen and reacts with mercuric chloride paper to give a yellow stain.

Substance + dil. HCl → H_3AsO_4

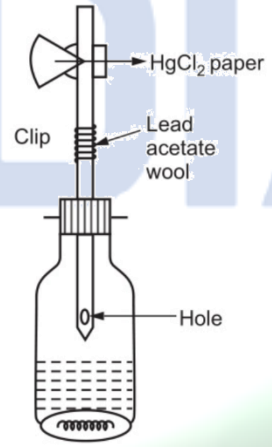
(contains Arsenic impurity) Arsenic acid

$H_3AsO_4 + H_2SnO_2 \rightarrow H_3AsO_3 + H_2SnO_3$

$H_3AsO_3 + 6[H] \rightarrow AsH_3 + 3H_2O$

- The depth of yellow stain on mercuric chloride paper will depend upon the quantity of arsenic present in the sample.
- When the sample is dissolved in **acid**, the Arsenic present in the sample gets converted to **Arsenic acid.**
- By action of reducing agents like Potassium iodide, stannous acid etc., Arsenic acid gets reduced to **arsenious acid**.
- The **nascent hydrogen** formed during the reaction, further reduces **Arsenious acid** to **Arsine gas**, which reacts with mercuric chloride paper, giving a yellow stain.

Apparatus



- It is having a wide mouthed glass bottle of 120 mL capacity having mouth of about 2.5 cm in diameter. This bottle is fitted with a rubber bung through which passes a glass tube, 20 cm long.
- The upper end of the glass tube is fitted with two rubber bungs(25 mm x 25 mm), each having a hole bored centrally and exactly 6.5 mm in diameter.
- One of the bungs has been fitted to the upper end of the tube, while the second bung has to be fitted upon the first bung in such a way that the mercuric chloride paper gets exactly sandwiched between the central perforation of the two.
- The bungs are kept in close contact by using rubber band or spring clip in such

a manner that the gas evolved from the bottle must have to pass through the 0.65 mm internal circle of mercuric chloride paper.

- During the test, the evolved gases have been passing through the side hole, the lower hole serving as an exit for water which condenses in the constricted part of the tube.
- An important feature has been the standardization of the area of Mercuric chloride paper which is exposed to the reaction of arsine gas.

Procedure

Test sample	Standard compound
The test solution is prepared by dissolving specific amount in water and stannated HCl (arsenic free) and kept in a wide mouthed bottle.	A known quantity of dilute arsenic solution in water and stannated HCl (arsenic free) is kept in wide mouthed bottle.
1 g of KI	1 g of KI
5 ml of stannous chloride acid solution	5 ml of stannous chloride acid solution
10 g of granulated zinc is added (all this reagents must be arsenic free). Keep the solution aside for 40 min	10 g of zinc is added (all this reagents must be arsenic free). Keep the solution aside for 40 min

- Stain obtained on mercuric chloride paper is compared with standard solution. Standard stain must be freshly prepared as it fades on keeping.
- **Inference:** If the stain produced by the test is not deeper than the standard stain, then sample complies with the limit test for Arsenic.

3. Illustrate the method of preparations, properties, assay, and uses of Ammonium chloride.

Answer

Ammonium Chloride

Method of Preparation

- It is prepared by the interaction of ammonia gas with hydrochloric acid.
- The solution is evaporated to dryness.
  $NH_3 + HCl \rightarrow NH_4Cl$
- It may also be prepared by treating ammonia gas liquors with lime and the liberated ammonia is passed into hydrochloric acid.

Properties

- Colourless crystals or a white, crystalline powder, odourless, highly soluble in water.
- Solutions of ammonium chloride are mildly acidic and freely soluble in glycerine.

Assay

- It is assayed by simple acid-base titration.
- Weigh accurately about 0.1 g of ammonium chloride, dissolves in 20 ml of water and add a mixture of 5 ml of formaldehyde solution, previously neutralized to dilute phenolphthalein solution, and 20 ml of water.
- After 2 minutes, titrate slowly with 0.1 M sodium hydroxide using a further 0.2 ml of dilute phenolphthalein solution as an indicator.
- 1 ml of 0.1 M sodium hydroxide is equivalent to 0.005349 g of NH_4CI.

Uses

1. Ammonium chloride is used as an expectorant in cough medicine.
2. Its expectorant action is caused by irritative action on the bronchial mucosa. This causes the production of excess respiratory tract fluid which presumably is easier to cough up.
3. Ammonium salts are an irritant to the gastric mucosa and may induce nausea and vomiting.
4. Ammonium chloride is used as a systemic acidifying agent in the treatment of severe metabolic alkalosis, in oral acid loading test to diagnose distal renal tubular acidosis. to maintain urine at an acid pH in the treatment of some urinary tract disorders.

SECTION C

SHORT ANSWERS TYPE QUESTIONS (5 × 7 = 20)

1. Discuss the physiological role and disease condition due to imbalance of calcium in body.

Answer

Physiological Role of Calcium in Body

1) Calcium is mainly found in the bones and teeth of the living beings.
2) Blood is a large tank of this mineral.
3) It helps in blood clotting. Deficiency of calcium increases the blood clotting time.
4) Calcium supports muscle contraction.
5) The deficiency of this metal leads to disorder of nerves.
6) It plays a significant role in the metabolism of nitrogen in plants. Absence of this mineral in the plants affects the size and number of chloroplasts.

Disease condition due to imbalance of Calcium in Body

- **Hypocalcemia:** This is a condition characterized by abnormally low levels of calcium in the blood. It can lead to symptoms such as muscle cramps, numbness or tingling in the extremities, muscle spasms, and in severe cases, seizures and heart rhythm disturbances.
- **Osteoporosis:** Calcium is crucial for maintaining bone density and strength. Insufficient calcium intake or absorption can lead to osteoporosis, a condition characterized by weak and brittle bones, increasing the risk of fractures.
- **Kidney Stones:** An imbalance in calcium levels can contribute to the formation of kidney stones. These are hard, mineral deposits that form in the kidneys and can be extremely painful. Calcium oxalate stones are the most common type of kidney stones, and they can develop when there is an excess of calcium and oxalate in the urine.

- **Hypoparathyroidism:** This condition occurs when the parathyroid glands, which regulate calcium levels in the body, do not produce enough parathyroid hormone (PTH). This leads to decreased calcium levels in the blood, causing symptoms like muscle cramps, tingling, and spasms.
- **Tetany:** Tetany is a condition characterized by muscle spasms and twitching, often caused by low blood calcium levels. It can result from various factors, including hypoparathyroidism and malabsorption disorders.

2. Outline anticaries agents. Explain the role of fluoride in dental caries.

Answer

Anticaries Agent

- A drug that aids in the prevention and prophylactic treatment of dental cavities (decay, caries).

Role of Fluoride in Dental Caries

- Fluorides obtained from food and water is very effective in the prevention of dental caries.
- Fluoridation: Fluoridation can be carried out by the addition of fluoride to the water. However, high fluoride causes mottling of teeth, increased density of bones, gastric disturbance, muscular weakness, convulsions and heart failure.
- Role of fluoride when salt or solution of fluoride is taken internally:
  - ✓ Fluoride is absorbed, transported, and deposited in bones or developing teeth.
  - ✓ The deposited fluoride on the surface of the teeth does not allow the action of acids or enzymes.
  - ✓ Very less amount of fluoride (1 ppm) is required for this purpose.
- **Route of administration:**
  - ✓ Route of administration is orally and topically.
  - ✓ Drinking water (0.5 to 1 ppm), fruit juice (1 ppm), sodium fluoride tablets or solution, 2.2 mg or topical application of 2 % solution.
  - ✓ A wide range of therapeutic fluoride concentrations are used as topical agents to prevent caries.

Method	Fluoride concentration (ppm)
Dentifrices, adult	1000-1500
Dentifrices, children	250-500
Mouth rinse,	230
Self-applied gels or rinses, prescription	5000

3. Classify cathartics according to their mechanism of action with suitable examples.

Answer

Cathartics

- Cathartics are agents which quicken, increase and facilitate the evacuation (defecation) from the bowel.

Classification

Class	Description	Examples
Stimulant Cathartics 	Through local irritation of G.I.T, directly and thereby stimulating peristaltis. These are called as stimulants.	Rhubarb, senna, podophyllum, castor oil, bisacodyl etc.
Bulk Cathartics 	Through increasing the bulk of intestinal contents and thereby stimulating peristaltis.	Bulk purgatives like ispagol, CMC, gums etc.
Emollient Cathartics 	By acting as lubricants of GIT and thereby facilitating smooth evacuation of feces.	Liquid paraffin, glycerine, mineral oils etc.
Saline Cathartics 	By increasing osmotic load of intestine by absorbing water and thereby stimulating peristaltis. These are saline cathartics.	sodium phosphate, magnesium sulphate, sodium potassium tartarate, magnesium carbonate etc.

4. Write the properties, storage conditions and uses of potassium permanganate and Boric acid.

Answer

Potassium Permanganate

Properties

- Potassium permanganate occurs in the form of dark purple coloured monoclinic prisms, almost opaque having a blue metallic luster.
- It is odourless.
- It is soluble in 15 parts of water and 3.5 parts of boiling water A solution of KMnO4 has a sweetish, astringent taste.
- It acts as a powerful oxidising agent.

Storage conditions

- It is kept in tightly closed containers.
- It must be handled with care because an explosion may occur when it is brought in contact with readily oxidizable substances.

Uses

1) It is used as an antiseptic in mouth wash.
2) As anti-infective it is regarded of immense value.
3) It is used in the treatment of urethritis.
4) As it is capable of oxidizing some drugs and used as an antidote in case of poisonings by barbiturates, chloral hydrate, many alkaloids.
5) A solution of potassium permanganate can destroy poison and prevent its absorption. But it should not be kept in stomach for a long time.
6) In veterinary practice, it has been very commonly used as an antiseptic.

Boric Acid

Properties

- Colourless, odourless pearly scales.
- Six-sided triclinic crystals.
- White odourless powder.
- It is odourless with slightly acidic and bitter taste and unctuous touch.
- It is stable in air, and has a density of 1.46.
- Boric acid is a weak acid.

Storage conditions

- Boric acid should be stored in a cool, dry place.
- It should be kept in a well-sealed container with a vented lid.

Uses

1) It is used as a local anti-infective agent.
2) It is used in dusting powders, local antiseptic creams, ointments, lotions etc. applied to skin or mucous or eye.
3) Aqueous solutions have been used as mouth wash, eye lotions, skin lotions.
4) It possesses weak bacteriostatic and fungistatic action.

5. What are Haematinics? Explain preparations, properties, assay and uses of ferrous sulphate.

Answer

Haematinics

- A hematinic is a nutrient required for the formation of blood cells in the process of hematopoiesis.
- The main hematinics are iron, B12, and folate.
- Deficiency in hematinics can lead to anaemia.

Ferrous Sulphate

Preparation

- Prepared by dissolving iron dust filings in excess of dilute H_2SO4.
- The iron dissolves with effervescence.
- When the reaction subsides, the liquid is boiled to concentrate, filtered and cooled thereafter to obtain the crystals, which are filtered and dried at room. temperature.

$$Fe + H2SO4 + nH2O \rightarrow FeSO4/H_2O + H_2O + H_2$$

Properties

- It is a pale, bluish green, crystalline or granular solid, which is odourless with saline metallic astringent taste. It is efflorescent in dry air and may get oxidised to ferric salt [Fe(OH)2(SO4)s]. having brownish colour.
- It is acidic to litmus with a pH of about 3.7. It is soluble in water, but practically insoluble in alcohol. When heated it decomposes to ferric oxide, sulphur dioxide and sulphuric acid.

Assay

- **By Redox Titration:** Aqueous sample solution is titrated against 0.1 N KMnO4 solution in the presence of dil. H2SO4 to a coloured end point.

$$FeSO4 + 2KMnO4 + 4H2SO4 \rightarrow K_2SO$$

Uses

- Used most widely as in the form of oral iron preparations like tablets, capsules, syrups, reconstitutable dry powders, etc. as a haematinic (promoting formation of haemoglobin) to treat iron deficiency, particularly in uncomplicated anaemias.

6. Outline the precautions to be taken during handling and storage of radioactive substances.

Answer

Precautions to be taken during handling

- The following guidelines provide information on the safe handling of radioactive substances. They are based on the relevant legislation and on the Code of Practice for Handling Radioactive Substances.

- The radioactive substances used should comply with the following characteristics:
  - Radiotoxicity must be as low as possible.
  - Short-living isotopes are preferred to long-living ones
  - The amounts used must be kept to a minimum.
  - Never work alone in a radioactive lab, especially not outside normal working hours. Always make sure to have someone nearby in case of emergency.
- Take all precautions to prevent radioactive contamination:
  - Always separate radioactive activities from non-radioactive activities.
  - As far as possible, limit the area where radioactive substances are used and mark the area, e.g. by using containers with absorbent paper.
  - Apply a radiation symbol to any containers and items that have come into contact with radioactive substances.
  - Never bring documents such as notes into the radioactive zone.
- When handling radioactive materials, always wear the appropriate protective clothing:
  - Wear a lab coat. If there is a risk of serious contamination, wear disposable clothing. Store your lab coat away from your regular clothes.
  - Always wear gloves when handling radioactive substances. Regularly check the radiation level of these gloves. Never touch anything with potentially contaminated gloves; use paper tissues instead.
  - Wear shoe covers in rooms where the floor may be contaminated.
  - Keep personal items such as handbags, etc., outside the lab.
- Use appropriate radiation shields. Return the stock solution to storage immediately after removing the amount needed.
- To avoid internal contamination, strict hygiene is essential when handling radioactive materials
  - Eating, smoking, drinking, and applying cosmetics are prohibited in radioactive labs.
  - Never pipette by mouth. Use pipetting devices instead.

- Wash your hands thoroughly when you leave the lab.

Storage of radioactive substances

- Radiopharmaceuticals should be kept in well-closed containers and stored in an area assigned for the purpose. The storage conditions should be such that the maximum radiation dose rate to which persons may be exposed is reduced to an acceptable level.
- Care should be taken to comply with national regulations for protection against ionizing radiation.
- Radiopharmaceutical preparations that are intended for parenteral use should be kept in a glass vial, ampoule or syringe that is sufficiently transparent to permit the visual inspection of the contents. Glass containers may darken under the effect of radiation.

7. What is antacid? Describe ideal properties and uses of antacids.

Answer

Antacid

- Antacid drugs give relief to pain due to hyper acidity.
- The beneficial effects of antacids are due to two mechanisms i.e., neutralisation of gastric juice and reduction in protolytical activity of pepsin.
- Elevation of the pH of the gastric content to more than pH 4-5 results in inactivation of enzyme pepsin and at this pH, the damaging effect of the gastric acid to the mucosa is minimum.

Ideal Properties

- **Rapid Onset of Action:** Antacids should work quickly to provide relief from symptoms. This means they should begin neutralizing stomach acid shortly after ingestion to alleviate discomfort promptly.
- **Effective Neutralization:** Antacids should effectively neutralize excess stomach acid to bring the pH of the stomach back to a more neutral level (close to pH 7). This helps reduce the burning sensation associated with acid reflux and heartburn.
- **Long-Lasting Relief:** Ideally, the relief provided by antacids should last for a reasonable duration to provide sustained comfort. While they may not provide as long-lasting relief as other acid-suppressing medications, such as proton pump inhibitors, they should still offer a reasonable period of relief.
- **Minimal Side Effects:** Antacids should have minimal adverse effects when taken as directed. Common side effects of antacids may include constipation or diarrhea, but they should generally be well-tolerated. Some antacids contain aluminum or

magnesium, which can accumulate in the body and lead to issues in individuals with kidney problems, so it's essential to consider this when selecting an antacid.

- **Ease of Administration:** Antacids should be easy to take and preferably available in various forms, such as tablets, liquids, or chewable tablets, to accommodate different preferences and needs.
- **Taste and Palatability:** The taste and texture of antacids can influence patient compliance, especially in the case of chewable tablets or liquid forms. Pleasant-tasting antacids are more likely to be taken as prescribed.

Uses

- **Heartburn:** Heartburn, also known as acid reflux or gastroesophageal reflux disease (GERD), occurs when stomach acid flows back into the esophagus, causing a burning sensation in the chest or throat. Antacids can provide rapid relief by neutralizing the acid and alleviating the discomfort.
- **Acid Indigestion:** Acid indigestion, often characterized by feelings of fullness, bloating, and discomfort in the upper abdomen, can be caused by excessive stomach acid. Antacids can help relieve these symptoms by neutralizing the acid.
- **Sour Stomach:** A sour stomach refers to an upset stomach characterized by nausea, belching, and a sour taste in the mouth. Antacids can ease these symptoms by neutralizing the excess acid and reducing the discomfort.
- **Reflux Esophagitis:** This condition occurs when the lining of the esophagus becomes inflamed due to repeated exposure to stomach acid. Antacids can help manage the symptoms and provide relief from the irritation.
- **Gastric Ulcers:** Antacids may be used as part of the treatment for gastric ulcers, which are open sores that develop on the lining of the stomach. By neutralizing stomach acid, antacids can help reduce irritation and promote healing.

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