- **PHARMACEUTICAL PACKAGING.**

- **Definition—** Pharmaceutical packaging is the phenomena or operation, as the part of any drug discovery and development program. Pharmaceutical products generally require a standard of packaging which is superior to that of most other products in order to support and comply with their main requirements, i.e. proven efficacy, safety, uniformity, reproducibility, integrity, purity with limited impurities, minimum side-effects coupled to minimum product liability risks, and a good shelf-life stability profile.
- For any packaging require a discipline and lots of knowledge about the drugs formulations and dosages form, and the general physical and chemical properties of drug substances. Packaging helps in the products stability, transportation, storage, and deterioration conditions.

- Pharmaceutical packaging of the economical means providing protection identification information, convenience and stability of the product.
    - **Factor affecting pharmaceutical packaging—**
- The type of dosage form
- The route or mode of administration or use
- The type of pack (Blister or strip)
- The mode of sale/marketing area
- The mode of dispensing via a combined device/pack.
    - **Types of packaging testing—**
    - Drop test.

    - Collapsibility test.
    - Vibration test.
    - Shock test.
    - Inclined impact test.
    - Revolving drum test.
- **Ideal characteristic of packaging—**
    - Provide the high degree of protection against any contamination

- Provide the high degree of protection against any contamina like environment as well as artificial issues.
- Do not show any incompatibity (physical or chemical) with product material.
- Easy to handling, storage and transport according to the custor convenience.
- Easy to sterilization method and easily participate in recycli process.
- Show more longevity and high printing property.
- Affordable economical value.

- **Types of packaging—**

- **Primary packaging—** In primary packaging material are directl covered the products and come close to the products and hold it. I provides the initial safety barrier for product. This type of packaging is often intended for the end user or consumer so it is also called consumer unit packaging. Example:- Strips, Blister, bottle, spray cane.
- **Secondary packaging—** These types of packaging apply, outside of the

primary packaging and it facilitates the handling of smaller products by combining them into a single pack. Example:- Boxes.

- **Tertiary packaging—** It is used for bulk handling and shipping. It facilitates the handling, storage and transport of goods. It provides the final barrier to products from damage.
  - **Types of packaging materials—**
  - Glass material.
  - Plastic material.
  - Metals materials.
  - Rubber materials.
  - Paper board materials

- **Glass packaging.**

- **Definition—** Neutral glass is a borosilicate glass containing significant amounts of boric oxide, aluminium oxide, and alkali or alkaline earth oxides. It has a high hydrolytic resistance and a high thermal shock resistance.
  - Glass has been widely used as packaging materials and it is moulded in any shape, size, and thickness. Most of parenteral preparation are used the glass materials.
- On the basis of hydrolytic resistance it divides into three parts.

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- **Type I glass containers** which are of neutral glass, with a high hydrolytic resistance, suitable for most preparations, not for parenteral use.

- **Type II glass containers** which are usually of soda-limesilica glass with high hydrolytic resistance are suitable for most acidic and neutral, aqueous preparations, not for parenteral use.
- **Type III glass containers** which are usually of sodalime- silica glass with only moderate hydrolytic resistance. They are generally suitable for non-aqueous preparations for parenteral use.
    - **Advantages of glass packaging—**
    - They are transparent or uncolored packaging to permit the visual inspection of the products contents.
    - They have a good protection for powder because powder very sensitive against the moisture and temperature.
    - Available in variety of shape and size according to our needs.
    - Colored glass (amber colored) is also used in the packaging for the more sensitive materials.
- **Disadvantage of glass packaging—**
    - High risk during the transport and handling because it is fragile in nature.
    - Glass is heavy in weight than other.

- High risk of product contamination due to broken glass piece and some time release alkali to aqueous preparation

    - **<u>Plastic packaging.</u>**

- **Definition—** Plastic packaging for pharmaceutical products is made from plastics based on the following polymers: polyethylene (low or high density), polypropylene, and polyvinyl chloride, polystyrene and to

a lesser extent polyethylene terephthalate. The containers consist of one or more polymers together with certain additives if necessary. They should be manufactured from materials that do not include in their composition any substances that can be extracted by any contents in such quantities so as to alter the efficacy or stability of the product or to present a toxic hazard. Additives may consist of antioxidants, lubricants, plasticizers and impact modifiers but not antistatic agents and mould release agents.

- **Advantages of plastic packaging—**

- It is flexible in nature so it cannot easily breakable.
- Due to less weight than the glass it is easy to transport and handling.
- Verity of shape and size are available according to our convenience.
- The high versatility of plastic allows for ease of reuse and recycling. In fact, these days' companies are creating specialized plastic bag making

- machines that help you optimize on the recyclability of plastic.
- The durability offered by plastic packaging also allows manufacturers to print eye-catching, high-quality custom designs, and thereby increase product visibility in a retail setting.

- **Disadvantage of plastic packaging—**

- Plastics are highly sensitive for light so it is easily effects by heat
- It is easily reacts with the products materials and alters the products physical and chemical properties.

- Some metals are reacts to the products and cause poisoning conditions.
- Rusting is cause in some metals by absorbing the moisture.

- **Rubber packaging.**

- **Definition—** Rubber is used mainly for the construction of closure meant for vials, transfusion fluid bottles, dropping bottles and as washers in many other types of product. The main types of rubber used for pharmaceutical products include natural rubber, neoprene, nitrile, butyl chlorobutyl, bromobutyl and silicone.
- Silicone is the most expensive and although the most inert, is readily permeable to moisture, gases and absorbent to certain preservative.Advantages of rubber packaging—
  - Water absorption is very low, so it provides the better resistance against the moisture and humidity.
  - Due to stretchable nature, it is easy to handling and transport.
  - It is the cheaper materials than metal and glass. It shows good economical value.
  - Most of the rubber materials are used for the closing apparatus and provide the addition protection against any contamination.
  - Nitrile rubber is heat resistant and oil resistant due to presence of nitrile group.
- **Disadvantage of rubber packaging—**
  - Absorption of bactericide and leaching of extractives are