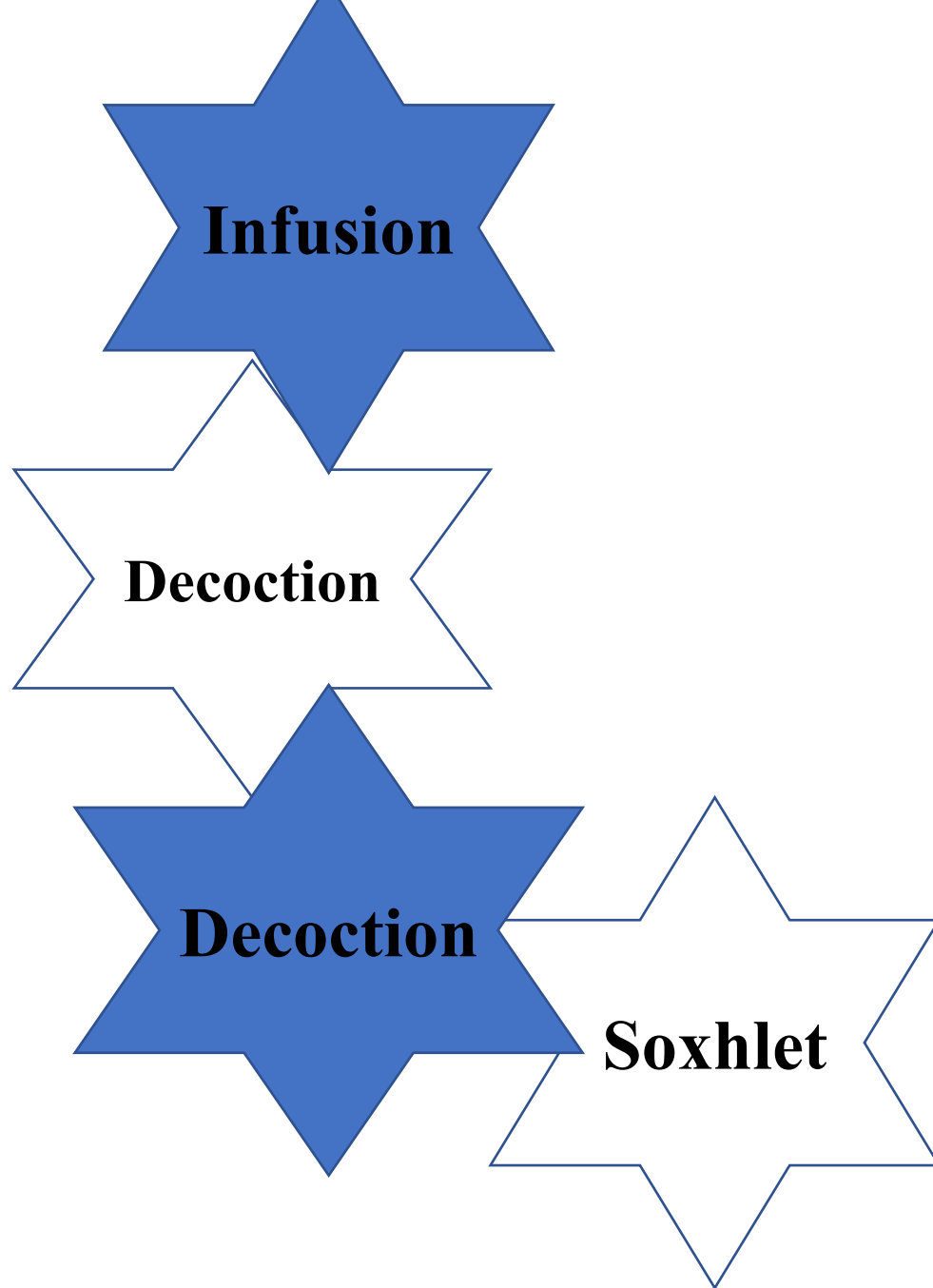




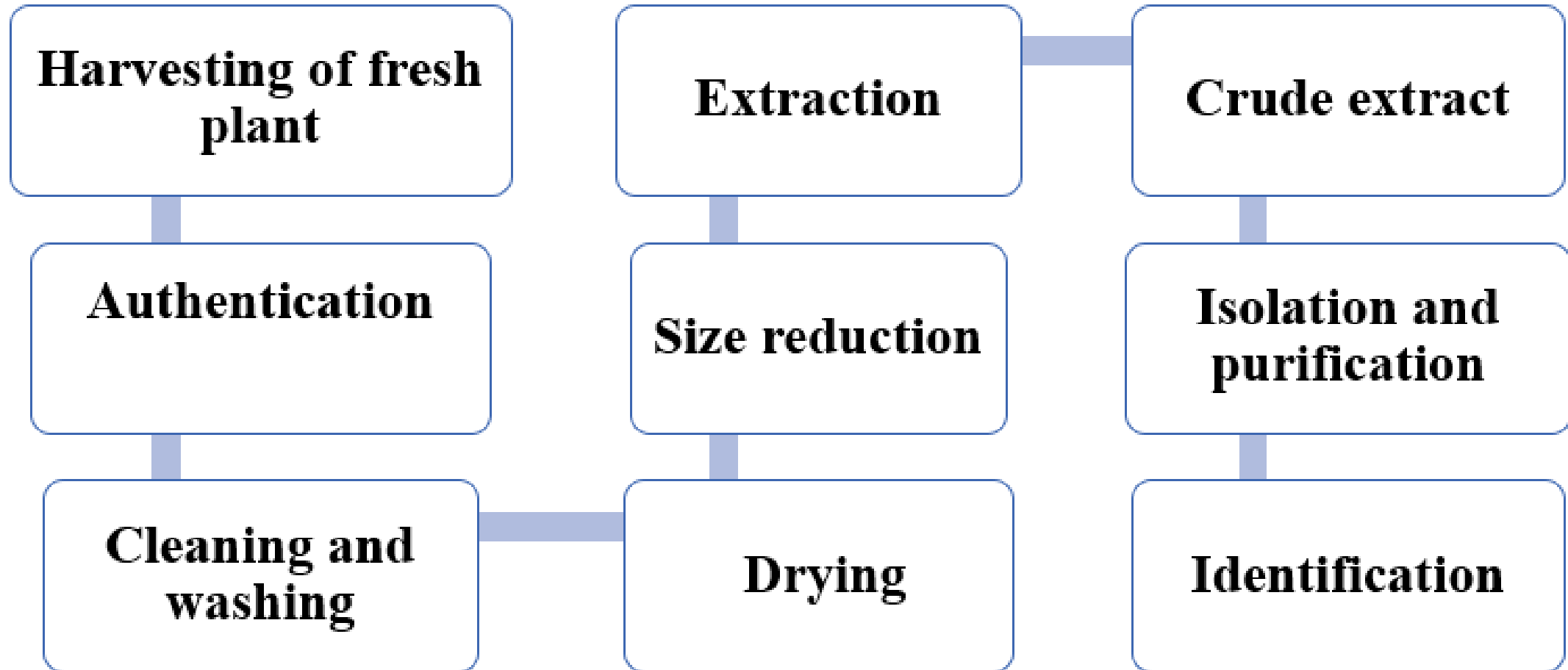
# **Extraction techniques**

**Asst. Prof. Dr Noor S Jaafar**  
**Second stage / Second semester**

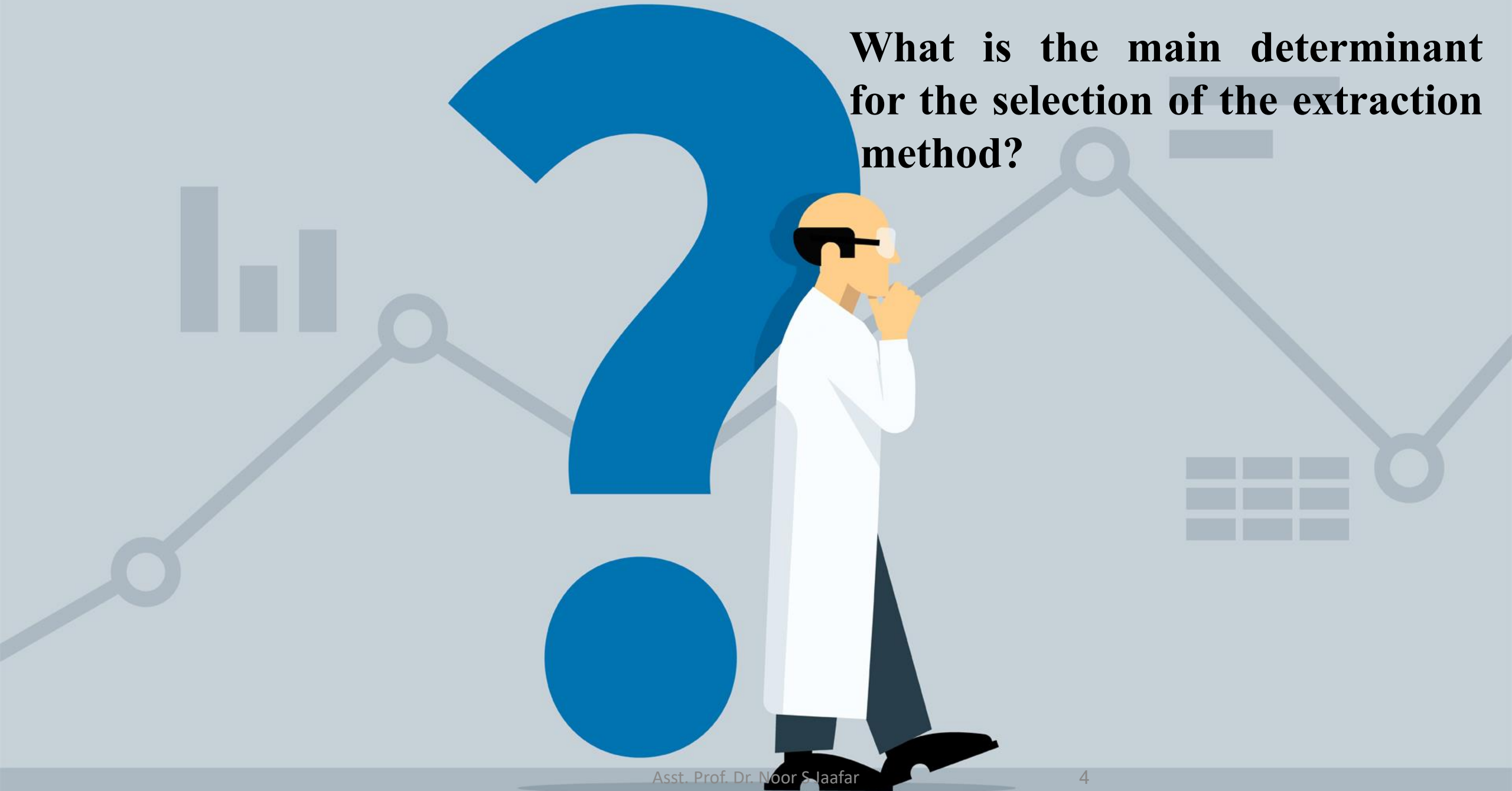
# Extraction

- Extraction involves the separation of the medicinally active constituents of plants, animal tissues, and microbes from the active or inert component by using solvent (s) and by using one of the standard extraction procedures.
- The products that are obtained from plants are relatively impure liquids, semisolid or powders, intended only for oral or external use. These total extractive products are called **Galenicals, which originated from the name Galen, a 2nd-century Greek physician.**

# Steps for the extraction of active compounds from plants



**What is the main determinant  
for the selection of the extraction  
method?**



# Extraction parameters

## Factors affecting extraction

**The texture of the plant material.**

**The water content of the plant material**

**The type of substances to be extracted or the nature of active constituents.**

# Methods of extraction can be divided into

## Cold methods

**Maceration**

**Percolation**

## Hot methods

**Decoction**

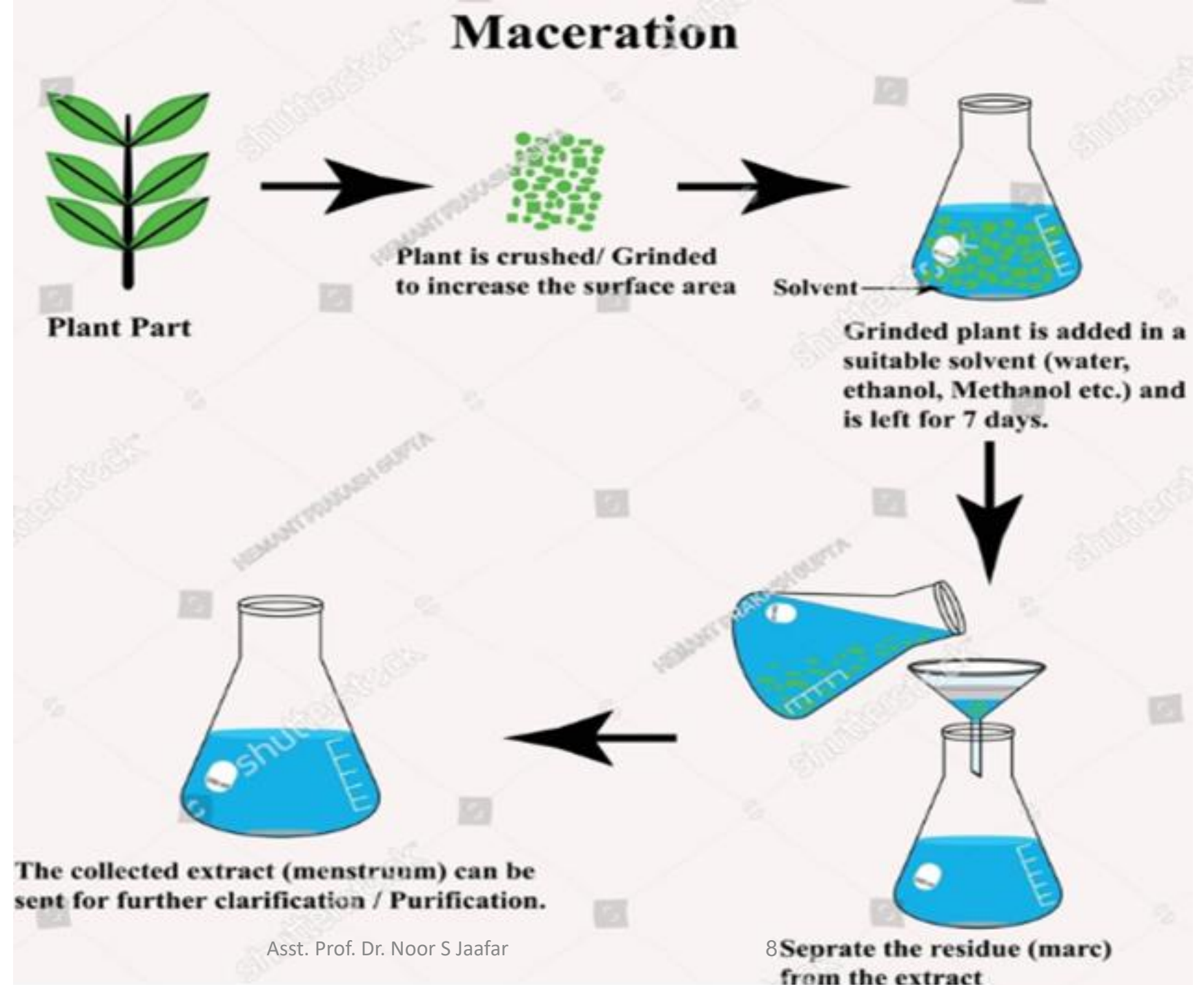
**Digestion**

**Continuous hot extraction methods**

# Maceration

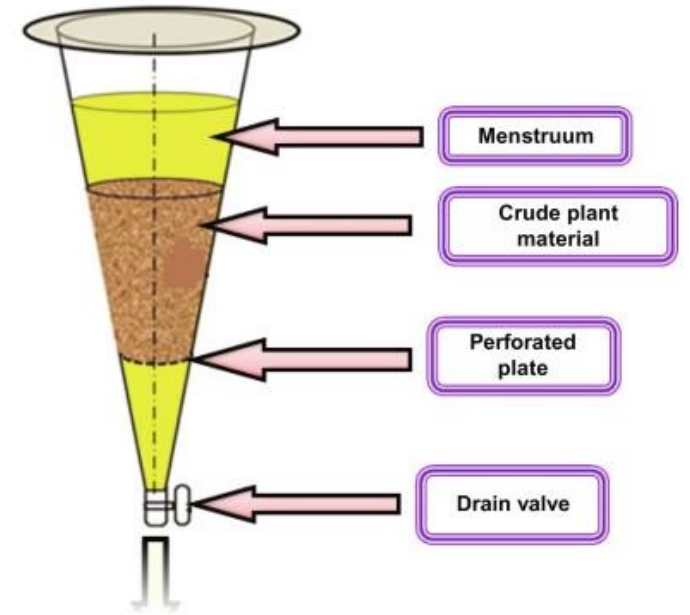
- Maceration involves leaving the pulverized plant to soak in a suitable solvent in a closed container.
- Simple maceration is performed at room temperature by mixing the ground drug with the solvent (drug solvent ratio: 1:5 or 1:10) and leaving the mixture for several days with occasional shaking or stirring.
- The main disadvantage of maceration is that the process can be quite time-consuming, taking from a few hours up to several weeks.

- **Marc:** solid residue obtained after extraction
- **Menstruum:** solvent used for extraction



# Percolation

- Percolation (from Lat. percōlāre, to filter) concerns the movement and filtering of fluids through porous materials.
- The powdered plant material is soaked initially in a solvent. In a percolator, additional solvent is then poured on top of the plant material and allowed to percolate slowly (drop wise) out of the bottom of the percolator.
- Additional filtration of the extract is not required because there is a filter at the outlet of the percolator.



# Infusion

- Infusion is the process of extracting chemical compounds or flavors from plant material in a solvent such as water, oil, or alcohol by allowing the material to remain suspended in the solvent over time.
- Used for those drugs that are soft in nature (flowers and leaves).
- In this procedure we have special container called 'Infusion pot' which contain sieves and cover with heavy lid. After the addition of the solvent ,boiling water, left for a while for the extraction of active constituent during that time, the volatile oil evaporated with steam and condenses on the lid. After that, we take the solvent which contain the active constituent.

# Decoction

- Decoction is a method of extraction by boiling of the dissolved chemicals.
- Hard and fibrous plant material, which may include stems, roots, bark, and rhizomes are used
- The active constituent should be heat-stable.
- The solvent used is water.
- In decoction, the powdered sample is boiled in a closed vessel using an appropriate quantity of water for half an hour or until half of the water evaporates.
- **Chloroform and ether** can't be used because we used a direct source of heat.



# Digestion

- A modified maceration where gentle heat (e.g., 35-50°C) is applied during the soaking process for a few hours to a day.
- In this method, the plant material is placed together with the solvent and application of gentle heat, so that the solvent will increase its power for extraction, and this method is used in cases where moderately elevated temperature is required.
- The aqueous preparations should be used up within 24 h of preparation, as they are quite liable to microbial contamination

# **Continuous methods**

**hot**

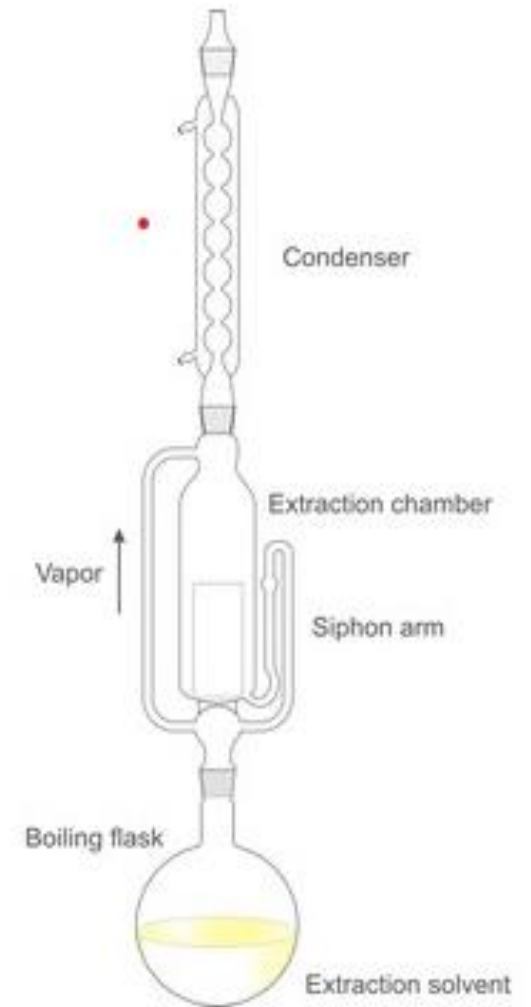
**extraction**

- Soxhlet
- Reflex
- Clevenger

# Soxhlet

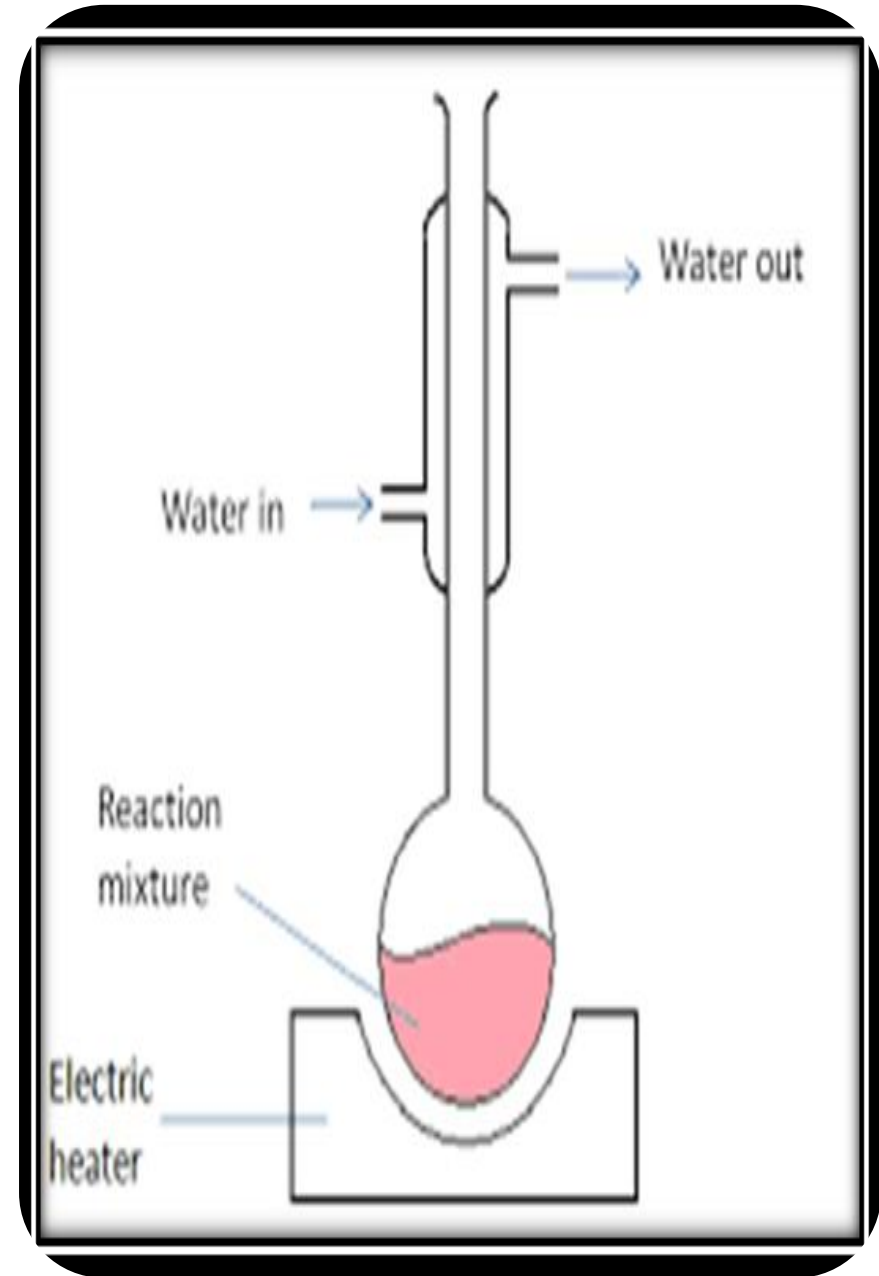
The plant powder is placed in a cellulose thimble in an extraction chamber, which is placed on top of a collecting flask beneath a reflux condenser. A suitable solvent is added to the flask, and the setup is heated under reflux.

When a certain level of condensed solvent has accumulated in the thimble, it is siphoned into the flask beneath.



# Reflux apparatus

Plant material is immersed in a solvent in a round-bottomed flask, which is connected to a condenser. The solvent is heated until it reaches its boiling point. As the vapor is condensed, the solvent is recycled to the flask, and the extraction is achieved.



# **Clevenger (water distillation, hydrodistillation)**

- In this method, we used a special apparatus which is called 'Clevenger',
- Used for isolating essential oils from aromatic plant materials like seeds, leaves, or flowers.
- Used for the extraction of hard parts of plants and for volatile oil not affected by heat.



**Clevenger  
(Oil heavier than Water)**



**Clevenger  
(Oil lighter than water)**