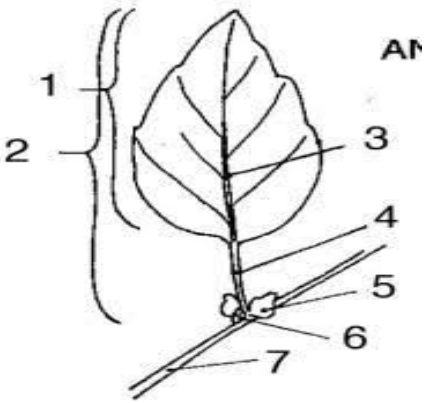
MORPHOLOGY AND ANATOMY OF LEAVES

Dr. Olumayowa Mary OLOWE

Plant Morphology

To successfully identify plants, it is necessary to have a keen awareness of taxonomic terminology and concise mental picture of leaf, bud. Stem, flower and fruit morphology.



Blade
Leaf

Mid rib

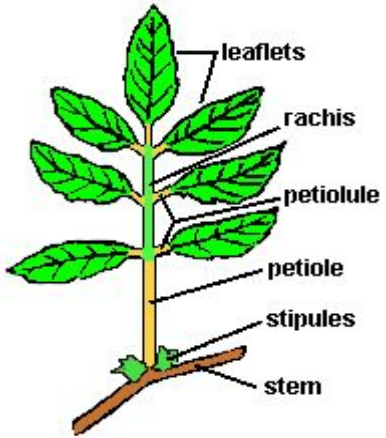
Petiole

Stipule

Bud

Stem

Simple Leaf



Compound Leaf

Plant Morphology Cont'd

- The position of the bud determines whether the leaf is simple or compound. In the case of the single leaf the bud is found in the axil of the leaf and stem. If the bud is located in the axil of a structure containing more than one leaf it is termed compound.
- Types of compound leaves include:

1. Palmately compound e.g *Berberis thunbergii* (Barberry),
2. Odd pinnate (Imparipinnate) e.g *Murraya*
3. Even pinnate (Paripinnate) e.g *Tamarindus indica*

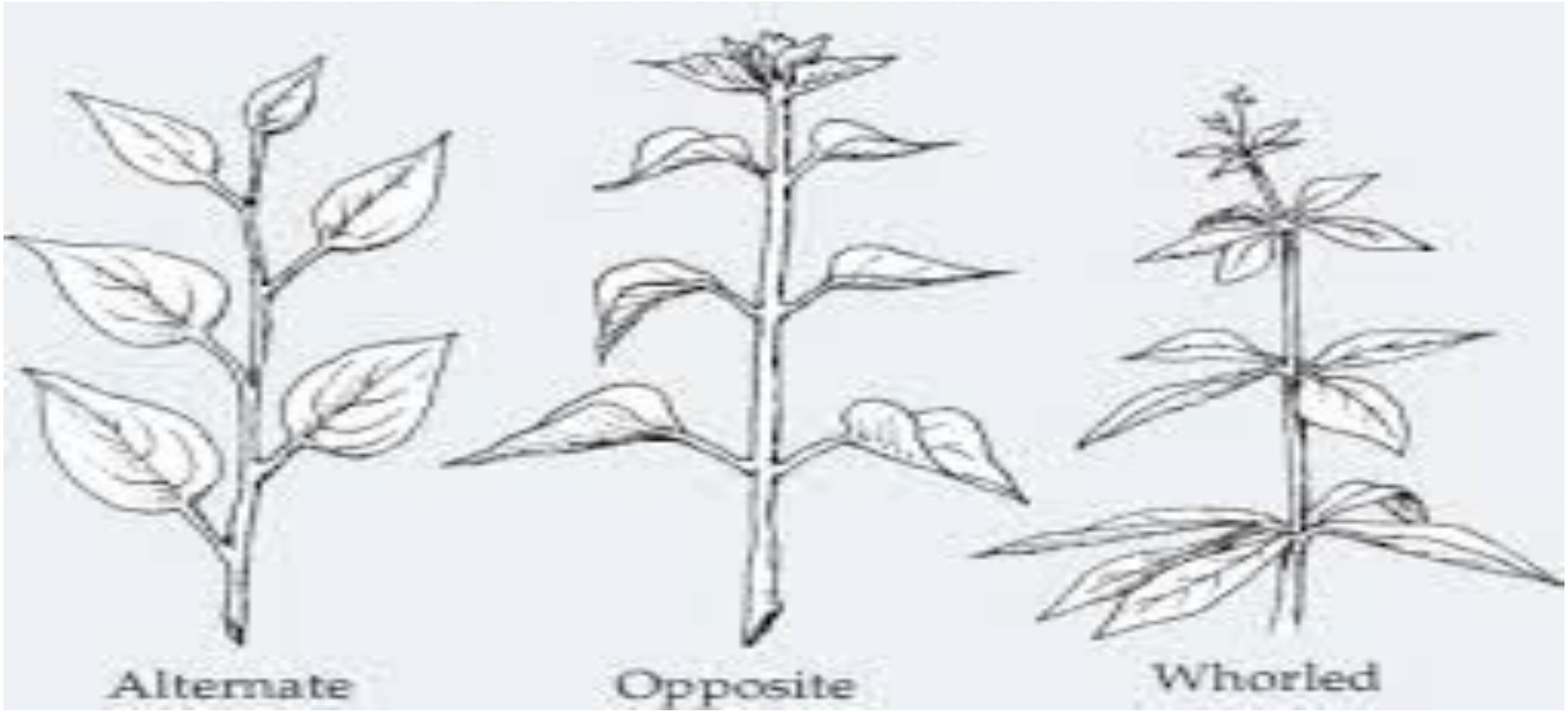
Compound Leaves

Pimately Compound Leaf

Odd Pinnately compound leaf

Even Pinnately Compound leaf

Arrangement of Leaves



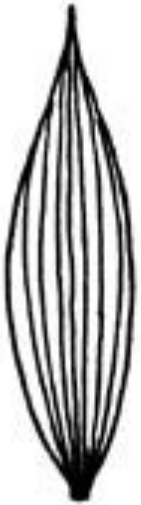
Arrangement of Leaves Cont'd

Alternate – Leaves or stems borne singly at each node (1 per node) e.g *Liquidambar styraciflua (Sweetgum), Berberis thunbergii* (Barberry).

Opposite – Leaves or stems borne across from one another at a node (2 per node) e.g *Olea* spp. (Olive tree), *Acer* spp. (Maple tree)

Whorled – Three or more leaves or stems arising at a node (3+ per node) e.g *Alstonia scholaris* (Blackboard tree), *Pittosporum eugenioides* (Lemonwood)

Types of Venation



Parallel

Reticulate

Penniveined

Palmate

Types of Venation Cont'd

Reticulate Venation:

When the veins are irregularly distributed to form a channel, it is known as Reticulate Venation. It is a common feature in dicots. There are two types

1. Pinnate Reticulate e.g *Hibiscus*, *Magnifera indica*
2. Palmate Reticulate e.g *Papaya, Cucurbita*

Parallel Venation:

Veins are parallel and do not form a network. There are of two types

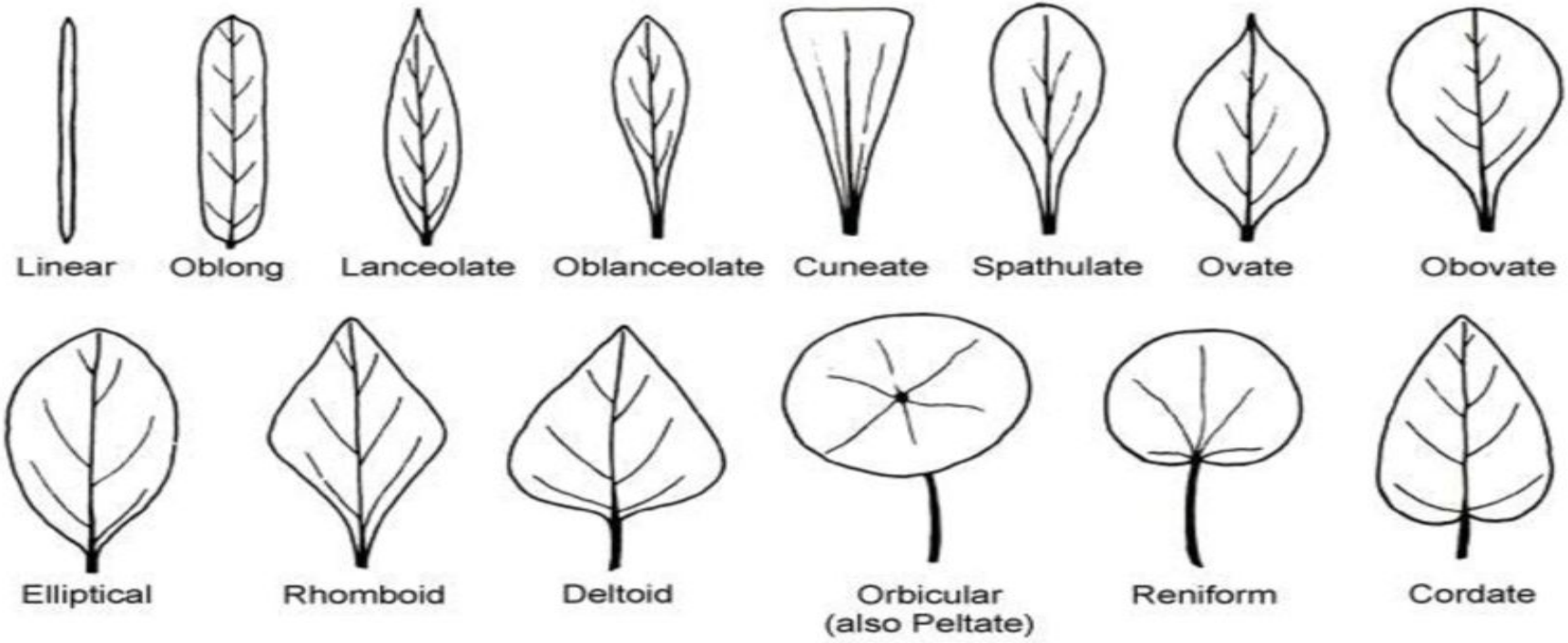
1. Pinnate Parallel e.g *Musa sapientum* (Banana)
2. Palmate Parallel e.g *Bambusa vulgaris* (Bamboo)

Types of Venation Cont'd

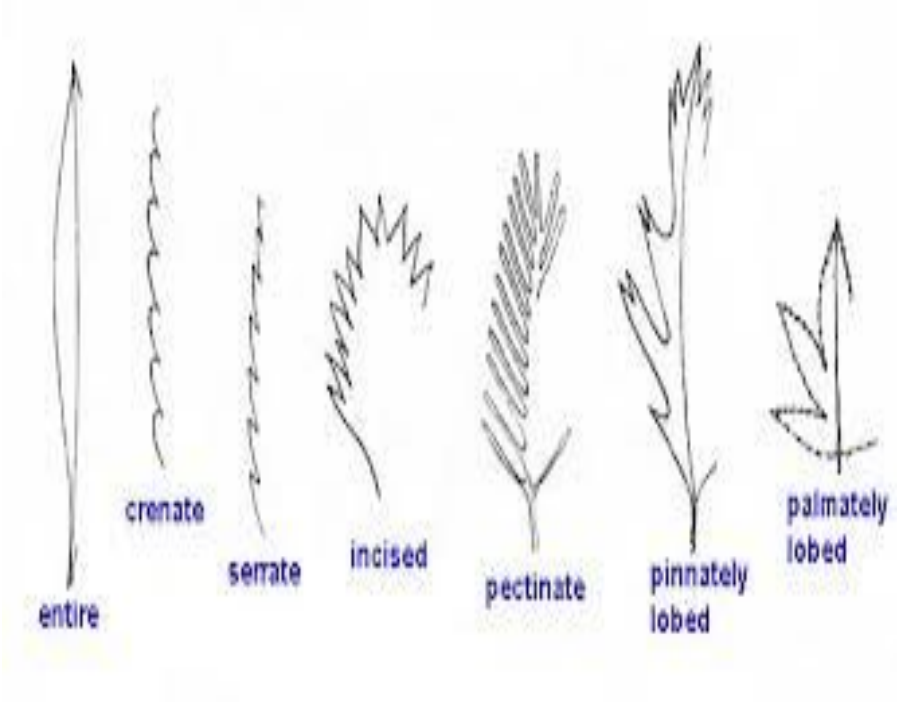
Penniveined Venation; the leaf has usually one main vein (called the **mid-vein**), with **veinlets**, smaller veins branching off laterally, usually somewhat parallel to each other; e.g. *Malus* (apples).

Palmate Venation: The veins radiate in a fan shape from the leaf petiole. Examples **include** *Acer* spp. (maple) and *Liquidambar styraciflua* (sweetgum leaves).

Leaf Shapes


Linear
Oblong
Lanceolate
Oblanceolate
Cuneate
Spathulate
Ovate
Obovate
Elliptical
Rhomboid
Deltoid
Orbicular
(also Peltate)
Reniform
Cordate

Leaf Margin


entire
crenate
serrate
incised
pectinate
pinnately lobed
palmately lobed

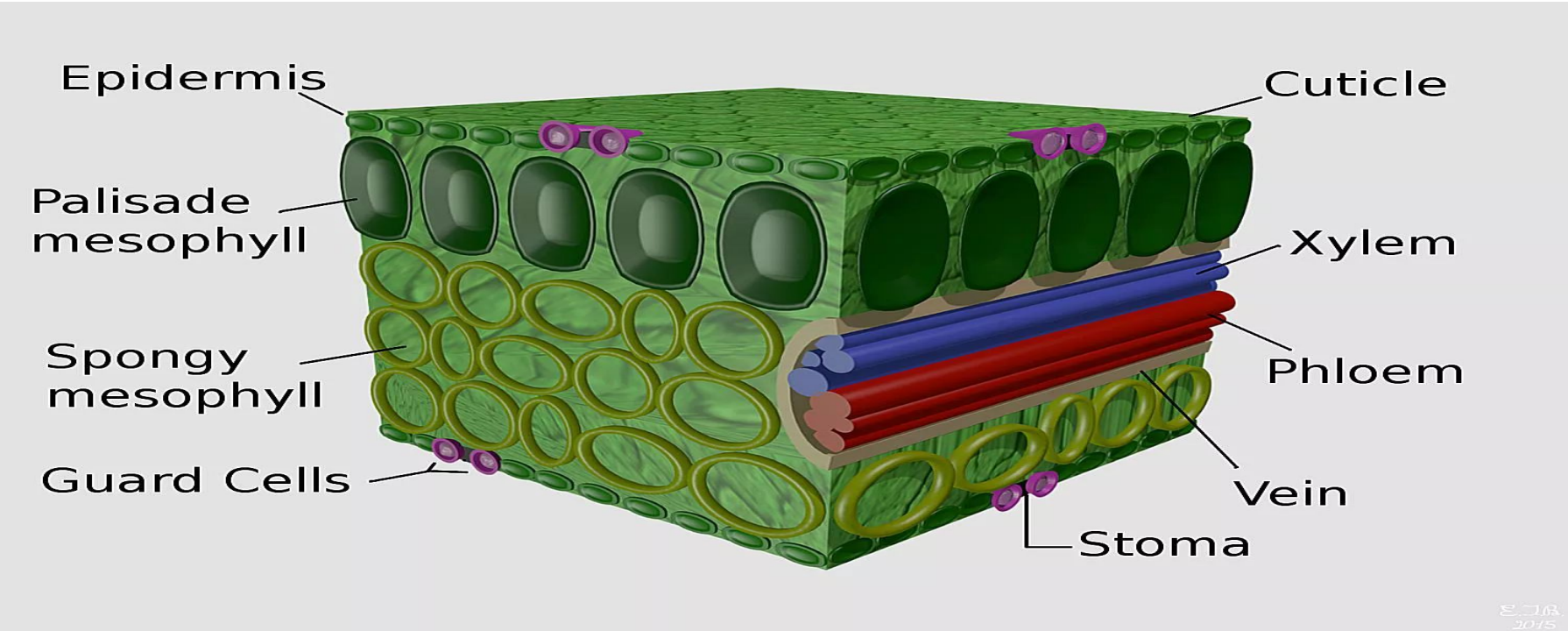

entire
serrated
lobed
undulate

Anatomy of Leaves

Leaves consist of:

- Epidermis with stomata
- Mesophyll (kind of parenchyma): Palisade mesophyll and Spongy mesophyll
- Vascular bundles, or veins.

INTERNAL STRUCTURE OF A LEAF



Source: https://www.thoughtco.com/plant-leaves-and-leaf-anatomy-373618

Leaf Anatomy

- The outer surface of the leaf has a thin waxy covering called the **cuticle**. This layer's primary function is to prevent water loss within the leaf. (Plants that leave entirely within water do not have a cuticle).
- Directly underneath the cuticle is a layer of cells called the **epidermis**.
- The vascular tissue, **xylem and phloem** are found within the **veins** of the leaf. Veins are actually extensions that run from to tips of the roots all the way up to the edges of the leaves. The outer layer of the vein is made of cells called **bundle sheath cells**, and they create a circle around the xylem and the phloem. In most veins, xylem is the upper layer of cells and the lower layer of cells is phloem. Recall that xylem transports water and phloem transports sugar (food).

- Within the leaf, there is a layer of cells called the **mesophyll**. The word mesophyll is Greek and means "middle" (meso) "leaf" (phyllon). Mesophyll can then be divided into two layers, the **palisade layer** and the **spongy layer**.

- Palisade cells are more column-like, and lie just under the epidermis,

- the spongy cells are more loosely packed and lie between the palisade layer and the lower epidermis. The air spaces between the spongy cells allow for gas exchange.

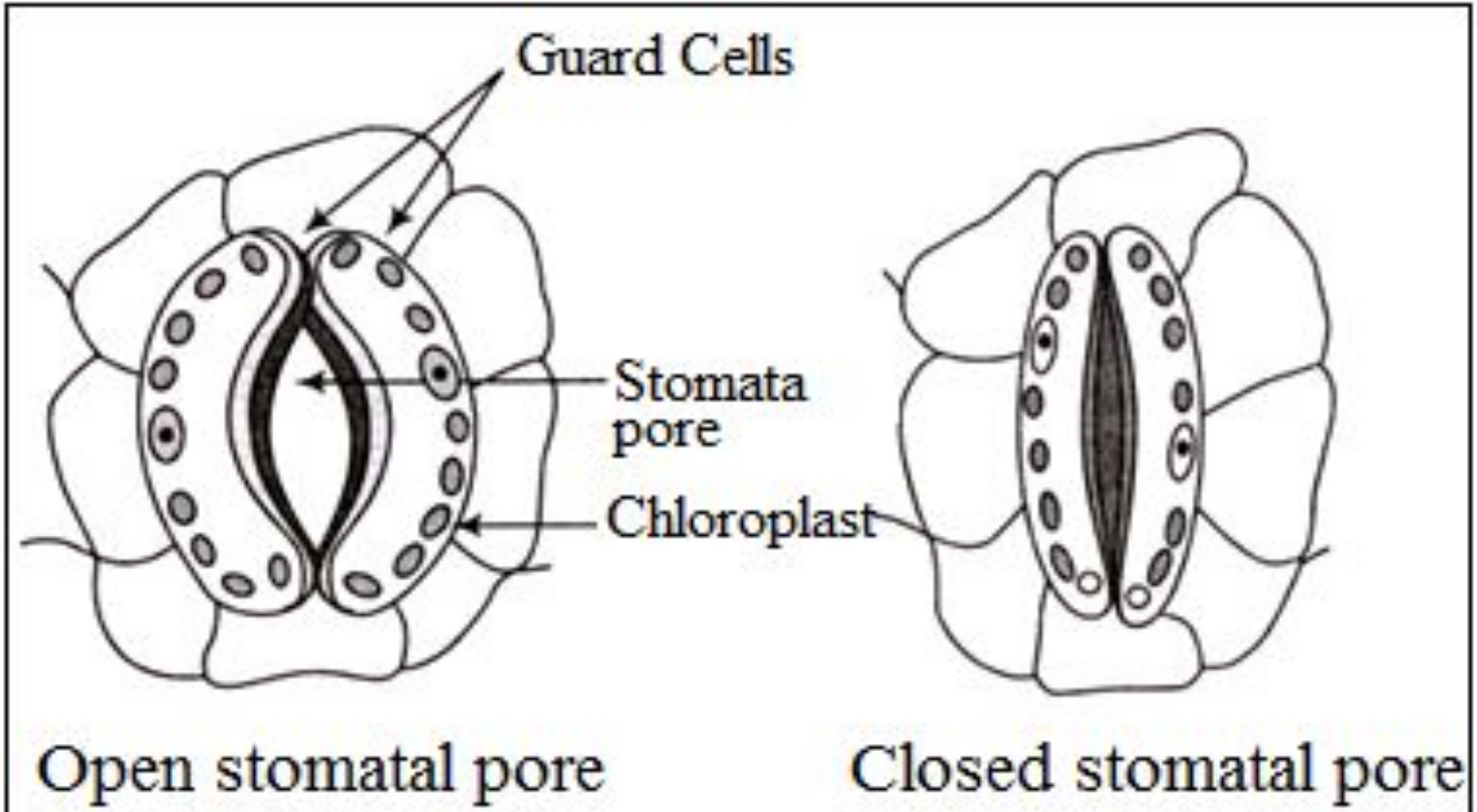
- Mesophyll cells (both palisade and spongy) are packed with chloroplasts, and this is where photosynthesis actually occurs.

Stomata

- Stomata are microscopic pores found on the underside of leaves. You will find the stomata in the epidermal tissue. The stomata is bounded by two half moon shaped guard cells that function to vary the width of the pore.

Stomata help regulate the rate of transpiration

- About 90% of the water a plant loses escapes through stomata
- open
  - Increase photosynthesis
  - Increase water loss through stomata
- closed
  - Decrease water loss through transpiration


Guard Cells
Stomata pore
Chloroplast
Open stomatal pore
Closed stomatal pore