i.e., autotrophs). Note also that plant
the two terms are essentially synony-
d on how they transport water, the
further subdivided into *seedless plants*
ing plants (*gymnosperms*) and flower-

plants, called *xylem* and
ed in the next chapter.)
er is abundant. Further-
nts do NOT have true
rworts, and hornworts.

contain the vascular
ves, and roots. They do
es, which can be

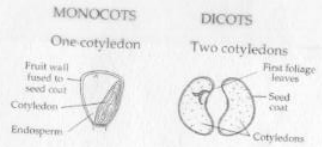
rs to the cones that
vergreen trees, such as
protected in a seed
ms. Gymnosperms do

produce flowers and
ts. Examples are

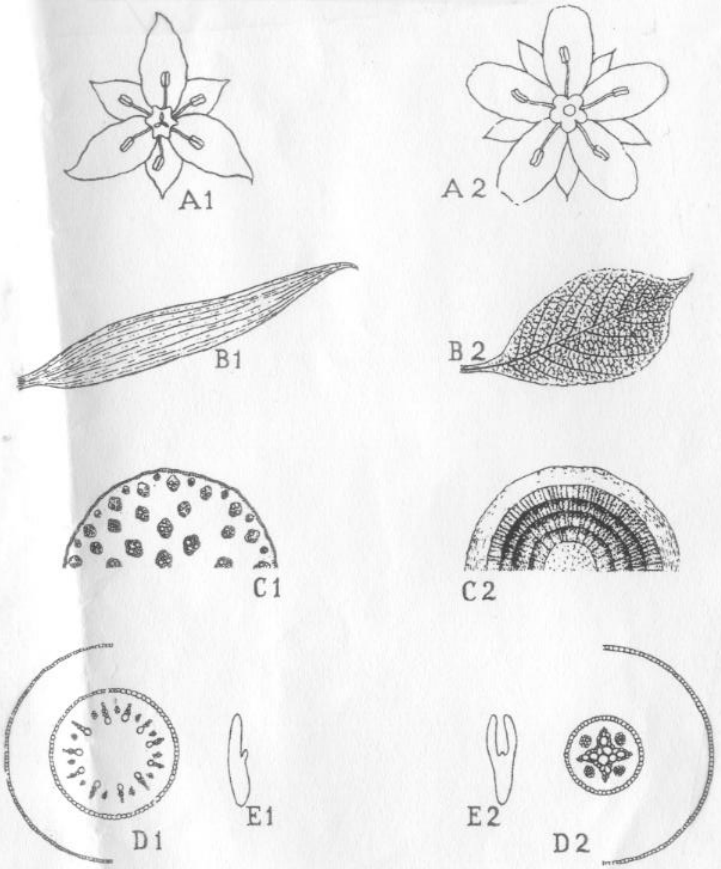
(*mono* = one)
ots include
ltiples of threes, a
tems, and a

netlike veins in
five, vascular

2 OF 4 1



Comparison of Monocots and Dicots
Figure 1

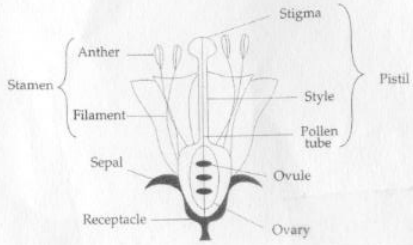


A1. Flower parts usually in threes or sixes
A2. Flower parts usually in fours or fives
B1. Leaves usually parallel veined
B2. Leaves usually net veined
C1. Stems endogenous, bundles separate and irregular in arrangement
C2. Stems exogenous, with central pith and outer cortex separated by bundles which form a hollow tube; annual rings in woody stems

D1. Roots have several to many xylem element
D2. Roots usually have three, four, or five xylem elements
E1. One cotyledon, or seed leaf
E2. Two cotyledons, or seed leaves

Flowers and Reproduction

Flowering plants are called angiosperms, and for the Biology E/M test you should know something about how they reproduce. Here's a typical flower and its parts:



The stamen: The stamen is the plant's male component. It consists of the *anther* and the *filament*. The filament supports the anther, which makes *pollen*. Pollen is made from little cells called *microspores*, and mature pollen grains contain a cell that can divide to form two sperm cells.

The pistil: The pistil is the plant's female component. It consists of the *stigma*, *style*, *ovule*, and *ovary*. Inside the ovary is the ovule, which forms cells called *megaspores*. Megaspores can divide to form eggs and polar bodies.

Here's how a flowering plant reproduces:

1. Some pollen grains fall onto the stigma, which is sticky. There are many ways this can happen; they can be blown there, fall there, be moved there by insects, etc. Once on the stigma, the pollen grains germinate.
2. During germination, a tube called the *pollen tube* grows down through the style to connect to the ovary.
3. The two sperm (from the pollen) travel down the pollen tube to enter the ovary and the ovule, where they undergo a double fertilization; one sperm fertilizes the egg, and the other sperm combines with the polar bodies.
4. The fertilized egg becomes the plant embryo and the polar bodies become *endosperm*. Endosperm is a food-storing tissue that surrounds the plant embryo.
5. The entire ovule, which contains the embryo and the endosperm, develops into a *seed*; and the ovary develops into a *fruit*. The fruit protects the seed and helps it disperse by wind or animals.
6. The seed is released (the fruit drops, the plant is eaten, etc.), and, when it finds a suitable environment, it develops into a new plant.

Here's a summary:

pollen falls on stigma
↓
pollen germinates
↓
pollen tube grows
↓
two sperm enter ovule
↓
egg is fertilized and becomes embryo
↓
polar bodies are fertilized and become endosperm
↓
the entire ovule becomes a seed and the ovary becomes a fruit