Plant Reproduction

- In the plant kingdom, both sexual and asexual reproduction occur.
- Recall from Chapter 3 that plants reproduce sexually by sporic reproduction, which is also called alternation of generations.
- Haploid cells have one copy of each chromosome (1n), while diploid cells have two copies of each chromosome (2n).
- The gametophyte (1n) produces gametes (1n), while the sporophyte (2n) produces spores (1n).
- The male and female gametes unite to form a sporophyte.
- Through mitosis, the male and female spores grow into male and female gametophytes.
- Sexual reproduction occurs when the male gamete (a sperm cell) unites with the female gamete (an egg cell).
- This union of male and female gametes is called ***fertilization***.

Alternation of Generations

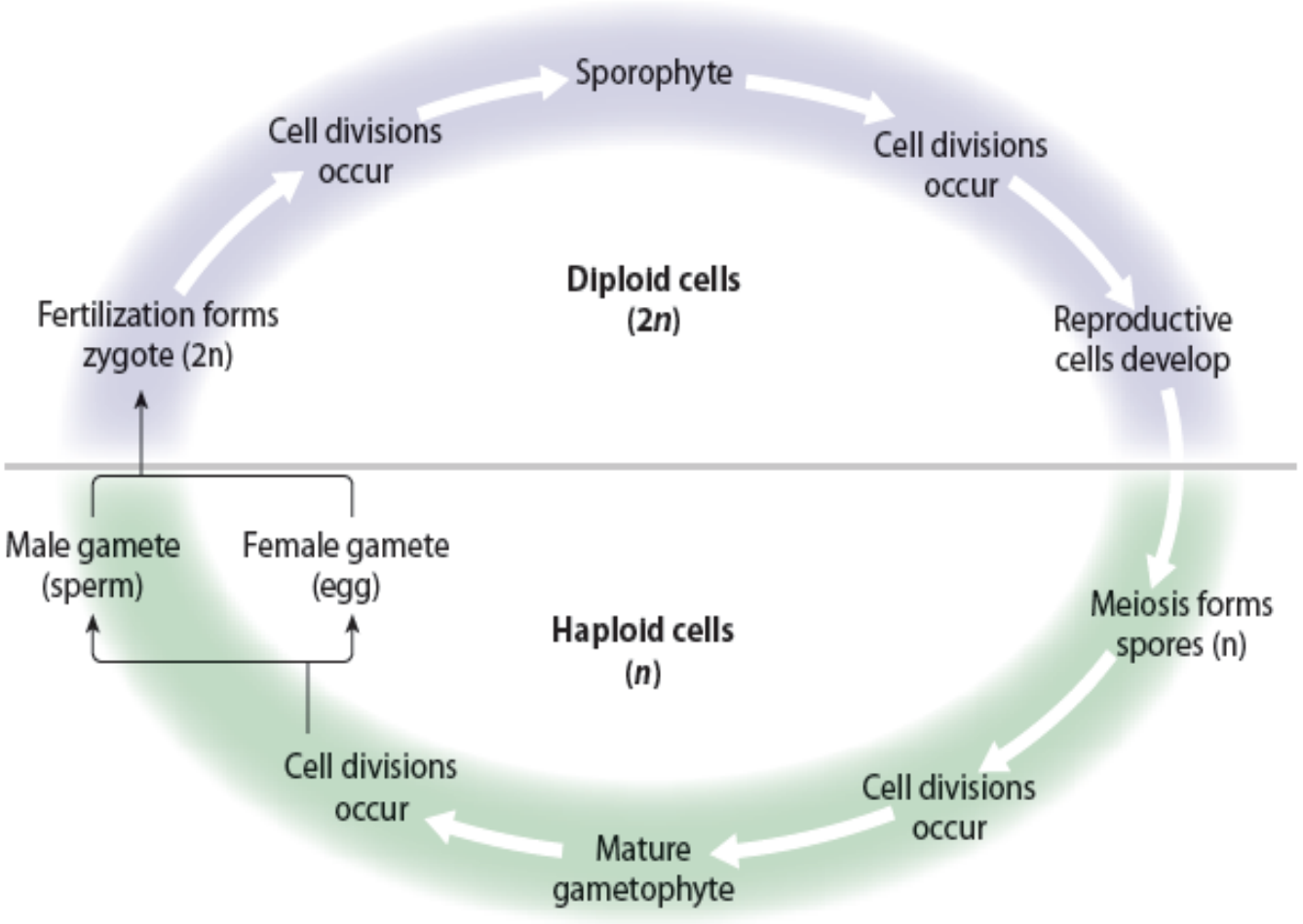


Figure 14.1 All plants have a life cycle involving alternation of generations. The cycle varies among species. The variation is mostly due to the type of structure that releases the spores.

Sexual Reproduction in Seedless Plants

- In seedless plants, fertilization requires the sperm to swim from the male gametophyte to the egg (female gametophyte).
- Therefore, water must be present, and the sperm must have a flagellum to enable it to move in the water.
- In non-vascular seedless plants, the gametophyte is the dominant generation, so the gametophyte plant is larger and longer-lived.
- In seedless vascular plants, the sporophyte is the dominant generation, and the gametophyte is smaller and shorter-lived.
- In both groups of seedless plants, however, the gametophyte is a free-living plant, independent of the sporophyte.

Sexual Reproduction in Seed Plants

- In seed plants, the gametophytes are not free-living plants.
- The male gametophytes, called microspores, are small structures that develop into pollen grains that, in turn, produce sperm cells.
- The female gametophytes, called macrospores, produce egg cells.
- In seed plants, the whole male gametophyte – not just the sperm – travels to the female gametophyte.
- ***Pollination*** occurs when the pollen grain lands on the female reproductive structure of another plant of the same species.
- The pollen grain encases the cells that develop into the sperm and protects them from drying out as they travel to the female gametophyte.

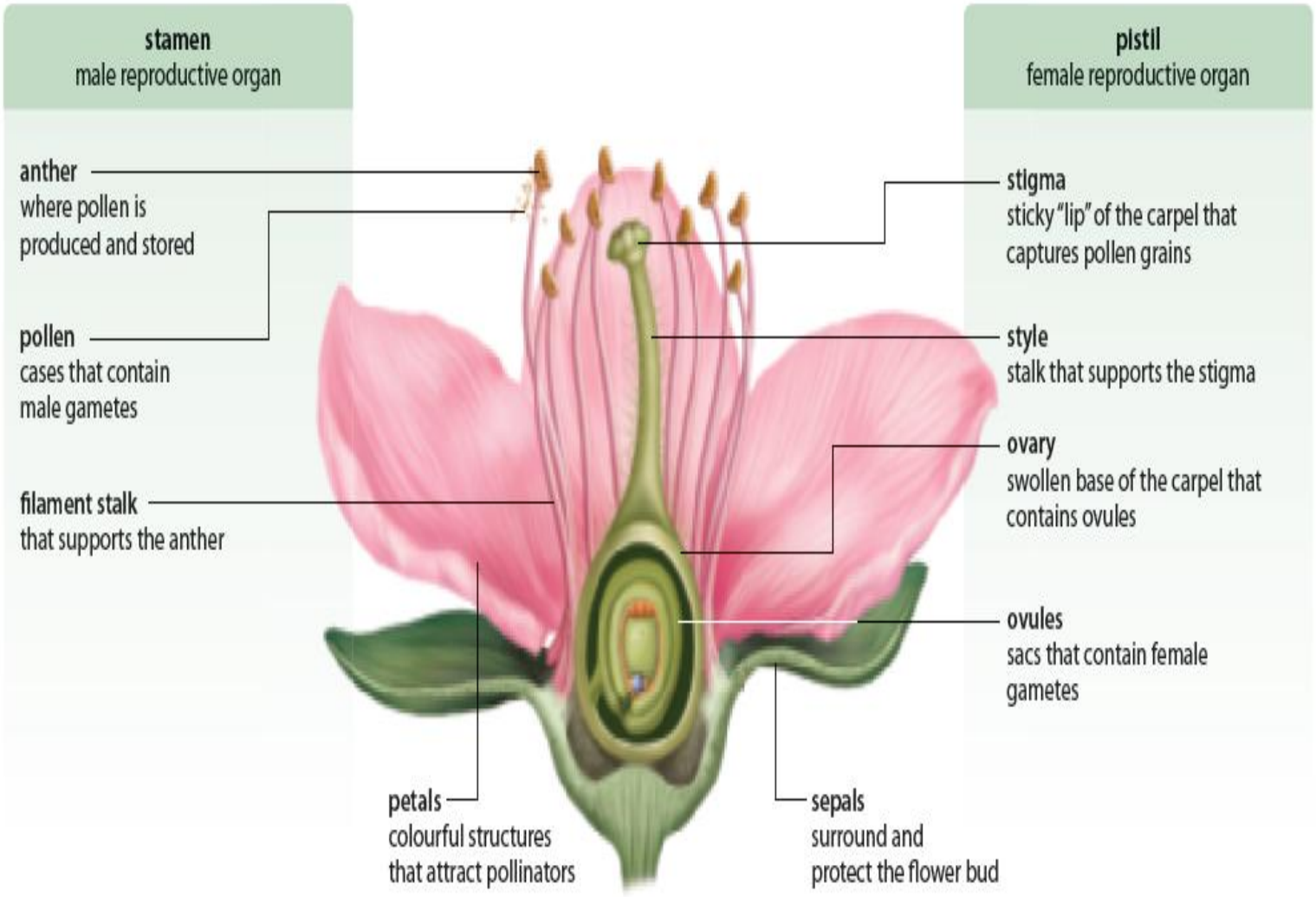
Sexual Reproduction in Gymnosperms

- Pollination does not require water to transport sperm to a female gametophyte (therefore the sperm do not have flagella).
- Instead, transfer of sperm to the egg occurs by means of a pollen tube. This structure is an extension of a pollen grain that grows toward the egg cell. Sperm develop in the pollen tube and move toward the egg.
- Fertilization occurs when a sperm unites with an egg to form a zygote.
- After fertilization, the zygote develops into an embryo, when together with a small supply of stored food, is covered by a tough, waterproof coat to form a seed.
- Seeds remain on the plant, within the female reproductive structure, until they are mature (several months to three years).
- The seeds are then released and carried away from the parent plant by the wind or by animals.

Sexual Reproduction in Angiosperms

- Angiosperms are the most diverse and widespread plants on Earth.
- The most important factor in this success is the structure that contains their reproductive organs – the flower.
- In general flowers have four organs**: sepals, petals, stamens,** and one or more **pistils**.
- Sepals protect the flower bud.
- Petals are usually colourful structures that attract pollinating insects and provide them with a platform on which to land.
- Most flowers have several stamens, which are male reproductive organs.
  - A stamen is composed of a filament and the anther. The filament supports the anther, which contains cells that undergo meiosis and mitotic cells divisions to form pollen grains.
- The female reproductive structure of a flower is the pistil.
  - In the centre of a flower is one or more pistils. A pistil usually has a stigma, a style, and an ovary. The stigma is the tip of the pistil and is the place where pollination takes place. The style connects the stigma to the ovary, which contains one or more ovules.

An Angiosperm



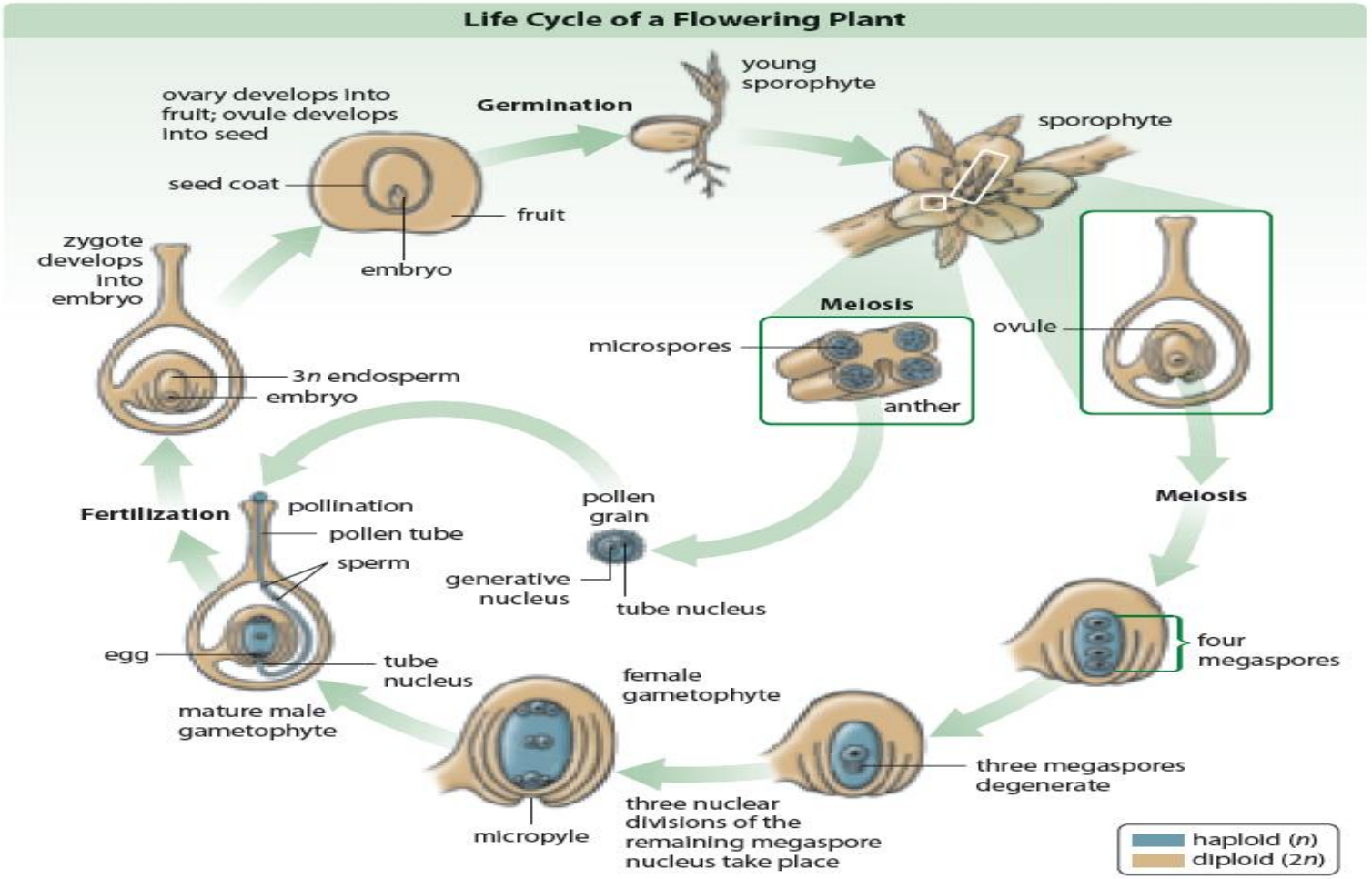
Variations Among Flowers – Structural Differences

- Flowers with sepals, petals, stamens, and one or more pistils are called ***complete flowers*** (roses, tulips, and lilacs).
- If a flower is missing one or more of these organs, it is an ***incomplete flower***. (wild ginger are incomplete, because they have no petals, as are most grasses).
- Flowers that have both pistils and stamens are called ***perfect flowers***.
- Flowers that contain either pistils or stamens, but not both, are called ***imperfect flowers***.
- In some species, such as corn plants and oak trees, individual flowers are imperfect but the plant bears both male and female flowers. These are called ***monoecious plants***, because all reproductive structures appear on one (mono-) plant.
- Other plants carry either male or female flowers, but not both. These are called ***dioecious plants***, because the reproductive structures are divided between two (di-) plants.

Pollination Mechanisms

1. **Self-pollination and Cross-pollination**
   - Self-pollinating plants can pollinate themselves or another flower on the same plant, but this can lead to inbreeding and loss of genetic variation.
   - Most angiosperms are cross-pollinating plants, meaning that they receive pollen from another plant, ensuring genetic diversity.
2. **Animal Pollination**
3. **Wind Pollination**

The Lifecycle of a Flowering Plant



A Summary of Plant Reproduction

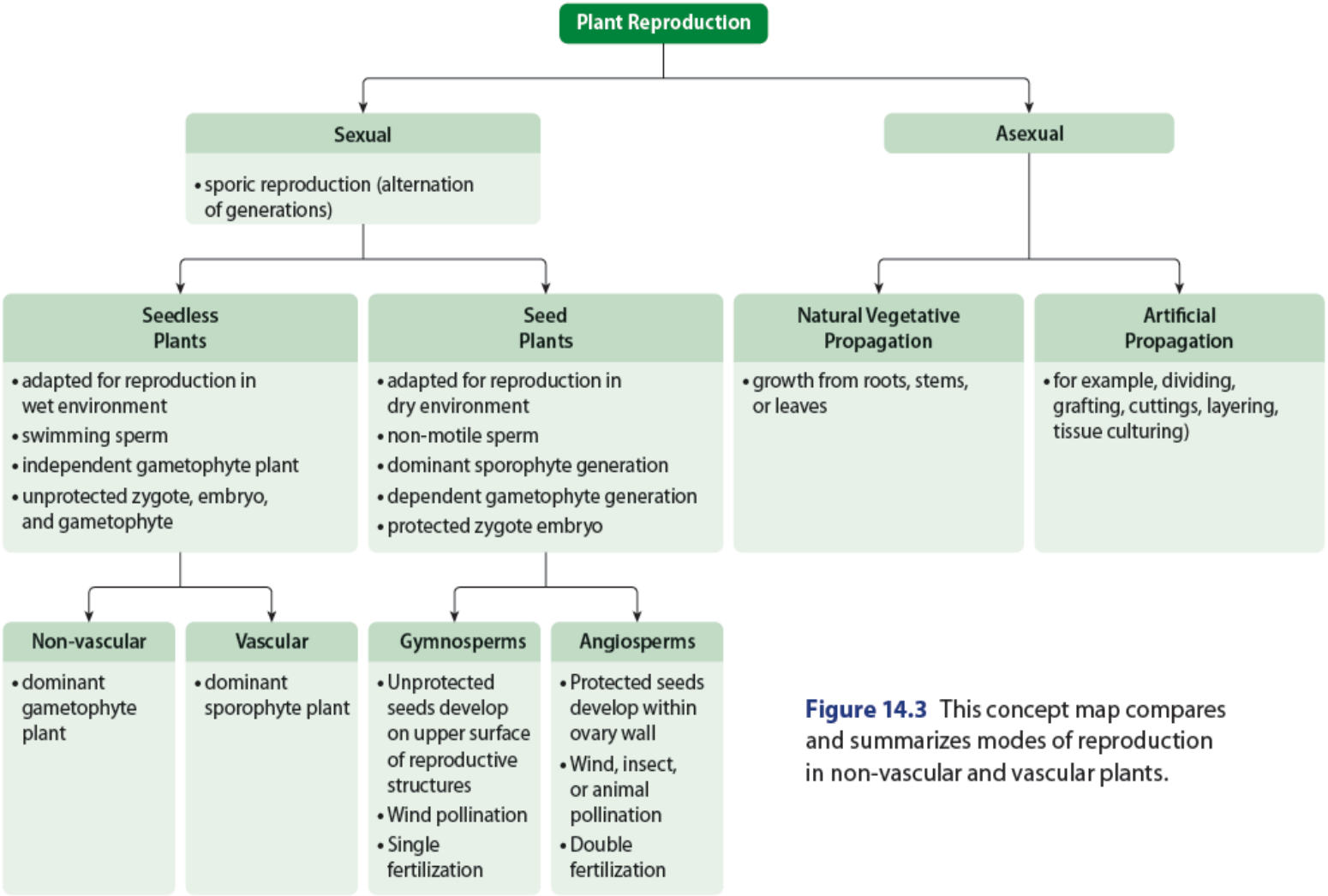


Figure 14.3 This concept map compares and summarizes modes of reproduction in non-vascular and vascular plants.