Plant Life Cycles

Section 1: Plant Reproduction

• How do plants reproduce?

Plants can reproduce by both sexual and asexual means. Sexual reproduction involves the coming together of sex cells, called gametes, which have often been produced by different parents. This has the benefit of generating greater genetic diversity in the offspring, which can in turn be useful in evolutionary change. Asexual reproduction, by comparison, involves only one parent and creates genetically identical offspring, which can be useful to rapidly increase a population in ideal conditions.

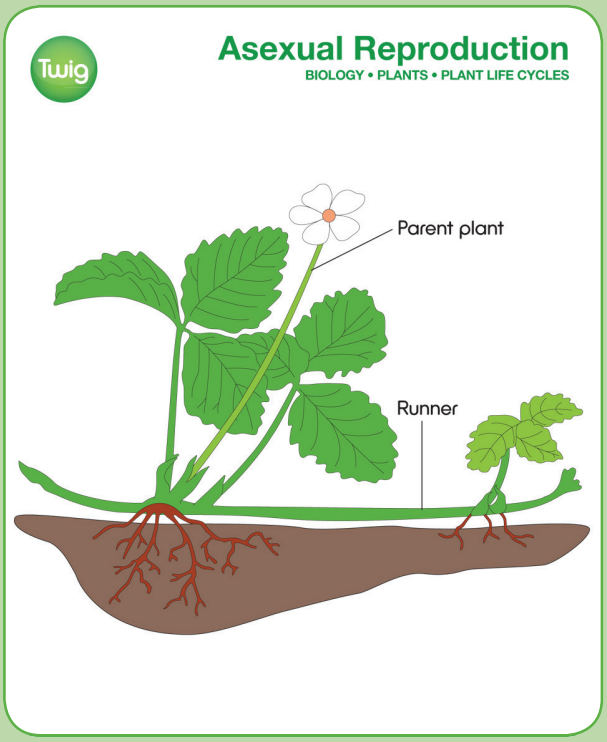
Extension Question

Q1. Can the same plant reproduce by both sexual and asexual means?

Yes. Most plant species are able to employ both sexual and asexual modes of reproduction. For example, a strawberry plant can grow runners (asexual) or produce flowers, seeds and fruits (sexual).

• What mechanisms do plants use to reproduce asexually?

DIAGRAM 01:



Typically, plants can grow extensions from the parent plant, which eventually become separate and then develop into new individuals, independent of the original parent. For example, plants such as strawberries can grow horizontal extensions called runners. Each runner eventually forms roots at some distance from the parent plant, allowing it to eventually develop into an independent plant, separate but genetically identical to its parent.

• Suggested Film

- Asexual Reproduction in Plants

Orchids have brightly coloured petals and sweet scents to attract insects

Extension Question

Q2. What are the benefits of asexual reproduction?

Asexual reproduction is an extremely successful strategy. Only one parent is needed, offspring can be created quickly and sometimes in great numbers, allowing a habitat to be colonised rapidly.

• How do plants reproduce sexually?

Plants can reproduce sexually using flowers. Inside the flower are the reproductive organs, including the male stamens and female ovary. Anthers on the stamen produce pollen, which contains the male gamete and must 'pollinate' a flower by landing on the stigma of the same or different plant. Some plants use the wind to distribute the pollen, others rely on insects. Once a flower has been pollinated, the pollen grain grows a tube down to the ovary where it 'fertilises' a female ovule, which in turn contains the female gamete. This fertilised ovule then develops into a seed and the ovary turns into a fruit.

Bees carry pollen from the male anther to the female stigma

- **Suggested Film**
  - **Sexual Reproduction in Plants**

Extension Question

Q3. What are benefits of sexual reproduction?

Sexual reproduction is often more complicated and risky than asexual reproduction, but it has the major advantage of producing genetic variation in the offspring. If the offspring have genetic differences it allows the species to evolve and adapt to changing conditions over time.

Section 2: Germination

• How are seeds dispersed?

Once the seed has been produced it needs to be dispersed away from the parent plant and in a place where it can successfully germinate. This is the job of the fruit. The fruits of different species employ different strategies for effective dispersal. Many, for example, develop into sweet, succulent fruits in order to be eaten by animals such as birds, which then disperse the seeds when they defecate. Others develop 'wings' and 'parachutes' in order to catch the wind, and some produce 'hooks' to catch in the fur of animals.

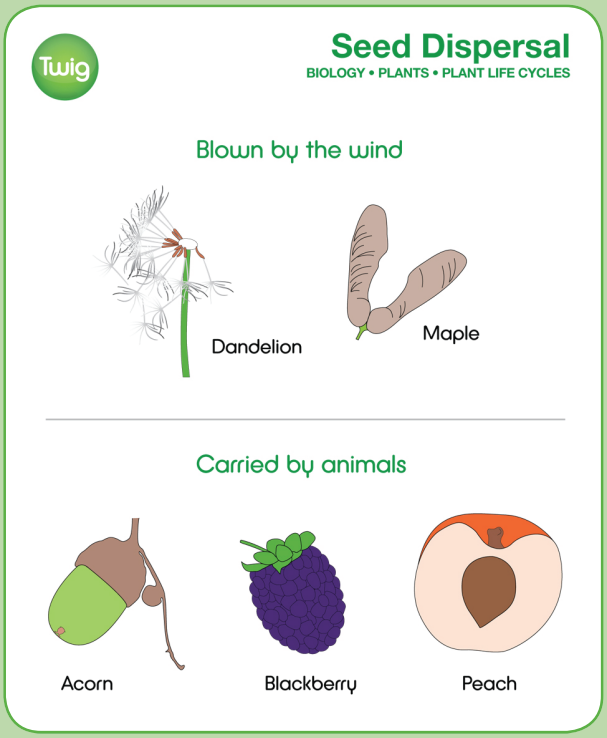
Extension Question

Q4. Why is dispersal important to the species?

Dispersal of seeds allows a species to colonise new habitats. It also ensures that offspring do not grow too close to their parents or each other, and this is important to minimise competition for resources such as water and light.

Dandelion seeds are carried by the wind.
Each seed has its own 'parachute'

DIAGRAM 02:



• What do seeds need to germinate?

Germination involves the development of the dormant seed into a growing seedling. This requires the seed to respire to release energy from its stored food reserves and to begin growing by producing new cells. In order to do this the seed needs three key conditions: water, oxygen and warmth. The water is necessary to hydrate the tissues, kick start chemical reactions and expand cells. Oxygen is required for aerobic respiration, and warmth is required so that the various chemical reactions can proceed at a suitable rate. Once these conditions are met, the metabolic processes in the seed can begin, food stores can be broken down, respiration can take place, and cell division can occur.

Extension Question

Q5. How does water enter the seed?

Seeds are dry and so water simply enters by osmosis. As water enters the seed swells, its coat often splits open and germination can begin.

• How do seeds germinate?

When a seed germinates the food reserves are broken down and used for both respiration and the production of new plant tissues. Cell division and expansion proceeds rapidly as the plant produces its first root (called a radicle) and its first shoot (called a plumule). The developing seedling has to rely entirely on its stored food reserves until it is able to manufacture its own food by photosynthesis.

Oak trees produce thousands of acorns, each containing just one seed

Extension Question

Q6. When a seed germinates, how does the root know to grow down?

Plants are able to sense stimuli in their environment including gravity. Roots are positively geotropic, meaning they can sense gravity and grow down in order to absorb water and minerals for the developing seedling. Shoots are negatively geotropic, so they grow up towards the light for photosynthesis.

• Suggested Film

- Oak Life Cycle

Section 3: Mutualism and Mimicry

• Why do plants rely on other organisms?

Plants are sessile organisms, which means they are fixed to the ground and cannot move from place to place. This presents them with unique challenges such as avoiding predation, reproducing with other individuals of the same species, and dispersing their offspring. They often employ other organisms to help them, frequently offering food and bribes in return! For example, many plants attract insects to their flowers with bright colours, sweet smells and the offer of nectar. In return, the insects carry pollen from plant to plant and thereby ensure successful pollination. In this relationship the species are helping each other: this is called a mutual relationship. Another example of mutualism is seen in the way plants allow their fruits to be eaten by birds and other animals. In return, of course, the plant gets its seeds dispersed when the animal defecates.

The acacia tree provides a good home to ants. In return, they protect the acacia by attacking the tongue and lips of any herbivore that attempts to eat it

• Suggested Film

- Plant and Animal Mutualism

Extension Question

Q7. Do humans have any mutual relationships with other species?

Many bacteria in the guts of humans live in a mutualistic relationship with their host. The bacteria gain food from the human's diet, and the bacteria help both in some aspects of digestion and in the production of various vitamins, which the human host needs for good health. There are such things as 'good' bacteria!

• What are plant mimics?

Many plants need to defend themselves against herbivores, which want to eat their leaves and stems. To protect themselves some species employ defences such spines and stings, or pack their tissues with foul tasting chemicals. Some plants mimic these plants even though they don't actually sting or contain poison. For example, the white dead nettle looks almost identical to the stinging nettle, and yet does not actually possess a sting itself, and as a result is not eaten by rabbits. There are many examples of mimicry in both the animal and plant kingdoms.

- **Suggested Film**
  - **Plant Mimics**

Extension Question

Q8. Are there any mimics in the animal kingdom?

There are plenty of animal mimics, especially amongst the insects. Hoverflies mimic wasps with their yellow and black striped bodies, and there are many examples of butterflies\ which mimic poisonous and foul tasting butterflies without going to the expense of producing the chemicals themselves.

• Quizzes

Sexual Reproduction

Basic

• What is the function of flowers?

A – respiration
B – asexual reproduction
C – photosynthesis
D – sexual reproduction

• What carries the male gametes?

A – petals
B – sepals
C – ovaries
D – pollen

• What is the scientific name for a plant egg?

A – ovule
B – anther
C – filament
D – ovary

• What term is used to describe the development of a seed into a seedling?

A – pollination
B – fertilisation
C – germination
D – flowering

Advanced

• What protects the developing flower bud?

A – petals
B – sepals
C – ovaries
D – pollen

• Pollination occurs when pollen lands on which part of the flower?

A – ovule
B – style
C – filament
D – stigma

• Once fertilised, what do the ovules develop into?

A – seeds
B – fruits
C – flowers
D – ovaries

• Once fertilised, what does the flower turn into?

A – a seed
B – a fruit
C – a stamen
D – an ovary

• Answers

Sexual Reproduction

Basic

• What is the function of flowers?

A – respiration
B – asexual reproduction
C – photosynthesis
D – sexual reproduction

• What carries the male gametes?

A – petals
B – sepals
C – ovaries
D – pollen

• What is the scientific name for a plant egg?

A – ovule
B – anther
C – filament
D – ovary

• What term is used to describe the development of a seed into a seedling?

A – pollination
B – fertilisation
C – germination
D – flowering

Advanced

• What protects the developing flower bud?

A – petals
B – sepals
C – ovaries
D – pollen

• Pollination occurs when pollen lands on which part of the flower?

A – ovule
B – style
C – filament
D – stigma

• Once fertilised, what do the ovules develop into?

A – seeds
B – fruits
C – flowers
D – ovaries

• Once fertilised, what does the flower turn into?

A – a seed
B – a fruit
C – a stamen
D – an ovariy