

REPRODUCTION: LIFE CYCLES, ASEXUAL & SEXUAL

17 JULY 2013

Lesson Description

In this lesson, we:

- Define reproduction in terms of:
 - Sexual and
 - Asexual
- Compare Asexual and Sexual reproduction:
 - Asexual reproduction in nature
 - Artificial asexual reproduction
- Look at Life Cycles with respect to:
 - Alternation of generations
 - Haploid and diploid states

Key Concepts

Definition of Reproduction

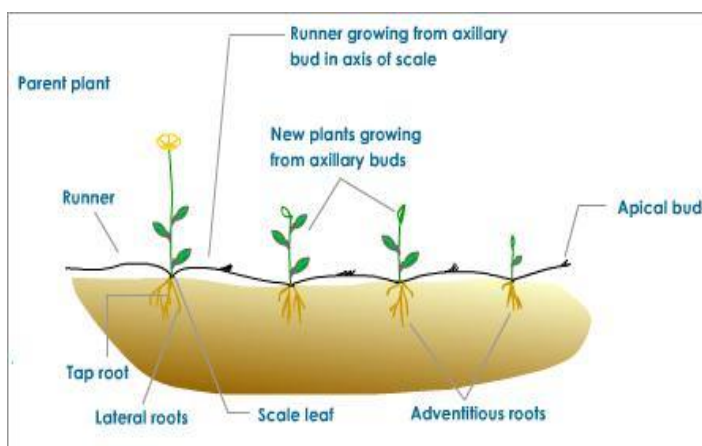
- **Asexual reproduction** is the formation of a new organism from a single parent by means of mitosis. The new organism is essentially a clone of the parent.
- **Sexual reproduction** is the formation of a diploid zygote by means of the fusion of haploid male and female gametes. The zygote undergoes mitosis and forms the new organism.

Comparison of Sexual and Asexual Reproduction

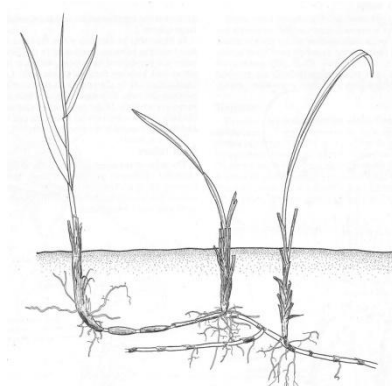
Sexual Reproduction	Asexual Reproduction
Advantages	
• Offspring are genetically different to each other and to parents • Increased chances of survival due to increased variation • The cross fertilisation of organisms to produce better / stronger / more viable organisms is possible	• Only 1 parent needed • New individuals genetically identical to parent • Offspring produced in a short amount of time • No need for pollinators or dispersal agents
Disadvantages	
• A genetic weakness in the parent will be passed on to offspring • No genetic variation from generation to generation • Too many offspring in a short time can lead to overcrowding • Two parents required • Offspring born helpless and vulnerable and may take a long time to mature • Some plants may require pollinating agents or dispersal agents	• A genetic weakness in the parent will be passed on to offspring • No genetic variation from generation to generation • Too many offspring in a short time can lead to overcrowding

Asexual Reproduction in Nature

- Mass produced crops such as sugar cane and potatoes in South Africa are planted using cuttings taken from the stem.
- **Stolons** are horizontal runners formed from lateral buds on a shoot. An example of this is a strawberry plant. The **stolons** have nodes and long internodes. A bud forms at each node and produces a new plant with a root and a shoot e.g. strawberry plants
- The new plant is nourished by the parent plant via the **stolon** until the new plant is self-sufficient
- Some plants have underground stems called **rhizomes** from which shoots and roots form. The **rhizome** disappears and the new plant becomes independent.



(<http://www.tutorvista.com/content/biology/biology-ii/reproduction/asexual-reproductions.php>)



(<http://www.biology-resources.com/drawing-plant-tropical-11.html>)

Artificial Asexual Reproduction

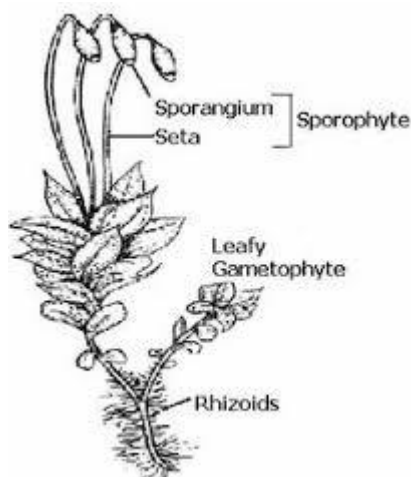
- There are two types of asexual reproduction – cuttings and tissue cultures.
 - Cuttings refer to a cut end of a stem being placed into water or moist soil and the roots then grow from the base of the stem.
 - Many flowers such as geraniums, chrysanthemums and carnations can be propagated from cuttings.
 - Tissue cultures use a single cell and mitosis to grow complete plants.
 - Plant hormones are used to promote growth.

Life Cycles

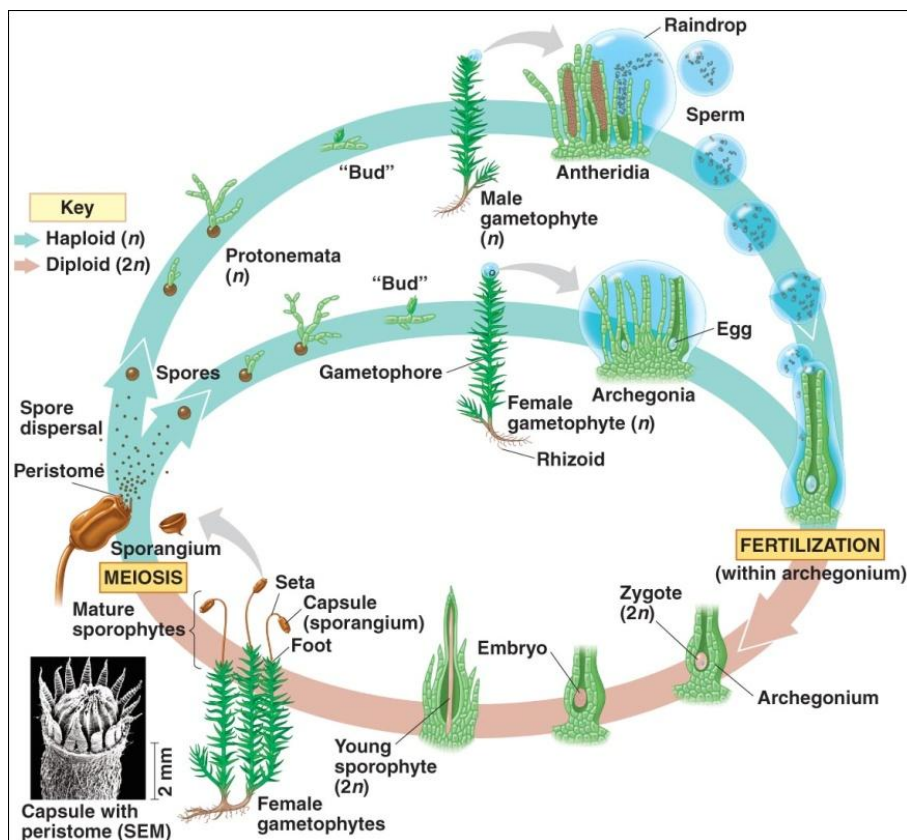
- Plants alternate generations – a haploid plant produces gametes (gametophyte generation) and alternates with a diploid plant that produces spores (sporophyte generation)

Life Cycle of the Moss

- A moss plant has the gametophyte generation as the dominant generation.
- The gametophyte can only reproduce sexually and the sporophyte generation can only reproduce asexually while the diploid sporophyte generation can only reproduce asexually and give rise to the gametophyte generation.



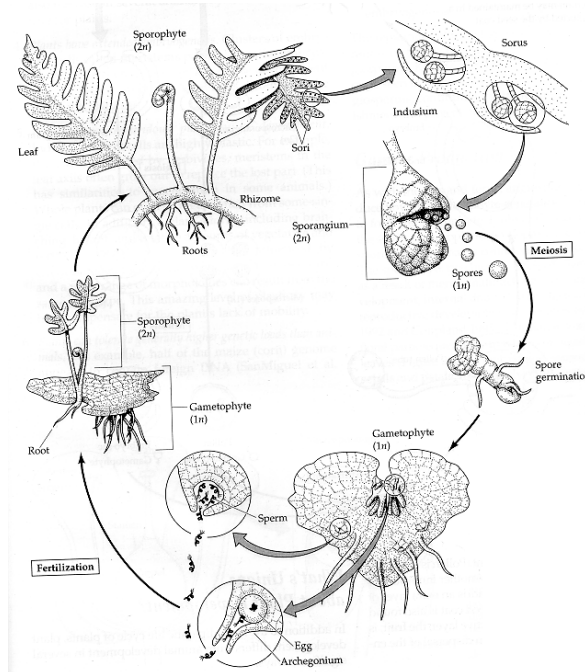
(<http://togreen.blogspot.com/2009/01/plant-classification.html>)



(<http://www.aquaticplantenthusiasts.com/plants/4554-aquatic-moss.html>)

Life Cycle of the Fern

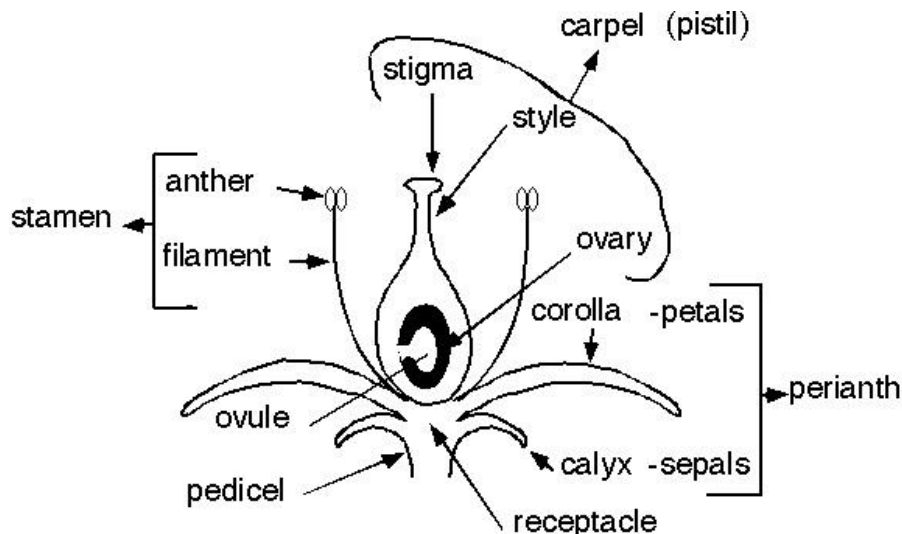
- The dominant generation is the sporophyte ($2n$) which has true roots, stems and leaves and conducting tissue.
- In the sporangium the spores ($2n$) divide by meiosis to produce spores (n).
- Spores germinate and form a gametophyte called a prothallus
- The antheridia (male organs) are found on the underside of the prothallus and the motile sperm swim in water to the egg in the archegonia (also on the underside). Fertilization produces a diploid zygote which divides by mitosis to form a new sporophyte plant.



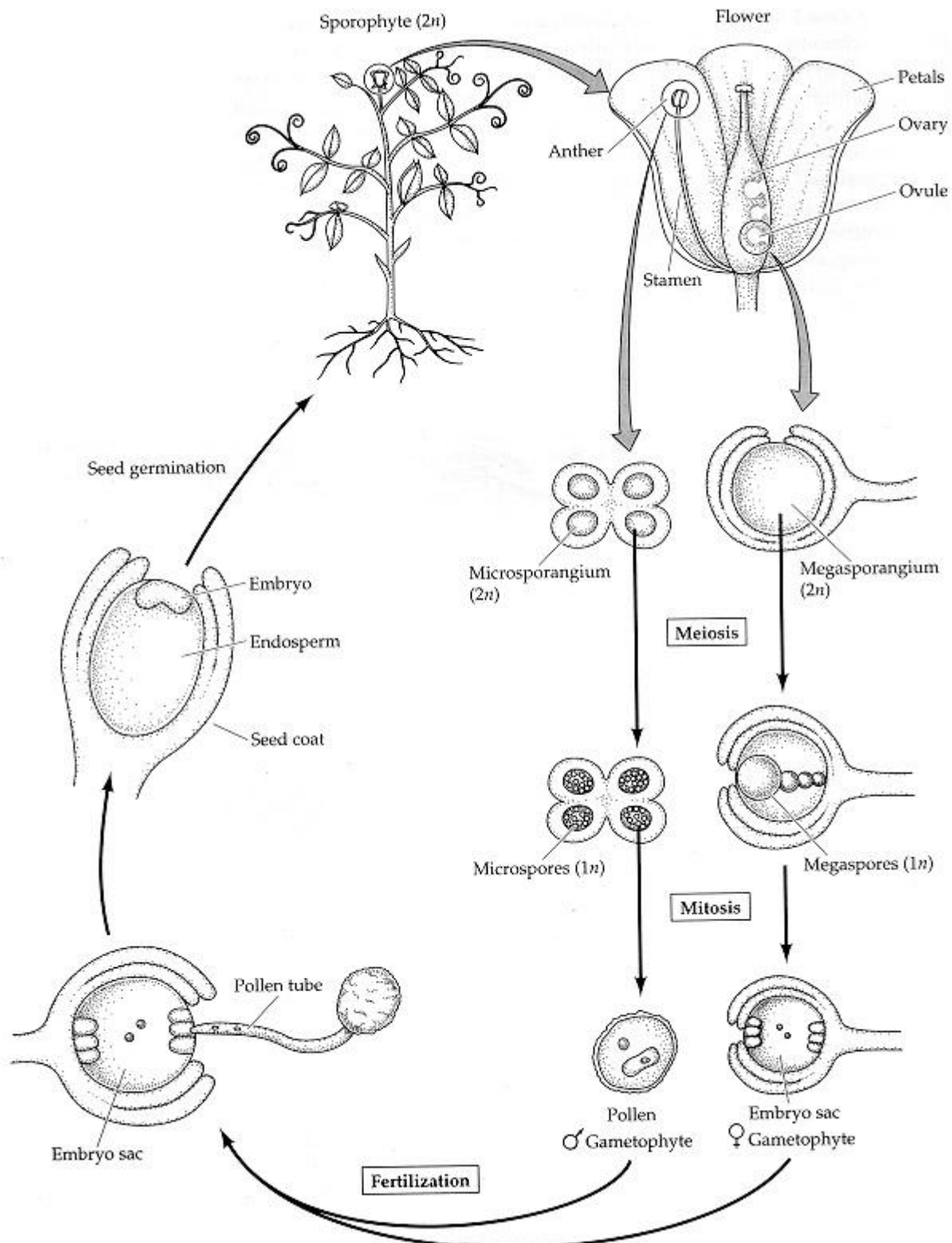
(http://www.esu.edu/~milewski/intro_biol_two/lab_2_moss_ferns/Fern_life_cycle.html)

Angiospermae

- The flowers are the reproductive organs
- The dominant generation is the sporophyte ($2n$) generation.
- Fertilisation is not water dependent



(http://botany.csd.tamu.edu/FLORA/301Manhart/repro/Flower%20diagram/flower_diagram.htm)



(http://biology.kenyon.edu/courses/biol114/Chap12/Chapter_12A.html)

Note: Refer to the grade 11 notes and videos about the moss, the fern and angiosperms for more details on the structures.

Questions

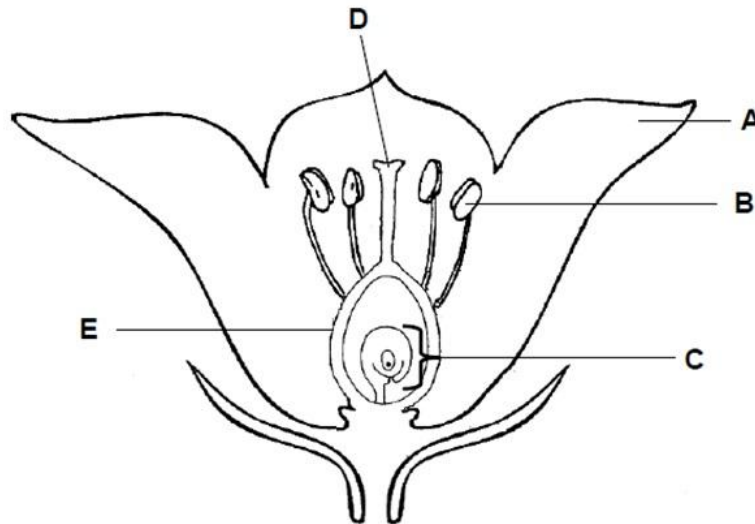
Question 1

- a.) After the process of fertilisation in a flower, the ...
- A petals remain permanently attached to the flower.
 - B ovules and ovary wall enlarge greatly.
 - C whole flower dries and drops off.
 - D ovary becomes a seed.
- b.) In a flowering plant, the fruit develops from the ...
- A corolla
 - B anther
 - C calyx
 - D ovary
- c.) The part of a plant that receives the pollen during pollination is the ...
- A stigma
 - B anther
 - C ovule
 - D petal
- d.) In which ONE of the following parts of a flowering plant does meiosis occur?
- A Cotyledons
 - B Pollen grain
 - C Anther
 - D Pollen tube
- e.) The transfer of pollen from anthers to a stigma
- f.) The type of reproduction in plants which does not involve the fusion of gametes
- g.) The structure into which the ovary of an angiosperm develops after fertilisation
- h.) A full set of chromosomes with all the genes of an organism
- i.) The type of reproduction involving a male gamete that fuses with a female gamete

Question 2

(Adapted from Life Sciences Exam Paper 1 March 2011)

Study the diagram of a flower below and answer the questions that follow:



- a.) Label parts **A, B, D** (3)
- b.) Describe how the male gamete reaches the ovum after pollination. (3)
- c.) What do the following structures develop into after fertilisation:
 - i. Structure **C** (1)
 - ii. Structure **E** (1)

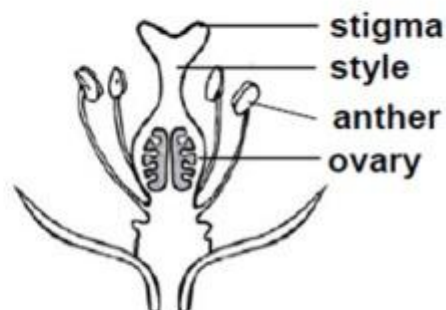
Question 3

(Adapted from Life Sciences Exam Paper 1 November 2011)

An investigation was done to determine the role of petals in insect pollination in apple flowers. When flowers are self-pollinated, the pollen tubes grow a little into the stigma and style and fertilisation does not take place.



Flower with petals



Flower without petals

The results are shown in the table below:

	NUMBER	
	Flower with Petals	Flowers without Petals
Pollen on stigma	158	25
Pollen tubes in the style	86	8
Ovules fertilised	38	4

- a.) Give an explanation for the presence of more pollen on the stigmas of the flowers with petals than on the flowers without petals. (2)
 - b.) Explain why there are more pollen tubes present in the styles of both types of flowers than the number of ovules fertilised. (2)
 - c.) State THREE ways in which this investigation could be improved. (3)
- (7)**