

REVISION: REPRODUCTION

11 SEPTEMBER 2013

Lesson Description

In this lesson, we:

- Revise asexual and sexual reproduction
- Revise the structure and function of male and female reproductive organs in humans

Key Concepts

Definition of Reproduction

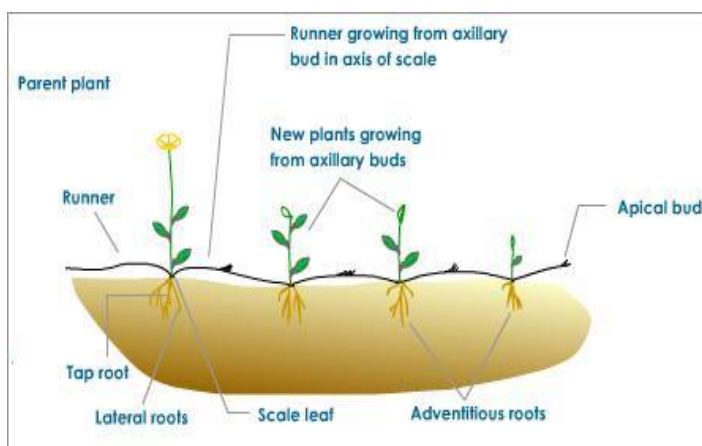
- **Asexual reproduction** is the formation of a new organism from a single parent by means of mitosis. The new organism is essentially a clone of the parent.
- **Sexual reproduction** is the formation of a diploid zygote by means of the fusion of haploid male and female gametes. The zygote undergoes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

Comparison of Sexual and Asexual Reproduction

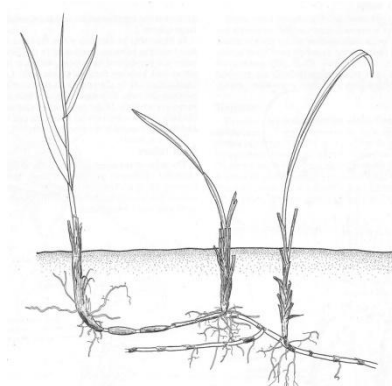
Sexual Reproduction	Asexual Reproduction
Advantages	
• Offspring are genetically different to each other and to parents • Increased chances of survival due to increased variation • The cross fertilisation of organisms to produce better / stronger / more viable organisms is possible	• Only 1 parent needed • 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

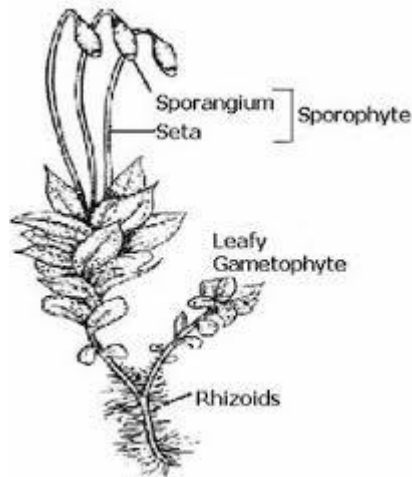
- There are two types of asexual reproduction – cuttings and tissue cultures.
 - Cuttings refer to a cut end of a stem being placed into water or moist soil and the roots then grow from the base of the stem.
 - Many flowers such as geraniums, chrysanthemums and carnations can be propagated from cuttings.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

Life Cycles

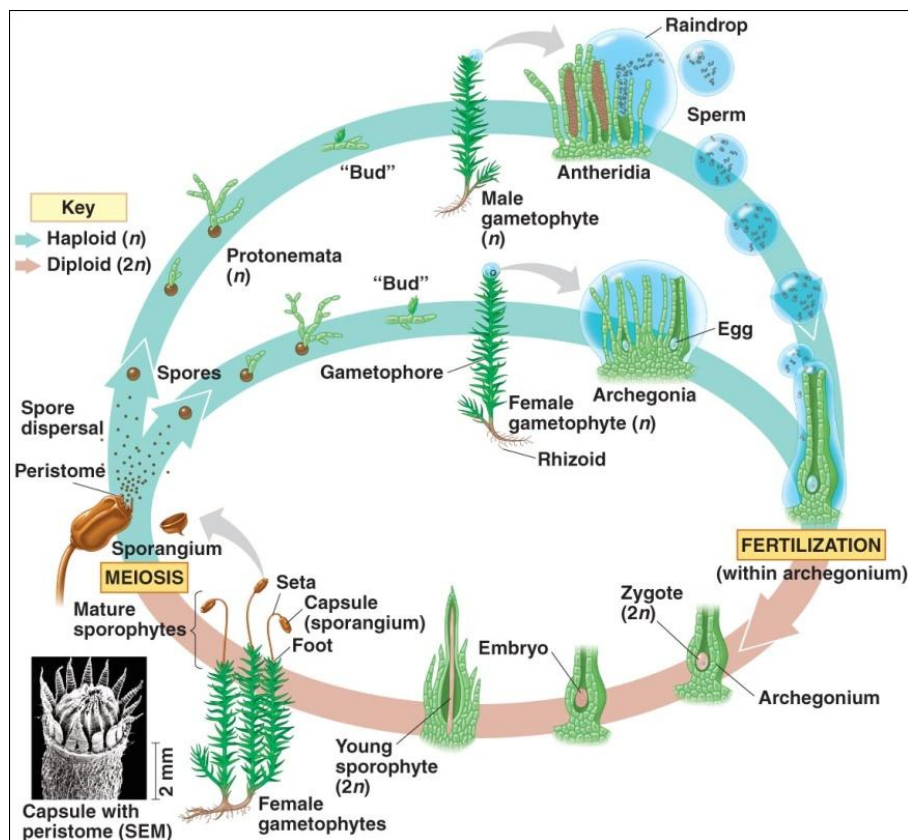
- Plants alternate generations – a haploid plant produces gametes (gametophyte generation) and alternates with a diploid plant that produces spores (sporophyte generation)

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>)

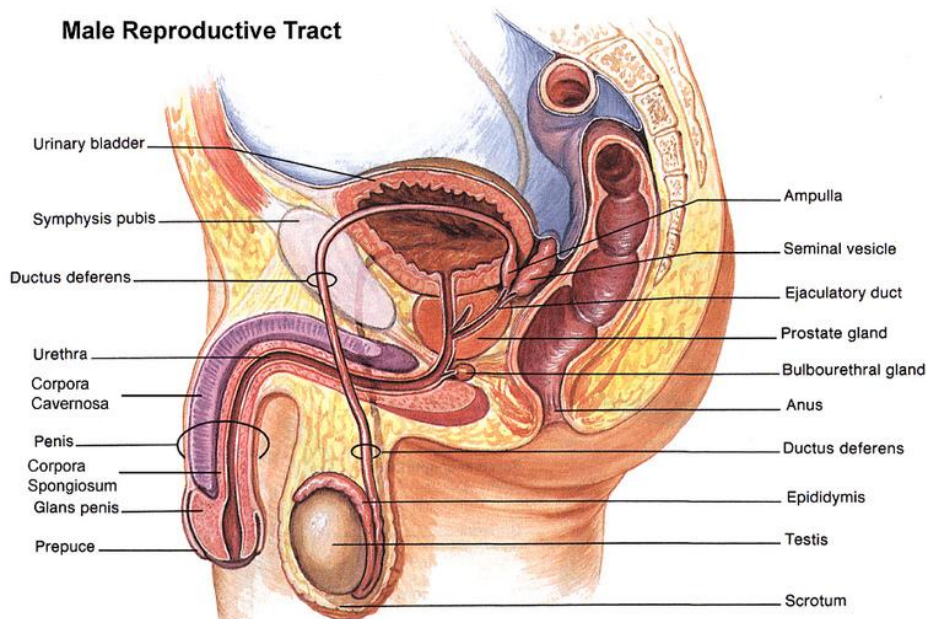
Human Reproduction

- Reproduction is the process whereby 2 parent organisms of the same species reproduce sexually, to create a new living organism of that species. Thus preventing extinction.

Male Reproductive Organs

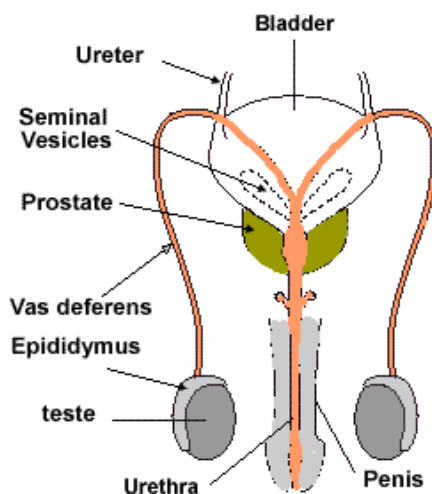
The role of the male reproductive system is to:

- Make sperm cells, and
- Deliver them into the body of the female so that fertilization can take place.
- A man's reproductive system, consists of the testes, sperm ducts, glands and the penis



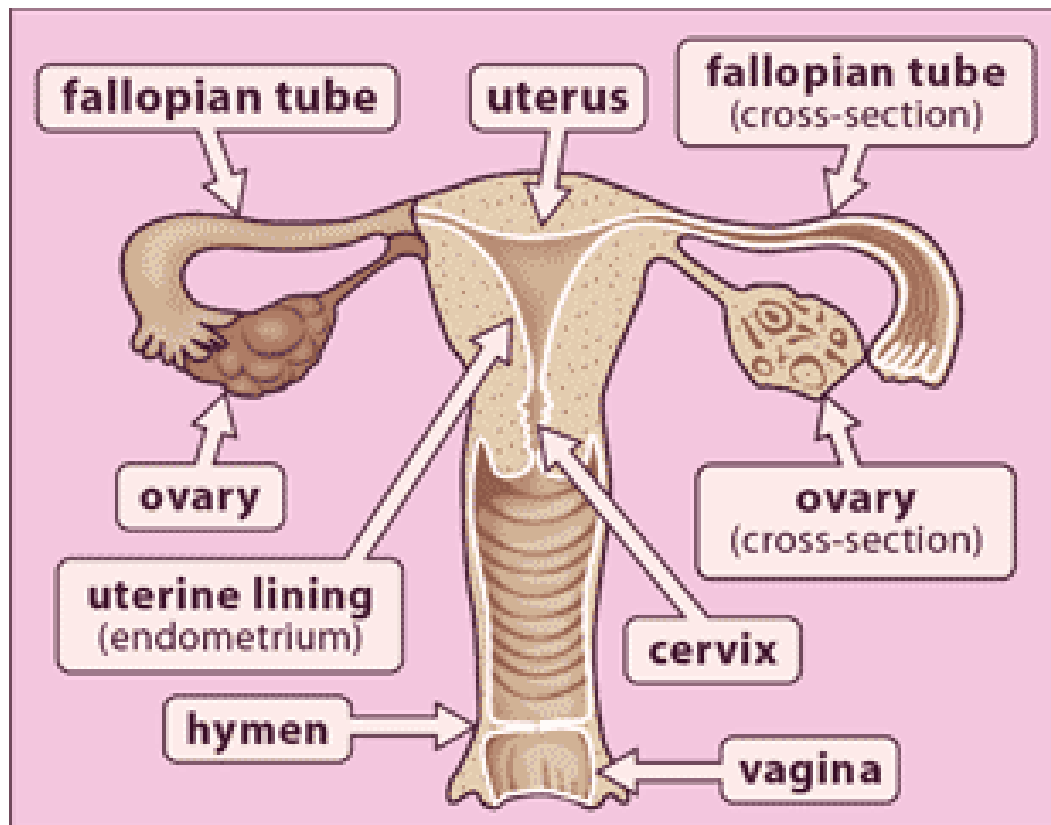
Modified from Van De Graaff, *Human Anatomy*, Wm. C. Brown: Dubuque, IA, 1988.

(<http://www.flickr.com/photos/79474535@N02/6968445060/>)



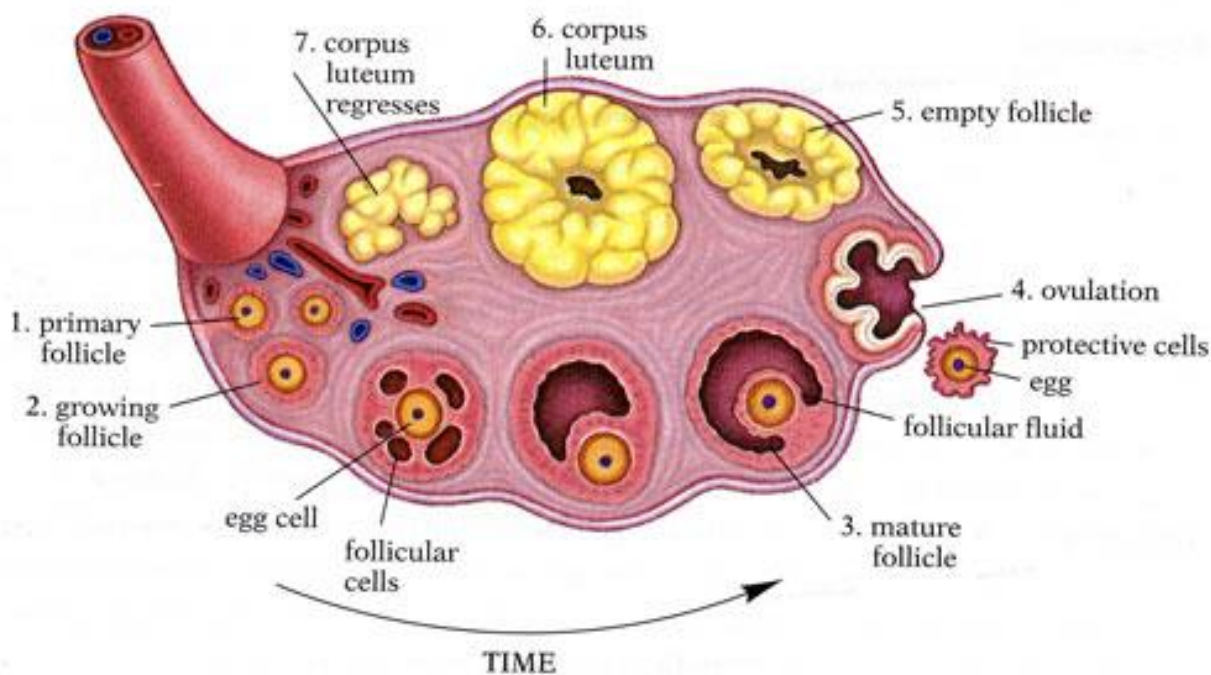
(<http://click4biology.info/c4b/6/hum6.6.htm>)

Female Reproductive Organs



(<http://endocrine101.wikispaces.com/Reproductive+System>)

- In mammals, females have a sexual cycle that can be divided into three cycles:
- The **ovarian** (oestrus) **cycle** that leads to the production of mature ova
- The **uterine cycle** that prepares the lining of the uterus to receive the fertilized egg
- The **menstrual cycle** that sheds the lining of the uterus lining if the ova is not fertilized
- The cycles are controlled by ovarian hormones, which are in turn controlled by hormones produced by the hypophysis (pituitary) gland



(<http://www.knowurflow.com/hormones-and-your-flow/>)

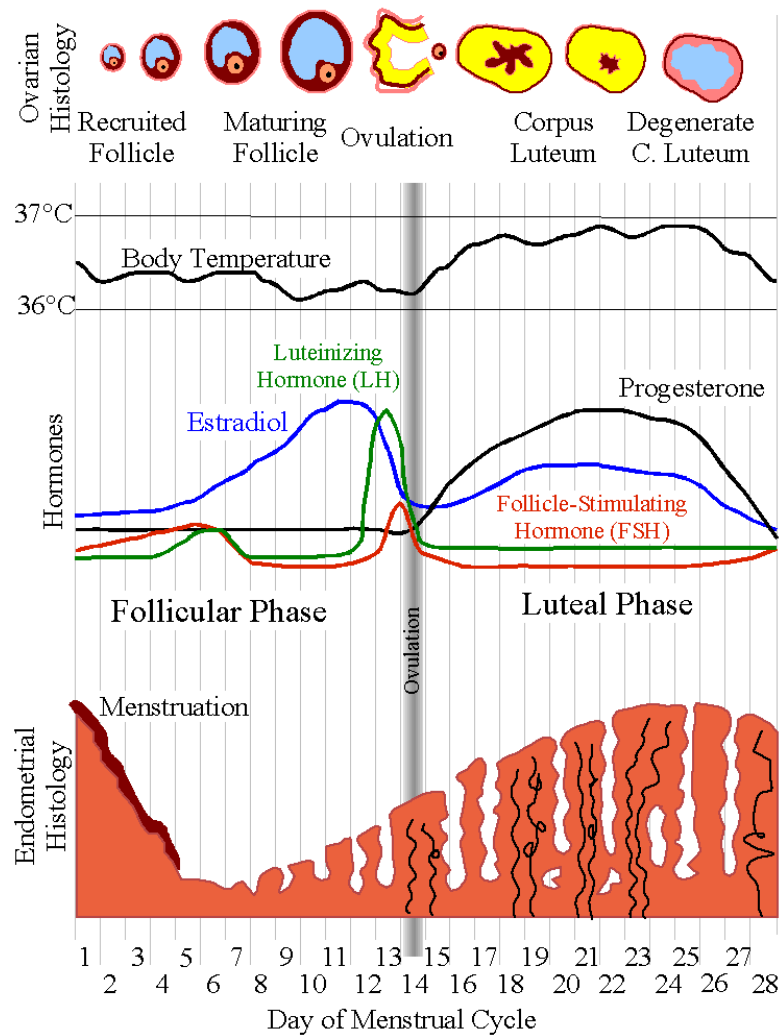
- Primary follicle – contains a primary oocyte ($2n$)
- Follicles ripen – due to Follicle Stimulating Hormone (FSH)
- Follicle continues to ripen – maturing follicles secrete oestrogen
- Primary oocyte ($2n$) surrounded by follicle cells
- Mature follicle (Graafian follicle) – secondary oocyte is formed by meiosis
- The follicle ruptures – secondary oocyte (n) is discharged → ovulation
- The follicle collapses – and becomes the corpus luteum which secretes progesterone
- The corpus luteum degenerates if fertilization does not occur

These changes take place in the endometrium in preparation for implantation of the fertilized egg

- The endometrium is the lining of the uterus.
- Day 1: Menstruation begins
- Day 6 – 14: Phase of proliferation of the cells of the endometrium. This grows to a thickness of 0.5mm
- Day 15 – 22: Phase of secretion - Secretions from the tubular glands contain glycogen and mucus. This maintains the endometrium in a receptive state in case of implantation of a young embryo. The endometrium grows to a maximum thickness of 5 – 6 mm
- Day 24: -Constriction of the arteries. This is the beginning of breakdown (necrosis) of extra layers

The Menstrual Cycle

- If the ova is not fertilized and implanted, the thickened endometrium is shed as a bloody fluid during menstruation
- The menstrual cycle is therefore linked to changes in the endometrium in a non-pregnant female
- The cycle normally spans 28 days, but can vary in length from 25 – 35 days, with menstruation lasting 3 – 10 days.
- The following diagram shows the events occurring in the ovary and endometrium together with the different hormones involved if fertilization does not take place



(Average values. Durations and values may differ between different females or different cycles.)

(<http://commons.wikimedia.org/wiki/File:MenstrualCycle2.pn>)