12 Reproduction

#106 Types of reproduction

Reproduction is the process that makes more of the same kind of an organism.

There are 2 types of reproduction: **asexual** and **sexual**.

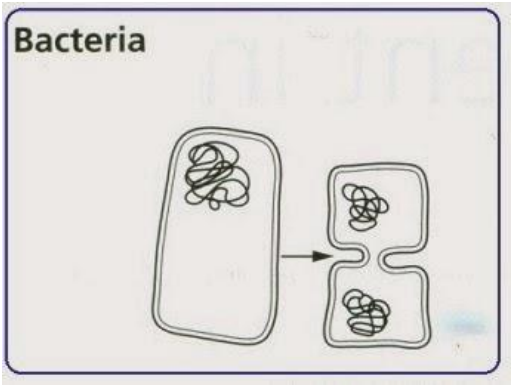
1. Asexual reproduction:

- the process resulting in the production of ***genetically indentical offspring*** from one parent.
- formation of a new organism, ***without involvement of gametes or fertilisation***.

Examples

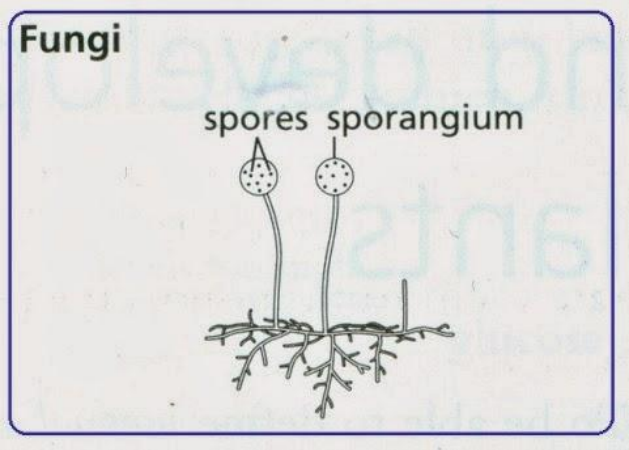
Bacteria

Bacteria reproduce asexually by binary fission. Inside an individual bacterium, the DNA replictates. Then the cell divides into two, with each daughter cell containing a copy of the parental DNA. Once the daughter cells have grown, they can also reproduce.



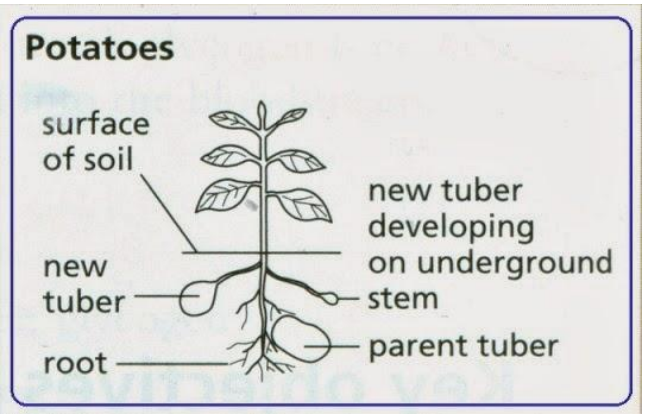
Fungi

Fungi can reproduce asexually by producing spores, which may be formed inside a structure called a sporangium. When ripe, the sporangium bursts open allowing the spores to be dispersed. In suitable conditions the spores germinate and grow to form new individuals.



Potatoes

Potatoes are stem tubers. The parent plant photosynthesises and stores the food produced in underground stems, which swell to form tubers. Each tuber contains stored starch, and there are buds in depressions in the surface known as eyes. In suitable conditions the buds use the stored food to form shoots, form which roots also develop. Each tuber can form a new plant.



Advantages and disadvantages

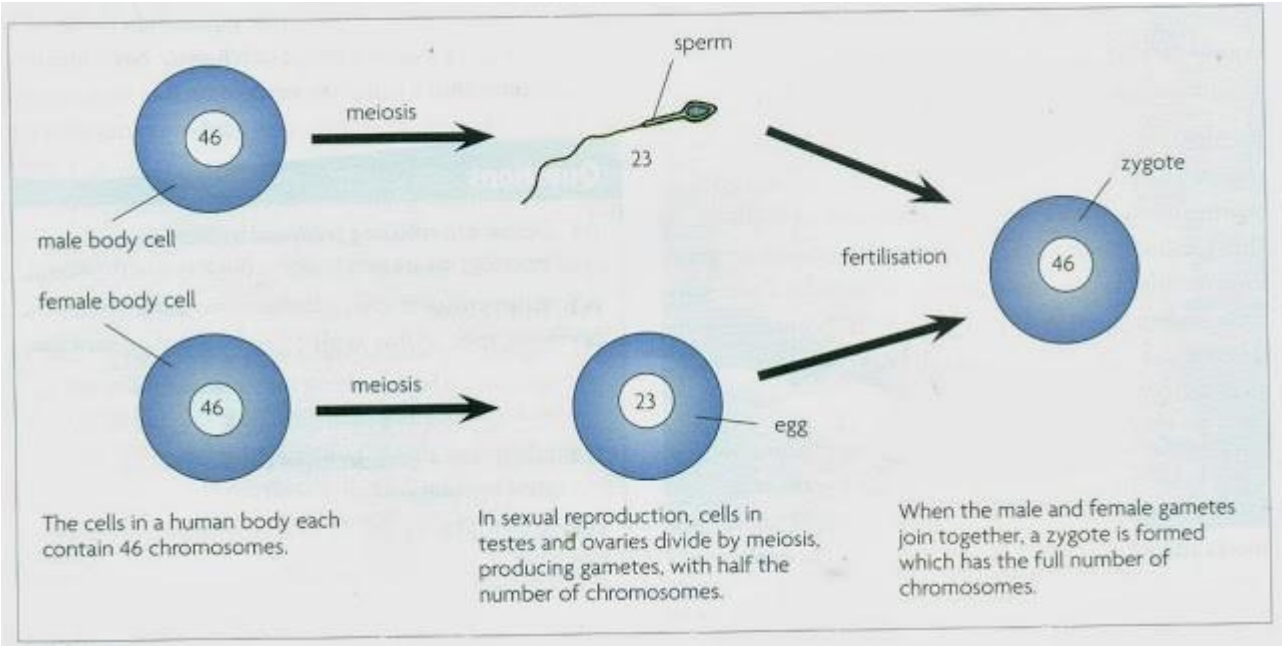
Advantages	Disadvantages
- quick - only one parent needed - no gametes needed - all good characteristics passed on - no dispersal (potato tubers) --> grow in same favourable environment as parent - store large amounts of food ---> rapid growth	- little variation ---> adaptation to environment is unlikely - offsprings inherit bad characteristics (e.g.: resistance from a disease) - lack of dispersal ---> competition (nutrients, water, light)

2. Sexual reproduction:

- the process involving the ***fusion of haploid nuclei*** to form a ***diploid zygote*** and the production of ***genetically dissimilar offspring***.

OR

- formation of a new organism by the fusion of gametes (fertilisation)



- Advantages	- Disadvantages
- variation in offspring ---> adaptation to environment - new varieties created ---> disease resistance	- 2 parents needed - Growth (of plant) is slow

Video: Asexual Reproduction
https://www.youtube.com/watch?v=jk2RJm5RBEk

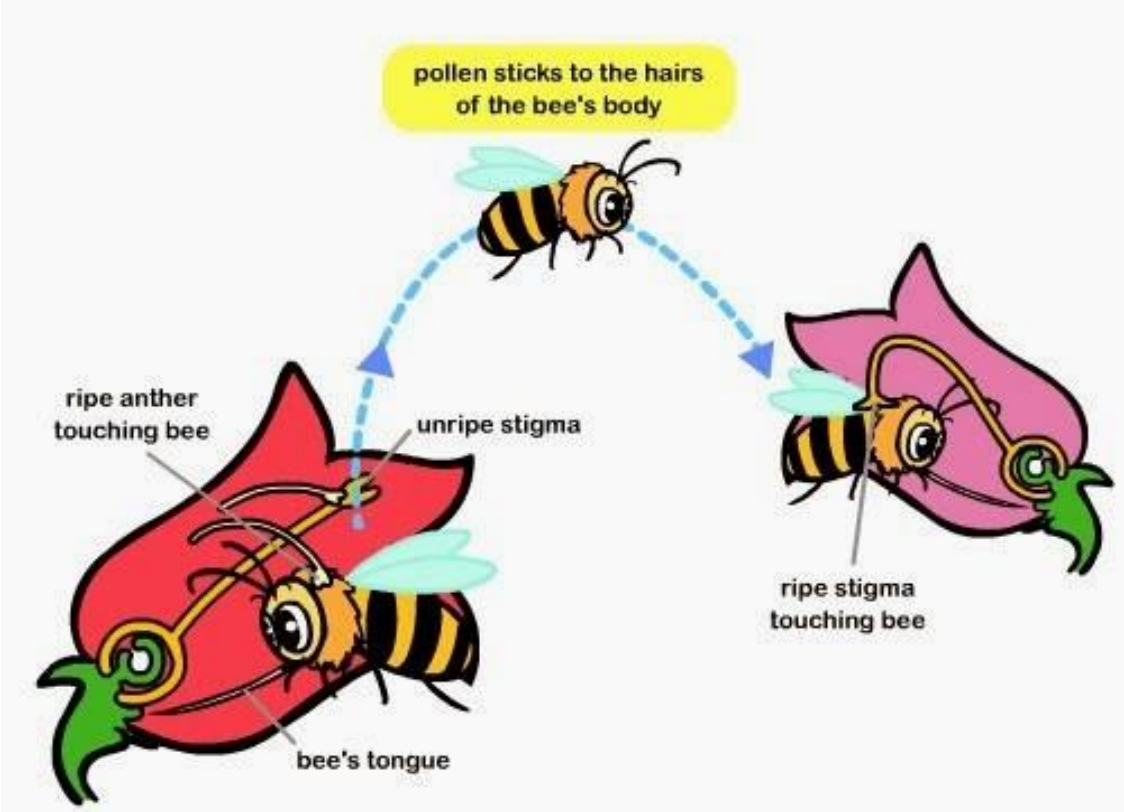
Video: Sexual Reproduction
https://www.youtube.com/watch?v=tFZeyFbBLXE

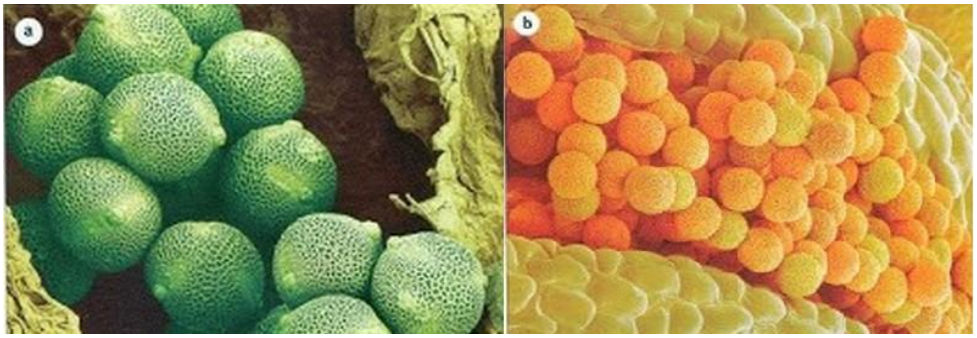
#107 Reproduction in plants - agents of pollination

Reproduction in flowering plants may occur both sexually or asexually.

Pollination can take place with the help of **agents**: **wind** or **insects.**

Pollination: transfer of **pollen grains from** the male part of the plant **(anther) to** the female part **(stigma).**





Pollen grains.

Structural adaptations

Features of wind- and insect-pollinated flowers

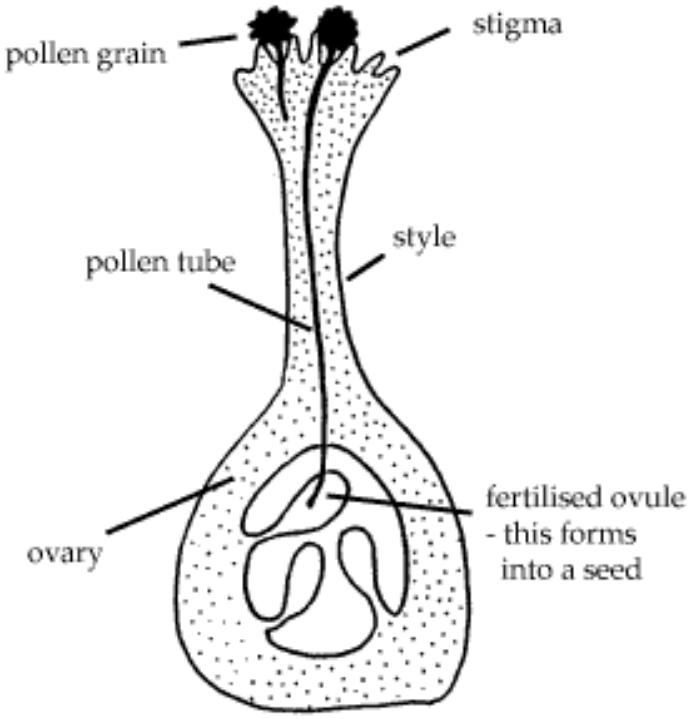
Feature	Insect-pollinated	Wind-pollinated
Petals	- large, coloured, scented - guidelines for insects into flower	- absent/small
Nectar	- produce by nectarines - attract insects	- absent/small and green
Stament	- inside flower	- long filaments: anther hang freely outside flower → pollen exposed to wind
Stigme	- small, sticky - inside flower → insects rub against	- large, feathery - hang outside flower → catch pollen
Pollen	- smaller amount - grain round and sticky or covered in spikes to attact to insects	- larger amount - grain smooth, light, easily carried by wind
Bracts (modified leaves)	- Absent	- Sometime present

Common misconceptions

Students often get confused between pollination and seed dispersal. When animals such as insects carry pollen, they aid pollination. When animal carry seeds, they aid seed dispersal.

Growth of pollen tube and the process of fertilization

Figure below shows a section through a single carpel.



If pollen grains are of the same species as the flower they land on, they may germinate. Germination is triggered by a sugary solution on the stigma, an involves the growth of a pollen tube from the pollen grain.

The pollen tube contains the male nucleus, which is needed to fertilise the ovule inside the ovary. The pollen tube grows down the style, through the ovary wall, and through the micropyle of the ovule.

Fertilisation is the fusion of the male nucleus with the female nucleus. If the ovary contains a lot of ovules, each will need to be fertilised by a different pollen nucleus.

Video: Flower Reproduction

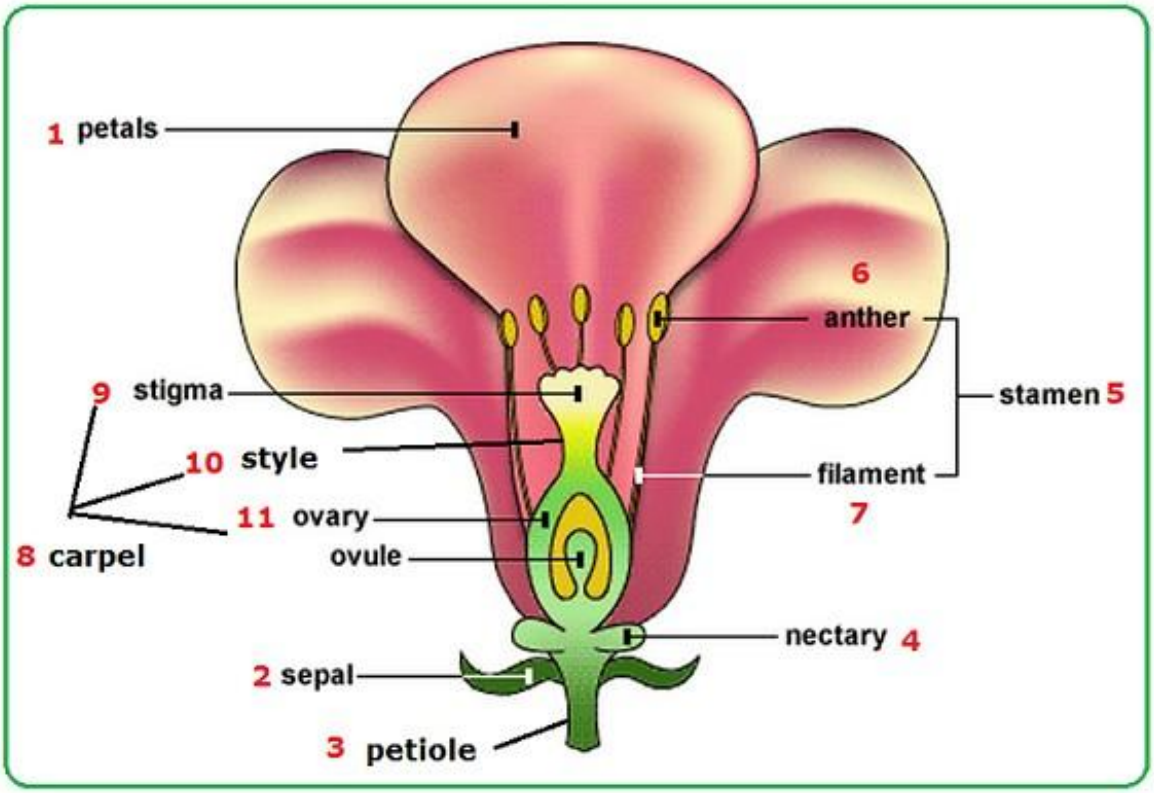
https://www.youtube.com/watch?v=YqM6rgB_l_o

Video: Sexual Reproduction in Flowering Plants

https://www.youtube.com/watch?v=CkBNEM2mD30

#108 Structure and functions of a flower

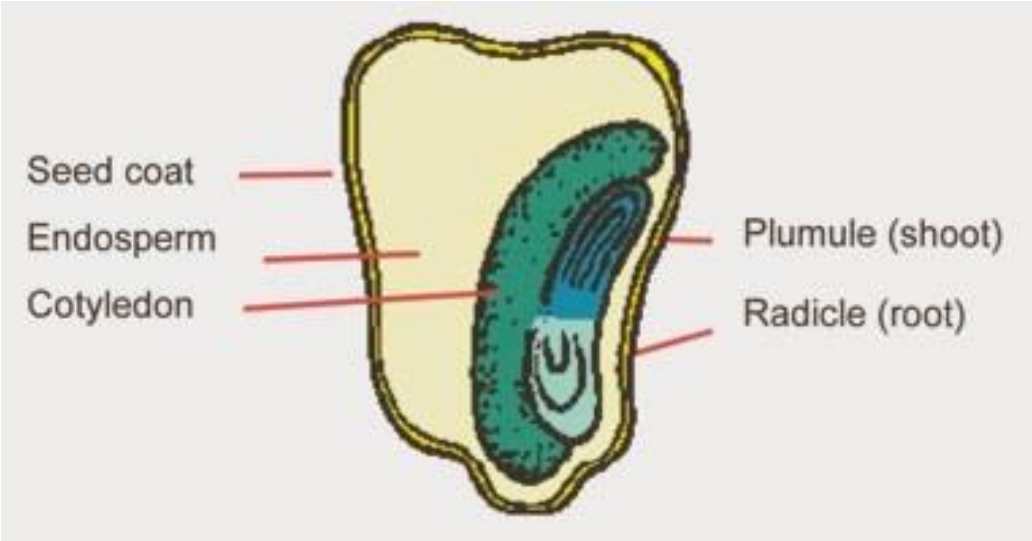
You need to be able to describe the **structure** and **functions** of a named **dicotyledonous** (two seed leaves) flower.



Functions of parts of a flower

	Part	Function
1	Petal	Often large and coloured, to attract insects
2	Sepal	Protects the flower while in bud
3	Petiole (stalk)	Supports the flower to make it easily seen by insects, and to be able to withstand wind
4	Nectary	Produces nectar, to attract insects
5	Stamen	The male reproductive part of the flower, made up of anther and filament
6	Anther	Contains pollen sacs, in which pollen grains are formed. Pollen contains male sex cells.
7	Filamen	Support the anther
8	Carpel	The female reproductive part of the flower, made up of stigma, style and ovary
9	Stigma	A sticky surface to the ovary, through which pollen tubes grow
10	Style	Links the stigma to the ovary, through which pollen tubes grow
11	Ovary	Contains ovules, which develop into seeds when fertilised.

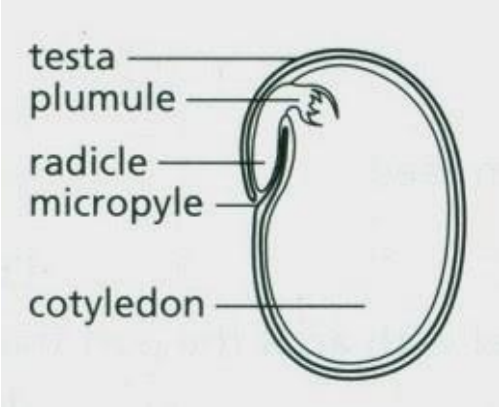
#109 Formation of seed, conditions affecting germination



The fertilised **ovule** divides by mitosis to form a **seed** containing the embryo plant and food stores called **cotyledons**.

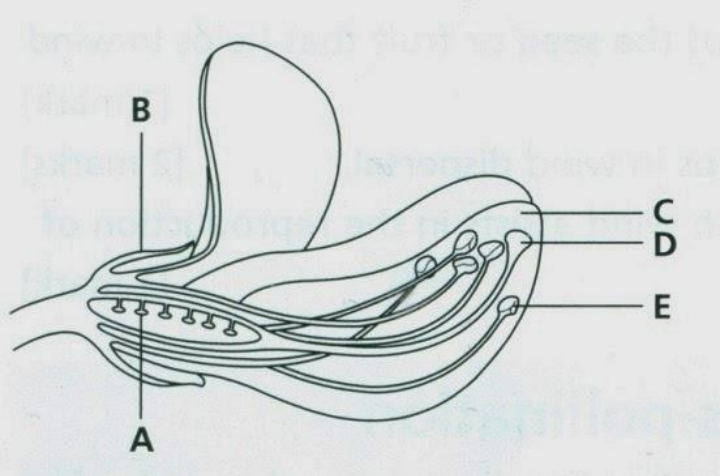
- The wall of the ovule forms the seed testa (coat).
- The ovary wall develops into a fruit, which may be fleshy (e.g. plum) or a dry pod (e.g. lupin or pea).

Structure of a non-endospermic seed



Try this

Figure below shows a section through a bean flower.



a) Name the parts labeled **A** and **B** [2 marks]

b) This flower is insect-pollinated. Suggest how parts **C, D** and **E** help in pollination of this flower. [3 marks]

c) After pollination, the ovules develop into seeds. Describe the events which occur after pollination and which result in the formation of seeds [4 marks]

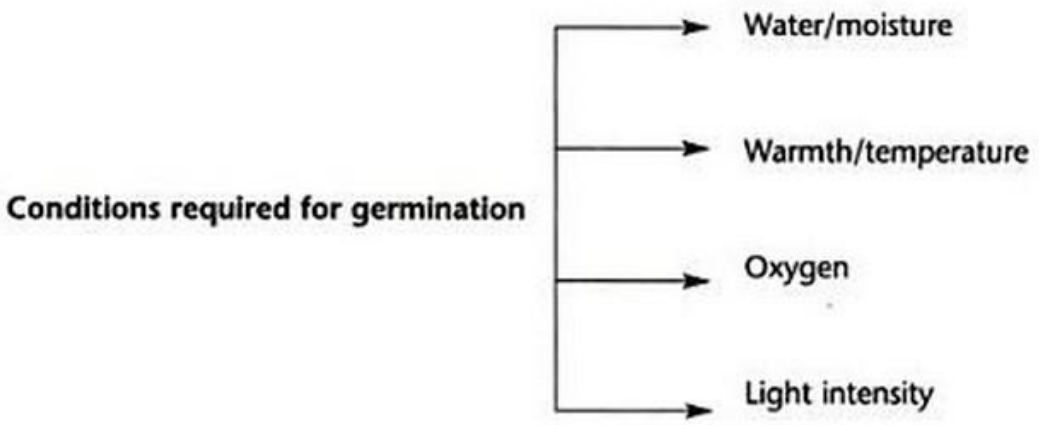
Answer

a) **A**: ovule, **B**:sepal

b) **C** (petal) are large and colourful to attract insects
D (stigma) is sticky and lies in the way of the insects to cllect pollen
E (anther) produces pollen and lies in the way of the insects to transfer pollen on to their bodies.

c) **Four** points form:
- pollen grains germinate
- pollen tube grows down the style
- through the micropyle
- into the ovule
- the male nucleus fuses with the female nucleus
- reference to fertilisation

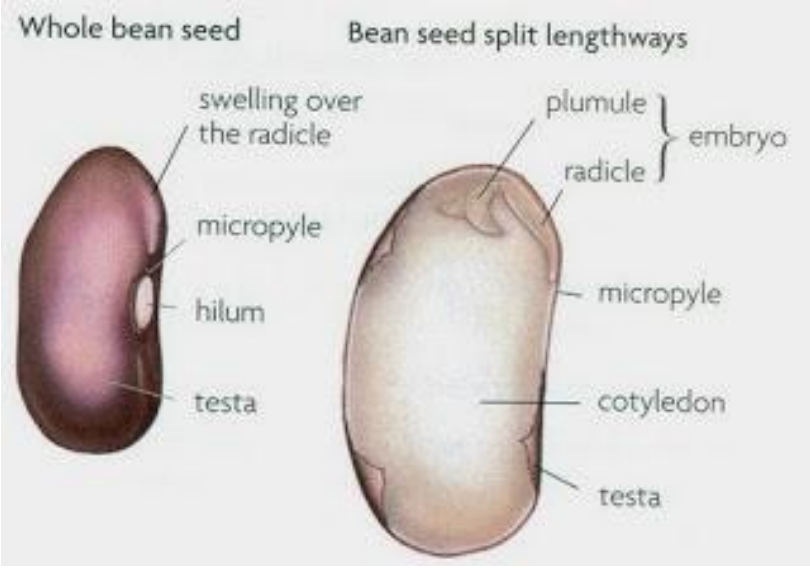
Environmental conditions affecting germination



1.Water:

- absorbed through **microphyle** until **radicle** is forced out of **testa**
- **activate enzymes** for converting soluble food stores in the cotyledons down to **soluble food** ---> for growth + energy production of baby plant.

2.Oxygen: respiration ---> release energy ---> growth



3.Warmth/temperature: enzymes present in the seed get activated and work best at optimum temperature (20-40^{0}C) which trigger growth in the baby plant.

4. Light intensity: high or very low light intensity does not allow enzymes to function normally.

#110 Seed dispersal

The flowers produce seeds which can be **dispersed** by the **wind** or other **animals,** providing a means of **colonising new areas**.

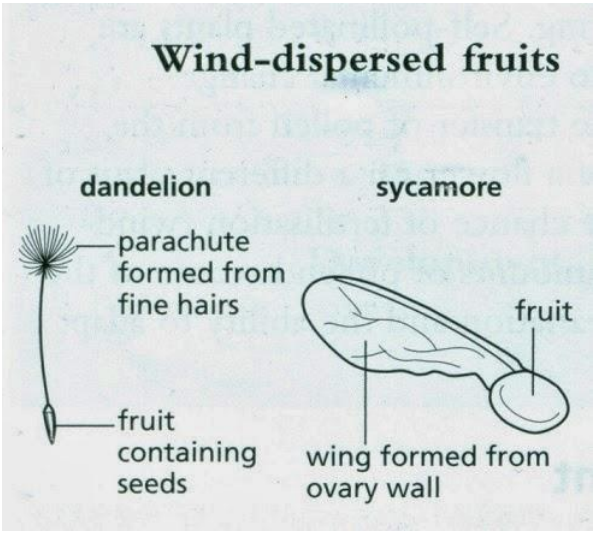
Nutmeg is dispersed by birds.
Photo credit: russolab.unl.edu

1. Wind-dispersed seeds

- Fruits contain seeds, and usually have a **parachute** or a **wing** to help them be carried away from the parent plant by the wind.
- Examples: dandelion, sycamore

The **dandelion** fruit has a group of fine hairs called a pappus, which catches the wind and acts like a **parachute**. The fruit counterbalances the pappus.

The **sycamore** has a **wing** with a large surface area. When the fruit drops off the tree it spins, slowing down in descent. If caught by the wind the seed will be carried away from the parent plant, reducing competition for nutrients, water and light.

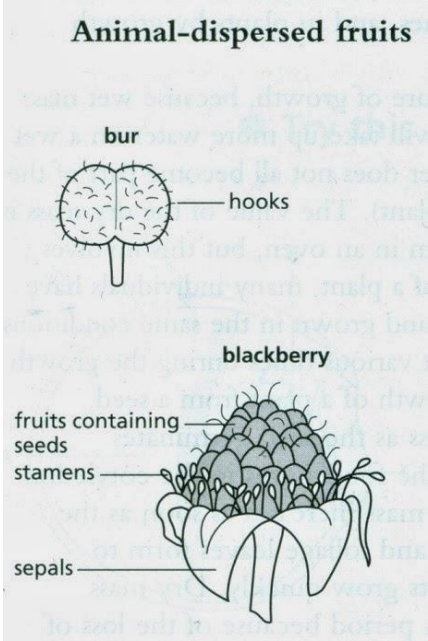


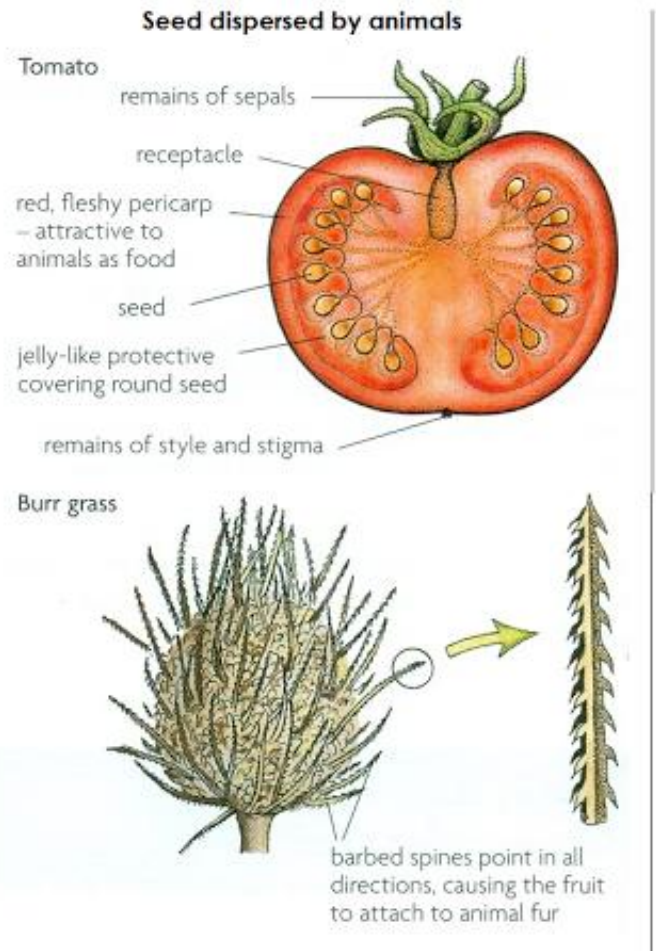
2. Animal-dispersed seeds

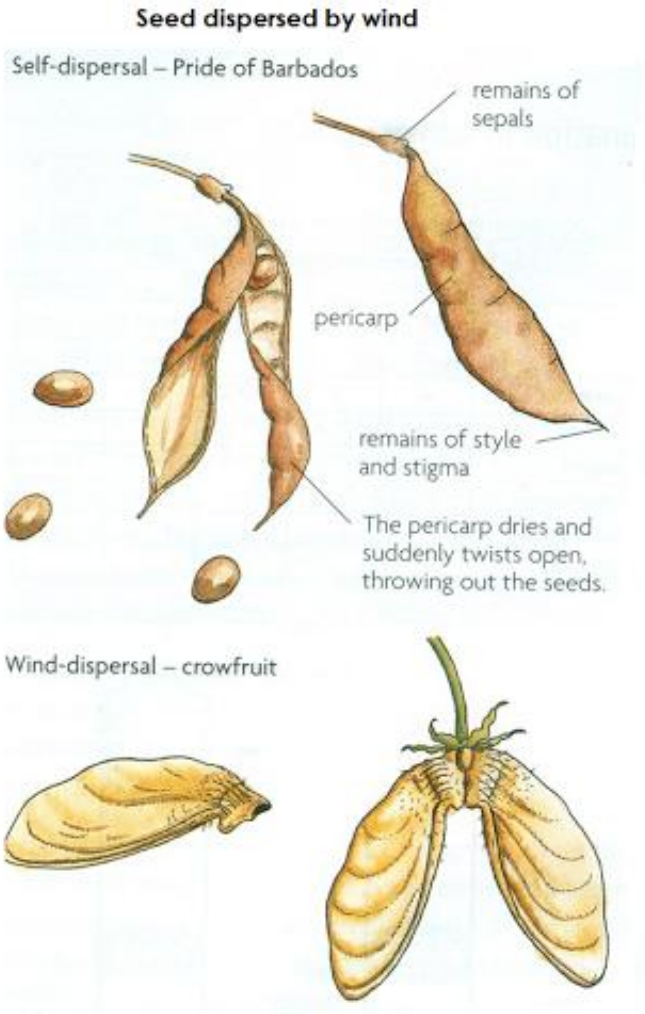
There are 2 main modification of fruits for animal dispersal: **succulent** fruits and **hooked** fruits.

Succulent fruits attract animals because they are brightly coloured, juicy and nutritious.
When **eaten**, the seed pass through animal's **faeces**, which may be a long way from the parent plant. The faeces provides nutrients when the seeds germinate.

Hooked fruits catch on to an **animal's fur** as it brushes past the parent plant. Eventually the seeds drops off, or the animal grooms itself to remove them. This disperses the seeds away from the parent plant.

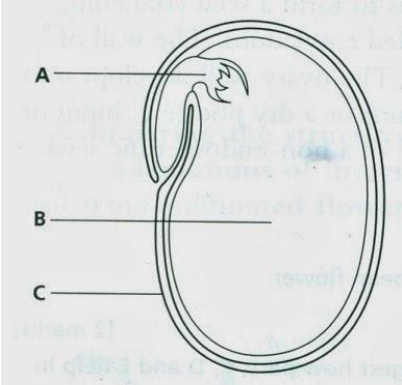






Try this

Figure below shows a section through a bean seed.



1. i) Name the parts labeled **A**, **B** and **C**. [3 marks]
   ii) Copy the diagram and label with an **X** the part that contains the seed's food reserves. [1 mark]

2. Seeds and fruits are dispersed away from the parents plant.
   i)Sketch a seed or fruit that is adapted for dispersal by wind. Label with a **Y** the special feature of the seed or fruit that helps in wind dispersal. [1 mark]
   ii) Suggest how this feature helps in wind dispersal. [2 marks]

   iii) Suggest another way in which wind assist in the reproduction of plants. [1 mark]

Answer

1. i) **A** plumule; **B** cotyledon, **C** testa (seed coat)
   ii) **X** on any part of the cotyledon.

2. i) Sketch of dandelion, sycamore…
   Y on the part that catches the wind (parachute, wing…).
ii) **Two** points from:
- description of how the feature catches the wind
- and slows down the descent of the seed or fruit
- so the seed or fruit is carried away from the parent plant.
iii) Wind pollination

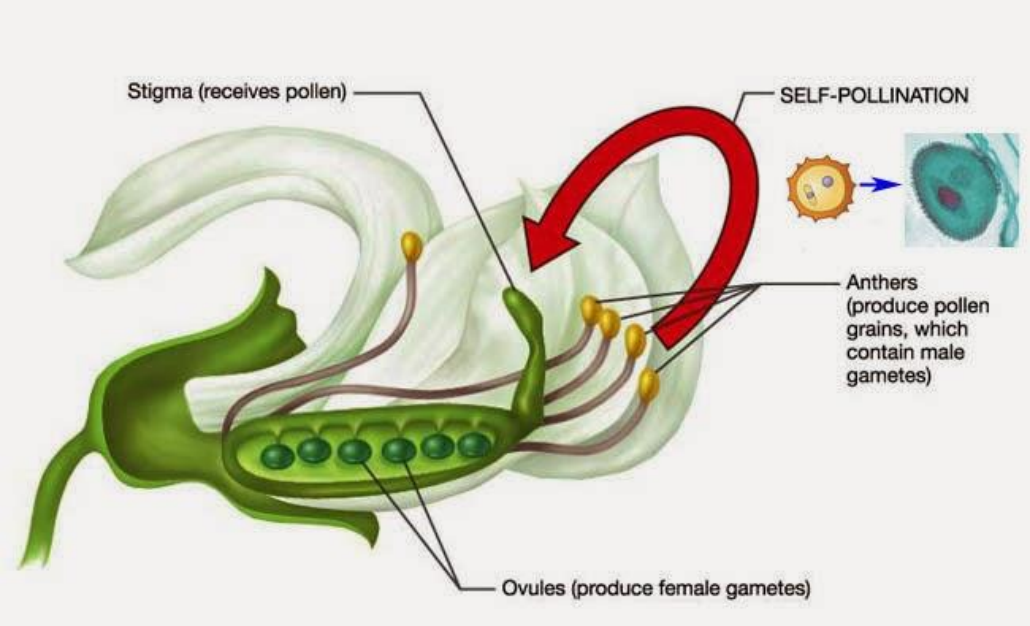
Video: Seeds - An amazing video taken from BBC's The Private Life of Plants documentary series (MUST SEE).
https://www.youtube.com/watch?v=buZV0h4vfmQ

#111 Self-pollination and cross-pollination

Self-pollination - transfer of pollen from the anther to the stigma of the same flower, or to another flower of the same plant.
Cross-pollination - transfer of pollen from the anther of a flower to the stigma of a flower on a different plant of the same species.

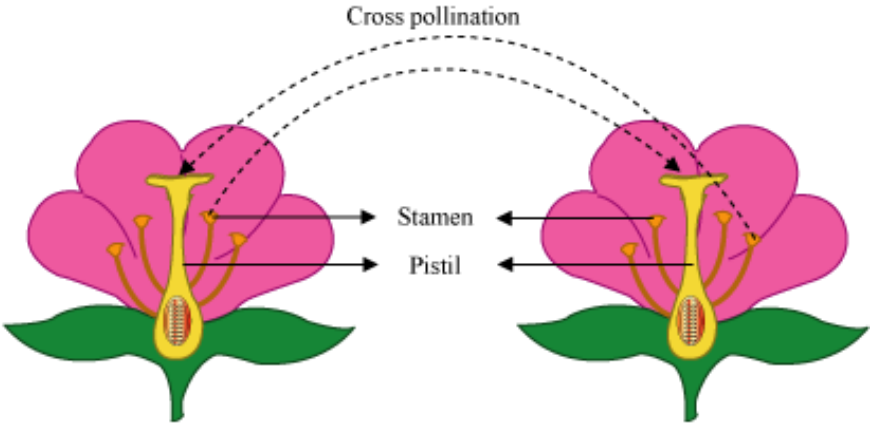
Self-pollination

- ↑ chance of successful pollination à smaller numbers of pollen
- ↑ chance of fertilisation and seed formation
- ↓variation in the offspring.
- ↓ ability to adapt to environmental change.



Cross-pollination

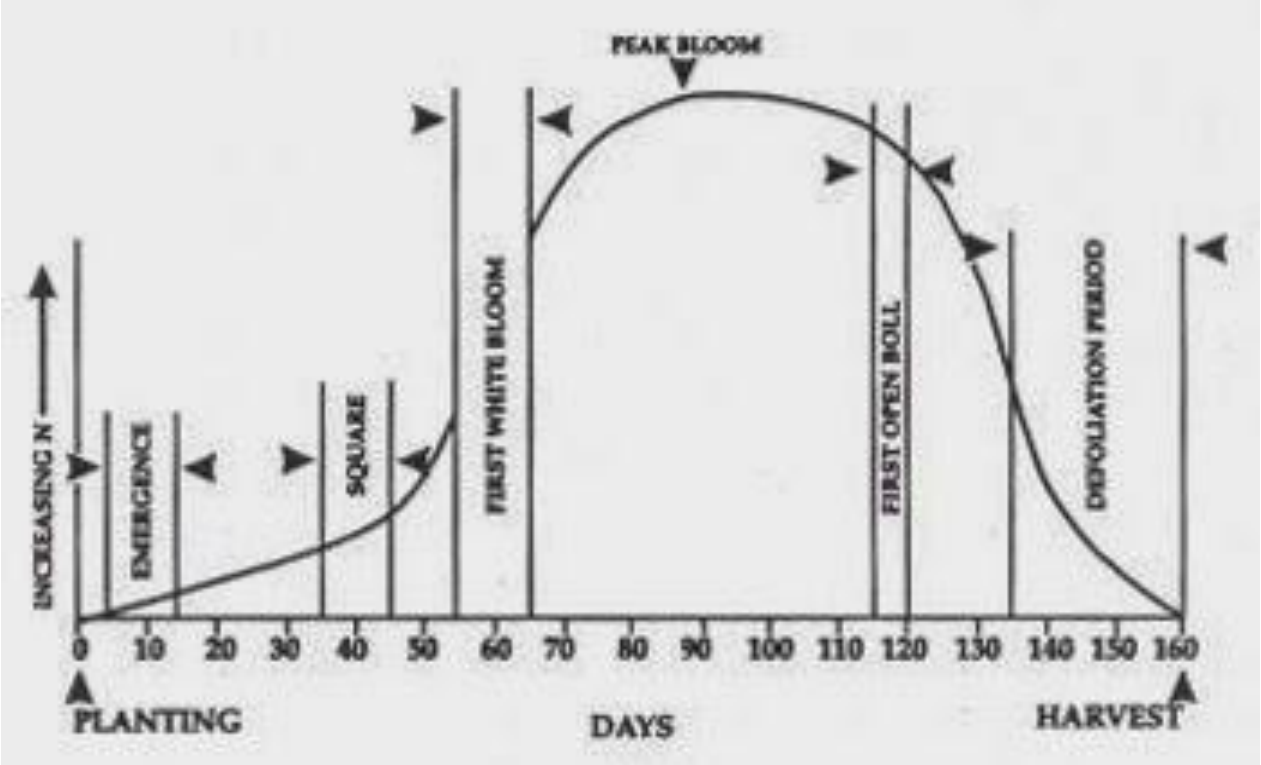
- ↓ chance of successful pollination à large amounts of pollen
- ↓ chance of fertilisation
- ↑ variation
- ↑ ability to adapt to environmental change.



#112 Growth and development

Growth - permanent **increase** in **size** and **dry mass**, by an increase in cell number or cell size or both.

Development - increase in **complexity**



1. Development

- increase in complexity of an organism as it grows. As the number of cells increases, they become differentiated (specialized for different tasks).

- change in shape to adapt for a specific function.

Examples:

- nerve cells are very elongated and can transmit electrical impulses

- xylem cells are elongated and lose their cell contents, with the cell walls becoming lignified so the cells conduct water efficiently.

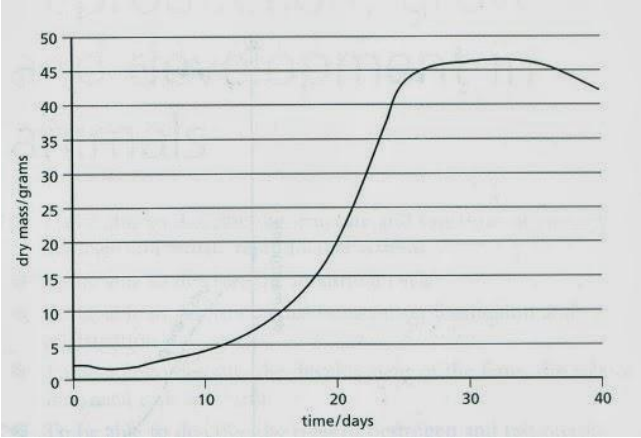
2. Growth

- due to an increase in cells, produced by mitosis.
- controlled by hormones (in animals) and growth substance like auxins (in plants).

Dry mass

- Often used as a measure of growth, because wet mass varies from day to day (e.g. plant will take up more water on a wet day than on a dry day, but the water does not all become part of the biomass – living material of the plant).
- Obtained by drying out the organism in an oven (killing it).
- Many individual have to be germinated at the same time and grown in the same conditions.
- Samples are dried at various times during the growth period.

Example: Changes of dry mass during the growth of a plant from a seed.



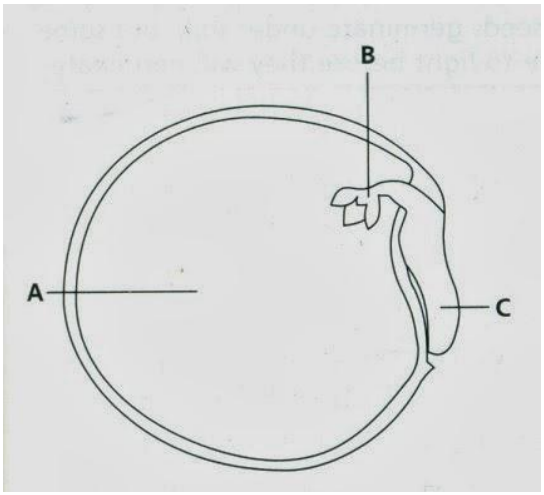
- ↓ slightly when the seed germinates, at day 2 (some of the stores in the cotyledon are being used in respiration).

- ↑ when the plumule stars to photosynthesise, and foliage leaves form to continue the process.

- ↓ at the end of the growth period (loss of seeds and fruits; leaves die).

Try this

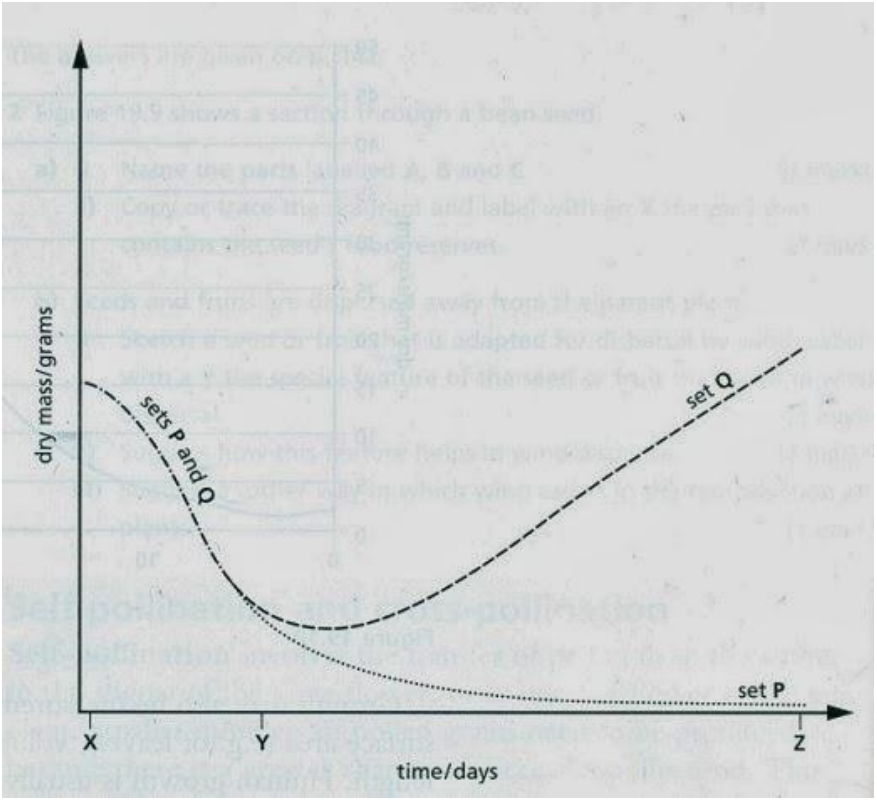
1. Figure below shoes a section through a seed of a dicotyledon.



i) What is the role of part **A**? [1 mark]

ii) What do parts **B** and **C** of the seed develop into after germination? [2 marks]

2. Figure below shows changes in mass of sets of pea seeds as they germinate and grow into seedlings, after germination set **B** was grown in the dark and set **Q** in the light.



i) Why is mass measured as dry mass? [1 mark]

ii) Explain the changes in dry mass between days **X** and **Y** in both sets of seedling. [4 marks]

iii) Explain why there is a difference in the dry mass of set **P** and **Q** between day **Y** and **Z**. [4 marks]

Answer

1. i) Stored food.
   ii) **B** develops into the shoot (or leaves)
   C develops into the root.

2. i) Wet mass varies according to the amount of water absorbed of lost from the plant, or dry mass represents the amount of cytoplasm.

ii) **Four** points from:
- the dry mass drops between days **X** and **Y** for both sets of seedlings
- food stored in the cotyledons
- is used to supply energy
- through respiration
- some food is converted into other materials
- for growth of the radical and plumule.

iii) **Four** points from:
- set Q increases in dry mass and st P decreases in mass
- set Q is in the light and can photosynthesise
- to make new cytoplasm
- set P is in the dark and can not photosynthesise
- set P uses up remaining food stores through respiration.

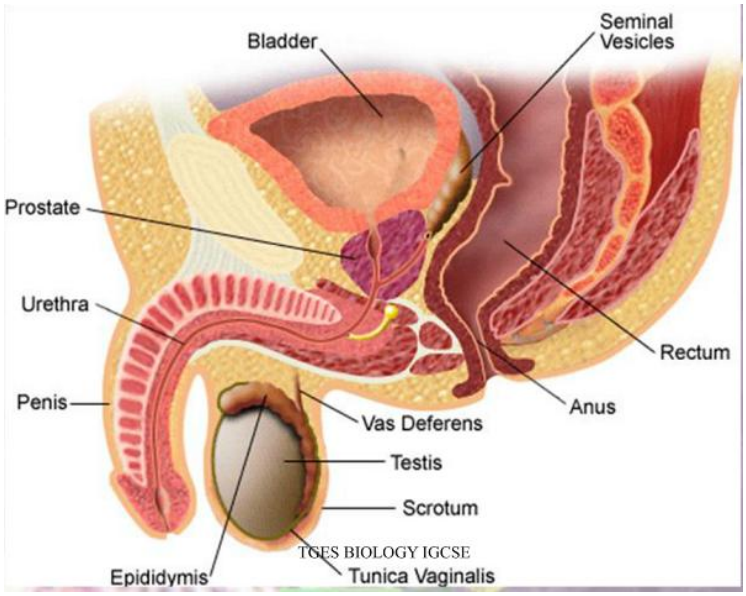
#113 Reproduction in humans - Reproductive system

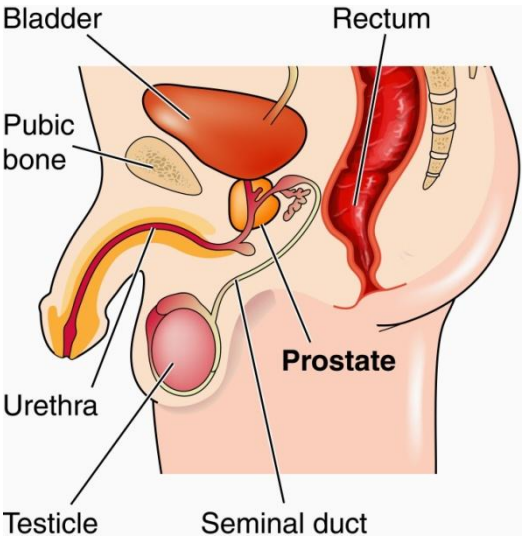
Reproduction in humans is when the male gamete (**sperm**) **fuses** together with the female gamete (**ovum/egg**).

At first, it is just one single cell, which **duplicates** over and over until after 9 months…… TA-Dahh! - A baby is born!

Male reproductive system

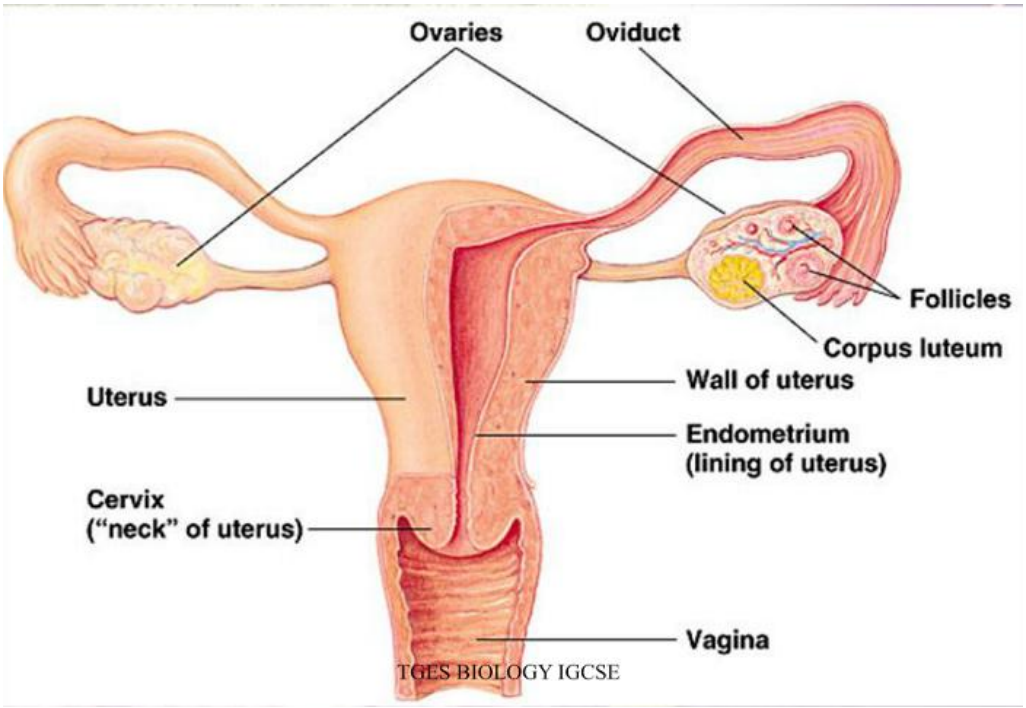
- **Testes**: produce **sperm** and **testosterone**
- **Scrotum**: a **sac** that keeps testes cool (outside body)
- **Sperm ducts**: **link testis to urethra:** allow passage of semen containing sperm
- **Prostate gland**: produce **alkaline fluid** ---> semen
- **Urethra**: urinate; pass semen (+sperm) through penis
- **Penis:** become firm, **inserted into vagina** during sexual intercourse ---> transfer sperm





Female reproductive system

- **Ovaries:** contains follicles, produce and stores **eggs,** produce **oestrogen**
- **Oviducts**: carries ovum to uterus; Fallopian tubes = site of fertilisation
- **Uterus** – where fetus develops
- **Cervix-** a ring of muscles that separate the vagina from the uterus
- **Vagina: receives sperm from erect penis** during intercourse



Comparing male and female gametes

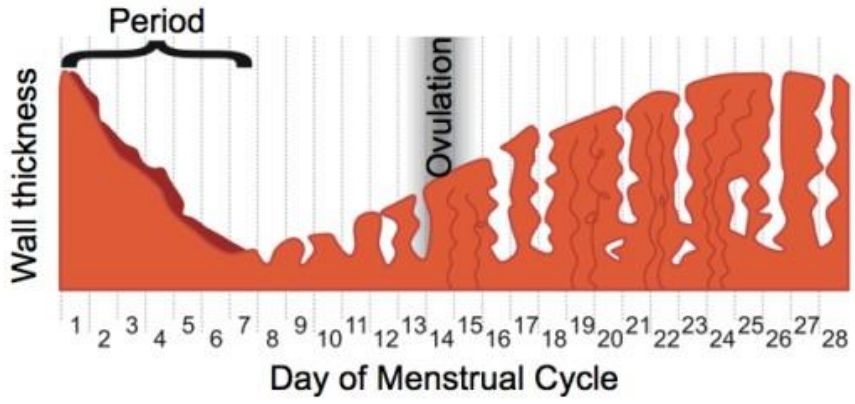
Feauture	Sperm cell	Egg cell
size	small	Larger than sperm
movement	Tail lashes from side to side	Doesn't move by itself – cilia and peristalsis in oviduct
Number produced	Millions constantly produced	Once a month (puberty ---> menopause)

Slide Show: Reproduction from TGES Biology
http://tgesbiology.weebly.com/uploads/9/0/8/0/9080078/reproduction.swf

Video: Human Body Systems - Reproductive System https://www.youtube.com/watch?v=GArALyhGtfQ

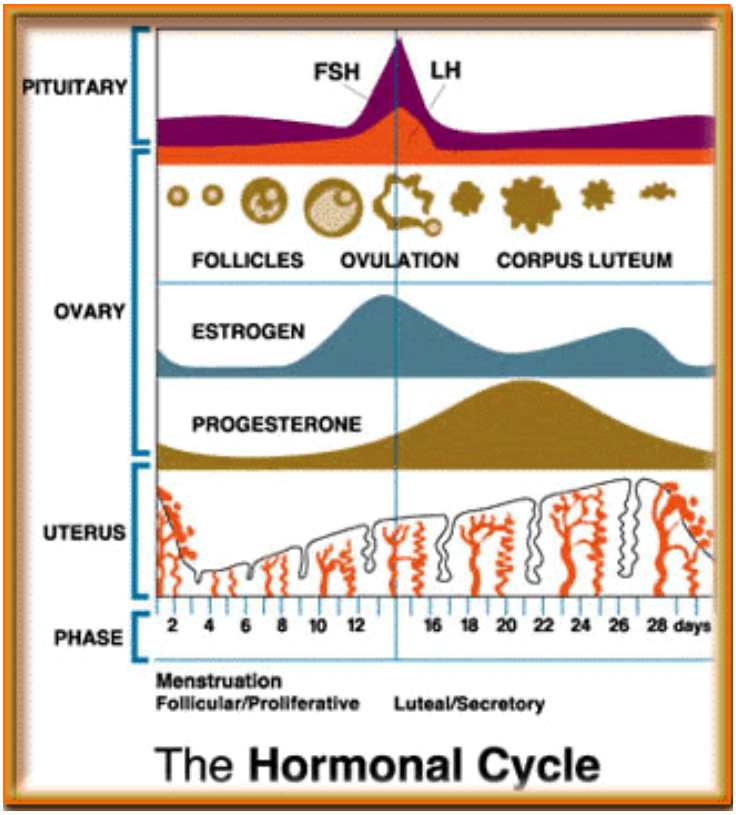
#114 Menstrual cycle

The **menstrual cycle** in women is a recurring process in which the **lining** of the uterus is prepared for pregnancy, and if pregnancy does not happen, the lining is shed at **menstruation**. The cycle lasts about 28 days.



Several **hormones** control this cycle:

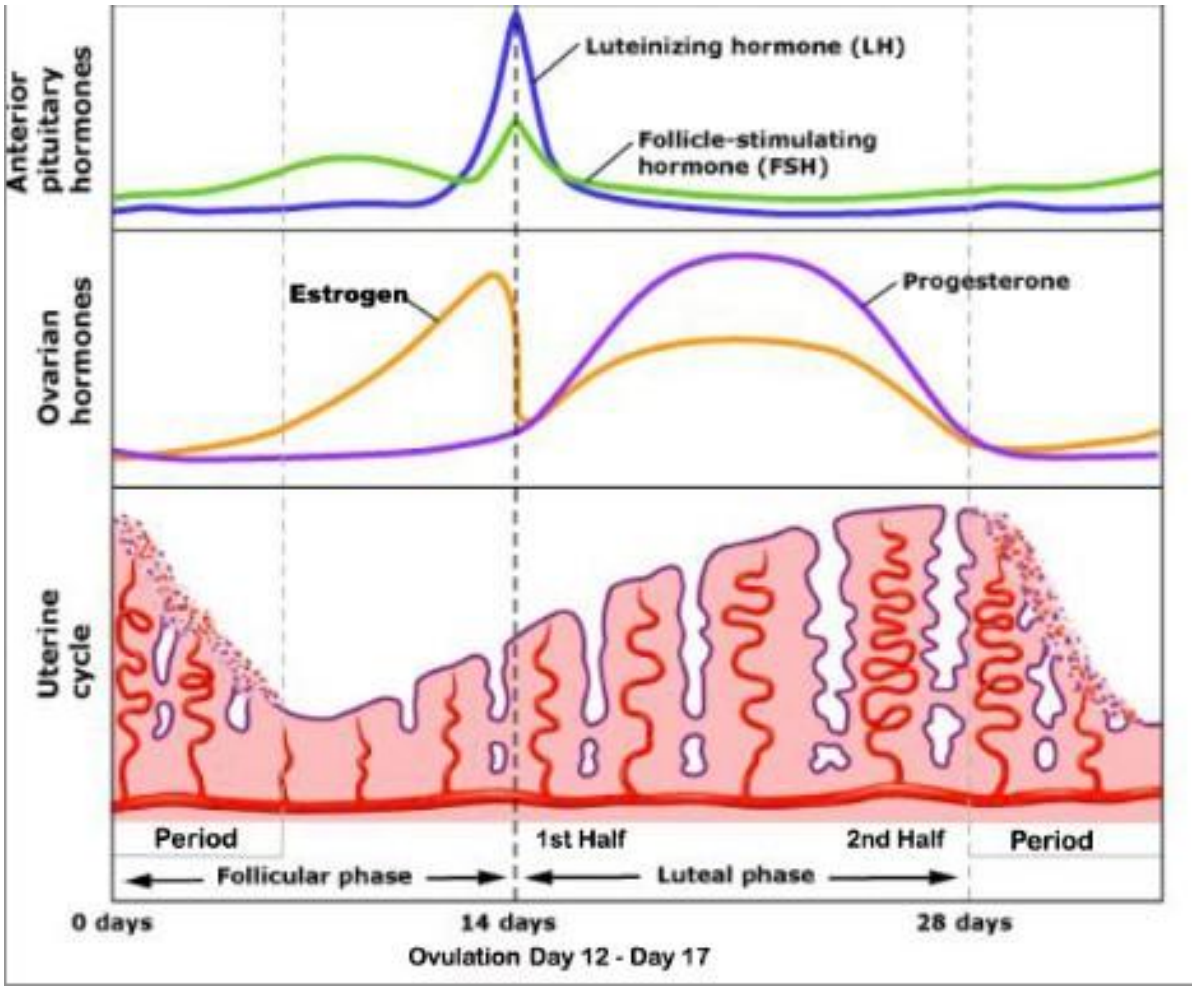
	FSH **LH**	**Oestrogen,** **Progesterone**
Secreted by	Pituitary gland (at the base of the brain)	Ovaries
Function	Control the release of egg from ovary	Change the thickness of uterus lining



1. Menstruation

- Usually, one egg is released from an ovary every month. Before the egg is released, the **lining** of the uterus becomes thick and spongy to prepares for a fertilised egg. It is full of tiny blood vessels, ready to supply the embryo with food and oxygen if it should arrive.
- If the egg is not fertilised, it is dead by the time it reaches the uterus.
- Is does not sink into the spongy wall, but continues onwards, down through the vagina.
- As the spongy lining is not needed now ---> it gradually disintegrates and is slowly lost through the vagina.
- This is called menstruation, or period and it last for about 5 days.

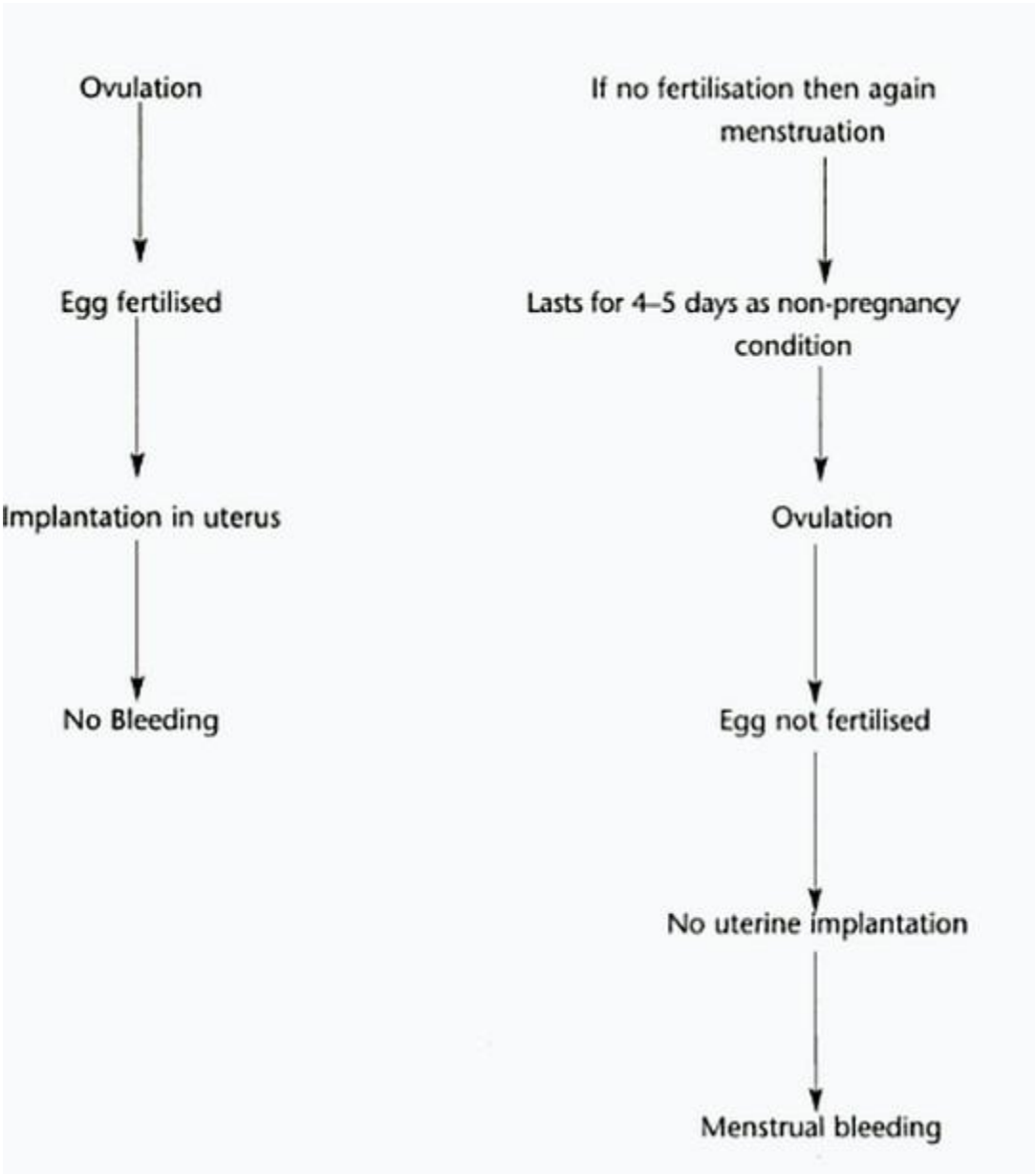
2. Ovulation



Ovary	Pituitary gland
• a **follicle** develops • secretes **oestrogen** • ↑↑ oestrogen in the blood. • lining of the uterus grows thick, spongy	• secretes **LH, FSH** • stimulates follicle to secrete oestrogen.
When the **follicle** is **fully developed** ---> **LH** ↑↑↑↑ and **FSH** ↑↑	
• follicles rupture and **release** fully developed **ovarian cells** (**ovulation**)	
• empty follicle stops secreting oestrogen • becomes a **corpus luteum** • secretes **progesterone** • uterus lining thick, spongy, well supplied with blood in case a egg is fertilised.	• ↓↓ **LH, FSH**

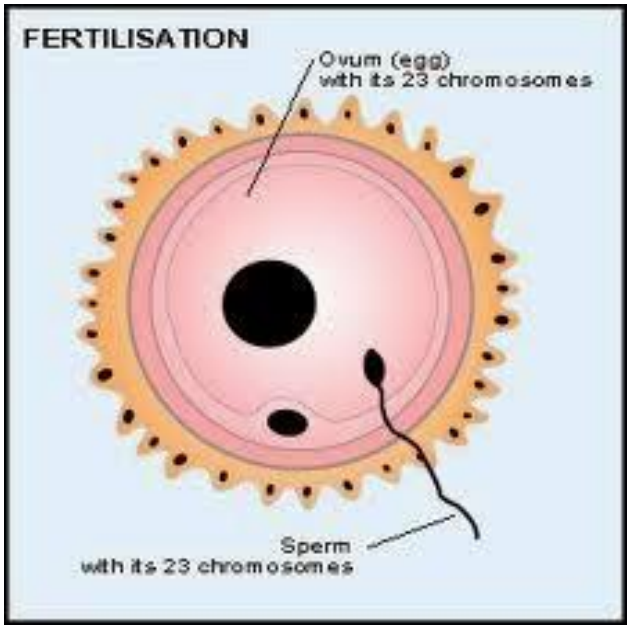
If the egg is not fertilized
• corpus luteum gradually disappears • no more progesterone secreted • uterus lining breaks down
Menstruation
• a new **follicle** develops

If the egg is fertilized
• corpus luteum does not degenerate so quickly • secretes progesterone until the embryo sinks into uterus wall and a placenta develops
Placenta secretes progesterone through pregnancy
• it maintains the uterus lining so that the menstruation does not happen during pregnancy

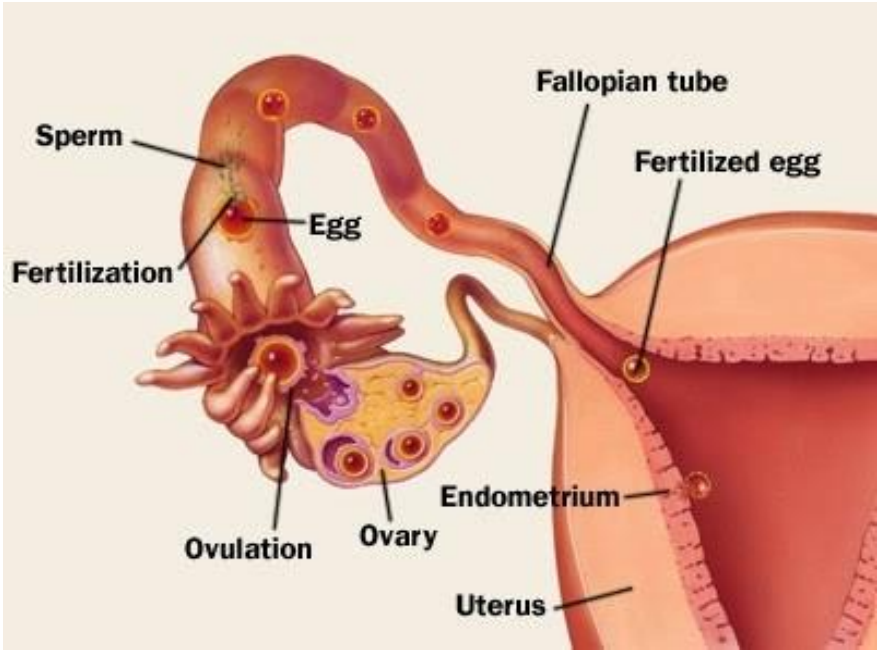

Ovulation
Egg fertilised
Implantation in uterus
No Bleeding
If no fertilisation then again menstruation
Lasts for 4–5 days as non-pregnancy condition
Ovulation
Egg not fertilised
No uterine implantation
Menstrual bleeding

#115 Formation of the fetus - fertilisation, implantation

After sexual intercourse, sperms swim through the cervix and the uterus into the oviducts, where they meet an egg. One **sperm** may **fertilise** the **egg** to produce a **zygote**.



After ovulation, the egg is caught in the funnel of the oviduct. Very slowly, the egg travels towards the uterus. If the egg is not fertilised by a sperm within 8-24 hours after ovulation, it will die. By this time, it has only traveled a short way along the oviduct. So a sperm must reach an egg while it is quite near the top of the oviduct if fertilization is to be successful.

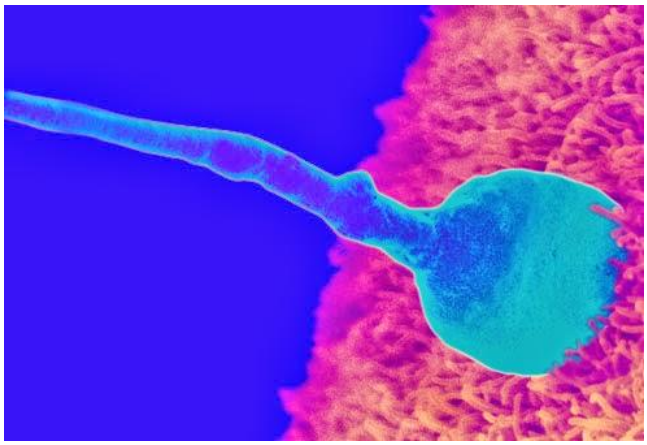


1. Sexual intercourse involves inserting the erect penis into the vagina.

- When stimulated, spongy tissue in the penis filled with blood and becomes erect.
- At the climax, semen is ejaculated from the penis into the neck of the vagina.
- Muscles in the wall of the sperm duct help to propel the semen forward
- The sperms with their tails swim from the vagina, through the cervix and uterus, into an oviduct.

2. Fertilisation happens in the oviduct

- ovum/egg pass down in oviduct
- a single **sperm penetrates the membrane of ovum** by secreting a protease enzyme; only the head of the sperm goes in, the tail is left outside.



Credit: Web MD

- the sperm nucleus and the egg nucleus **fuse** to form a **diploid zygote** = **fertilization**

- sperm can remain active in the oviduct for at least 2 days and the ovum may take a day to pass from the ovary to the uterus, so there is a fertile period of 3 to 4 days around ovulation when fertilization can happen.

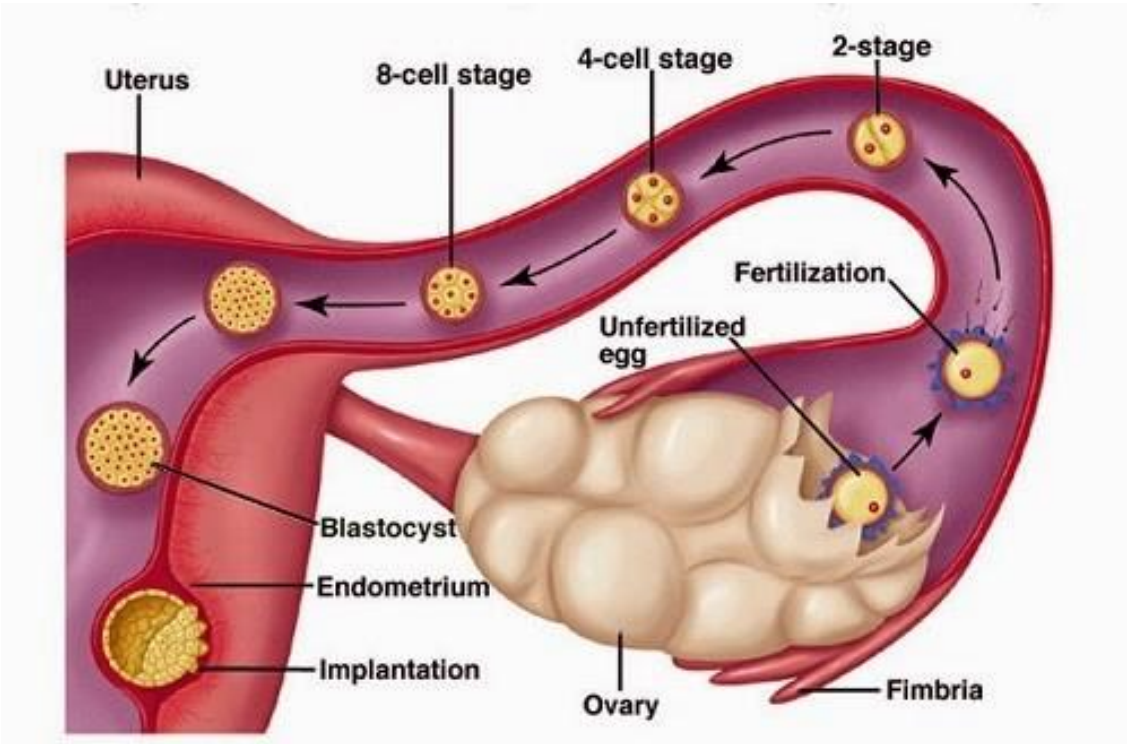
3. The zygote implants in the uterus wall

- the zygote moves slowly down the oviduct. As it goes, it **divides** by mitosis.

- it takes several hours for the embryo to reach the uterus, and by this time it is a ball of 16 or 32 cells (a **blastocyst**).

Egg implanting in uterus. Credit: Web MD

- the uterus has a thin, spongy lining, and the embryo sinks into it = **implantation**.

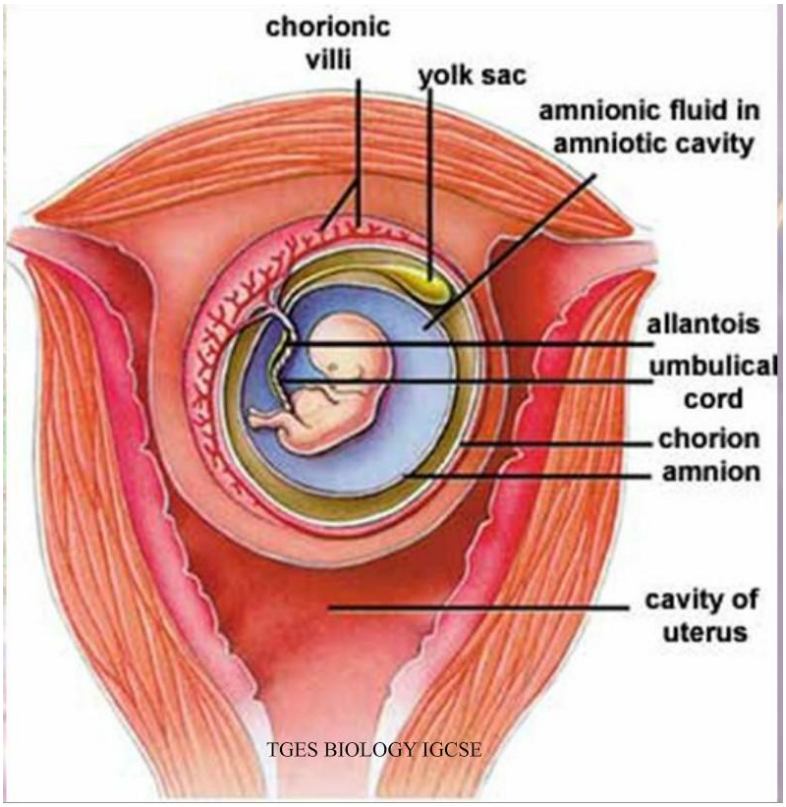


Credit: soc.hawaii.edu

#116 The development of the fetus

The **blastula** develops into an **embryo** and some of the cells form a **placenta**, linking the embryo with the uterus lining. Organs such as the heart develops and, after **8 weeks**, the embryo is called a **fetus**.

Growth of the fetus requires a good supply of nutrients and O_2. This is achieved through the link between the **placenta** and the mother's blood supply in the uterus lining. The placenta is soft and dark res, and has finger-like projections called **villi**. The villi fit closely into the uterus wall.

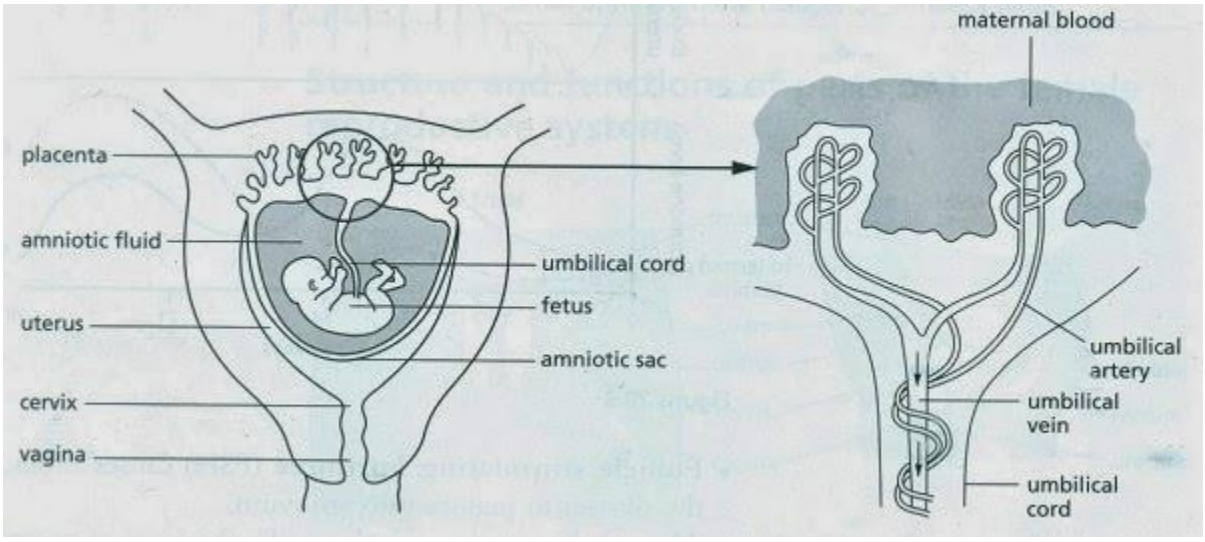


1. Umbilical cord

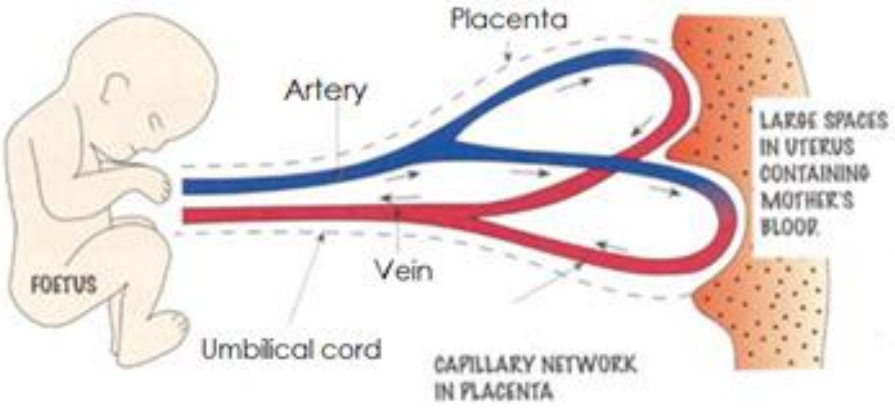
- joins fetus to placenta; contains:
- 2 arteries: blood from fetus ---> placenta
- 1 vein: returns blood ---> fetus

2. Placenta

Brings blood supply of fetus close to mother's



- Blood from the fetus passes through the **umbilical cord** in the **umbilical artery** to the placenta.
- Here it comes close to the mother's blood.
- transport O_2 + nutrients (amino acids, glucose…) from mother ---> fetus
- transport CO_2 + wastes (urea…) from fetus --->mother (through umbilical vein).



Prevents mixing

This is really important because the fetus and mother may have different blood groups - any mixing could result in **blood clotting**, which could be fatal to both mother and fetus.

3. An amnion protects the fetus

The fetus is surrounded by a strong membrane, called amnion. Inside the amnion is a liquid called amniotic fluid.

The fetus in the amniotic sac. Credit: preventdisease.com

Amniotic sac: **membrane** from embryo cells: encloses fetus, prevents entry of bacteria

Amniotic fluid: supports, protects fetus from **mechanical damage**; **absorbs urine** released by fetus.

Try this

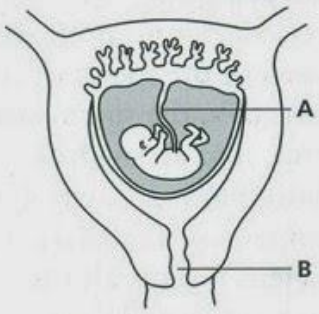


Figure 20.5

1 Figure 20.5 shows a fetus developing in the uterus.

a) i) Copy the figure, and label parts **A** and **B**. [2 marks]

ii) Outline **three** functions of the placenta. [3 marks]

iii) The blood of the fetus and that of the mother flow close to each other in the placenta, but do not mix. State **two** advantages to the fetus of having a separate blood system from that of the mother. [2 marks]

Answer

a) i) **A,** umbilical cord ; **B,** vagina

ii) **Tree** functions from:
- transfers O_2 from mother to fetus
- transfers nutrients (of named nutrients) from mother to fetus
- transfers CO_2 from fetus to mother
- transfers wastes (or named wastes) from fetus to mother
- allows the transfer of antibodies from mother to fetus
- prevents mixing of the blood of mother and fetus.

iii) Helps prevent bacteria passing from mother to fetus, the blood group of mother and fetus may be different.

Sample question and answer

Sample question

Figure 20.6 shows a fetus developing in the uterus. Copy and complete the table below by identifying the parts labelled **A**, **B** and **C** and stating a function of each one.

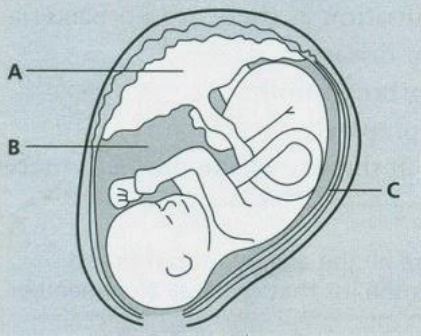


Figure 20.6

Part	Name	Function
A		
B		
C		

[6 marks]

Student's answer

Part	Name	Function
A	placenta ✓	provides the fetus with blood containing oxygen from the mother ✗
B	amniotic fluid ✓	protects the fetus ✗
C	uterus ✗	contains the fetus during pregnancy ✗

Examiner's comments

The description of the function of the placenta is very badly worded: the placenta prevents the blood of the mother and fetus from mixing. Answers containing biologically incorrect information are penalised.

Details about the amniotic fluid are too vague to gain the mark for the function. The correct answer was 'to protect the fetus from physical damage'.

*Part **C** is the amniotic sac, which contains the amniotic fluid.*

#117 Antenatal care

Ante-natal (before birth) **care** is a routine care for the healthy pregnant woman.

Dietary needs

Before the baby is born, it obtains all its dietary requirements from its mother through the placenta. The mother's **diet** needs to be **balanced** so that's the fetus receives all the materials needed for healthy growth and development.

If the mother's diet is deficient in any nutrients, the bay may not develop properly. So her diet should contain plenty of:

- amino acids ---> healthy grow and development
- calcium ---> development of the skeleton
- iron ---> red blood cell formation
- energy (carbohydrates/ fats) – help to move mother's heavier body.

Exercise

- gentle exercise (swimming, walking…)
- special exercises

Things to avoid

- drugs: aspirin, heroin
- smoking: nicotine and CO
- alcohol drinking
- viruses: HIV, rubella (can pass across the placenta, risking the fetus health).

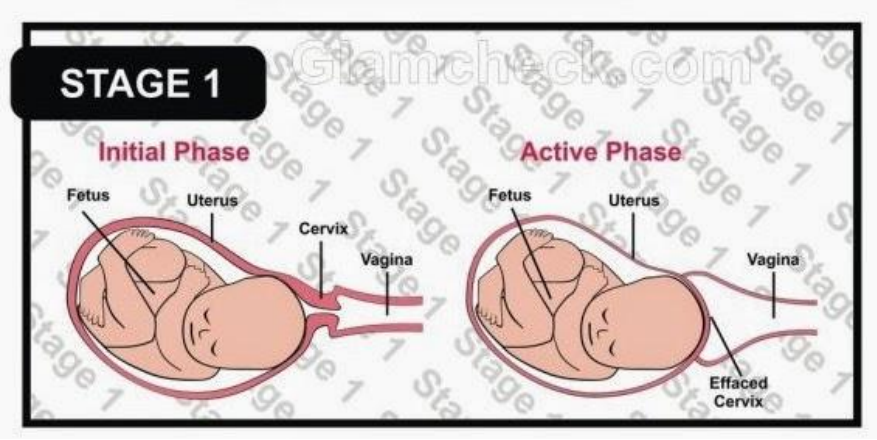
#118 Process of birth

Birth begins when the strong **muscles** in the wall of the uterus start to **contract**. This first stage of birth (called **labour**) is triggered by the hormone oxytocin.

Stages of birth

Stage 1

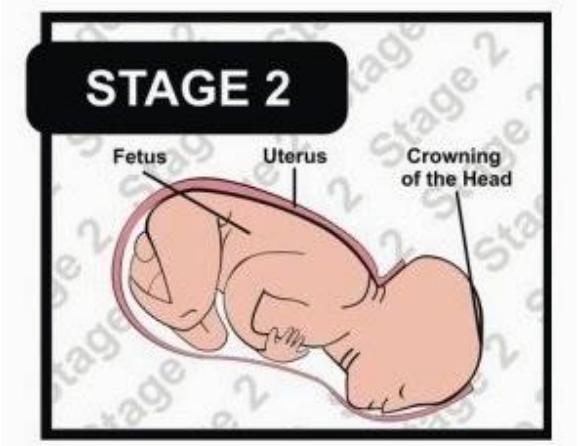
The muscular walls of the uterus start to contract, slowly stretch the opening of the cervix.



The pressure breaks the amniotic sac, releasing the **amniotic fluid**.

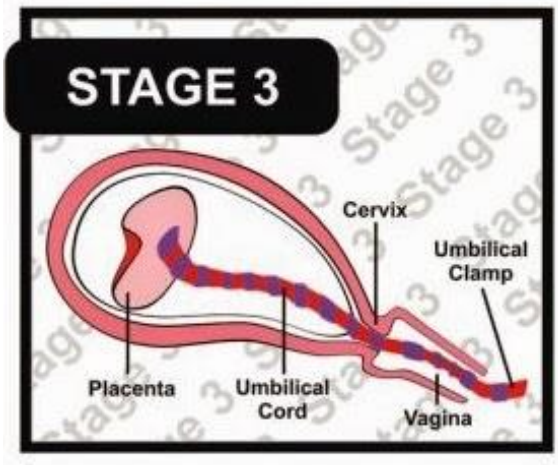
Contraction gradually become more frequent, pushing the baby down towards the **cervix**, which become **dilated** to allow baby to pass through.

Stage 2



The **vagina** stretches to allow the baby to be born.

Stage 3



The baby is still attached to the placenta by the umbilical cord, so this is cut and tied. The **placenta** breaks away form the wall of the uterus and passed out (**afterbirth**).

Process of birth

Try this

Describe, in sequence the main events which occur during birth. [3 marks]

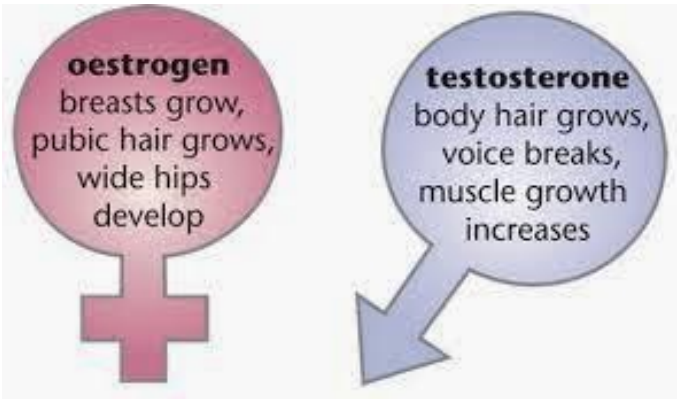
Answer

Three points from**:**

- the wall of the uterus contracts
- the amniotic sac bursts
- amniotic fluid passes out though the vagina
- the cervix dilates
- the baby passes out through the cervix and vagina.

#119 Sex hormones

Sex hormones (testosterone in boys and oestrogen in girls) are responsible for the development of **secondary sexual characteristics** at puberty.



Sex hormones

	Testosterone	Oestrogen
Secreted by	testes	ovaries
Make changes	in boys	in girls

Puberty

- the **sex organs** (ovaries in girls, testes in boys) become **mature** and start to secret hormones, making gametes (ova and sperms)

- happens at about **10-14 years.**

Secondary sexual characteristics at puberty

Male	Female
Voice becomes much lower (breaks)	Breasts grow, nipples enlarge
Hair start to grow on chest, face, under arms and in pubic area	Hair develops under arms and in pubic area
Body becomes more muscular	Hip become wider
Penis becomes larger	Uterus and vagina become larger
Testers start to produce sperm	Ovaries start to release eggs and period begin (menstruation)

Sites of production of **oestrogen** and **progesterone** in the menstrual cycle and in pregnancy

Hormones	Site of production	
	In the menstrual cycle	**In pregnancy**
Oestrogen	Ovaries	Placenta
Progesterone	Corpus luteum (remains of follicle in ovary after ovulation)	Placenta

Try this

Try this

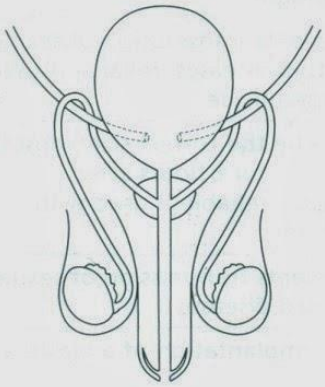


Figure 20.7

3 Figure 20.7 represents part of the male reproductive system, together with parts of the urinary system.

a) Copy or trace the figure and label:
   i) the sperm duct (vas deferens) [1 mark]
   ii) the urethra. [1 mark]

b) What is the difference in function of the urethra in males and females? [2 marks]

c) i) The hormone testosterone controls the development of secondary sexual characteristics in males. State **two** of these characteristics which develop at puberty. [2 marks]
   ii) On your drawing label clearly where this hormone is produced. [1 mark]
   iii) Some international athletes, female as well as male, have taken testosterone, illegally, as a drug. Suggest why these athletes might have done this. [2 marks]

Answer

a) i) Sperm duct labeled correctly between the testes and urethra.

ii) Urethra labeled correctly between bladder and tip of penis.

b) In males the urethra carries urine and semen at different times; in females the urethra only carries urine.

c) i) **Two** male secondary sexual characteristics from:
- voice becomes much lower (breaks)
- hair starts to grow on chest, face, under arms and pubic area
- body becomes more muscular
- penis becomes larger
- testes start to produce sperm.

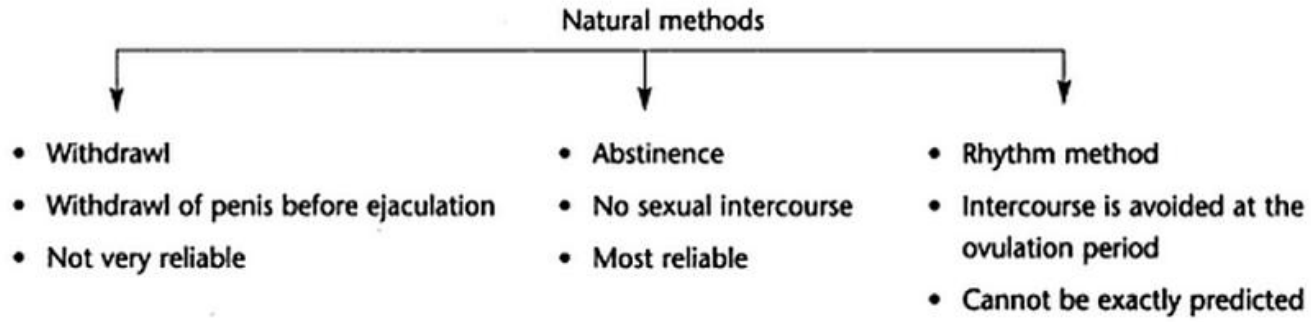
ii) Testis (or testes) labeled correctly.

iii) testosterone makes muscles grow, so the athletes can run faster or perform better.

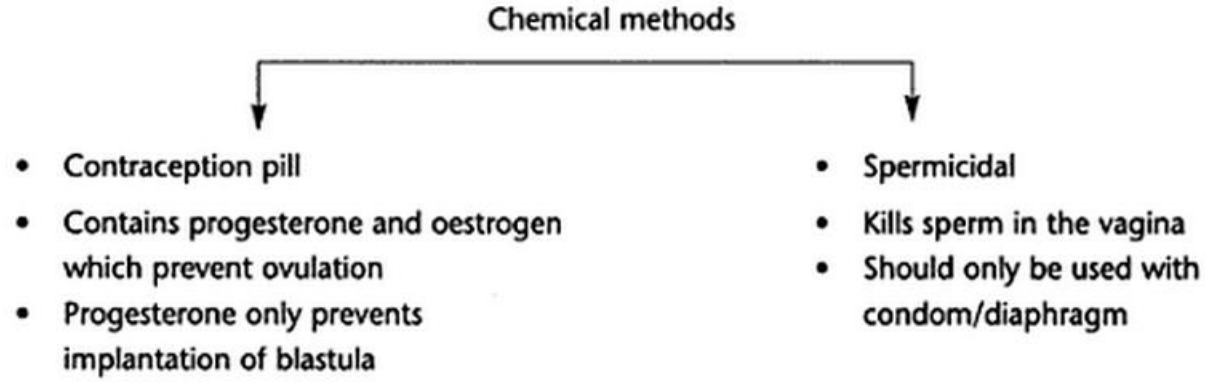
#120 Method of birth control

There are 4 main groups of **birth control** methods:
natural, **chemical**, **mechanical** and **surgical.**

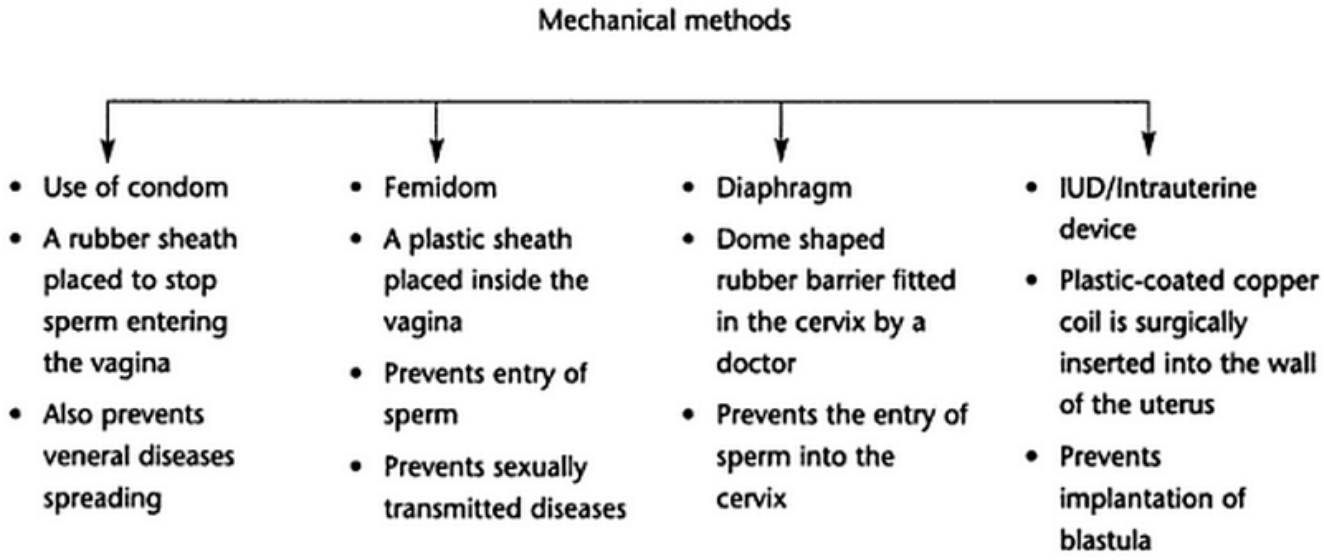
1. Natural methods



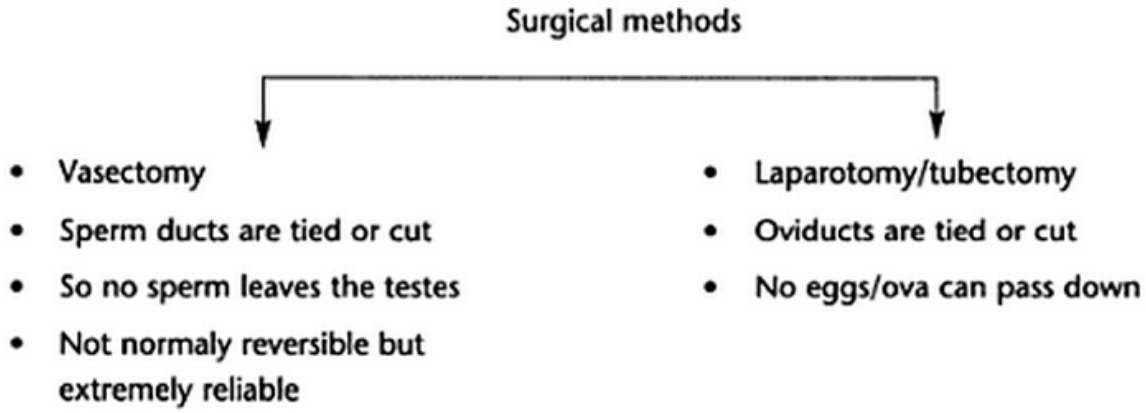
2. Chemical methods



3. Mechanical methods



4. Surgical methods



Photos from WebMD:

Chemical methods

Birth Control Pill

The most common type of birth control pill uses the hormones estrogen and progestin to prevent ovulation. When taken on schedule, the pill is highly effective.

About 8% of typical users get pregnant, including those who miss doses. Like all hormonal contraceptives, the pill requires a prescription.

Spermicide

Spermicide contains a chemical that kills sperm.

It comes in the form of foam, jelly, cream, or film that is placed inside the vagina before sex.

Mechanical methods

Male Condom

The latex condom is the classic barrier method. It prevents sperm from entering the woman’s body, protecting against pregnancy and STDs.

Of couples who rely only on male condoms, 15% get pregnant in a year.

Female Condom

The female condom is a thin plastic pouch that lines the vagina and can be put in place up to 8 hours before sex.

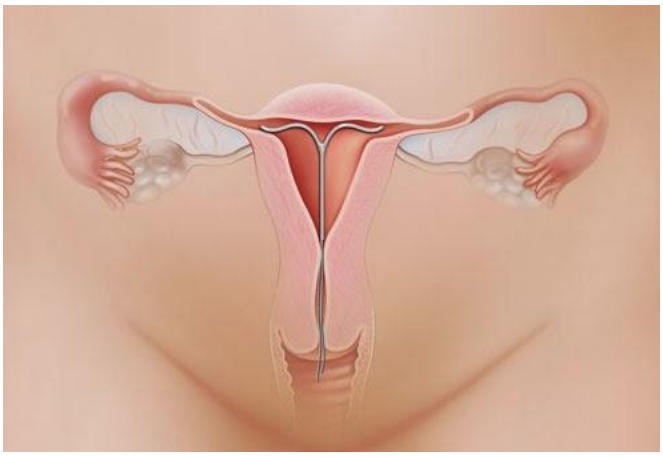
Users grasp a flexible, plastic ring at the closed end to guide it into position.

It's somewhat less effective than the male condom.

Diaphragm

The diaphragm is a rubber dome that is placed over the cervix before sex.

IUD

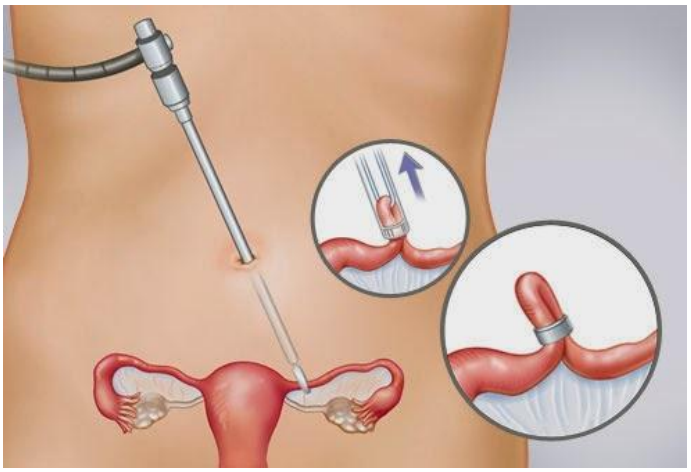


IUD stands for intrauterine device, a T-shaped piece of plastic that is placed inside the uterus by a doctor.

The copper IUD, ParaGard, works for as long as 12 years. The hormonal IUD, Mirena, must be replaced after 5 years. Both types make it more difficult for sperm to fertilize the egg.

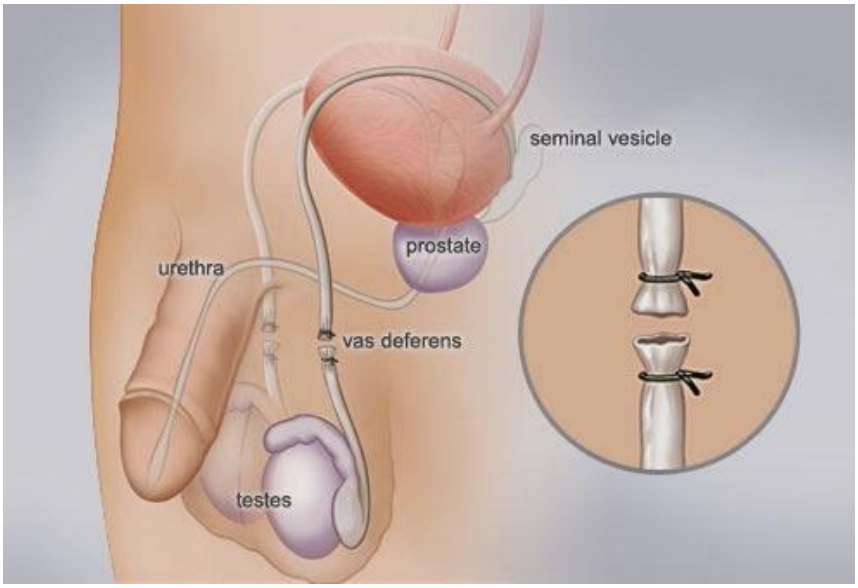
Fewer than eight in 1,000 women get pregnant.

Surgical methods



Tubal Ligation
A surgeon closes off the fallopian tubes, preventing eggs
from making their journey out of the ovaries.

Vasectomy



Besides condoms, a vasectomy is the only birth control option available to men. It involves surgically closing the vas deferens – the tubes that
carry sperm from the testes, through the reproductive system.
This prevents the release of sperm but doesn't interfere with ejaculation.

Least Effective Methods

Without using any form of birth control,
85% of sexually active couples will get pregnant within a year.
Even the least effective birth control options
reduce that number considerably.

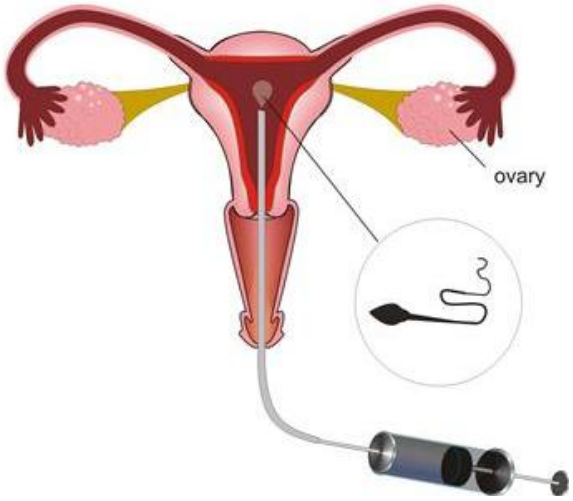
Source: Letts Revise IGCSE - Biology:Complete Study and Revision Guide

Slide Show: Birth control Options from WebMD

http://www.webmd.com/sex/birth-control/ss/slideshow-birth-control-options

#121 Artificial insemination, hormones in fertility drugs

An **artificial insemination** procedure uses a thin, flexible tube (catheter) to put **sperm** into the woman's **reproductive tract** (vagina, cervix, uterus) around the time of ovulation. For some couples with infertility problems, insemination can improve the chances of pregnancy.



Artificial insemination

If the problem causing the couple's infertility is in the man (he may not be producing healthy sperms), then **sperms** from a **donor** is collected in a clinic, and can be **stored** at a low temperature for many months or even years. The woman can then attend the clinic, and some of the sperms can be placed into her reproductive tract.

Prior to insemination, the sperm usually are washed and concentrated (placing unwashed sperm directly into the uterus can cause severe cramps). Concentration is accomplished by selectively choosing highly active, healthy sperm that are more capable of fertilizing an egg.

The artificial insemination may be a real help to a couple, as it allows them to have a child that they could not otherwise have.

Problems:

- The man has to be able to accept that the child is not biologically his.

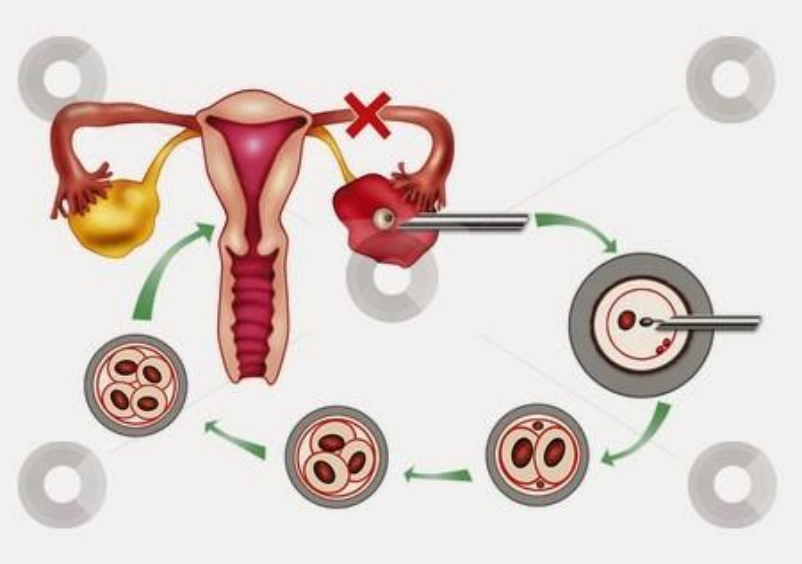
- When the child grows up, he may wants to know who his biological father is. Some people think that the identity of the sperm donor should be given to the child. However, this may cause more problems than it solves. Many sperm donors wish to remain anonymous.

Use of hormones in fertility drugs

Fertility drugs are used when the woman is not producing enough eggs. She is given hormones, including FSH and LH, that cause multiple release of eggs.

- The eggs can be allowed to be released into the oviduct in the normal way.

- If the woman has a problem with **blocked oviducts**, the **eggs** are removed from her ovaries just before they are due to be released, and placed in a warm liquid in a **Petri dish**. Some of her partner **sperms** are added, and fertilization takes place in the dish. 2 or 3 of the resulting **zygotes** are placed into her **uterus**, where they develop in the usual way. This is called ***In vitro* fertilization** (**IVF**).



IVF

Problems:

- The treatment is quite expensive, and not always successful. Some argue that the it should not be freely available to anyone who wants it. Other think that the inability to have children can be so devastating to a couple that they should receive the treatment free of charge.

- Sometimes 2 or 3 embryos develop, so the couple might have twins or triplets when they really only wanted one child.

#122 Breast feeding vs formula milk?

This has been a tough question for many years: Which is better - **breast milk** or **fomula milk?** While breast milk is nutritious, it has its inconveniences. Formula milk is convenient but expensive. What to choose?

	Breast feeding	Formula milk
Advantages	- has antibodies; no bacteria - foodstuffs in correct proportions - no risk of allergic reaction - correct t° - no additives/ preservatives - builds mother - child bond - no cost; no preparation - breast-feeding triggers reduction of uterus size	- less painful - other people can feed baby - may contain supplement vitamins, minerals
Disadvantages	- may be painful - mother needs to be present - damage beauty	- more likely to develop illness (diarrhoea, urine infection…) - risks of wrong mixture - expensive

Fun fact! Breast milk can naturally and easily remove eye make-up! Plus, it can cure certain eye diseases!

There are several other things you could do with breast-milk :) Find out more, just for fun, at:

http://www.breastfeeding-problems.com/using-breast-milk.html

I swear, some of these facts can blow your mind!

Video: Breastfeeding vs bottle feeding - DrTummmy.com

https://www.youtube.com/watch?v=XPi0odcvegM

#123 HIV/ AIDS - transmission and prevention methods

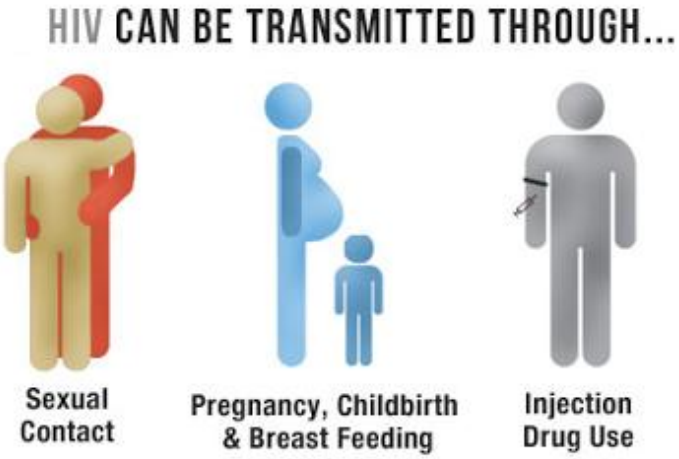
AIDS (Acquired Immune Deficiency Syndrome) is a disease caused by the HIV.
HIV can not live outside the human body. It is an especially **fragile** virus - much less tough than the cold virus.
It is **transported** in **body fluids**. You can only become infected with HIV through direct contact of your body fluid with those of someone with the virus.

How HIV affects the immune system

- The HIV virus **attacks** some types of **lymphocyte** (white blood cells) in the blood stream.
- Lymphocytes produce **antibodies** ---> attack the **antigens** on invading microbes.
- Some lymphocytes are **stored** in lympho nodes ---> protection against **future infection**.
- **HIV prevents** this immunity being retained, so the AIDS sufferer has no protection against diseases such as tuberculosis (TB) and pneumonia.

Methods of transmission:

- unprotected sexual intercourse with infected person
- drug use involving sharing needle used by infected person
- transfusion of infected blood
- infected mother to fetus
- feeding a baby with milk from an infected mother
- unsterilised surgical instruments



Prevention methods

- condom for sexual intercourse
- refuse sexual intercourse
- screen blood (for transfusion)
- use sterilized needles
- feed baby with bottled powdered milk (if mom has HIV)
- use sterilised surgical instruments.

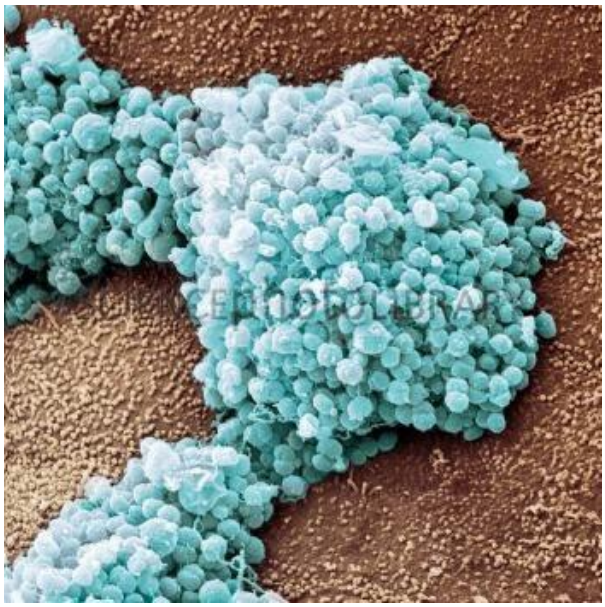
Video: How is HIV Transmitted?

https://www.youtube.com/watch?v=z8BwYFlTAGY

Video: How to prevent HIV transmission?

https://www.youtube.com/watch?v=NXnvP_sKS9k

#124 Gonorrhoea



Gonorrhoea bacteria, Credit: Science photo library

Gonorrhoea is caused by bacteria that can be **passed** from one person to another during **sexual intercourse.** ***Neisseria bacterium*** is a small, round cell. It can only survive in moist places, such as tissues lining the tubes in the **productive systems** of a man and a woman.

Symptoms

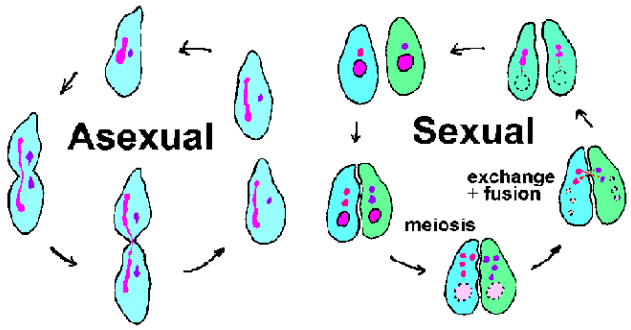
- If gonorrhoea bacteria are living in a woman's vagina or a man's urethra, the infection can be passed during sexual intercourse.
- The first symptoms occurs 2-7 days after infection.
- Man: the bacteria reproduce inside the urethra ---> unpleasant discharge and pain when urinating.
- Woman: the bacteria reproduce mostly in the cervix, although they can also do so in the vagina ---> many woman do not notice discharge or suffer a pain as men do.
- Most men with gonorrhoea know that they have it, many women are unaware that they have the infection.

	Signs and symptoms	Effects	Treatment
Male	- **Sores** on penis - **Discharge** of pus from penis - **Pain** when urinating	- Damage to urinary and reproductive organs - Sterility - Blindness in a baby born to a mother with the disease.	Antibiotic, e.g. penicillin
Female	- Discharge of pus from vagina, but not always obvious - Often **no symptoms**		

Severe eye pathology in a baby born to a mother with gonorrhoea: eyelids swollen, profuse purulent discharge. If untreated blindness may result.
Credit: cehjournal.org

#125 Summary of Reproduction

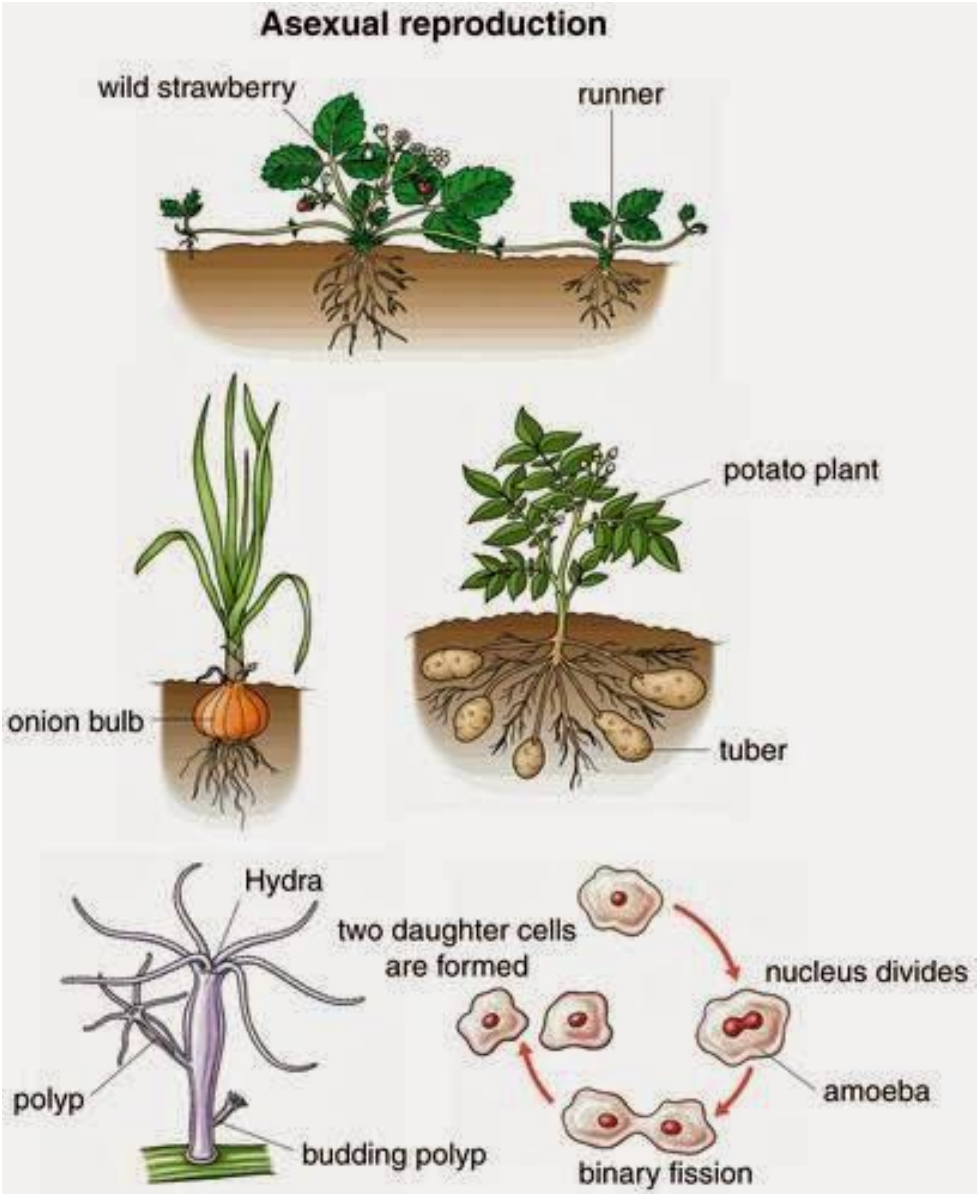
Reproduction is the biological process by which new "**offspring**" individual organisms are produced from their "**parents**". It is a fundamental feature of all known life.



Two types of reproduction:
sexual and **asexual.**

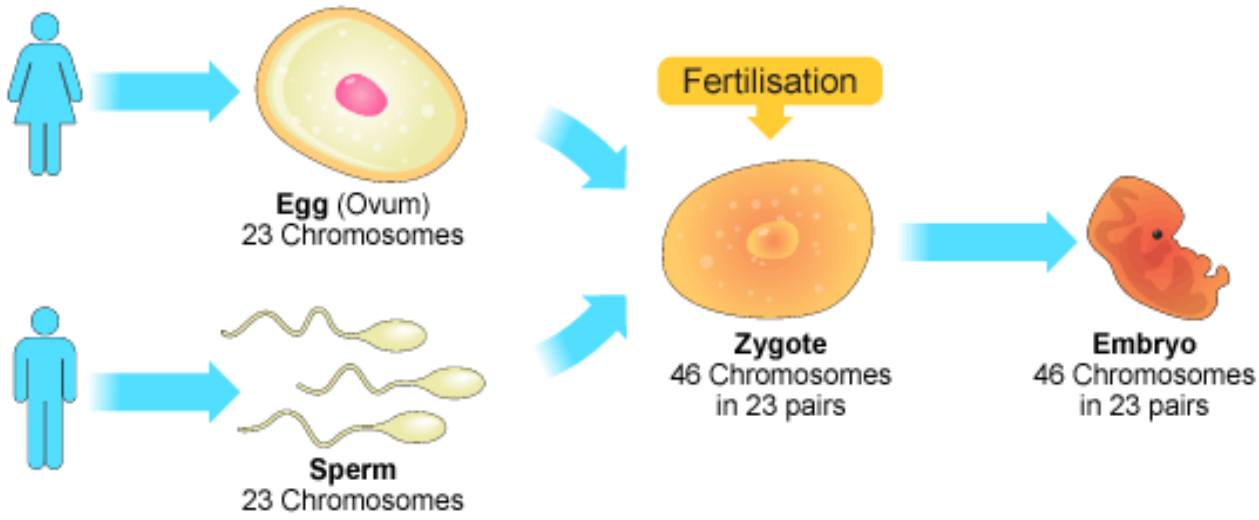
Asexual reproduction

It involves cell division by **mitosis,** producing a group of genetically identical individuals called a clone. Bacteria, fungi and potatoes can reproduce asexually.



Sexual reproduction

Sexual reproduction involves the production of genetically different gametes by **meiosis**. A male gamete fertilises a female gamete, producing a zygote which is genetically different from its parents.



In human

- The male gametes are **sperms**, they are made in the **testes**. During sexual intercourse, semen containing sperms passes out to the penis and into a woman's vagina.
- The female gametes are **eggs** and are made in the **ovaries**. After sexual intercourse, sperm swim through the cervix and uterus into the **oviducts**, where they may meet an egg. One sperm may fertilise the egg to produce a **zygote**.
- The **zygote** travels to the uterus and **implants** into the lining, growing into an **embryo** attached t the uterus wall via an umbilical cord and **placenta**. The placenta brings the growing embryo' blood very close to the mother's blood, so that's nutrients and waist products can diffuse between them.
- The growing embryo is protected by **amniotic fluid** produced by the amnion.
- After birth, a young mammal is fed on **milk** from its mother. This provides it with exactly the correct balance of nutrients, as well as antibodies which protect it from infectious diseases.

- An egg is releases from an ovary about one a moth. If it is not feritlised, the thick lining of the uterus breaks down, in **menstruation**.
- The menstrual cycle is controlled by the **hormones** oestrogen, progesterone, FSH and LH.
- **Birth control** helps a couple t avoid having unwanted children. There are natural, surgical, mechanical and chemical methods.
- Hormones can be used to increase fertility.
- **Gonorrhoea** and **HIV/AIDS** are infectious diseases that can be transmitted by sexual contact.

In plants

- The **flowers** are the reproductive organs. Male gametes are make inside pollen grains, produced by anthers. Female gametes are make inside ovules produced by ovaries.
- The movement of pollen from an anther to a stigma is called **pollination**, and may be brought about by insects of the wind.
- After landing on a suitable stigma, a pollen grain **germinates** and the gametes travel down the style to the ovules. Here, **fertilisation** takes place and a **zygote** is produced. The zygote develops into an **embryo**, and the ovule develops into a **seed**. The ovary develops into the **fruit**, containing the seeds which contain the embryos.
- Fruits are adapted to **disperse seeds**, using animals or the wind.
- Seeds require certain condition before they will germinate.