

INCREASING ACCESS TO SECONDARY SCHOOL LEVEL EDUCATION THROUGH THE PRODUCTION OF QUALITY LEARNING MATERIALS

JUNIOR SECONDARY LEVEL

BIOLOGY

Module 7: Continuity of Life

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Ministry of Education and Botswana College of Distance and Open Learning (BOCODOL), Botswana
Ministry of Education, Science and Technology and the Malawi College of Distance Education (MCDE), Malawi
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JUNIOR SECONDARY LEVEL SCIENCE - BIOLOGY

MODULE 1 – Introduction to Biology and the Classification of Living Things

Unit 1 The Science of Life

Unit 2 Biological Skills

MODULE 2 – The Living Cell

Unit 1 Cell Structure and Organisation

Unit 2 Levels of Organisation

Unit 3 Compounds of Life

MODULE 3 – Energy and Life

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Unit 1 Transport in Plants

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MODULE 6 – Support, Movement and Control

Unit 1 Support and Movement

Unit 2 Hormonal and Nervous Control

Unit 3 Control and Regulation



MODULE 7 – Continuity of Life

Unit 1 Reproduction

MODULE 8 – Organisms and the Environment

Unit 1 Ecological Principles

Unit 2 Population Growth and Regulation

Unit 3 Human Influence on the Environment

MODULE 7

CONTINUITY OF LIFE

MODULE INTRODUCTION

All living organisms feel the need to reproduce. This is very important to ensure the survival of the species. Plants, for example, reproduce both asexually and sexually. Reproduction in humans is very specialised in order to protect the growing embryo. The offspring produced have many characteristics similar to their parents. This is due to inheritance which leads to continuity of and variation within the species. This Module looks at **Reproduction** and **Inheritance**.

MODULE OBJECTIVES

At the end of this Module, you should be able to:

- describe the various processes underlying reproduction
- differentiate between the various types of reproduction in living organisms
- outline the principles of inheritance.

REPRODUCTION

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REPRODUCTION

INTRODUCTION

Organisms die due to old age and disease, others get killed. New individuals are born to replace those that die.

All organisms produce young ones like themselves to continue the survival of their kind. This process is called ***reproduction***.

This Unit looks at the processes underlying reproduction in living organisms.

OBJECTIVES

At the end of this Unit, you should be able to:

- explain *meiosis* and *mitosis*
- describe sexual and asexual reproduction in plants
- describe sexual reproduction in humans
- list some sexually transmitted diseases, (STDs)
- outline their transmission mechanism
- list preventive steps for sexually transmitted diseases.

1.0 CELL REPRODUCTION

Cells have the capacity of reproducing themselves. **Chromosomes** play a very important role in this process.

Chromosomes

Chromosomes are threadlike substances found in the nucleus of a cell. The chromosomes contain information which determines all the organism's characteristics. They also control all the cell's activities.

Diploid Cell

A cell which contains the full number of chromosomes is called a ***diploid cell***.

Haploid Cell

One which contains half the normal number of chromosomes is called a ***haploid cell***.

1.1 CELL DIVISION

Cells can divide in two different ways. These are:

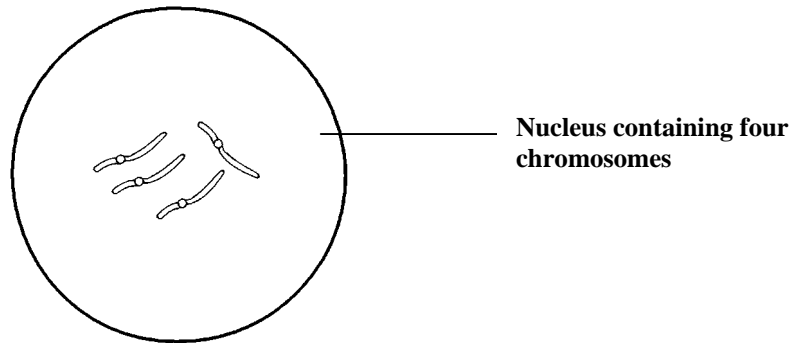
- Mitosis
- Meiosis

Mitosis

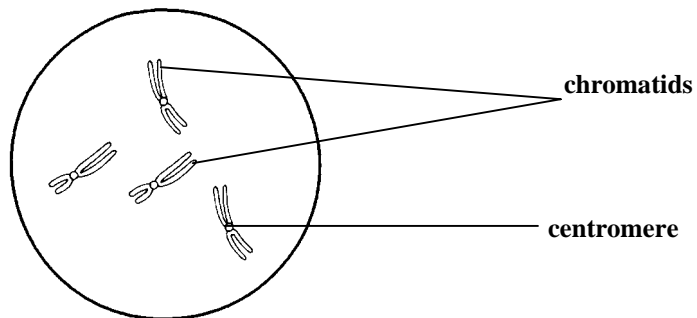
Mitosis produces an exact duplicate of the set of chromosomes resulting in two identical daughter nuclei. Mitosis occurs in stages. Let's now turn to these stages.

Figure 1 explains how mitosis occurs

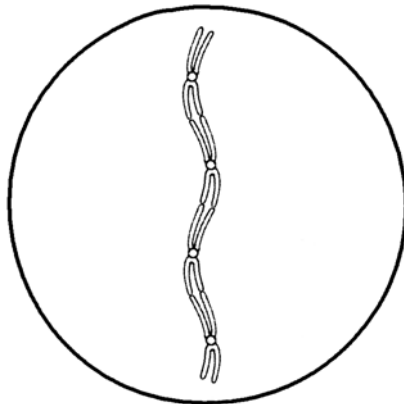
Stage 1: chromosomes become thicker



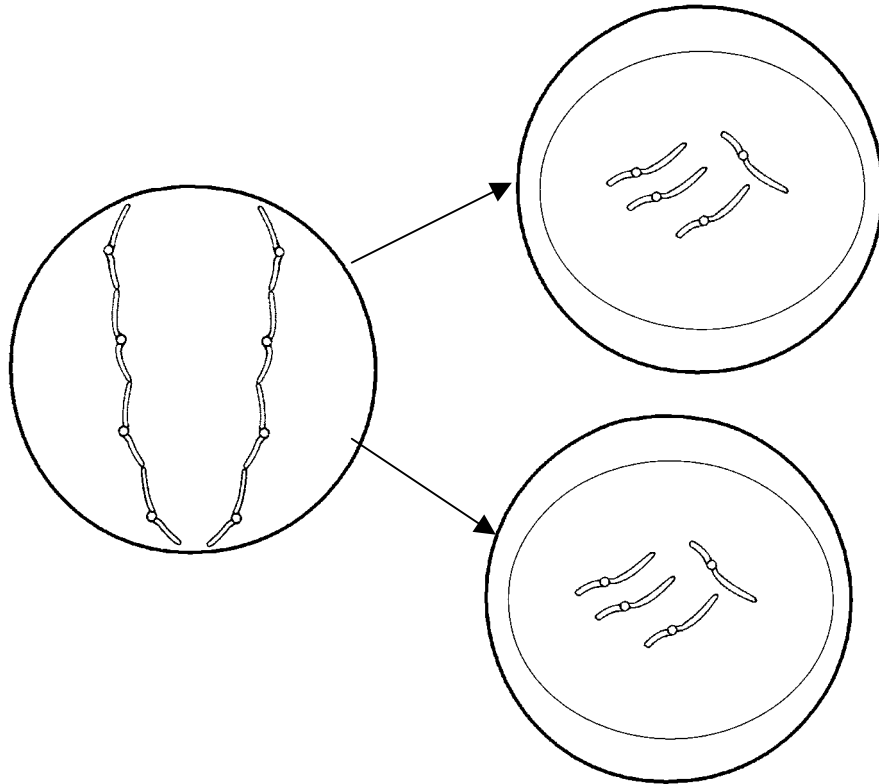
Stage 2: each chromosome divides to give an exact copy of itself. We call these **chromatids** and they are held together by a **centromere**.



Stage 3: the chromatids line up at the middle of the cell.



Stage 4: the chromatids separate and move to opposite ends of the cell. The cell then splits into two. Two daughter cells with the same number of chromosomes are produced.



Mitosis occurs in cell division during growth and asexual reproduction.

You must understand that growth by mitosis is a controlled process. If cell division gets out of control, a disorganised mass of cells is produced. This is called a tumour which may lead to cancer.

We can now proceed with the following investigation.



INVESTIGATION 1: Observing mitosis in the cells of a root tip.

<p>For each investigation you will require the materials indicated.</p>	<p>Materials needed:</p> <ul style="list-style-type: none">• young root• scalpel• acetic orcein stain• slide• coverslip• microscope• watch glass• acid <p>Method:</p> <p><i>A root tip is a region of rapid growth. The chromosomes in the cells in this region are easily seen to be undergoing mitosis.</i></p> <p><i>Prepare your own slide as follows:</i></p> <ol style="list-style-type: none">1. <i>Cut off the end of a young root (e.g. from a germinating onion).</i>2. <i>Place the root tip in a watch glass containing acidified acetic orcein stain.</i>
--	--

<p>You should record your answers in the space provided.</p>	<ol style="list-style-type: none">3. <i>Warm the watch glass for about five minutes. Be careful not to overheat it.</i>4. <i>Now place the root tip on a slide with a drop of acetic orcein stain.</i>5. <i>Break up the root tip carefully with a needle and spread out the cells as much as possible.</i>6. <i>Put a coverslip on your specimen.</i>7. <i>Observe your slide under the low power of your microscope and then under high power.</i> <p><i>Identify cells which are undergoing mitosis. Use figure 1 to determine which stage each cell has reached.</i></p>
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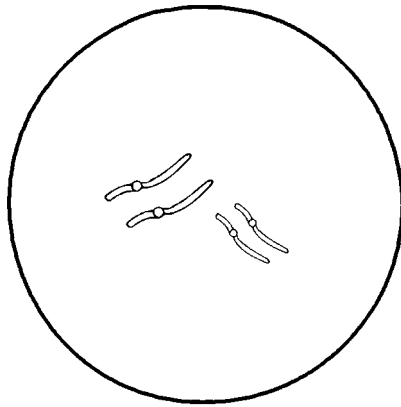
Meiosis

Another name for meiosis is reduction. This is because the daughter cells have half the number of chromosomes. Like Mitosis, Meiosis also occurs in stages.

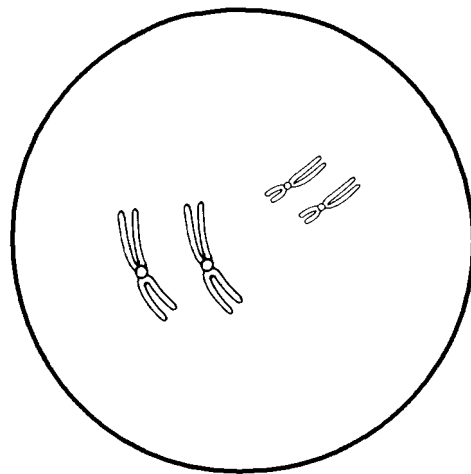
Figure 2 illustrates the stages of meiosis in a cell with four chromosomes.

First Division

Stage 1: chromosomes become visible

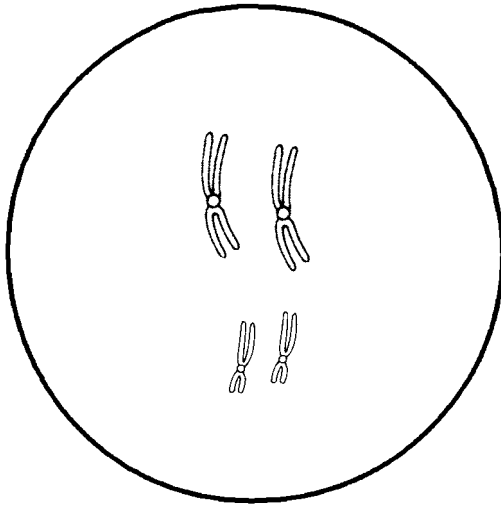


Stage 2: chromosomes replicate to produce chromatids

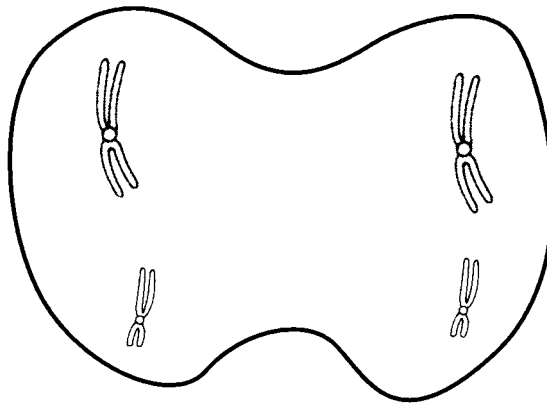


Stage 3: chromosomes exist in pairs. The chromosomes in a pair look alike and are called *homologous chromosomes*.

Homologous chromosomes pair up in the middle of the cell's nucleus.



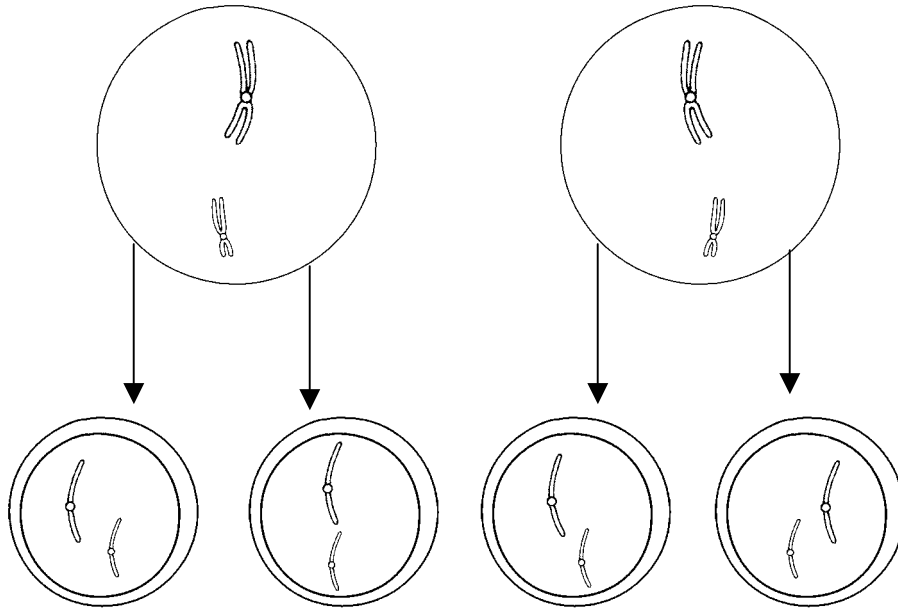
Stage 4: the homologous pair breaks apart and each chromosome moves to opposite ends of the cell. The cell splits into two.



Second Division

The chromatids now separate and move in opposite directions like in mitosis.

The two cells then split.



Observe that one parent cell produces four daughter cells, each with half the original number of chromosomes, i.e. haploid cells are produced.

The daughter cells are genetically different from the parent cell as they do not carry the same chromosomes.

Meiosis is important in sexual reproduction. It occurs in the eggs of the female and in the sperms of the male. The process ensures that the number of chromosomes in an organism remains constant.

We can now proceed with the following investigation.



INVESTIGATION 2: Observing slides showing meiosis

<p>For each investigation you will require the materials indicated.</p> <p>You should record your answers in the space provided.</p>	<p>Materials needed:</p> <ul style="list-style-type: none">• Slides of TS* of ovary• TS of testis• Microscope <p>Method:</p> <p><i>1. Observe the slides and identify cells which are undergoing meiosis.</i></p> <p><i>Try to identify the stage of meiosis you are observing.</i></p>
--	---

***TS – Transverse section**

 *Before proceeding further, complete the following activity.*

ACTIVITY 1

1. Explain what you understand by
 - (i) homologous chromosomes
.....
 - (ii) chromatids
.....
 - (iii) mitosis
.....
 - (iv) diploid cells
.....

2. A human being has 46 chromosomes in a diploid cell. How many chromosomes are present in
 - (i) a skin cell.....
 - (ii) a sperm cell.....
 - (iii) an egg.....

You will find the answer at the end of the Module.

1.2 REPRODUCTION IN PLANTS

We shall now turn to reproduction in plants. The reproductive part of a plant is a flower. After pollination and fertilisation, the flower produces fruits containing seeds. You must surely have noticed fruit trees bearing flowers before the fruits start to develop. The fruit contains seeds. The seeds when sown, germinate to give a new plant. Plants can also reproduce without flowers i.e. asexually.

NB: Pollination and fertilisation will be explained later on, so don't worry too much about them now. They are the TWO main stages in sexual reproduction in plants.

Asexual and sexual reproduction

There are two types of reproduction in plants:

- Asexual and
- Sexual reproduction

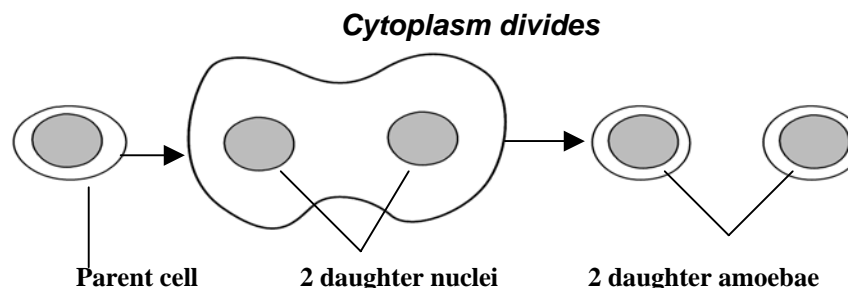
1.2.1 ASEXUAL REPRODUCTION

In asexual reproduction, a new individual arises from a single parent. The process is very simple and involves mitosis which we've already looked at. Asexual reproduction occurs mainly in simple organisms like bacteria and fungi.

Let us have a look at some examples of asexual reproduction now.

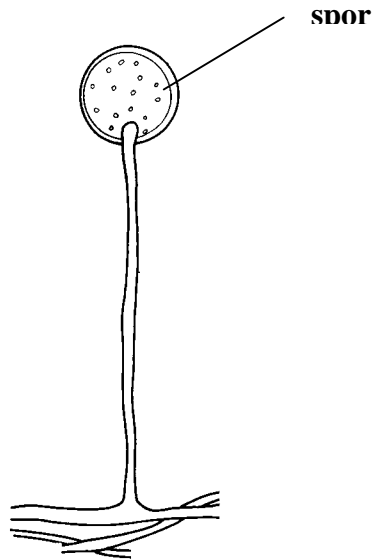
Binary fission in Amoeba (a unicellular organism)

During binary fission, the nucleus divides by mitosis forming another nucleus. The cytoplasm then contracts forming two daughter Amoebae.



Spore formation in fungi

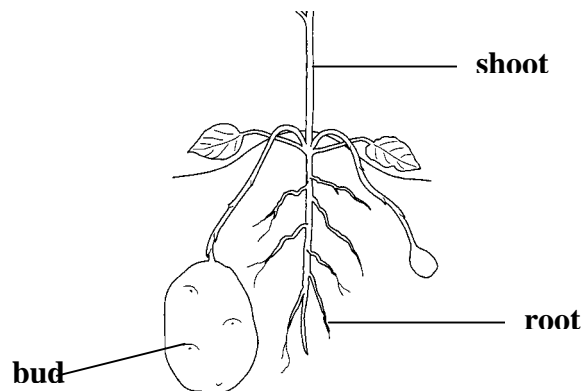
The fungus bread mould grows on bread left lying around for a few days. It produces spores which can grow into new individuals.



Tuber formation in potatoes

The potato plant forms tubers in an underground stem which can survive through adverse conditions. The tuber then produces buds. This can easily be seen if you leave a potato in a cupboard for a while.

Each bud can produce a new plant.



1.2.2 SEXUAL REPRODUCTION

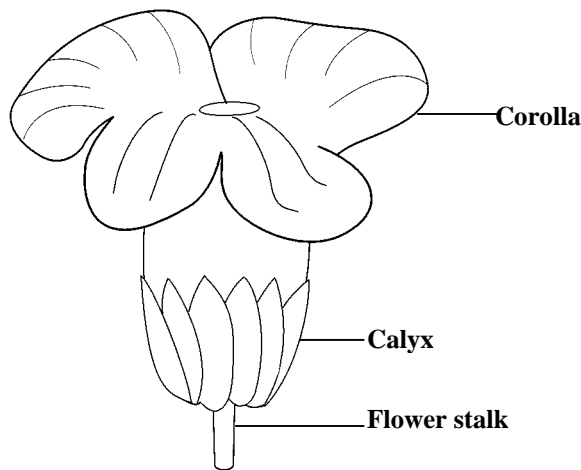
Sexual reproduction involves two parents - a male and a female. They produce sex cells by meiosis. These fuse together and divide by mitosis to form a new individual.

Let us now have a look at the reproductive structures in a named plant.

1.3 REPRODUCTIVE STRUCTURES - PLANTS

The reproductive structures of a plant are found in a flower.

Let us have a look now at a typical flower of a dicotyledonous plant e.g. the convolvulus. It normally climbs on trees, hedges etc producing flowers.

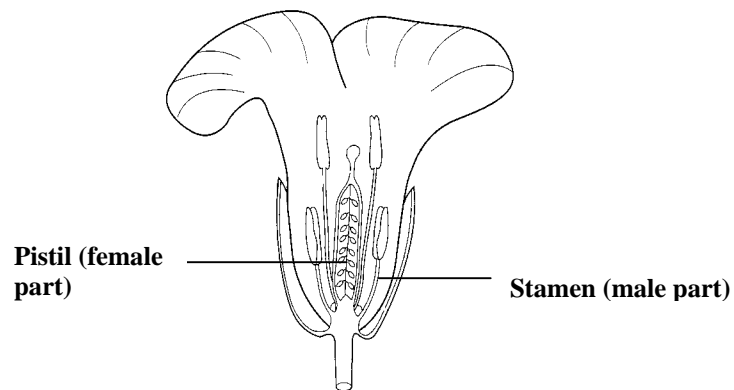


Drawing of the whole convolvulus flower

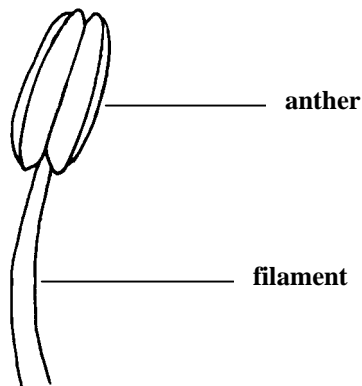
The convolvulus flower consists of the following parts:

1. corolla – the corolla consists of purple or pink petals. In the convolvulus flower all the petals are fused together but this is not the case for all flowers.
2. calyx – the calyx consists of green sepals which completely enclose the flower bud.

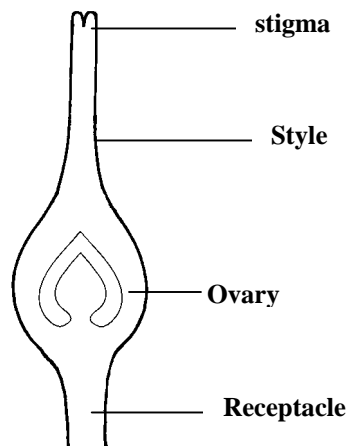
If you split the flower into two, right down the tube, you will find the male and female reproductive parts.



Stamens – there are five stamens attached around the base of the petals. Each stamen consists of an anther and a filament.



Pistil – the pistil is found at the centre of the flower. It consists of the stigma, style and ovary.



1.3.1 FLOWER PARTS - FUNCTIONS

Calyx	It protects the flower in the bud stage when it is very delicate.
Corolla	The corolla in insect pollinated flowers is large, brightly coloured and scented. It is used to attract insects.
Stamens	The anther produces pollen grains which contain the male sex cells. The filament bears the anther.
Pistil	<p>The stigma receives the pollen grains during pollination.</p> <p>The style holds the stigma.</p> <p>The ovary is the most important part of a flower. It contains the ovules which develop into seeds after fertilisation.</p>

We shall now turn to pollination and fertilisation which are the **TWO** main stages in sexual reproduction in plants.

1.4 POLLINATION

Pollination is the transfer of pollen grains from the anther to the stigma of a flower.

If the pollen is transferred to the stigma of the same flower or another flower of the same plant, then the flower is *self-pollinated*.

If the pollen is transferred to a flower of another plant of the same kind, then the flower is *cross-pollinated*.

Pollination is carried out in two main ways by

- insects and by the
- wind.

We can now proceed with the following investigation.



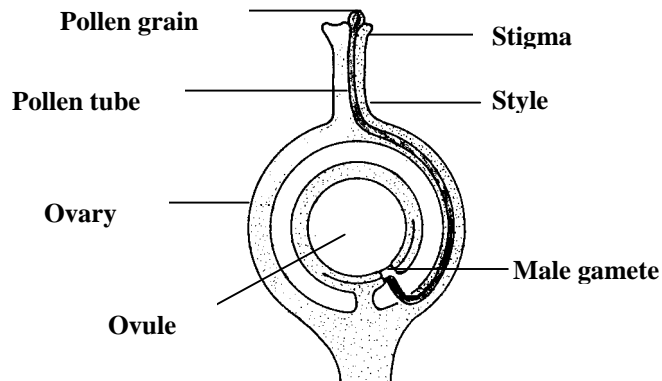
INVESTIGATION 3: Observing wind pollinated and insect-pollinated flowers

<p>For each investigation you will require the materials indicated.</p> <p>You should record your answers in the space provided.</p>	<p>Materials needed:</p> <ul style="list-style-type: none">• an insect pollinated flower like hibiscus or balsam• a wind-pollinated flower like coconut or maize. <p>Method:</p> <ol style="list-style-type: none">1. <i>Look carefully at each flower and draw them.</i>2. <i>Construct a table with the following headings to compare the two kinds of flowers:-</i><ul style="list-style-type: none">▪ <i>Size of flower</i>▪ <i>colour of petals</i>▪ <i>presence of scent</i>▪ <i>position of stamen and stigma</i>▪ <i>appearance of stigma</i>3. <i>Think of the ways in which the structure of each flower adapts it for insect pollination or wind pollination.</i>
--	---

1.5 FERTILISATION

After pollination, the pollen grain absorbs nutrients from the stigma and produces a pollen tube. This tube grows down the style until it reaches the ovary.

The pollen tube enters the ovary through the micropyle (a hole) and grows towards the ovules. It then bursts open releasing the male gamete. The latter then fertilises the female gamete found in the ovule.

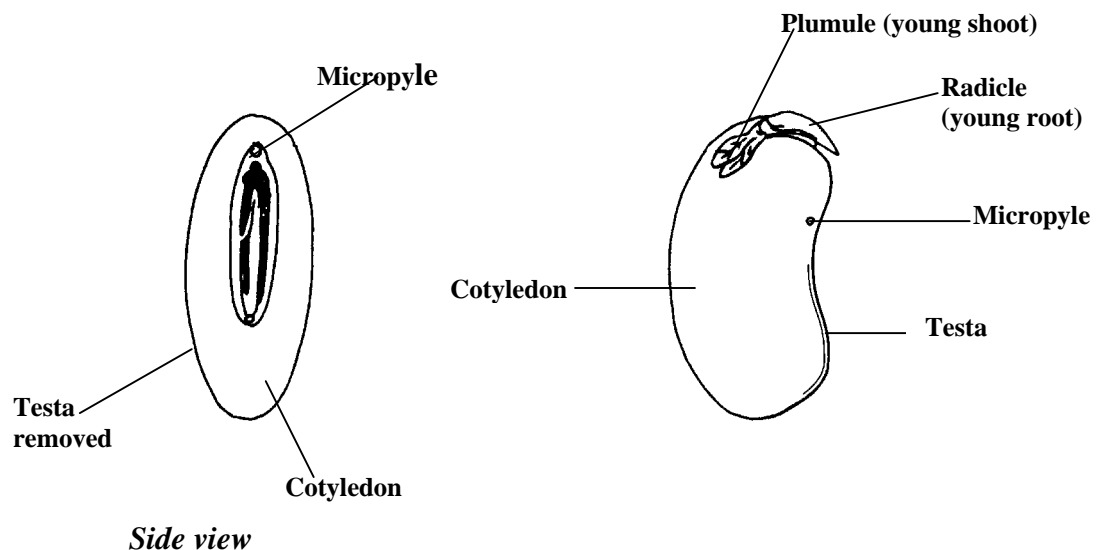


Fruits and Seeds

After fertilisation, the ovules develop into seeds and the ovary develops into a fruit. All the other parts of the flower dry up and fall off.

Structure of a seed

E.g. a broad bean seed



We can now proceed with the following investigation.



INVESTIGATION 4: Experiment to find out the conditions necessary for germination.

For each investigation you will require the materials indicated.

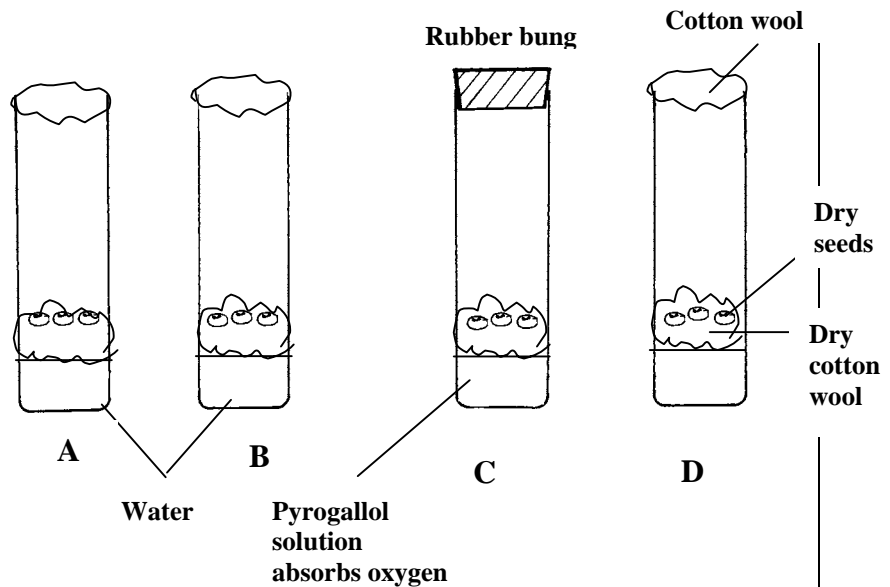
You should record your answers in the space provided.

Materials needed:

- 4 test-tubes
- cotton wool
- cress seeds
- pyrogallol solution
- rubber bung

Method:

1. Set 4 test-tubes as shown below:



In test-tubes A, B, and C place soaked seeds on damp cotton wool.

2. *Place tubes A, C and D in a warm place.
Place tube B in the refrigerator.*

3. *Fill in the table below for each tube*

	Condition		
Tube	Water	Warmth	Oxygen
<i>A</i>			
<i>B</i>			
<i>C</i>			
<i>D</i>			

4. *Observe the seeds after 3 days
In which tube or tubes have the seed germinated?
Which conditions are therefore required for
germination?*

1.6 DISPERSAL OF FRUITS AND SEEDS

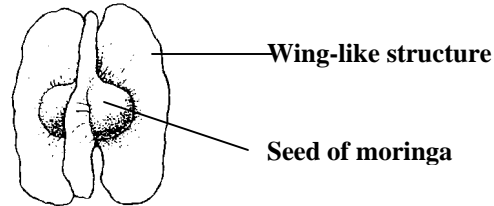
Fruits and seeds need to be scattered away from the parent plant in order to avoid competition between the two. This will also allow the seed to grow somewhere else, in another area for example.

There are two main ways by which these can be dispersed:

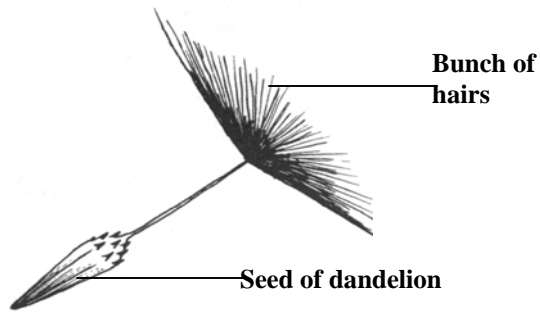
- by wind
- by animals

1.6.1 WIND DISPERSAL

Some seeds have thin membranes surrounding them. These offer a large surface area which serves as wings. *E.g. seeds of conifers, jacaranda and horse raddish tree (moringa).*



Other seeds have a bunch of hairs like a parachute attached to them, *e.g. milk thistle, cotton and dandelion.*



Both these structures allow the seeds to be easily blown away by the wind.

1.6.2 ANIMAL DISPERSAL

There are two main ways in which fruits and seeds are dispersed by animals:

- some fruits are fleshy and succulent when ripe. Animals eat them. The seeds are very hard and have to be discarded *e.g. the mango fruit.*
- in other fruits like the guava, the seeds are small and easily swallowed by the animal. The seeds pass undigested through the animal's alimentary canal and are scattered with the faeces. You must have noticed birds feeding on guavas or pawpaws.

1.7 SEED GERMINATION

After the seeds are dispersed, they will germinate under favourable conditions.

Let us now investigate those conditions required for germination.



INVESTIGATION 5: Looking at seeds

<p>For each investigation you will require the materials indicated.</p> <p>You should record your answers in the space provided.</p>	<p>Materials needed:</p> <ul style="list-style-type: none">• Broad beans soaked in water <p>Method:</p> <ol style="list-style-type: none">1. <i>Look at the outside of the broad bean seed.</i>2. <i>Draw it and identify the different parts.</i>3. <i>Carefully remove the coat. Compare and identify the different parts. Draw and label the seed.</i>
--	---

We can now proceed with the investigation on formation of pollen tubes in sugar.



INVESTIGATION 6: Formation of pollen tubes

For each investigation you will require the materials indicated.

You should record your answers in the space provided.

Materials needed:

- 15% sucrose solution
- 2 glass slides
- 2 coverslips
- 2 hibiscus flowers with ripe pollen grains
- paint brush
- microscope

Method:

1. Put a drop of sugar solution on one of the slides.
2. Pick up a few pollen grains from the anther of your hibiscus using the paintbrush. Place them in the sugar solution and put on the coverslip.
3. Set up a second slide using water instead of sugar solution.
4. Leave the slides in a warm dark place for about one hour.
5. Now observe the slides under the microscope.
 - (i) What is the appearance of the pollen grains in each slide?

.....

- (ii) What do you conclude from that about the stigmas of flowers?

.....



Before proceeding further, complete the following activity.

ACTIVITY 2

1. Give the function of each of the following structures:

(a) petal (b) anther (c) ovary (d) stigma

.....

.....

.....

.....

2. What happens to each of the following parts of a flower after fertilisation?

(a) petals (b) stamen (c) ovary (d) ovules

.....

.....

.....

.....

3. What do you think is the function of the testa in the seed?

.....

.....

.....

.....

4. What are the conditions required for germination?

.....

.....

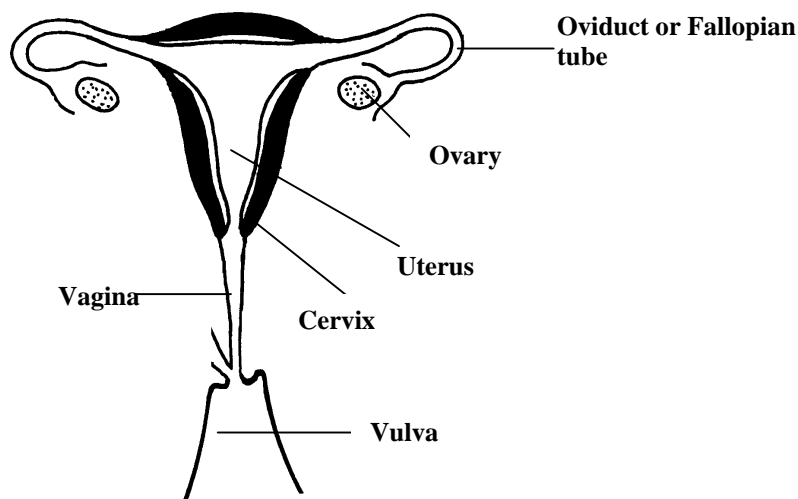
You will find the answer at the end of the Module.

1.8 SEXUAL REPRODUCTION – IN HUMANS

Having seen reproduction in plants, we shall now turn to reproduction in humans. In human beings, the fusion of the sex cells takes place in the female body. The resulting zygote then develops into a baby inside the woman's body itself. In some animals like frogs and fish, eggs are laid and the offspring are not well protected. Human babies develop in a constant and secure environment and are well taken care of by their parents till they become adults.

The human reproductive system consists of organs which produce the sex cells or gametes.

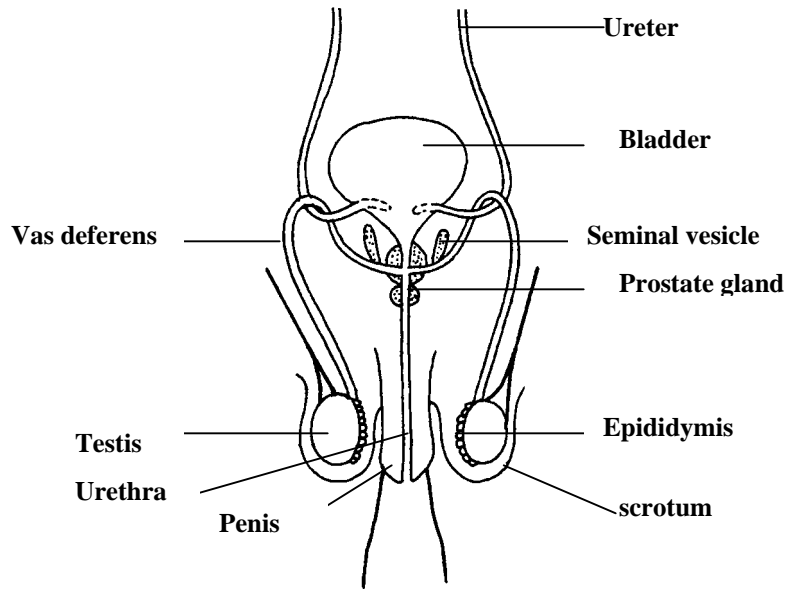
1.8.1 THE FEMALE REPRODUCTIVE SYSTEM



It consists of:

- *two ovaries*. These produce ova or eggs alternately during the menstrual cycles.
- *the fallopian tubes or oviducts*. They lead from the ovaries to the uterus.
- *the uterus*. It is a muscular structure in which a zygote develops.
- *the vagina*. It leads to the outer part of the body. It receives the erected penis during sexual intercourse.

1.8.2 THE MALE REPRODUCTIVE SYSTEM



It consists of:

- *two testes* (singular testis). These produce the male gametes called **sperms**.
- *two vas deferens*. These carry sperms towards the penis.
- *two seminal vesicles* and the *prostate gland*. These produce a secretion called semen which nourishes sperms.
- *the urethra*. It is a tube which serves to carry both urine and sperms.
- *the penis*. It hangs outside the male body. It is made up of spongy tissue and becomes erect when sexually aroused.
- *the scrotum*. It is a sac-like structure which encloses the two testes. It maintains sperms at a lower temperature than the normal body temperature.

1.9 PUBERTY

This is the period during which a human changes from a child into an adult. During this period, large amounts of hormones are produced by the reproductive organs.

During puberty or adolescence, boys and girls undergo sexual development physically and emotionally.

Changes in girls

Between the ages of 10 to 15, girls' ovaries start producing large amounts of a hormone called **oestrogen**. This oestrogen causes the following secondary sexual characteristics to develop in girls:

- breasts develop
- hips become larger and more rounded
- hairs start to grow in the armpits and around the vagina
- the voice becomes more high pitched
- menstruation starts.

At the same time the girl starts ovulating i.e. her ovaries start to release eggs.

Changes in boys

Boys go through puberty between the ages of 11 to 16. The testes start producing large amounts of the hormone **testosterone**. The latter causes the following secondary sexual characteristics in boys:

- the voice breaks
- hairs grow in the armpits, on the face, chest and pubic region
- the chest becomes broader and muscles develop.
- the adolescent boy's testes start producing sperms.

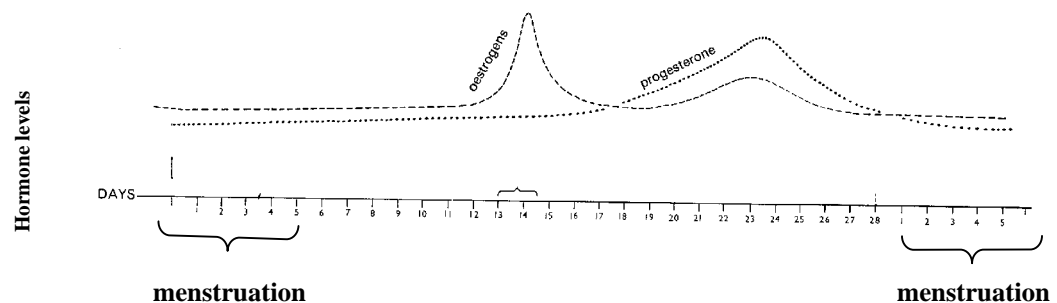
Oestrogen and testosterone also bring about emotional changes in boys and girls. They become more interested in the opposite sex, in their own bodies and in clothes.

1.10 THE MENSTRUAL CYCLE

From puberty onwards, a girls' ovary produces an ovum which is released and passes to the uterus. This process occurs every 28 days and is called the menstrual cycle.

Let us now have a look at the different steps in this cycle which lasts about 28 days.

- The first day of the cycle is the day that menstruation starts.
- From day 1 to day 14 an ovum develops and matures in one ovary.
- At day 14 the ovum is released into the oviduct. This is called **ovulation**. At the same time as ovulation is occurring, the uterus lining becomes thicker getting ready to receive a fertilised ovum.
- The egg moves towards the uterus. If it is not fertilised till about day 18 it dies. The lining of the uterus also starts breaking down.
- At day 28 the uterus lining breaks down completely. Blood and dead cells flow out of the vagina. This is called **menstruation**. The cycle stops at menopause at around the age of 50.
- During the first 14 days of the menstrual cycle oestrogen is secreted in increasing amounts. After ovulation another hormone, progesterone is also secreted by the ovary. Both hormones cause the uterus lining to become thicker and prepare it to receive a fertilised ovum.



Menstrual cycle

1.11 SEXUAL INTERCOURSE, FERTILISATION AND IMPLANTATION

Sexual Intercourse

During sexual intercourse, the erect penis is placed into the vagina.

Ejaculation occurs and sperms are released which can survive for up to two days into the female reproductive system.

Fertilisation

If sexual intercourse occurs around the day of ovulation, the fertile ovum may fuse with one of the sperms. This process is called **fertilisation**. The fertilised ovum is called a zygote.

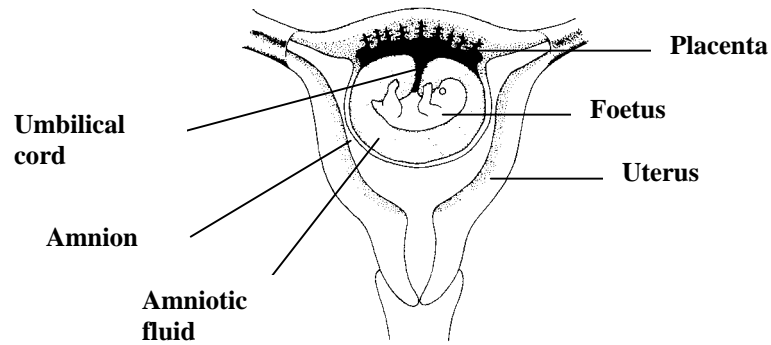
Implantation

The zygote divides continuously to form a ball of cells which embeds itself in the wall of the uterus. This process is called **implantation**. The zygote is now called an **embryo**.

1.12 DEVELOPMENT OF THE FOETUS

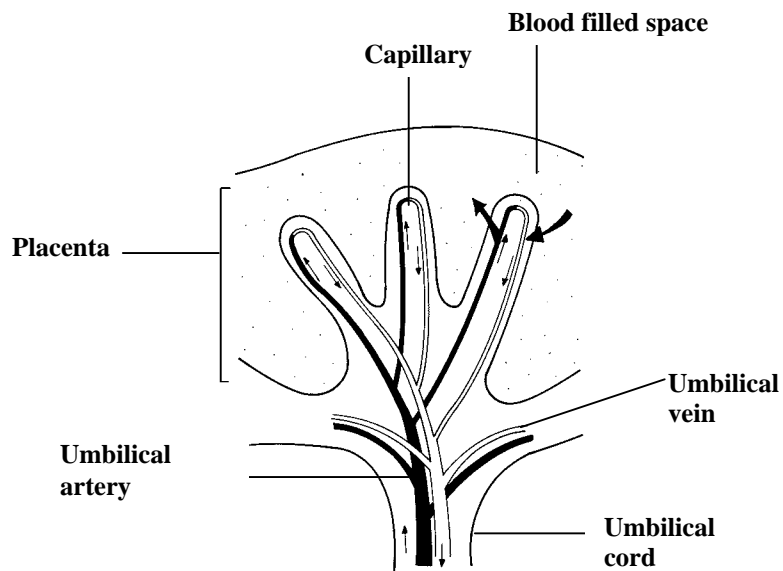
After fertilisation it takes nine months for the embryo to grow and develop into a baby until birth.

By three months the embryo has all its organs well formed. It is now called a foetus. A placenta is formed in the wall of the uterus which nourishes the developing foetus. An umbilical cord connects the placenta to the foetus.



3 months old fetus in uterus

The placenta develops from the embryo, it is the place where foetal blood comes into contact with maternal blood and exchange of materials occurs. The umbilical cord carries an umbilical artery and an umbilical vein.



The umbilical artery carries deoxygenated blood and waste products away from the foetus. Exchange of substances between the mother's blood and foetal blood occurs in the capillaries in the placenta. The umbilical vein then takes oxygenated blood and food to the foetus.

The amniotic sac encloses the developing foetus. It is filled with amniotic fluid which acts as a shock absorber and which provides a stable environment for the foetus.

1.13 ANTE-NATAL CARE

Throughout pregnancy, regular check-ups must be done. We must ensure that both mother and baby are fit and well and that the baby is developing properly.

While we don't need any special diet, a healthy diet with a variety of foods is needed to provide the baby with the various nutrients.

Alcohol and cigarettes should be avoided. Reduce sugar and fat intake. Increase the intake of fresh fruits, vegetables and cereals which contain a lot of fibre to ensure a smooth functioning of the alimentary system.

Here are a few tips.

Bread and potatoes are satisfying meals we also need protein foods – meat, fish, eggs, cheese. Beans, peas and nuts are easily available and cheap too. Dairy foods like milk, cheese, and yoghurt contain calcium necessary for the baby's development. Liver twice a week will provide the required iron intake.

1.14 BIRTH AND POST-NATAL CARE

After nine months, the wall of the uterus contracts pushing the baby out. The placenta is also expelled from the uterus.

Immediately after birth, milk is produced in the mother's breasts. Human milk is an ideal food. The baby is well nourished, getting antibodies too in the mother's milk.

However, some mothers bottle-feed their babies. Let us have a look at the advantages of breast-feeding compared to bottle-feeding.

- Breast milk is complete food together with antibodies which protect the baby from infection. These antibodies are not present in powdered milk.
- Breast milk is always available at the right temperature.
- Breast feeding brings the mother and the baby into close contact. This enhances a deep and loving relationship between the two.
- Breast feeding is free, bottle feeding is expensive.

1.15 GROWTH AND DEVELOPMENT

With time and under the parents' care, the baby grows and develops into an adult.

Growth is the increase in the dry mass of an organism. The organism gets bigger. We can say it is the permanent increase in size. Growth involves the division of cells to make new ones. The new cells formed increase in size.

Development is an increase in complexity of the organism. All organisms start life as one cell. This cell divides continuously to become a multi-cellular organism. The cells become specialised developing into various organs of the organism to perform specific functions.

1.16 BIRTH CONTROL

Nowadays all couples must plan the size of their family. This is for controlling the size of the population, for financial and health reasons. Birth control prevents pregnancy without avoiding sexual intercourse.

Let us have a look at the different methods of birth control:

1. Natural The couple avoids sexual intercourse during the fertile phase i.e. around the time of ovulation. This is usually between day 11 and day 17 of the menstrual cycle.

2. Chemical The woman uses a spermicide at the time of sexual intercourse. This kills the sperms. She may also take contraceptive pills which prevent ovulation

- 3 Mechanical The man uses a condom during sexual intercourse. This is a thin rubber cap worn over the penis during sexual intercourse. This cap collects all the sperms.
The woman uses a diaphragm. It is placed over the cervix just before sexual intercourse. This prevents the sperms to reach the uterus.
She may also use an intra uterine device (IUD). This is a coil placed inside the uterus which prevents implantation of the ovum.

4. Surgical The man undergoes a vasectomy where the sperm carrying tubes are cut and tied. The sperms are thus no longer discharged.

The woman undergoes tubal ligation. The oviducts are cut and tied so that the ova no longer enter the uterus.

The surgical method is an irreversible method of birth control.

1.17 INFERTILITY TREATMENT

Most couples today try to control their family size.

Some couples on the other hand are unable to conceive, i.e. the woman cannot become pregnant, or the man is infertile.

Artificial insemination can then be carried out. The sperm from a donor is made to fertilise the woman's ovum. The woman may be required to take fertility drugs to induce ovulation. Fertility drugs are known to cause birth defects or even the development of more than one embryo.

All these methods of contraception or insemination are however highly controversial. Some people say that these are not natural and therefore unethical.

1.18 SEXUALLY TRANSMITTED DISEASES (STDs)

During sexual intercourse body fluids come into close contact. Many germs can be transmitted in this way. Some sexually transmitted diseases are:

Gonorrhoea

This disease is caused by a bacterium.

In man, the urethra becomes inflamed causing pain during urination. Pus can also be discharged.

In women, the infection may not have symptoms, but there's increase in discharge. It may spread from the urethra to the whole reproductive system causing sterility.

The disease however is curable by treatment with antibiotics.

Syphilis

It is also caused by a bacterium and occurs in stages. About 4 weeks after intercourse, sores appear on and around the genital areas. These disappear without treatment.

The germs enter the bloodstream and infect other organs. The second stage appears some months after infection. Sores appear on the mouth, throat and genital areas, the person may also have a mild fever. These symptoms also disappear.

In the last stage, internal organs are affected. The person may become blind, have heart failure, paralysis and psychiatric troubles. Death may ensue.

Syphilis also can be cured by antibiotics at any stage. Check-ups must be done for up to 2 years for a complete cure.

**AIDS (Acquired
Immune
Deficiency
Syndrome)**

This deadly disease is caused by the HIV virus (Human Immuno Deficiency Virus).

The virus is present in body fluids like blood, semen and vaginal fluids, of the infected person.

The HIV virus attacks and destroys the white blood cells of the infected person. These cells you will recall defend our body against germs and infections. As a result the infected person catches infections and diseases easily which can lead to death.

AIDS also occurs in stages:

- the infection stage - the HIV virus enters the body
- the incubation stage – the virus remains dormant in the body showing no signs or symptoms. This stage can last for years without the person knowing that he is infected, he is then said to be HIV positive. This person can infect others.

The AIDS stage This is the stage where the person suffers and ultimately dies. There is no cure for the disease yet.

Let us consider the different ways in which the disease can be transmitted:

- Sexual intercourse with an infected person.
- Drug addicts sharing infected needles.
- During blood transfusion when infected blood is used.
- During pregnancy, an infected woman may infect the foetus.
- During breast feeding, when the mother is infected.

1.18.1 STDs - PREVENTION

Following from what has been said before you can surely think of ways in which to prevent the transmission of AIDS. I'm certain you have thought of the following:

- educating people
- having only one sexual partner
- using a condom during sexual intercourse with a stranger
- screening donated blood
- not taking drugs and sharing instrument like needles or razors

In general, to prevent transmission of STDs:

- people must be educated through campaigns
- avoid casual sex with all sorts of different people

- safe sex must be practised
- people who have had several sexual partners must go for check ups.
- Condoms must be used



Before proceeding further, complete the following activity.

ACTIVITY 3

1. *List the commonly occurring STDs in your country.*

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.....

2. *Describe the effects of testosterone on a boy's body.*

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.....
.....
.....
.....

3. (i) *When does a girl start producing oestrogen?*

.....
.....

- (ii) *What are its effects on her body?*

.....
.....
.....
.....

4. *What is fertilisation?*

.....
.....

5. State **two** advantages of breast-feeding over bottle-feeding.

.....
.....

6. Which method of birth control is most unreliable and why?

.....
.....

7. How does an IUD prevent pregnancy?

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.....

8. How does an embryo get its food in the uterus?

.....
.....

9. What are the symptoms of Syphilis?

.....
.....
.....
.....

You will find the answer at the end of the Module.



POINTS TO REMEMBER

- Reproduction is the process by which organisms produce new ones like themselves.
- Mitosis produces daughter cells similar to their parents.
- Meiosis produces daughter cells which are genetically different from the parent cell.
- Asexual reproduction involves a single parent. Sexual reproduction involves the fusion of a male and a female gamete.

In Plants

- The reproductive part is a flower.
- Pollination is the transfer of pollen grains from the anther to the stigma.
- After fertilisation, the ovary develops into a fruit and the fertilised ovules become the seeds.
- Fruits and seeds can be dispersed by animals, wind and water.

In Man

- The male gametes are sperms which are produced by the testes.
- The female gametes are the ova which are produced in the ovaries.
- Hormones bring about changes at puberty.
- The menstrual cycle lasts for about 28 days.
- Fertilisation is the fusion of the male gamete with the female gamete.
- Pregnancy lasts for about nine months.
- The foetus is nourished by the placenta.
- Birth control prevents pregnancy though sexual intercourse occurring.
- STDs can be transmitted during unprotected sexual intercourse.
- AIDS is an incurable but preventable disease.

ANSWERS TO ACTIVITIES

UNIT 1

ACTIVITY 1

1.
 - (i) They are pairs of chromosomes which carry information concerning the same characteristics.
 - (ii) Chromatids are obtained when a chromosome replicates to give **two** equal parts joined at the centromere.
 - (iii) Mitosis is a type of cell division which produces daughter cells identical to their parents.
 - (iv) Diploid cells contain the normal number of chromosomes, e.g. in human beings diploid cells contain 46 chromosomes
2.
 - (i) skin cell: 46 chromosomes
 - (ii) sperm cell: 23 chromosomes
 - (iii) egg cell: 23 chromosomes

ACTIVITY 2

1.
 - (a) Petals attract insects.
 - (b) The anther produces pollen grains
 - (c) The ovary produces and protects ovules.
 - (d) The stigma receives the pollen grains during pollination.
2.
 - (a) Petals dry and fall off.
 - (e) The stamen dries and falls off.
 - (f) The ovary develops into the fruit.
 - (g) Ovules develop into seeds.
3. It protects the plumule and radicle.
4. Water, Oxygen and right temperature.

ACTIVITY 3

2.
 - voice breaks - hairs grow on different parts of the body
 - chest broadens- muscles develop
 - testes produce sperms

3.
 - (i) at puberty
 - (ii) breasts develop - hips broaden
 - hairs grow on different parts of the body
 - voice becomes sharper
 - menstruation starts
 - ovulation occurs every 28 days

4. It is the fusion of the male gamete with the female gamete.
5. It contains antibodies. It is available at the right temperature.
6. The Natural Method
Because the exact time of ovulation is difficult to determine.
7. It prevents implantation of the zygote in the uterine wall.
8. By the placenta.
9. It occurs in stages:
Stage 1: sores around genital area
Stage 2: sores on different parts of body like mouth, throat and sex organs
Stage 3: internal organs are affected