BIOLOGY GRADE 10 SHORT NOTE

3.4. Reproductive health

- Sexual intercourse is the most important process for sexual reproduction.
- The journey of sperm along the male reproductive structures is described as:
- Testis --> Epididymis --> vas deferens --> urethra.
- After entering the Female reproductive organ the sperm cell passes along the following pathway in Female reproductive organ:
- Vagina --> cervix --> Uterus --> oviduct (fallopian tube).
- The ovum (egg) is released from the ovary to fallopian tube by the process called **ovulation**.
- During ejaculation millions of sperm cells release in to the fallopian tube where the ovum is fertilized.
- Thus, **fertilization** takes place in the **fallopian tube**.
- **Fertilization** or **conception** is a condition when a single sperm cell joins with the ovum.
- A fertilized ovum is called **zygote** which develops in to a baby.

Contraception

- **Contraception** is the method of avoiding pregnancy.
- There are different contraceptive methods which differ from one another in **a way they are used** and their **effectiveness**.
- The major contraceptive methods used by people can be classified as:
- Natural method
- Physical or barrier method
- Intrauterine device (IUD)
- Hormonal methods
- Sterilization

Natural method

- The natural birth control (contraceptive) method is carried without using any physical or hormonal materials. This involves:
- **Rhythm or calendar method**- based on the understanding of the menstrual cycle and prediction of the ovulation time.
- This method works perfectly for those women with regular menstrual cycle.
- **Breast Feeding** -This is because the women do not ovulate while she is feeding breast, since the level of progesterone in the blood is still high to regulate the feeding of breast.
- **Advantages**: there are no side effects and this method is permitted by most religions.
- Carried out with care and scientific precision about recording techniques it can be very effective.
- **Disadvantages**: it depends on full cooperation of both partners and it is not always easy to pinpoint ovulation so pregnancy can result.
- **Effectiveness**: 10 pregnancies per 100 woman years.

Physical or barrier method

- This method prevents mainly the meeting of sperm and ovum. This includes:
- **Condom** - as sheath that is used to prevent the sperm from entering the vagina.
- It can male or female condom.
- The female condom is too expensive than the male condom.

- Thus, the male condom is most widely used and available.
- **Advantages**: no side effects, don't need medical advice, used every time you have sex offers protection against sexually transmitted diseases such as syphilis and HIV/AIDS.
- **Disadvantages**: can interrupt intercourse. Sheath may tear or get damaged during intercourse, allowing semen to get through. s
- **Effectiveness**: 2.5 pregnancies per 100 woman years.
- **The female condom** – a thin sheath worn by a woman during sex. It lines the vagina so that sperm cannot enter the cervix.
- **Advantages**: no side effects, don't need medical advice, used every time you have sex it protects from infection with HIV/AIDS or other sexually transmitted diseases.
- **Disadvantages**: can only be used once, can be expensive, gives better protection against pregnancy when used with spermicide, takes practice to insert it properly.
- **The diaphragm or cap** - is a thin rubber of inserted in to the vagina before intercourse to prevent the entry of sperm on the cervix.
- **Advantages**: no side effects, offers some protection against cervical cancer.
- **Disadvantages**: must be initially fitted by a doctor. May be incorrectly positioned or damaged and allow sperm past. Gives better protection against pregnancy when combined with spermicide.
- **Effectiveness**: 2.5 pregnancies per 100 woman years.

Hormonal Method

- This method involves the use of natural hormones (**oestrogen and progesterone**) to prevent pregnancy. It involves;
- **Mixed pill** - consists of the hormones oestrogen and progesterone.
- This raises the level of estrogen and progesterone in the blood.
- Raising of the oestrogen in the blood is detected by the **pituitary gland** which slows down the production of **follicle stimulating hormone (FSH)**.
- **FSH** is responsible for maturation of egg, and if the egg is do not mature there is no pregnancy.
- **Progesterone** - increases the mucus in the cervix and vagina to prevent the entrance of sperm cell.
- This is the **most reliable contraceptive method**.
- **Advantages**: the combined pill particularly is very effective at preventing pregnancy.
- The pill is taken at regular daily intervals and so does not interfere with intercourse.
- It may offer some protection against certain tumours.
- **Disadvantages**: the pill may increase the risk of certain tumours.
- It can cause raised blood pressure and an increased tendency for the blood to clot.
- **Effectiveness** (combined pill): 0.5 pregnancies per 100 woman years (due to human error in taking the pill).

Hormone implants

- Small silicone Capsules containing female hormones implanted under the skin (arm) of the women.
- The hormones released slowly in to the blood and can prevent pregnancy for five years.
- It can be removed if the woman wants to get pregnant.
- **Advantages**: the implant is very effective at preventing pregnancy and can last for up to five years.

- **Disadvantages**: there can be side effects including changes to your periods, headaches and depression.
- **Effectiveness**: 0.5–1 pregnancy per 100 woman years.

Hormone injections -

- It is a method of giving injections to woman.
- The injections contain female hormones, **oestrogen** and **progesterone**.
- It can prevent pregnancy for up to thr**ee months**.
- **Advantages**: very effective at preventing pregnancy. Only need an injection every three months.
- **Disadvantages**: you can't change your mind once you have had the injection – you can't get pregnant for about 3 months.
- There are some side effects – it can affect your periods and may give you headaches.
- **Effectiveness**: 1 pregnancy per 100 woman years (because sometimes women don't get their injections regularly enough).

Sterilization or surgical contraception

- **Vasectomy** is a male sterilization which involves cutting and tying of **deferens (sperm duct)**.
- This prevents the movement of the sperm along the urethra.
- **Tubectomy** is a female sterilization which involves cutting and tying of **fallopian tube (oviduct)**.
- This prevents the release of egg from ovary to fallopian tube.
- **Advantages**: almost 100% guaranteed to prevent pregnancy.
- Permanent control of fertility.
- Removes the problem of human error in contraception.
- **Disadvantages**: for women in particular it involves a general anaesthetic.
- Not easily reversible.
- **Effectiveness**: 0.01 pregnancies per 100 woman years.

Intrauterine device IUD)

- it is a device which is made of a plastic and copper to be inserted in to the uterus by a doctor.
- It does not prevent fertilization but prevents the **implantation** of the early embryo.
- It can prevent pregnancy for up to **twelve years**.
- **Advantages**: once inserted, no further steps need to be taken.
- Relatively effective at preventing implantation and pregnancy.
- **Disadvantages**: can cause pain and heavy periods.
- Can cause uterine infections which may lead to infertility.
- If pregnancy does occur it has a high chance of being in the Fallopian tubes (ectopic pregnancy).
- **Effectiveness**: 2.5 pregnancies per 100 woman years.
- **Table: Effectiveness of the contraceptive methods.**

Contraceptive method	Effectiveness
Rhythm or calendar	90%
Condom	97.5%
Diaphragm	97.5%
Pills	99.5%
Hormonal injections	99%
Hormonal implants	99%
Sterilization (vasectomy and Tubectonmy)	100%
IUD	97.5%

Human Immunodeficiency Virus and Acquired Immune Deficiency Syndrome (HIV/AIDS)

- **Acquired Immune Deficiency Syndrome (AIDS**) - is the medical term for a combination of illnesses that result when the immune system is weakened or destroyed.
- It is the advanced form of an infection caused by **Human Immunodeficiency Virus (HIV)**, a virus that attacks the immune system, making the sufferer susceptible to other diseases.
- **HIV/AIDS** is a big problem in Ethiopia. Between 60 000–70 000 people die of AIDS every year, at the moment, and well over a million people are infected with the virus.
- HIV attacks your immune system so you cannot fight off infections such as TB or even a cold.
- HIV, the virus that leads to AIDS, can be spread through four bodily fluids – **blood, semen, vaginal secretions and breast milk**.
- It is most commonly spread through **unprotected sex** with an infected partner (without using a condom).
- An HIV-infected mother can infect her baby during pregnancy, at birth or through breastfeeding.
- HIV can also be passed on by an infected **blood transfusion** or by sharing non-sterilized **needles, syringes or razors.**

The Symptoms of HIV/AIDS

- The symptoms of HIV/AIDS are different at different stages of the disease.
- After about three months some people start to feel unwell – early symptoms include **fevers, headaches, tiredness, and swollen glands**, but not everyone infected with HIV feels ill.
- These symptoms are very mild and easily mistaken for an ordinary infection.
- After about three months, HIV antibodies appear in your blood – you become HIV-positive.
- As the immune system weakens, an infected person may develop more symptoms including **swollen lymph glands, night sweats, fever, cough, diarrhea, and/or weight loss**.
- As the disease progresses the symptoms become more noticeable and more severe.
- **The symptoms of the final stages of AIDS include:**
- extreme fatigue
- rapid weight loss
- appearance of swollen or tender glands in the neck, armpits or groin
- unexplained shortness of breath, frequently accompanied by a dry cough
- infections such as TB and pneumonia

- persistent diarrhoea
- intermittent high fever
- appearance of one or more purple spots on the surface of the skin, inside the mouth, anus or nasal passages caused by a rare cancer, Karposi's sarcoma
- whitish coating on the tongue, throat or vagina as fungal infections take hold
- forgetfulness, confusion and other signs of mental confusion

The incubation period

- The first symptoms appear 3–12 weeks after you have become infected.
- This is the **initial incubation** period of the virus.
- Before this you can't even detect the infection with a test because your body has not produced enough antibodies.
- It can take 20 years or more before all the symptoms of the disease appear.

Treatment

- There is no **cure for HIV/AIDS**, and there is as yet no **effective vaccine** either.
- **Antiretroviral medications** are used to control the reproduction of the virus and slow the progression of HIV-related disease.
- **Abstinence** from extra-marital sex and being faithful within marriage or a relationship is the safest option of controlling the spread of HIV/AIDS.
- There are other ways in which you can protect yourself. You should never use drugs that are non-medicinal, especially those that require needles.
- Pregnant women need to be screened, and if found to be at risk, given drugs to reduce the risk of infecting their unborn child.
- Caesarean deliveries are advised, and HIV-positive mothers should bottle feed their babies if at all possible as the virus can pass through to the baby in the breast milk.

Female genital mutilation and reproductive health

- One of the harmful traditional practices in Ethiopia is **female genital mutilation (FGM)** also known as **female genital excision (FGE)** or more locally as '**removing the dirt'**.
- In Ethiopia, with great wisdom and understanding, many people have begun to understand that this traditional practice causes harm rather than good.
- **Bogaletch Gebre** is a shining example.
- Not only was she the first Ethiopian woman to join the science faculty at the University of Addis Ababa, she has also established the **Kembatta Women's Self-Help Centre, Kembatti Mentii GezzimaTope (KMG).**
- Our government has set up a national committee known as the **Eradication of Harmful Traditional Practices (EHTP)** to educate the people and reduce such harmful traditional practices

3.5. Homeostasis

- **Homeostasis** is the process of maintaining constant internal environment in order to keep the body's function normal and stable.
- The word homeostasis is derived from a **Greek** word, "**homios"** means **'like'** or **'the same'** and "**stasis**" means **'state'**.
- The major factors that should be kept stable in the body are

- The sugar (glucose) level of the blood
- Body temperature
- Salt and water balance of the body
- Removal of excretory products such as urea and carbon dioxide
- The pH level of the body's tissues and organs, etc.

The organs of homeostasis

- The major homeostatic organs of the body are: Skin, Kidneys, Lung and Liver.

1. Temperature regulation

- Regulation of body temperature is important in organisms for various activities.
- For example, the activity of our body's enzymes is determined by our body temperature.
- **Enzymes** are sensitive to temperature. Thus, they get denatured at extremely high temperature and become inactive at temperature.
- For example enzymes in human body are active at 37 ^{o}C which is **optimum** for the action of enzymes in the body.
- Organisms gain and lose heat through different ways.
- Living organisms gain heat through **respiration, conduction, convection and radiation** from their surroundings.
- Organisms lose heat by **evaporation** of water from the body surfaces, **conduction**, **convection** and **radiation**.
- **Radiation**- The diffusion of heat from the warmer body to relatively colder objects with the air.
- **Evaporation** - evaporation of water from the surface of the body depending on factors like **temperature, humidity and air currents**.
- **Conduction** is the transfer of heat from the hotter to the cooler object, when two objects are in **contact**.
- **Convection** - Is the transfer of heat between an organism and the environment by the currents of air or water which is in contact with the surface of an organism.
- Therefore, the heat gain and the heat lost must be balanced based on the body's need.
- Based on their temperature regulating mechanisms organisms can be classified as **poikilotherms (ectoderms)** and **homeotherms (endothermic).**

Poikilotherms

- They are organisms with variable body temperature which is affected by environmental temperature.
- Examples: Fish, reptiles, amphibians

Homeotherms

- They are organisms which have constant body temperature which is not affected by environmental temperature.
- Examples: birds and mammals
- Table, comparison of poikilotherms and homeotherms

Homeotherms	Poikilotherms
Have constant body temperature	Have variable body temperature
Need to consume more food	Consume less amount of food
Produce more internal heat. (20 times that of poikilotherms)	Produce little internal heat

Temperature regulation in poikilotherms

- When they are in colder condition they:
  - Bask in the sun.
  - Press their bodies close to warm surface.
  - Erect special sails or areas of skin which allows them to absorb more heat from the sun.
- When they are getting too hot they may:
  - Move into the shade.
  - Move into water or mud.

Temperature regulation in homeotherms

- Homoeothermic animals regulate their body temperature through **Physiological Behavioral** and **Morphological** methods.

Physiological methods of temperature regulation

- **Sweating** - is the process in which heat evaporates (oozes) from the body in the form of sweat.
- Sweat largely consists of **water** and **nitrogenous waste** to a little extent.
- Sweat has a cooling effect on the body.
- **Vasodilatation** - is the process in which the capillaries under the skin Surface dilate when the body temperature rises.
- Dilation of capillaries under the skin brings more blood on the skin surface with more heat to be evaporated.
- It has cooling effect on the body.
- **Panting and licking** - allow losing more heat through the mouth in form of evaporation.
- Some animals like dog and cat may lick themselves with saliva to cool their body.
- These methods are used by those animals which have body covered with fur and have little chance to lose heat by sweating.
- **Vasoconstriction** -Is constriction (narrowing)of blood capillaries under the skin in order to prevent loos of heat by evaporation when the body temperaiure falls.
- **Piloerection** (pulling the hairs up right)-results in colder condition.
- The erector muscles under the skin contract which pulls the hairs upright trapping an insulating layer of skin to conserve more heat.
- **Shivering** results in rapid contraction and relaxation of muscles which increases the rate of respiration to generate more heat when body feels colder.
- **Fat layer under the skin (Subcutaneous fat)**
- It prevents excessive loss of heat from the body.
- Animals living in cold climatic regions have thick layer of fat under their skin to keep their body warm.

Behavioral Methods of Temperature Regulation

- Clothing
- Seeking shade or shelter
- Taking high - calorie food
- **Hibernation** -The condition in which organisms go in to a very deep sleep in colder seasons.
- During this condition the whole metabolic process drops.
- **Aestivation** - The condition in which some animals hide underground or under a layer of mud and go in to a deep sleep in warmer conditions.
- **Wallowing or bathing** –By wallowing in mud or bathing in water, the animals cover themselves in water and the water evaporates from the surface of their skin, cooling them down.
- For example, elephants and pigs.
- **Burning fires, central heating, air conditioning**, etc. By burning a fire or turning on the heating we can warm things up and reduce the heat we lose, keeping us warmer.
- Air conditioning is used in some buildings and vehicles to cool the air down if it gets too hot.

Controlling the core body temperature

- Control of the temperature relies on the **thermoregulatory** centre in the brain.
- **Thermoregulatory** - centre area of the brain responsible for controlling body temperature.
- This centre contains receptors which are sensitive to the temperature of the blood flowing through the brain itself.
- Extra information comes from the temperature receptors in the skin, which send impulses to the thermoregulatory centre giving information about the skin temperature.
- These receptors are so sensitive they can detect a difference of as little as 0.5 °C.

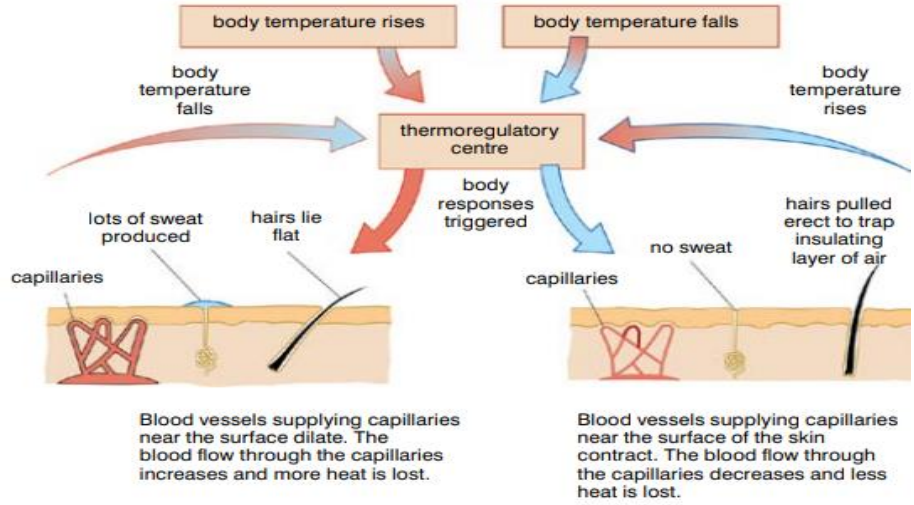


Figure 3.59 *The thermoregulatory centre in the hypothalamus of your brain acts as your body thermostat. As a result of all these sensitive control mechanisms, the core temperature of your body is usually kept the same with only about 1 °C variation.*

- When the thermoregulatory centre detects changes in temperature, our first responses are **conscious** – we put more clothes on, or take clothes off, move outside or light a fire.

- But if the core temperature starts to move in one direction or the other, automatic body responses take over.
- The control of the body temperature is an example of a negative feedback loop.
- The feedback control of the body temperature involves the thermoregulatory centre in the brain and the skin.

2. Excretion

- **Excretion** is the process of getting rid of metabolic wastes from the body.
- **Metabolic wastes** are waste materials which are produced as a result of the metabolic processes in the body.
- **Excretory organs** are organs which involved in getting rid of metabolic wastes.
- The major excretory organs of the body are **lungs**, **skin** and **kidney**.
- **Lungs** are organs of **gas exchange** but also they are excretory organs which are involved in the removal of carbon dioxide waste which is produced as a **bi-product of respiration**.
- **Skin** is another excretory organ which is involved in removal of excess salt, water and nitrogenous wastes from the body.
- **Urea** is a metabolic waste which is produced in the liver.
- Since our body cannot store excess amino acids or proteins, it will be **deaminated** or broken down in to carbohydrate and ammonia.
- The carbohydrate is stored or used.
- The ammonia combines with carbon dioxide makes the **urea**.
- The urea is filtered out of the blood in the kidney and removed as **urine.**
- . **Urea is a nitrogenous waste.**
- **Nitrogenous waste** – is nitrogen-rich chemical waste of several cellular processes, excreted via urine.

Water balance and ionic control

- **Osmoregulation** – is control (regulating) of the water and electrolyte (ionic) balance in the body.
- The amount of daily water gained must be in balance.

- Table: The average daily water intake and output in adult human per day.
- Balancing the ionic concentration of the body is very important.

Water intake		**Water loss**	
Source	Amount in Cm^3	Source	Amount in Cm^3
Drinking	1400	Urine	1500
Food	800	Sweat	600
Cell respiration	400	Breathing (exhalation)	400
		Feces	100
Total	2600	Total	2600

- The mineral ions are taken in to the body with the food we eat and lost in the form of sweet and largely in the form of urine from the kidney.

The kidney

- **The kidneys** are bean shaped reddish brown organs which are located on the either side of the waist.
- The kidneys are blood filtering organs which removes **excess water, excess salt and nitrogenous wastes** such urea in the form of urine from the body.
- Kidneys - are the major excretory and osmoregulatory organs of the body.

Longitudinal sections of the kidney

- The outer region of the kidney is called **cortex**, while the inner region of the kidney is called **medulla**.
- The medulla consists of pyramids that open in to a hallow chamber of **pelvis**.
- Each kidney consists of millions of **nephrons** in which **blood filtration** and **reabsorption** takes place.
- **Nephrons** are functional units of the kidney.

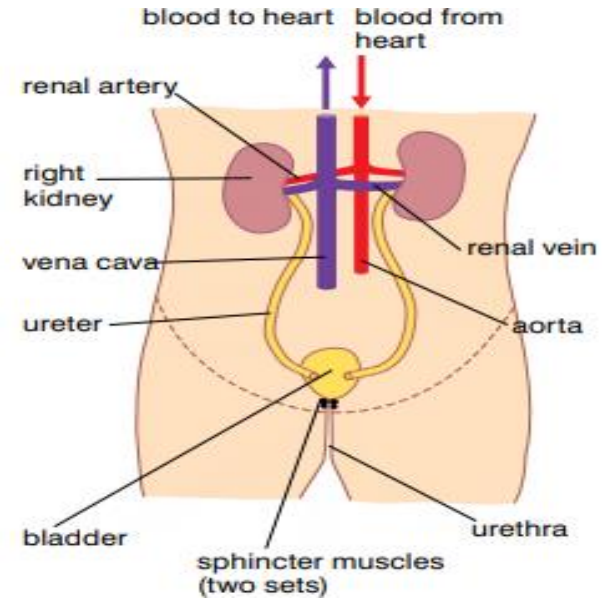


Figure 3.61. Our kidneys are very important organs of homeostasis, involved in controlling the loss of water and mineral ions from the body as well as getting rid of urea.

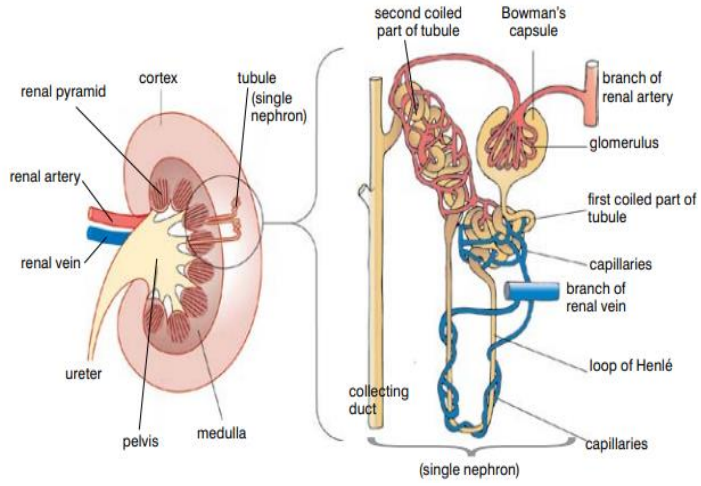


Figure 3.62 The kidney filters the blood and removes materials which are not needed to form the urine. The kidney tubules or nephrons are the units which carry out the work.

Structures of nephrons

- **A nephron** has the following major parts
- **Bowmans capsule** - is a cup shaped structure.

- It is the site of the **ultrafiltration** of the blood.
- **Bowman's capsule** is the expanded end of a kidney tubule or nephron that acts as a filter to produce urine.
- **Ultrafiltration** is the removal of excess water and other substances from the blood
- **Renal tubules** -are long narrow tubules which are divided in to three regions.
- These are Proximal (first convoluted) tubule, Loop of Henle and Distal (second coiled) convoluted tubule.

The Urinary System of Humans

- **The human urinary system** consists of the organs of the body which are involved in the removal of urine from the body.
- **Ureter** is a tube which carries the urine from the kidney to the urinary bladder.
- **Urinary bladder** - Is a temporary storage site of urine.
- **Sphincter muscles** - are special muscles at the base of the bladder to control the release of urine in to urethra.
- **Urethra** - is a tube that discharges the urine out of the body.
- **Renal artery** - supplies oxygenated blood to the kidney.
- **Renal vein** - carries deoxygenated blood away from the kidney in to the inferior venacava.
- **Collecting duct** - transport urine down through the medulla and deliver it to the pelvis.

Urine Formation

- **Renal artery** carries blood to the kidney.
- The renal artery branches in to afferent arterioles.
- **Afferent arteriole** - supplies blood to the **glomerullus** which are found in the **Bowmans capsule**.
- **Efferent arteriole** is the arteriole that takes blood from glomerullus.
- Thus the afferent arterioles are much wider than efferent arteriole, this creates a pressure in the glomerullus as the blood moves from afferent arteriole to efferent arteriole.
- The urine is formed in two stages;
  1) Ultra (pressure) filtration
  2) Reabsorption

Stage 1: Ultra (pressure) filtration

- Involves separation large substances from smaller one by a very fine filter as a result of the pressure created in the glomerulus.
- The blood enters glomerulus at high pressure; as a result substances with smaller size like **water, salt, glucose, urea** and others are forced out of glomerulus in to the renal tubule.
- These substances are called **glomerular filtrate**.
- However, substances with large size like **blood cells** and **blood proteins** cannot leave the glomerulus and are passed to **efferent arteriole**.

Stage 2: Reabsorption

- **Reabsorption** -is the process in which useful substances found in the glomerular filtrate are reabsorbed back in to the blood, since the body cannot afford to lose all these substances.
- The renal tubule is surrounded by blood capillaries, thus the capillaries, thus capillaries reabsorb all the Substances that are required by the body back in to the blood.

- **First coiled (Proximal) tubule** is where much of the reabsorption takes place.
- All the glucose, around 67% of the sodium ions and around 80% of the water is reabsorbed.
- It has increased surface area.
- **Loop of Henle**- is where urine is concentrated and more water is conserved.
- It is also involved in maintenance of blood PH at 7.3-7.4.
- **Second Coiled (Distal) tubule** - is where the main water balancing is done.
- If the body is in shortage of water, the pituitary gland is stimulated to release the hormone antiduretic hormone (ADH) to increase the reabsorption of more water in to the blood.
- Finally the salt need by the body is reabsorbed.
- **ADH** is the hormone produced by the **pituitary gland** that reduces the production of urine in the kidneys and prevents loss of water.
- It increases the permeability of the walls of the renal tubule to reabsorb water.
- **Collecting duct** - is a part where the liquid (**urine**) is collected.
- **The urine** is formed from the **urea, excess water and salt** that are not reabsorbed back.
- The reabsorbed substances in the capillaries move into small veins (venuoles) and then to the renal vein in order to be carried back in to the inferior venacava which returns the purified blood back into the body.
- **Osmoreceptors** - are specialized cells in the brain which are responsible for monitoring the osmotic pressure of the blood and extra cellular fluid.
- If the water content of the blood is too low (high salt concentration in the blood) they stimulate the pituitary gland to release more ADH in to the blood.
- The amount of ADH produced by the pituitary gland depends on the concentration of water in the blood.
- If the water concentration in the blood is too high the amount of ADH produced is less. However, if the concentration of the blood is less, and vice versa.

The Liver and Homeostasis

- **Liver** is a red brown organ situated in the abdomen beneath the diaphragm.
- It is a very special organ that plays a very important role in maintaining the homeostatic stability of the body.
- It has special blood supply; it is directly supplied from the gut through hepatic portal vein.
- Large number of reactions takes place in the liver in which most of them are involved in **homeostasis**.

The major functions of the liver are:

1. Regulation of blood sugar level, since it is the storage site of glycogen.
2. Controlling and balancing the fat and cholesterol levels in the blood.
3. **Deamination** - The process of removing excess amino acids from the body since our body has no ability to store excess proteins.
4. The breakdown of worn-out red blood cells and hemoglobin (a red pigmented substance in the blood that carries oxygen)
5. **Formation of bile**; **Bile** is a salty substance which has the following roles in digestion:

- ✓ **Emulsification** fat in to fat droplets

- ✓ **Neutralizing** the acidity of chyme which is acidic.

6. **Detoxification** - The process of removing toxics. That is why our liver gets damaged when people consume drugs excessively.

- ✓ For example, addiction and excessive consumption of alcohol causes **cirrhosis** of the liver.
- ✓ **Cirrhosis is** liver disease caused by alcoholism.

7. **Temperature control** - since many reactions take place in liver, it produce more heat.

UNIT 4

FOOD MAKING AND GROWTH IN PLANT

Plants

Lower plants	**Higher plants**
Mosses	Gymnosperms (Non-flowering)
Ferns	Angiosperms (Flowering)

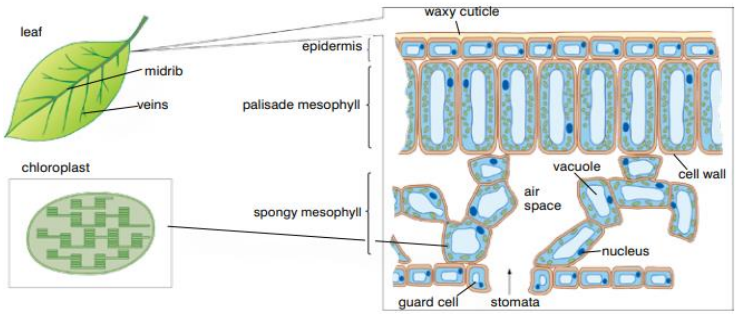
- ➢ **Flowering plants** are the most Successful and complete groups of plants.
- ➢ All flowering plants have well developed stem, leaves, flowers and roots.
- ➢ **Flowers** are reproductive organs.
- ➢ **Leaves** are photosynthetic organs that are capable of converting light energy, carbon dioxide and water in to organic substance (Food).
- ➢ **Stem**-is a part which provides support and transportation of substances (water, mineral, food).
- ➢ **Roots** - attaches the plant to the ground and involved in absorption of water and minerals.

4.1. The leaf

- ➢ **The leaf** is known as a **photosynthesizing machine** of a plant.

External structure of the leaf

- ➢ **Blade** - is an extended surface of the leaf.
- ➢ **Petiole**-joins the leaf to the stem.
- ➢ **Midrib**- is the main vein and consists of vascular tissues (xylem and phloem).
- ➢ **Margin** – The leaf border.
- ➢ **Apex**-The tip of the leaf.



The upper and lower epidermis

- ➢ **Epidermal layer** is composed of tightly fitting cells without chloroplast.

- They are covered with a water proof layer called **waxy cuticle**.
- This helps to prevent excessive water loss by transpiration.
- **Lower epidermal cells** are modified into bean shaped cells called **guard cells**.
- **Guard cells** are the only cells in the epidermis that **contain chloroplasts**.
- **Stomata (singular-stoma) -** are spaces between two guard cells.
- It allows **exchange of gases** during photosynthesis and respiration as well as evaporation of water (transpiration).
- **Carbon dioxide** - diffuses in to the leaf and **oxygen** diffuses out of the leaf through the stomata.
- The lower epidermis contains large number of stomata.

Palisade mesophyll

- **Palisade mesophyll** - consists of closely packed cells near the surface of the leaves.
- It consists of **many chloroplasts**.
- Thus, it is the **main photosynthetic tissue** of the plant.

Spongy mesophyll

- **Spongy mesophyll** has a lot of air spaces which provides a big surface area for **gas exchange.**
- Spongy cells contain **fewer chloroplasts**, thus it is a photosynthetic tissue.
- It mainly serves for movement of carbon dioxide needed during photosynthesis in the cell.
- **Vascular bundles** consist of **xylem and phloem tissues**.
- **Xylem (dead tissues)** - helps to bring water from the soil to the cells of the leaves.
- **Phloem (living tissues)** carries products of photosynthesis away from the leaves to all the cells of the plant.
- **Chloroplast** - is the organelle in the cytoplasm of plant cells where **chlorophyll** is stored and photosynthesis takes place.

4.2. Photosynthesis

- **Photosynthesis** is the process in which green plants synthesize organic substances (sugar) from the inorganic raw materials found in their surroundings.
- **During photosynthesis plants require**:
  - **Chlorophyll** - The light absorbing pigment found in the **chloroplast**.
- **Water**-from the soil.
- **Carbon dioxide** from the air.
- **Light** - from the sun.
- The reaction of photosynthesis can be summarized as:

$$6CO_2 + 6O_2 \xrightarrow{chlorophyll/light} C_6H_{12}O_6 + 6O_2$$

- The process of photosynthesis occurs in two main stages.
- These are **light dependent** stage and **light independent** stage.

I. Light dependent stage

- This is the stage at which light is required.
- The sunlight is used to split water molecules in to hydrogen ion and oxygen.

$$12H_2O \xrightarrow{chlorophyll/light} 24H^+ + 6O_2$$

- The hydrogen ions are trapped by a hydrogen acceptor substance called **NADPH**, in order to be used in the light independent stage.

- Some amount of light energy is changed in to a form of chemical energy called **ATP** which serves as energy for the light independent stage.
- Takes place in the **grana** of the chloroplast.
- **The metabolic coenzymes** reduced **nicotinamide adenine dinucleotide** (**NADH**) and **flavin adenine dinucleotide (FAD)** is the primary electron donor and acceptors respectively participate in almost all biological metabolic pathways.
- **NADH** is a derivative of **Vitamin B3 (Niacin/Nicotinamide)** while **FADH2** is a derivative of **Vitamin B2 (Riboflavin).**

II. Light independent stage

- This stage does not require light but does not mean it occurs at night time.
- It involves the use of products from light dependent stage and carbon dioxide from the air to form sugar (glucose).

  $24H^+ + 6CO_2 \longrightarrow C_6H_{12}O_6 + 6H_2O$
- Takes place in the **stroma** of the chloroplast
- The overall reaction of photosynthesis is:

$$12H_2O \xrightarrow{chlorophyll/light} 24H^+ + 6O_2$$
$$24H^+ + 6CO_2 \longrightarrow C_6H_{12}O_6 + 6H_2O$$
$$6CO_2 + 6O_2 \xrightarrow{chlorophyll/light} C_6H_{12}O_6 + 6O_2$$

- Glucose that is produced by photosynthesis is directly used to produce energy (respiration) used for cellular activities, growth, reproduction etc.
- **Sugars produced by photosynthesis are:**
- ✓ Built into starch for storage
- ✓ Built in to molecules like fructose (fruit sugar) and sucrose (double sugar) to be transported around the plant.
- ✓ Built up in to molecules like cellulose to make new plant cell walls.
- ✓ Used to make amino acids (building blocks of proteins) along with nitrates and other nutrients.
- ✓ Built up in to fat and oils (lipids) for storage in seed and make part of cell membranes.
- ✓ To build up important molecules such as **chlorophyll.**
- **Glucose molecule** is mainly stored in the form of **starch** which is stable and insoluble form of carbohydrate.

The need for photosynthesis

- Photosynthesis needs chlorophyll, carbon dioxide, water and sun light.

Testing a leaf for starch

- After photosynthesis starch is temporary stored in the leaf.
- Thus to check whether the leaf is photosynthesizing or not, it is tested for starch through the following steps.
  - Detach a leaf from a plant
  - Put the leaf in a boiled water for 30 seconds to kill the leaf
  - Place the leaf in ethanol solution to remove the chlorophyll pigment.
  - Dip the decolorized leaf into cold water to soften it.
  - Add iodine solution on to the leaf.

- If the color of the leaf turns **blue black**, it shows the **presence of starch** in the leaf

The need for light

- Light is needed for splitting water into hydrogen and oxygen.
- To form the chemical energy found in glucose molecule formed by photosynthesis.
- To demonstrate sunlight is essential for photosynthesis:
  - Take a healthy plant, growing in a pot.
  - Destarch a plant by putting it in darkness for few days, so that it loses its starch. This process is called **destarching**.
  - Test one leaf for starch, inorder to make sure that it does not contain starch.
  - Cut a simple shape (For example **'E'**) from a piece of aluminum foil or black paper, the cut shape should allow light to pass through it.
  - Fasten the foil or black paper firmly over both sides of a leaf.
  - Place a plant in sunlight for 3-4 hours
  - Detach the leaf and test it for starch.
  - **Result** - only the cut part **'E'** which received light turns blue black showing presence of starch.
  - Therefore, it can be concluded that only the part which received light turns blue black and photosynthesize.

The need for carbon dioxide

- **Carbon dioxide** is needed during photosynthesis to incorporate the **carbon and oxygen** that is found in glucose molecule.
- To demonstrate that plants need carbon dioxide for photosynthesis:
  - Take two plants growing in a pot. Plant A and plant B.
  - Destarch both plants by placing them in a dark place for few days.
  - Put both plants in a bell jar which do not allow air to enter. Place potassium hydroxide solution around plant A.
  - **Potassium hydroxide** has an ability to absorb carbon dioxide from the surrounding air.
  - Place both plants in light for few hours.
  - Test leaf from both plants for starch
  - **Result**:-The leaf of plant A produces less starch while the leaf from plant B produces sufficient amount of starch.
  - Therefore, plant B produced enough amount of starch by using the carbon dioxide from respiration of the plant.
  - But plant A produce less amount of starch because the potassium hydroxide absorbed the carbon dioxide which made the plant to face shortage of CO_2 to make enough starch.

The need for chlorophyll

- **Chlorophyll** is needed to absorb sunlight which used as a main source of energy for the process of photosynthesis.
- To demonstrate the need of chlorophyll for photosynthesis.
  - Take plant with a variegated leaf.
  - **Variegated leaf** is a leaf which is not completely green and has yellowish or white spots.
  - Destarch a leaf by placing the plant in a dark place.

- Place the plant in light only for few hours.
- Take a leaf and test it for starch.
- **Result** -only the greenish part turns blue black. Therefore, the **variegated** parts which have no chlorophyll do not produce starch.

The need for water

- **Water** is needed during photosynthesis as a source of **hydrogen ion** found in glucose molecule formed.
- To demonstrate the need for water in photosynthesis:
  - Supply a plant with a heavy water containing the ^{18}O isotope of oxygen.
  - These atoms are **radioactive**.
  - The radiation they produce can be detected by **radiation sensitive machine** are called **radioactive tracers**.
  - The experiment only shows Oxygen produced during photosynthesis comes from the splitting of water molecule.

The importance of photosynthesis

- Photosynthesis is one of the most important reactions on Earth.
- It is through photosynthesis that the ultimate source of energy for the Earth – in other words, the sun – is tapped and converted into chemical energy which is available to life.
- Around 35×10^{15} kg of new biological material is produced every year as a result of photosynthesis.
- This new material can then be used as a **food source** by billions of living organisms, including people.
- The organisms that carry out photosynthesis in water may be **true plants**, such as water **weeds**, but they also include many **algae** and most importantly of all, the **photo plankton** (**phytoplankton**).
- These are tiny organisms, protists and bacteria, which carry out photosynthesis and produce over half of the biomass of the Earth.
- Photosynthesis is very important the health of the environment in other ways as well.
- Almost all living organisms need oxygen for cellular respiration. That oxygen is produced as a waste product of photosynthesis.
- Living organisms produce carbon dioxide as a waste product when they respire.
- Carbon dioxide is a **greenhouse gas** – it helps to trap heat from the sun around the surface of the Earth.
- Plants and other photosynthesizing organisms **remove carbon dioxide** from the atmosphere all the time.
- So photosynthesis is very important for maintaining the balance of oxygen and carbon dioxide in the atmosphere.
- If carbon dioxide levels build up, this may lead to **global warming**.

4.3. **Transport in plants**

- In simple plants like mosses transport materials like carbon dioxide, water, oxygen, mineral salts and products of photosynthesis are transported from one cell to another cell by **diffusion and active transport**.
- These plants have no special transport system.

- In higher plants gases move by diffusion, while transportation of water, mineral and food takes place through specialized tissues called **vascular bundles (xylem and phloem**).
- Plants absorb water and minerals from soil.
- Water is absorbed from the soil by osmosis through specialized **root hair cells**.
- **Root hairs** - hair-like extensions that increase the surface area.
- Root hair cells increase the surface area of the root for **osmosis** to take place.
- **Osmosis** is the movement of water molecules from the region of higher concentration to lower concentration through a semi-permeable membrane.
- The soil has high water concentration than the root hair cells.
- Thus, water moves from the soil to the root by osmosis.
- Once the water entered the root hair cells, it moves from one cell to another cell by osmosis; until it reaches **xylem vessels**.

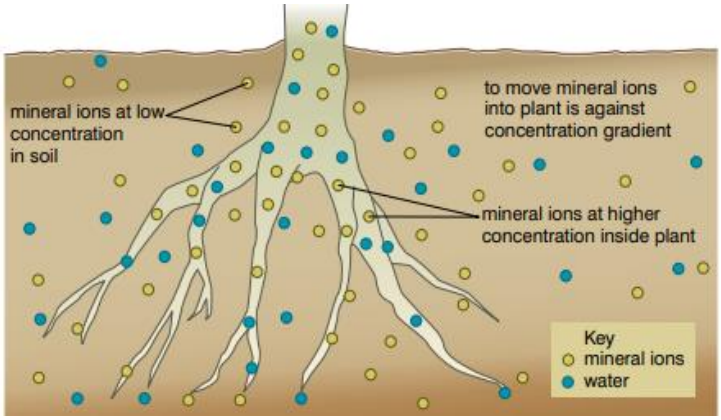
Active transport in plants

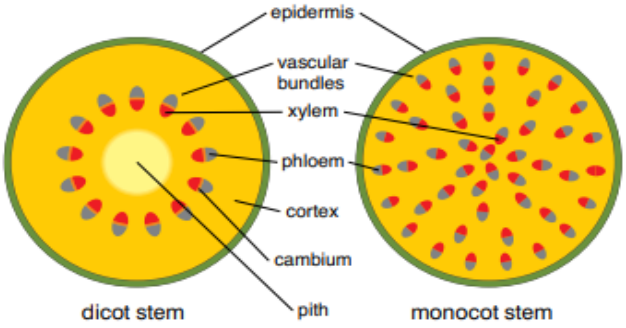
- **Plants need active transport during:**
- Absorption of mineral ions from the soil.
- **Translocation** - transportation of food or organic substances from the leaf to parts of a plant.
- Active transport involves the movement of molecules **from very dilute solution to less dilute solution**.
- The soil environment has relatively less minerals concentration than the root hair, thus minerals move from the soil (less ionic concentration) to the root hair (more ionic concentration) by active transport system.
- Mineral ions are needed by plant to make important substances like **proteins**.
- Active transport requires **expenditure of energy** from respiration.

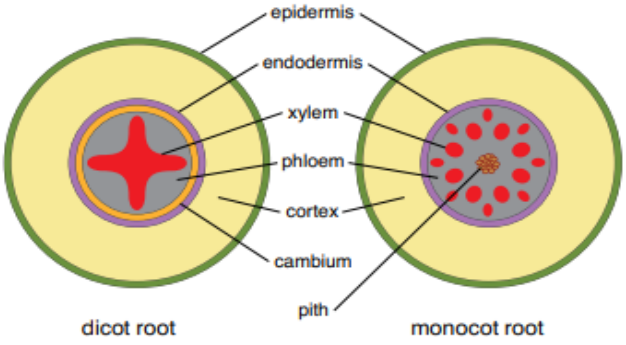
A double Transport System

- Transport in plants is important to move substances like **carbon dioxide, water, oxygen, organic substances and mineral ions** around the plant.
- Transportation in plants is known to be a double transport system.
- **A double transport system** requires two separate transport systems.
- These are **phloem and xylem vessels**.
- **Phloem** -is a **living tissue**.
- **It** Involved in transport of organic materials made by photosynthesis from the leaf to different parts of a plant.
- Plants expend energy to move organic substances along the phloem.
- Thus, transportation of organic substances in plants is an **active transport system.**
- The organic substances which are transported through phloem are needed for making new plant materials and stored in storage organs.
- - It carries water and mineral ions from the soil around the plant
- **Xylem** -is known as a **dead vessel**.
- It carries water and mineral ions from the soil around the plant.
- **Transpiration** is the major factor responsible for movement of water in xylem vessel.

- Movement of water through xylem vessel from the root to the leaves does not required energy, thus it is a **passive transport system**.
- **In monocot** plants **xylem** and **phloem** vessels appear in a **scattered manner not in ring.**
- **In dicot** plants xylem and phloem vessels **appear in rings**
- Phloem vessels are found just underneath the bark and xylem vessels found inner to phloem vessels.
- If complete ring of bark of a tree is nibbled (removed) especially in young plants, the organic substances are prevented from reaching some parts in which the tree will die.







The need for transport in plants

- Plants need glucose for cellular respiration which provides energy for the plant.
- Plants store Sugar (glucose) in the form **starch** which is osmotically inactive (insoluble).
- The starch which is stored can be converted into glucose (sugar) when needed by the plant mostly when the plan is not photosynthesizing.

- Plants store starch at different storage organs. For example: **Root, Stem, Leaves.**
- Storage organs are important for a plant to survive difficult conditions.
- Plants also store starch in their **fruit** and **seeds**, which are sources of energy for humans and other animals.
- **Minerals** are needed for making of proteins and other molecules within the cells.
- The **water** is needed for **Photosynthesis** and **Keep the plant cells turgid and firm**.

Transportation stream

- Water moves many meters along xylem vessel as a result of **transpiration stream**.
- It does **not** involve **active transport**.
- **Transpiration** – is the **lose (evaporation**) of water from a plant through the **stomatal** opening.
- The opening and closing of stomata is controlled by **guard cells**.

Factors responsible for water movement

- The major factor responsible for water movement along the stem through xylem vessel is **transpiration stream (pull).**
- **The major forces for water movement in transpiration stream are:**
  - **Adhesive force** - is a force of attraction between xylem vessels and water molecules.
  - **Cohesive forces**- attraction between water molecules (polar substances). Water molecules stick together in order to move along xylem vessels.
  - **Capillarity** - The ability of water to rise in fine (narrow) tubes.
  - **Root pressure** -is the pressure created in the root as a result of turgidity of the root cells when water enters into them from the soil.
- Water moves from xylem cells (high water concentration) to the leaf cells (less water concentration) **by osmosis**.

Factors affecting the rate of transpiration

- **Temperature -** as the temperature increases the rate of evaporation of the leaf (transpiration) increases.
- **Light -** light makes stomata to stay open, which is for photosynthesis. However, when stomata opens water evaporates from leaf.
- **Number of stomata -** if a leaf has many stomata; it increases the exposure of the leaf to lose more water.
- **Air movement (winds)** - water vapour around the stomatal opening is swept away from the leaf by air movements or wind which increases the rate of water vapour to diffuse out.
- **Humidity** - when the concentration of water vapour in the atmosphere is saturated, less amount of water diffuses (evaporates) to the atmosphere from leaf.

Adaptations of plants to reduce water loss

- Plants lose most of the water they absorb from the soil by **evaporation**.
- Evidences show that about **99%** water absorbed from the soil is lost by **transpiration**.
- Thus plants need to reduce the rate of transpiration through adaptations like:
  - **Waxy cuticles** - water proof structures found on the surfaces of the leaf. **Cuticles** are **thick and shiny** in plants at hot climate.
  - **Reduced number of stomata** - which reduces water loss.

- **Stomata on the underside of the leaf** - which reduces exposure of the leaf to the sun.
- **Reduced number of leaves** – reduces number of stomata, so less transpiration.

Transpiration and agriculture

- In order to save the water requirements, especially in areas where there is limited water resource farmers must work for the mechanisms that reduce water loss.
- **Transpiration can be reduced by:**
  - Growing plants which transpire less
  - Reducing air movements over the crop by planting taller plants in rows along the direction of wind break.
  - Destroying unwanted weeds
  - Removing dying or damaged leaves. Etc.

4.4. Response in Plants

- Plants respond to changes in their surrounding environment through their own coordinating mechanisms.
- Coordination and response in plants is managed by **hormones**.
- Plant hormones are sometimes called **phytohormones**.
- **Phytohormones -** have various effects on plants. These include:
  - Coordination of flowering
  - Cell division
  - Cell elongation
  - Fruit ripening, etc.

Germination of Seeds

- **Germination** is the process by which a seed changes into a seedling.
- Germination of a seed requires necessary conditions. These includes:
  - **Oxygen** - is needed for respiration of a seed to produce energy for germination.
  - **Moisture (water)** - is used for **hydrolysis** of insoluble substances (starch) stored in a seed.
  - **Optimum temperature** - for the action of enzyme called **diastase** that converts **starch i**n to **simple sugars**, and also an enzyme **lipase** converts stored **fats** in a seed in to **fatty acid** and **glycerol**.
- A seed contains the following structures:
  - **Endosperm** – is a food storage tissue of a seed.
  - **Embryo**- is a part which develops in to a main plant. It has three main parts: **plumule, radicle** and **cotyledons**.
  - **Plumule (embryonic shoot**)-a part which later develops in to the shoot system.
  - **Radicle (embryonic root**) - develops in to a root system.
  - **Cotyledons (seed leaves)** - serves for storage of starch mainly in dicot seeds.
  - **Testa (seed coat**) - the outer protective cover of a seed.
  - **Microphyle** - Tiny hole through which water and oxygen enters the seed.
  - Table: Comparison between monocot seed and dicot seed.
- If the seed do not condition required for germination it stays **dormant**. Seeds are kept dormant in **seed banks** to preserve.

BIOLOGY GRADE 10 SHORT NOTE

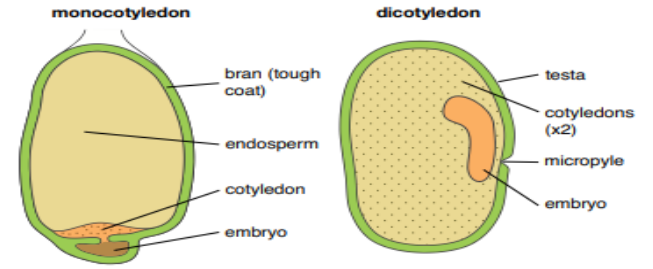


Figure 4.21 The internal arrangements of monocot and dicot seeds may look very different, but their basic parts are the same – an embryo ready to develop, a food store to supply the energy needed and a protective seed coat.

Monocot seed	Dicot seed
Has one cotyledon	Has two cotyledons
The main food store is endosperm	The endosperm move food into cotyledon which is a main food store
The embryo remains a very small part of a seed	The embryo takes most of the seed parts

Types of germination

- **Epegeal (dicot) germination**
  - It is a type of germination in which the cotyledons are carried above the soil.
  - **The hypocotyl** carries the cotyledons and plumule above the soil surface.
  - **Hypocotyl**- is the first **leaf-like** structure that appears on a germinating seed. It grows **upwards** in response to **light**.
  - This type of germination occurs **in dicot plants.**
  - Example- bean, groundnut, cotton etc.
- **Hypogeal (monocot) germination**
  - It is a type of germination in which the cotyledons remain underground.
  - The plumule pushes out of the soil by leaving the cotyledons in the ground.
  - This type of germination is exhibited by **monocot plants**.
  - Example: Maize, wheat, sorghum etc.

Plant growth hormones

- Growth of plant is regulated by plant hormones.
- The main hormones involved in growth of plants are: **Auxin, Gibberellic acid, Cytokinin, Ethylene** and **Absicisic acid.**
- These plant hormone can affect growth in plants differently:

1. **Auxin (IAA)** – is the best known plant hormones that involved in general plant growth.

- It stimulates elongation of new plant cells.
- Induce the formation of roots on cuttings
- Seed germination
- It allows the plant to grow taller, to increase its exposure to sun.
- Prevents falling off fruit before ripening
- **IAA (Indole - Acetic Acid**) The main type of auxin which is well known.

2. **Gibberellins** -It affects growth of plants in different ways:

- It is largely involved in the growth of plant stems
- It helps seeds to break their dormant period and start to germinate.
- It stimulates production of enzymes used to break down food stored in a seed.

- It makes dwarf plants grow in to normal size.

3. Cytokinins - It stimulates the cell division in plants.

- Together with auxin are used to cause differentiation of roots, stems, leaves and buds of a plant.
- They are also involved in breaking seed dormancy.

4. Ethylene - Is a gaseous hormone which is involved in the following activities:

- Ripening of fruit
- Prevents falling of leaves and fruits in some plants.

5. Abscisic Acid (ABA) - It inhibits growth

- It plays role in leaf fall
- It is also involved in seed dormancy and may involve in geotropism.

Tropic responses

- **Tropism** - is a directional growth movement of plants in response to **stimuli.**
- Tropism can be:
- **Positive tropism**- growth movements toward the stimuli.
- **Negative tropism** -growth movements away from the stimuli.
- Some examples of tropic responses are:
  - **Phototropism**- Is a directional growth movement of plants in response to **light**.
  - **Geotropism** - Is a directional growth movement of plants in response to **gravity.**
  - **Chemotropism** - is directional growth movements in response to **chemicals**.
  - **Hydrotropism** - is a directional growth movement of plants in response to **water**.
  - **Tigmotropism** - growth in response to **touch.**
- Example; Plant roots grow down the soil and shoots grow up the ground.
- Therefore:
  - The growth of **root** is an example of **positive geotropism** and **negative phototropism**.
  - The growth of **shoot** can be an example of **positive phototropism** and **negative geotropism.**
- The response of **seedlings (baby plants**) to gravity can be detected by an **apparatus** called **klinostat**, which can stop gravity from being a unilateral (one directional) force on the earth.
- Another important example is growth of root towards water in a damper soil.
  - This is **positive hydrotropism**.
  - Tropic responses can be summarized as:

Tropism	**Stimulus**
Phototropism	Light
Geotropism	Gravity
Tigmotropism	Touch
Hydrotropism	Water
Chemotropism	Chemicals

Nastic Movements

- **Nastic movements** are non-directional growth of plants in response to stimuli.
- Some examples of nastic movements include:
  - Opening of flowers.
  - Falling of fruit and seeds.

BIOLOGY GRADE 10 SHORT NOTE

UNIT 5

CONSERVATION OF NATURAL RESOURCE

5.1. Definition of natural resources

- **Natural resources** are resources that exist in nature and are useful for human beings.
- These includes; gold, platinum, diamond, potash, natural gas, coal, vegetation, wild animals etc.
- Natural resources can be grouped as **renewable** and **nonrenewable**.

Renewable Natural Resource	Nonrenewable natural Resource
Resources that are capable of being produced indefinitely.	Are resources that cannot be easily made or produced if they are used once.
Includes mostly living things and their products	Includes mostly non – living things
They can be reused and replaced easily	They cannot be easily replaced.
Examples: Vegetation, Animals (lion, cattle, etc.) Water, Air	Examples: Gold Coal Petroleum Diamond etc.

Conservation and biodiversity

- **Conservation** - is a **wise use** of natural resource which involves **protection** and **preservation** of the natural environment.
- Only if the natural resources are properly used and managed can last for the future.
- If a natural resources are not wisely used their number declines and they finally become **extinct**.
- **Note: Extinction** - is the loss of a species everywhere in the world or particular habitat.
- **Biodiversity** - is a measure of wealth of species in a given place or habitat.
- This includes all types of living organisms ranging from small microorganisms to big trees and largest animals.
- It is mostly measured by the number of species breeding at a particular area.

5.2. Importance of biodiversity

- **Biodiversity** is important in various ways:
- The balance in an ecosystem. Organisms interact with one another and their physical environment.
- For example plants carryout the process of photosynthesis which is important for:
  - Rainfall through transpiration
  - Stabilizing the atmosphere and world climate.
  - Plant roots hold the soil which avoids soil erosion by flooding.
- Thus, if biodiversity is reduced the natural balance in an ecosystem gets affected.
- To develop the genetic diversity of crops and animals in order to have an organism that fits with different conditions.
- It also helps to develop organisms that act as sources of medicine, clothing, food and other useful things.
- To have areas with admirable and wonderful biodiversity this is enjoyable.

- People destroy the biodiversity and replace an area with only a single type of crop, this is called **monoculture**.
- **Monocultures are:**
  - Not attractive to look at.
  - Do not support wide range of plants and animals.
  - Increases the risk of diseases to spread so quickly.
- Biodiversity of an area is lost for various reasons:
  - To grow crops for **agricultural purposes**.
  - For growing **industrial raw materials** in a large scale.
  - For example, **sugar cane** is grown on a huge area as a source material for **sugar factories**.
  - Deforestation
  - Environmental pollutions like acid rain.
- Therefore conservation of biodiversity or natural environment is useful for the **continuity of life** on the earth.
- Thus, it is better to establish ways of protecting and preserving biodiversity.
- **Some of the ways to conserve the biodiversity are:**
  - Establishing legal actions which protect humans from killing or harming individual species.
  - Reducing pollutions by reducing the levels of carbon and developing other mechanisms that reduce climatic change.
  - Reducing loss of habitats through occur deforestation and other human activities.
  - Establish **national parks**, **sanctuaries** and **zoos**.

5.3. Vegetation

- Vegetation cover of an area varies in different climatic areas of the world.
- For example, tropical rainforest areas have diversity of vegetation while desert areas have least diversified vegetation.
- Ethiopia is a country with diversity of vegetation.

Importance of plants

- Plants are useful for human beings and rest of the world in various ways.
- **Some of their uses are:**
  - Sources of food (producers)
  - To make drinks such as Tej, Tella, Coffee (buna), tea etc.
  - Export products for a country. Ethiopia is generating the highest in come from coffee export.
  - For building materials. These include building of homes, schools and making of house hold equipment and furniture.
  - For timber production
  - Sources of medicines (both traditional and modern). Some of the traditional medicines prepared form plants and used in Ethiopia are; **Kosso** for worms, Yedega Agazen for treating dysentery.
  - Release oxygen in to the atmosphere
  - Absorb atmospheric carbon dioxide
  - A habitat for many types of animals.

Human Effect on Vegetation

- Human beings can affect the vegetation cover of an area in various ways for different resources.
- This action of humans that reduces or eliminates the vegetation cover of an area is called **deforestation**.
- People deforest trees (vegetation) through:
  - Cultivation of crops for food or commercial purposes.
  - Selling of timber.
  - Overgrazing by domestic animals.
  - Fire
  - Building of homes.
  - Releasing pollutants like SO_2 (sulpher dioxide) and NO_2 (nitrogen dioxide) which can form acid rain.

Endemic species of plants in Ethiopia

- **Endemic** - is an organism (plant or animals) which is unique to a particular geographic location or country.
- **Endemic** means unique to a particular geographic location.
- In Ethiopia there are around 7000 species of higher plants from which around 800 of them are endemic species which are unique to Ethiopia.
- **Some of the endemic plants species in Ethiopia are:**
  - Teff (*Eragrostis teff)*
  - Enset (*Ensete ventricosum*)
  - *Ficus vasta*
  - Noug (*Guizotia abysinica*)
  - Juniper (tid)
  - Kerero
  - Sembo
  - Zigba
  - Anchote, etc.

The History of Ethiopian Vegetation

- Ethiopia is a country which had naturally blessed with its vegetation;
- However, due to improper and unwise use of it, Ethiopian vegetation cover is declined largely, even though we still do have a chance for recovery.
- E**mperor Zera Yekob (1434-1468)** organized the collection of seeds of indigenous plants such as Juni**per (tid), olive (woira) and podo (Zigba)** from **wof-washa** which he planted them in **Menagesha** mountain and is preserved until now.
- **Emperor Menelik II (1895)** - ordered introduction of **bahrzaf (Eucalyptus)** to replace native vegetation.
- **Bahrzaf (Eucalyptus)** is widely used for various purposes in Ethiopia but it is found to damage the soil. Therefore, a big concern should be given to **indigenous plants**.
- **Sustainability** of vegetation resources in our country is very important.
- **Sustainable resource** means capable of being maintained and/or replaced.
- The history of vegetation cover of Ethiopia at different times can be summarized as:
  - Originally……..35%

- 1952……16%
- 1980……3.6%
- 1987……2.7%
- 1990..... 2.4%

➢ These data show that there is a decline in Ethiopian vegetation cover from time to time.

Conservation

➢ Various ways can be suggested to conserve our vegetation.

➢ Concerning conservation of vegetation in Ethiopia the concerned bodies should participate actively.

➢ **Some of these who are involved include:**

- The Government working with various bodies to conserve and replant endemic species.
- Research institutions like the national Herbarium at Addis Ababa University holding much information about Ethiopian plants.
- **Individuals like**:
- **Dr. Mesfin Tadesse (1997)** suggested ways of conserving on natural vegetation.
- **Professor Legesse Negash** worked on a means of replanting indigenous tree species.

➢ **Some of the ways to conserve or vegetation resources include**:

- Educating the society on ways of being careful about conserving vegetation resources. This includes fire preventation.
- **Afforestation**-planting young trees.
- Helping people to generate alternative sources of income for those who relied on vegetation resources.
- Establishing **national parks**.

5.4. Wildlife

➢ Ethiopia is one of the richest countries in its wildlife resources. This involves variety of mammals, birds, insects, reptiles, etc.

➢ Wildlife reserve has much importance.

➢ **Some of the importance of wildlife are:**

- Economic or commercial value from tourism.
- Educational, scientific and recreational value.
- Maintenance of natural balance in an ecosystem.

➢ For example, Predators keep down the number of herbivores which helps to maintain a balance in an ecosystem.

Endemic wildlife species of Ethiopia

➢ In Ethiopia there are many endemic species of mammals, bird, amphibians, reptiles, etc.

➢ **The endemic mammalian species of Ethiopia includes**:

- Gelada Baboon (chilada)
- Walia Ibex (Walia)
- Menelik's Bushbuck (Yeminilik Dikula)
- Mountain Nyala (Yedega Agazen)
- Swayne's Hartebeest (Yeswayne qorkee)
- Ethiopian wolf

- **The endemic birds species of Ethiopia include:**
  - Thick-billed raven (kura)
  - Wattled ibis (Gagano)
  - Black winged lovebird
  - White - collared pigeon
  - Prince Ruspolis Turaco

Human effect on wildlife

- Human beings can affect the wildlife resource in different ways.
- **Some of the human effect on wildlife includes:**
  - Destruction of forest habitat (deforestation) which is a home for wild animals.
  - Uncontrolled hunting which is done mostly for pride, food, clothing, trade, etc.
  - Human settling in a wild habitat.
- Therefore, human activities keep down and reduce the number of wild animals which finally leads to extinction.
- Accordingly, some of the wild species of Ethiopia are on the brick of extinction. **These are**:
  - Walia Ibex
  - Ethiopian Wolves
  - Grevy's Zebras
  - Mountain Nyala
  - White-winged fluff tail
  - Ankober serin bird

Wildlife Conservation

- Wild life conservation involves protection of habitat and managing populations.
- **This is done through**:
  - Establishment of wildlife conservation areas like national parks, sanctuaries, zoos, wildlife reserves.
  - Preventing the spread of diseases. For example; vaccination of Ethiopian wolves against a viral disease called **rabies**.
  - Controlling human settlement in wild habitats.
  - Establishing laws to control illegal effects of humans like hunting.
  - Awareness creation in the society.
- **National parks** are conservation areas designed to give maximum protection to wild animals.
- **Wildlife sanctuaries** are conservation areas established to focus on a particular species.
- **Wildlife reserve** is an area for conservation, management and propagation of wildlife.
  - It involves controlling human settlement, hunting and capturing wild animals.
  - It is a highly protected area.
  - Table: National Parks of Ethiopia

BIOLOGY GRADE 10 SHORT NOTE




National park	Area (Km^2)	Location	Wild animals
Abijatta shalla lakes	887 Km^2	Oromiya	Flamngos, white pelicans, Golden Jackals, Oribi warthog, Grants Gazelle
Awash	786 Km^2	Oromiya	Wild pigs, Zebra, Dik-dik, Anubis and Hamadyras, Baboons, Cheetahs, Leopards, Ostriches, Carmine Bee eaters, Abyssinian Roller
Bale mountains	2,150 Km^2	Oromiya	Gelada Baboon, Mountain Nyala, Ethiopian wolves, Menilik's Bush Buck
Gambella	5,000Km^2	Gambella	Nile Perch, Crocodiles, Hippos, Roan Antelope, Hyena, Lions, Elephants, Buffalo, Zebra, Vervet Monkey, black Monkey
Rift Valley lakes			Flamingos, White Pelicans, Fish Eagles, Spoon Bills, Abdim's Storks, Ibises, Warthogs, Grant's Gazelle
Mago	2,000 Km^2	SNNPR	Giraffe, Elephants, Lions, Buffalo, Cheetah, Zebra, Leopard, Oryx, Vultures, black Rhinos
Omo	4,000Km^2	SNNPR	Kudu, Hart Beast, Oryx, Anubis, Baboons, Lions, Cheetah, Buffalo, Giraffes, Elephants
Semien Mountain	220	Amhara	Walia Ibex, Ethiopian Wolves, Gelada Baboon
Yangudi Rassa	4,730Km^2	Afar	Wild Ass, Kudu, Grevy's Zebra, Cheetah
Maze	210 Km^2	SNNPR	Swayne Hart Beast

- **Harar Wildlife sanctuary -** Located in Oromia region Hararge Zone
  - Involved in protection of elephant and black lion.
- **Kuni - Muktar mountain Nyala sanctuary**
  - Protection of endemic **mountain Nyala**.

- **Senkelle swayne's Heartbeest sanctuary**
  - Dedicated to protection of **hartebeest**
- **Yabelo wildlife sanctuary**
  - Located in Borena Zone Oromia Region
  - Includes vegetation like **Acacia**, **Jeniperus procera, olea europaea**.
  - Consists of wildlife like **ostrich.**
- **Didessa wildlife sanctuary**
  - Located at Illu Aba bora zone Oromia Region

5.5. Air

- Organisms need air for getting oxygen which is need during aerobic respiration and carbon dioxide during photosynthesis.
- However, currently due to increasing rate of **urbanization** and **industrialization**; **pollutant** substances are released in to the atmosphere and caused air pollution.
- **Pollution** is the **contamination** of the natural environment by harmful substances as a result of human activities.
- For environmental pollution every bit of activities like throwing garbage, dog fouls on the street do have their own contributions.
- **Pollution** - is something that contaminates the air, soil and water.
- Air pollution can occur in different forms, these include**; global dimming, global warming,** and **acid rain.**

1. **Global dimming** is a worldwide **blockage** or **reduction** of sunlight from reaching the earth's surface as a result of unburned hydrocarbons released in to the atmosphere in the form of **smoke**.
   - It is sometimes called **'black carbon pollution'.**
2. **Global warming** - Is the rising of **temperature** on the earth's surface as a result of accumulation greenhouse gases like **carbon dioxide** and **methane** in atmosphere.

- **Green houses gases** like carbon dioxide are important because they can trap heat from the sun and keeps the earth's surface warm.
  - This is called **greenhouse effect**.
  - Increasing level of **carbon dioxide** and **methane** increases the **greenhouse effect** by increasing the earth's temperature.
- **Carbon dioxide level is increasing as a result of human activities. This involves**:
  - Burning of fossil fuels from cars, planes and power stations.
  - **Deforestation** - since plants reduce atmospheric CO, during **photosynthesis**.
- **Methane** - Is a pollutant greenhouse gas.
- **It is released into the atmosphere as a result of:**
  - Growth of rice in swampy conditions where methane is largely released.
  - Digestive activity of cattle produces methane.
- **Carbon monoxide** - is a pollutant which is released by burning of fossil fuels.
  - It combines with hemoglobin and reduces oxygen carrying capacity of the blood.
  - Carbon monoxide poisoning can lead to death and it is difficult to detect because it has no smell or color.

- It is found in cigarette smoke.

3. **Acid rain** -is caused by pollutants like sulphuric and nitrogen oxides which are released in to the atmosphere from factories, cars and other vehicles.

- It is formed when the falling rain water reacts with oxides of sulphur and nitrogen.
- **It damages our environment by:**
  - Killing leaves
  - Depletion of soil which destroys roots of trees.
  - Pollution of lake, river and stream water.
  - Damage on building materials by reacting with calcium carbonate.
- **The natural causes of acid rain includes:**
  - Volcanic eruptions and lightning.
  - Water vapor from clouds.
  - Rain
- Human causes for acid rain are burning of fossil fuels from industries and vehicles.

Other effects of air pollution on humans

- Air pollution can affect our health in various ways. Some of the effects are discussed below:
  - Chronic respiratory problems
  - Lung cancer
  - Heart disease
  - Brain damage
  - Nerve, liver and kidney problems
  - Development of skin problems including skin cancer by the damage of UV-rays as a result of ozone depletion.

Preventing air Pollution in Ethiopia

- Air pollution is a global problem.
- Accordingly, every nation have a responsibility in reducing air pollution.
- In relation to air pollution the following preventive measures should be taken in Ethiopia:
  - Avoid use of traditional fuels like wood and animal dung.
  - Using non pollutant alternative source of energy like solar, wind and hydroelectric powers.
  - Establishment of laws to control the pollution from factories.
  - Controlling fire on forest.
  - Avoiding release of industrial chemicals in to rivers and lakes.
  - Educating the society on mechanisms that help to reduce air pollution.

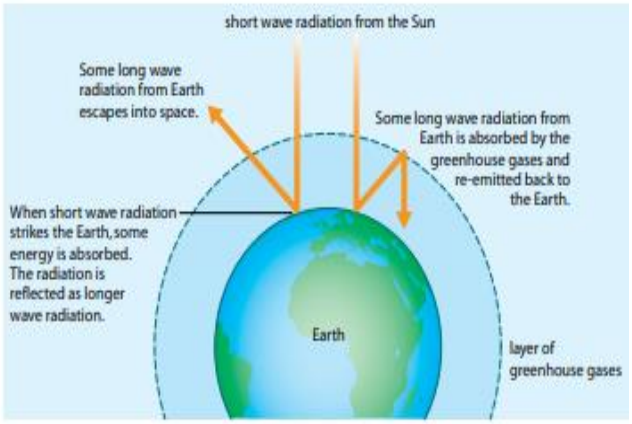


Figure 5.14 *Most scientists believe that global warming is a result of the build-up of air pollutants such as carbon dioxide. The pollution is produced all over the world. Here in Ethiopia we are already feeling the effects.*

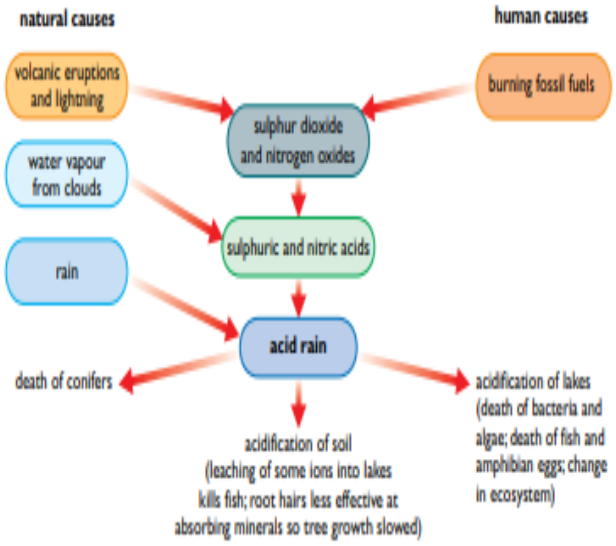


Figure 5.15 *Air pollution in one place can cause acid rain – and serious pollution problems – somewhere else entirely. Depending on the prevailing winds, it can even be in another country!*

The End!!!

Thank You For Your Nice Attention!!!

GOOD LUCK!!!