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LIFE AND LIVING

CELL STRUCTURE

- (a) A cell is the fundamental structural unit of organisms.
- (b) Cells are responsible for the following activities:
- Providing a structure for the body
 - Assist in the growth of organisms by dividing themselves.
 - Take nutrients from food and convert them into energy.
- (c) Cells are too small to see with a naked eye and can only be seen through a microscope (microscopic).

PARTS OF THE CELL

- A cell comprises the following organelles:

Cell membrane

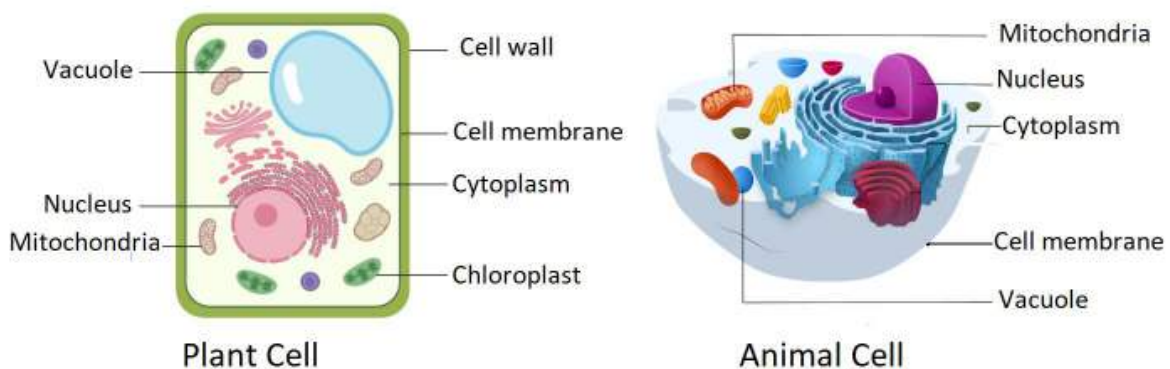
- A thin semipermeable layer of protein and fat that surrounds the cell

Function

- It controls what enters and leaves the cell.

Cell wall

- Cell wall is an organelle made of cellulose and only found in plant cells.



Functions

- (a) Protects the cell organelles
- (b) Gives the cell strength and structure or shape.

Cytoplasm

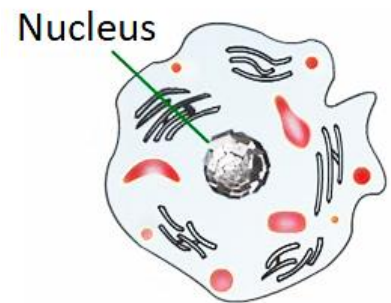
- (a) The word “cyto” means a cell and “plasm” means a fluid.
- (b) It is a gel-like appearance mainly composed of water with enzymes, salts, organelles and organic molecules.

Functions

- (a) It houses the cell's organelles
- (b) Give shape to the cell
- (c) Supports biochemical reactions like respiration.

Nucleus

- (a) A nucleus is an organelle that is enclosed by a membrane.
- (b) A nucleus is found in most cells except bacteria and blue green algae (found in eukaryotic cells).



Functions:

- (a) A nucleus contains the DNA or carries the genes of the organism, e.g. colour of the eyes etc.
- (b) It controls and regulates the activities in the cell, e.g. growth and metabolism).

Mitochondria

- Mitochondrion is an organelle with a round to oval shape.

Function

- It generates energy for the activities of the cell or release energy from food.

Mitochondrion

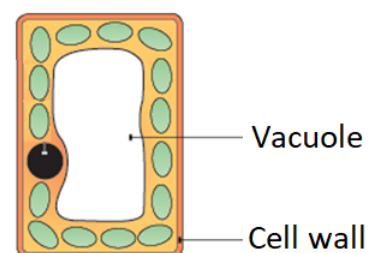


Vacuole

- It is an organelle in the cell filled with cell sap.

Function

- It stores water, food and metabolic waste.



Chloroplast

- (a) Chloroplast is a cell organelle found in plants, algae and cyanobacteria and more concentrated in the leaves.
- (b) It has a high concentration of chlorophyll.
- (c) It is found in plant leaves surrounded by guard cells.



Functions

- (a) Chloroplast contains chlorophyll which absorbs light energy for photosynthesis.
- (b) Produce energy for the cell through photosynthesis.

DIFFERENCES BETWEEN A PLANT AND ANIMAL CELLS

Plant Cell	Animal Cell
○ Chloroplast	○ No chloroplast
○ Vacuole	○ Small or no vacuole
○ Cell wall	○ No cell wall
○ Rigid or regular due to cell wall	○ Irregular since it does not have a cell wall

CELLS IN TISSUES, ORGANS AND SYSTEMS

- (a) Cells have different sizes and shapes.
- (b) Cells are specialized in their functions.
- (c) Cells combine and work together form a tissue.
- (d) Tissues form an organ.
- (e) Organs work together to form a system, e.g. digestive system, excretory system.
- (f) Systems work together to form an organism.

STEM CELLS

- (a) Stem cells are special human cells from which all other specialized cells are generated.
- (b) Stem cells can develop into different types of cells.
- (c) Stem cells can develop into different specialized cells such as brain, skin, muscle etc.
- (d) They can renew themselves or multiply / divide.
- (e) They are not specialized.

ACTIVITY

Answer the following questions:

1. What is a cell?

-
- A cell is a basic unit of all organisms which means all organisms are made up of cells.

2. What is the meaning of microscopic?

-
- Can be seen with the help of a microscope.

3. What is the function of the nucleus in a cell?

-
- Acts like the brain of the cell or coordinates the activities of the cell

4. Which part of the cell holds the genetic code or DNA of the organism?

-
- The nucleus also contains the DNA or holds a genetic code of the organism

5. In what type of cells do we find the nucleus!?

-
- The nucleus can only be found in **eukaryotic** cells and not **prokaryotic** cells.

6. Distinguish between **eukaryotic** and **prokaryotic** cells.

-
- Eukaryotic cells have a defined nucleus while prokaryotic cells do not have a defined nucleus.

7. What happens to the DNA if a cell does not have a nucleus?

-
- If an organism has no nucleus it means the DNA is floating around the cell in the **nucleoid**.

8. In which organelle does respiration take place?

-
- Respiration takes place in the **mitochondrion** which means both plant and animal cells have a mitochondrion.

9. What is another term for cell membrane?

-
- Plasma membrane

10. What is the function of the cell membrane?

-
- It controls what enters and leaves the cell

11. In what organelle does photosynthesis take place?

- Photosynthesis takes place in the **chloroplast**

12. Describe what a cell wall is.

- A cell wall is the protective structure of the cell which strengthens the cell and gives it structure or shape.

13. What are the two functions of the cell wall?

- Give the cell shape
- Make the cell rigid

14. What are unicellular organisms?

- Organisms consisting of one cell.

15. What are the three differences between a plant and animal cells?

Plant Cell	Animal Cell
○ Chloroplast	○ No chloroplast
○ Vacuole	○ Small or no vacuole
○ Cell wall	○ No cell wall

16. Discuss the shape and size of different cells.

- Cells have different sizes and shapes depending on the type of plant.

17. Distinguish between a tissue, organ and a system.

- Cells combine and work together form a tissue.
- Tissues form an organ.
- Organs work together to form a system, e.g. digestive system, excretory system.

18. Why are systems important?

19. What are stem cells?

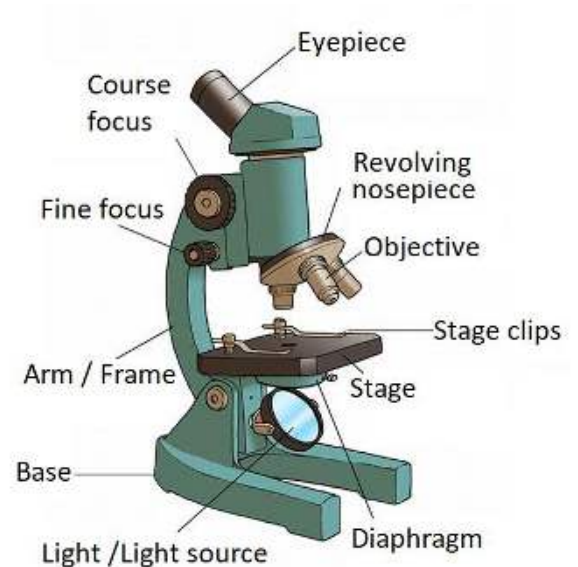
-
- Stem cells are the foundation for every tissue or organ which can renew themselves or multiply / divide. They are not specialized and can develop into different specialized cell such as brain, skin, muscle etc.

20. Discuss what stem cells are about.

-
- Stem cells can develop into different specialized cells such as brain, skin, muscle etc.
 - Stem cells are special human cells from which all other specialized cells are generated.

MICROSCOPE

- A. Objective lens – Produce required magnification
- B. Arm – supports the lenses
- C. Stage – holds the slides / Putting the slide
- D. Stage clips – hold the slide in place
- E. Diaphragm – Controls the amount of light
- F. Base – supports the microscope and contain electronics
- G. Light source – shines bright light through
- H. Course focus – moves stage up and down
- I. Fine focus – used to make small focus adjustments
- J. Eyepiece – for viewing enlarged object
- K. Body tube – light passage to the eyepiece



ACTIVITY: PREPARING A SLIDE

MATERIALS

- | | | |
|----------------------|---------------------------------|------------------------------------|
| 1. scalpel or knife | 6. coverslips | 9. distilled water / bottled water |
| 2. forceps | 7. medicine dropper | 10. iodine solution |
| 3. onion | 8. tissue paper or filter paper | 11. light microscope |
| 4. dissecting needle | | |
| 5. microscope slides | | |

METHOD

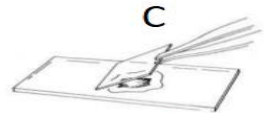
- A. Cut the onion into quarters.
- B. Use forceps to pull or peel a small piece of the very thin membrane-like epidermis lining off one of the **inner** layers of the onion.
- C. Place the epidermis on the slide.
- D. Cover the slide with 2 – 3 drops of water.



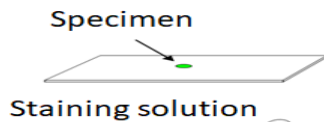
Cut the onion



Peel off epidermis



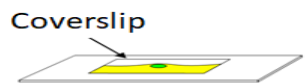
Place epidermis on slide



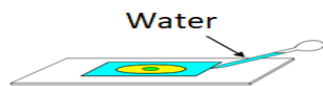
Step 1
Place specimen on slide



Step 2
Add staining solution on slide



Step 3
Cover specimen

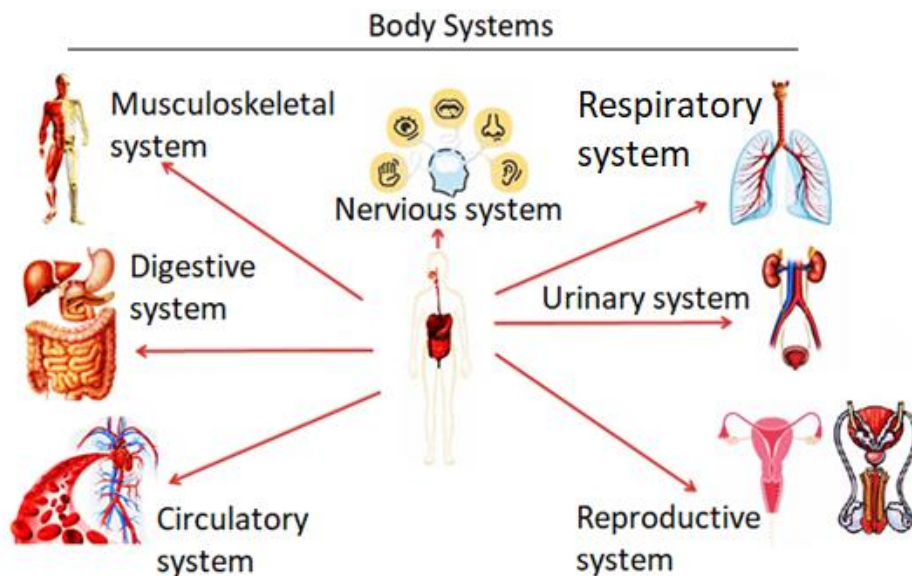


Step 4
Add water around coverslip

- E. Gently lower a coverslip onto the cell.
- F. Hold the coverslip up with a dissection needle and gently lower the slip.
- G. Wipe off excess fluid around the edge of the coverslip.
- H. Adjust the low power objective lens to be in line with the eyepiece.
- I. Switch on the lamp or use the mirror to reflect the light onto your stage.
- J. Place the prepared slide onto the stage and secure it with the stage clips.
- K. Look through the eyepiece and use the fine focus to focus your image.
- L. Use the fine focus to magnify your cells and draw your observation.

BODY SYSTEMS

- (a) There are 11 body systems in the human body.
- (b) These systems work together to create a unit, i.e. a human being.
- (c) Shown in the diagram are some of the body systems (7 body systems).



MUSCULOSKELETAL SYSTEM

- (a) It houses and protects organs in systems in all vertebrates, protects internal organs such as the heart, brain and liver, gives support and shape to the body.
- (b) It enables movement and storage for minerals such as calcium and phosphorus.
- (c) Muscles are responsible for pulling bones during movement.
- (d) Tendons join muscles to bones.
- (e) Ligaments hold bones together.

DIGESTIVE SYSTEM

- To break down food into small molecules which are absorbed into the body.

CIRCULATORY SYSTEM

- To circulate blood throughout the body and to get rid of waste products such as urine.

RESPIRATORY SYSTEM

- Responsible for movement of gases in and out of the body (gaseous exchange).

NERVOUS SYSTEM

- It comprises the brain, spinal cord and nerves.
- It controls what you think, do (conscious or unconscious) or feel.

URINARY SYSTEM

- The urinary system removes toxins and wastes from the body through urine using tubes and ducts.

REPRODUCTIVE SYSTEM

- The reproductive system produces sex cells; male (sperms) and female (eggs or ova) and sex hormones; testosterone (in males) and oestrogen (in females) for the purpose of sexual reproduction or to produce offspring.

THE DIGESTIVE SYSTEM

- The digestive system is a system responsible for the breaking down of food from the moment it is ingested to the moment it is egested.
- The process responsible for the breaking down of food is known as **digestion**.

ACTIVITY

1. How many systems are there in a human body?

-
- There are 11 body systems

2. List the seven systems you have studied.

-
- Musculoskeletal, reproductive, excretory, circulatory, respiratory, urinary and digestive systems.

3. Discuss the role of the musculoskeletal system.

-
- It houses and protects organs in systems in all vertebrates, protects internal organs such as the heart, brain and liver, gives support and shape to the body.
 - It enables movement and storage for minerals such as calcium and phosphorus.

4. Discuss the role of the circulatory system.

-
- To circulate blood throughout the body and to get rid of waste products such as urine.

5. Give details about the nervous system.

-
- It comprises the brain, spinal cord and nerves.
 - It controls what you think, do (conscious or unconscious) or feel.

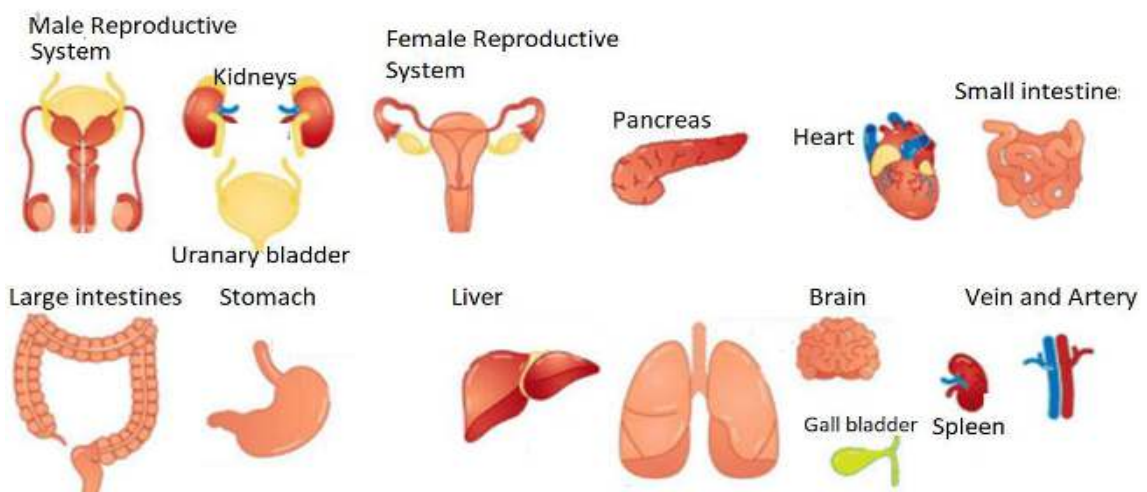
6. Discuss the role of the urinary system.

-
- The urinary system removes toxins and wastes from the body through urine using tubes and ducts.

7. What is the importance of the reproductive system?

-
- The reproductive system produces sex cells; male (sperms) and female (eggs or ova) and sex hormones; testosterone (in males) and oestrogen (in females) for the purpose of sexual reproduction or to produce off springs.

8. Use the diagram to answer the questions that follow.



8.1 Which two systems belong to the reproductive system?

-
- Male and Female reproductive system.

8.2 Which organs belong to the digestive system?

-
- small intestine, large intestine, liver, pancreas, stomach and gall bladder.

8.3 List the organs from the diagram that belong to the circulatory system.

-
- spleen, heart, vein and artery

DIGESTION

- Digestion is the breaking down of insoluble food substances into soluble substances that can be absorbed into the blood system and used by the cells.
- Digestion happens at different stages.

TYPES OF DIGESTION

The two types of digestion are:

- Chemical digestion
- Mechanical digestion

CHEMICAL DIGESTION

- (a) Chemical digestion uses digestive juices to break down food into fine pieces.
- (b) Digestive juices include saliva, gastric juice, gall, pancreatic juice and intestinal juice.
- (c) Digestive enzymes speed up the digestion process.

MECHANICAL DIGESTION

- (a) Mechanical digestion is the physical breaking down of food during digestion.
- (b) The word mechanical involves motion.

Activities of mechanical digestion include:

- (a) Cutting, tearing and biting – to enable the food to fit into the mouth.
- (b) Grinding and chewing – once the food is in the mouth it must be chewed or grinded before it is swallowed.
- (c) Rolling and mixing – the food must be mixed with saliva and rolled into bolus before it is swallowed.
- (d) Swallowing – when the food has been cut, chewed and mixed with saliva, it can now be swallowed. The tongue pushes the food down into the oesophagus and a process called **peristalsis** moves the food down to the stomach.
- (e) Peristalsis is wave like movement of the alimentary canal to propel food (content) forward.

ACTIVITY

1. What is digestion?

-
- Digestion is the breaking down of insoluble food substances into soluble substances that can be absorbed into the blood system and used by the cells.

2. What are the two types of digestion?

-
- Chemical digestion
 - Mechanical digestion

3. Fully distinguish between the two types of digestion.

-
- Chemical digestion uses digestive juices to break down food into fine pieces whereas mechanical digestion is the physical breaking down of food during digestion.

4. Discuss ALL the essential mechanical digestion activities.

-
- Cutting, tearing and biting – to enable the food to fit into the mouth.
 - Grinding and chewing – once the food is in the mouth it must be chewed or grinded before it is swallowed.
 - Rolling and mixing – the food must be mixed with saliva and rolled into bolus before it is swallowed.
 - Swallowing – when the food has been cut, chewed and mixed with saliva, it can now be swallowed. The tongue pushes the food down into the oesophagus and a process called **peristalsis** moves the food down to the stomach.

5. Mention at least three digestive juices.

-
- saliva, gastric juice, gall, pancreatic juice and intestinal juice

6. Discuss what peristalsis is.

-
- Peristalsis is wave like movement of the alimentary canal to propel food (content) forward.

THE ALIMENTARY CANAL

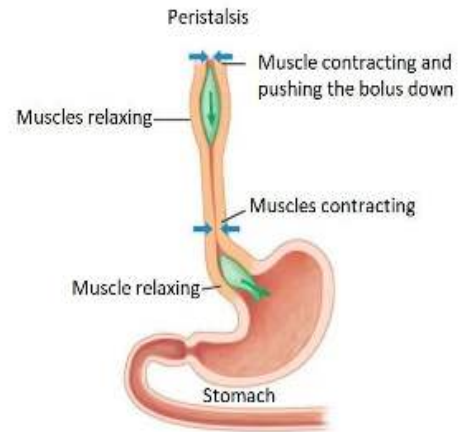
- The alimentary is just a food passage comprising the mouth, oesophagus, stomach, small intestines and large intestine.

A. THE MOUTH

- Digestion starts in the mouth with the cutting, chewing and swallowing.
- The teeth cut, tear and chew the food.
- The digestion of starch takes place in the mouth.
- The tongue mixes the food with saliva.
- The food is rolled into bolus before it is swallowed.

B. OESOPHAGUS

- The oesophagus is just a passage for food to the stomach.
- There is no digestion taking place in the oesophagus.
- Food move from the mouth to the stomach through the oesophagus
- The process through which the food moves through the oesophagus is known as peristalsis.
- The muscles contract to push the food rolled into bolus down.

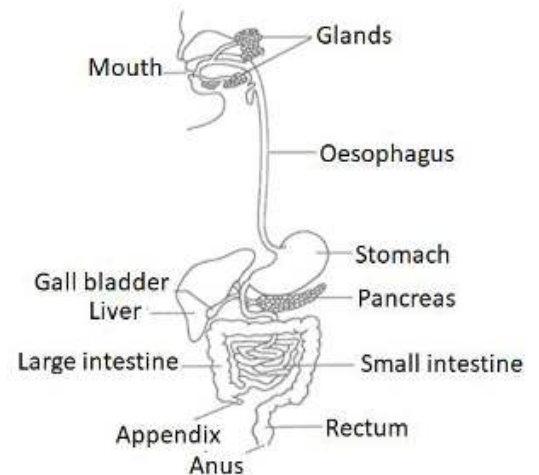


C. THE STOMACH

- The food enters the stomach through the pyloric valve.
- The stomach has a bag like structure.
- Once the food is in the stomach it is turned around and mixed with gastric juice.
- Gastric juice**, also called **gastric acid**, is mixed with **hydrochloric acid**.
- Gastric juice is the stomach acid secreted by the stomach lining responsible for chemical digestion in the stomach
- The food moves out of the stomach through the cardiac valve.
- Peristalsis helps push the food out of the stomach into the small intestines.

D. SMALL INTESTINE

- (a) The three parts of the small intestine are: the **duodenum** (25cm), **jejunum** (2.5m), and **ileum** (3.5m).
- (b) In the small intestine there are millions of tiny finger-like organelles known as the villi.
- (c) The villi absorb the food into the blood system.



E. LARGE INTESTINE

- (a) There is no digestion in the large intestine.
- (b) The large intestine is storage for undigested food before it is defecated.
- (c) Absorption of water and mineral salts also happen in the large intestine.

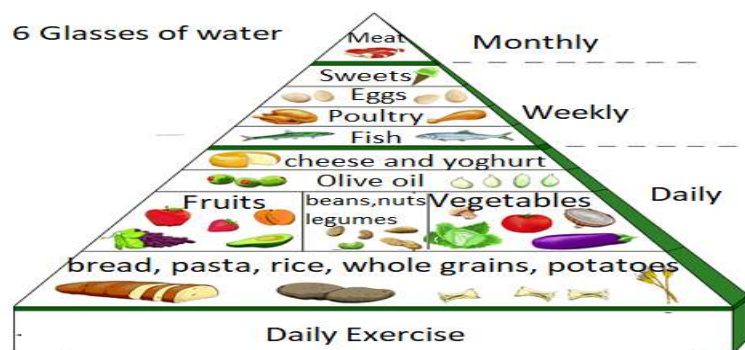
F. HEALTHY EATING DIET

- (i) Healthy eating refers to eating right quantities of foods from all food groups.
- (ii) The main food groups include fruits and vegetables, proteins, fat and sugar, dairy products and whole grains.
- (iii) Healthy diet is important in order to lead a healthy life.
- (iv) Eat your food as medicine or eat your medicine as food.
- (v) A healthy diet should have less fats, sugary items, salt and processed foods.

Processed foods include canned and frozen vegetables

THE SIX ESSENTIAL FOOD NUTRIENTS COMPRISE THE FOLLOWING:

- (a) Carbohydrates
- (b) Fats and oils
- (c) Vitamins and minerals
- (d) Proteins
- (e) Fibre and
- (f) Water



HEALTH ISSUES

- (a) **Anorexia nervosa** is excessive self-food restriction to avoid gaining weight. This is done mainly by teenagers.
- (b) **Diarrhoea** – condition of in which faeces are frequently discharged in a liquid form following viral or bacterial infection.
- (c) **Ulcers** – a condition of painful sores following the damage of the stomach walls or of small intestine by digestive juices. This happens if the mucus layer gets too thin or the stomach generates too much acid. Bleeding ulcers are the most dangerous.
- (d) Of late there was another concept called A4. This concept encourages girls to have a waist that is the size of an A4.
- (e) **Bulimia nervosa** is an eating disorder where one eats and forces themselves to vomit. The purpose of doing this is to be as lean as they possibly can.
- (f) **Liver cirrhosis** is a condition that leads to loss of liver cells replaced by scar tissue following long term exposure to toxins like alcohol or viral infections preventing the proper functioning of the liver by limiting blood flowing through the liver.

ACTIVITY

1. What are the parts of the alimentary canal?

- mouth, oesophagus, stomach, small intestines and large intestine

2. Where does digestion start?

- Digestion starts in the mouth with the cutting, chewing and swallowing.

3. What type of digestion takes place in the mouth?

- Mechanical digestion

4. Discuss what happens in the mouth during digestion?

- cutting, chewing and swallowing, tongue mixes the food with saliva and rolling the food into bolus and swallowed.

5. Discuss what happens in the oesophagus?

-
- Food move from the mouth to the stomach through the oesophagus

6. Describe the shape of the stomach.

-
- The stomach has a bag like structure

7. Discuss what happens in the stomach.

-
- In the stomach food is turned around and mixed with gastric juice and mixed with hydrochloric acid.

8. What is gastric acid?

-
- Gastric juice is the stomach acid secreted by the stomach lining responsible for chemical digestion in the stomach

9. What are the three parts of the small intestines?

-
- The three parts of the small intestine are: the **duodenum**, **jejunum** , and **ileum** .

10. What is the size of each part of the small intestines?

-
- The **duodenum** (25cm), **jejunum** (2.5m), and **ileum** (3.5m).

11. What organelles are responsible for the absorption of food in the small intestines?

-
- The villi

12. Discuss what happens in the large intestine.

-
- The large intestine is storage for undigested food before it is defecated.
Absorption of water and mineral salts happen in the large intestine.

13. Describe each of the three possible health problems relating to digestion.

-
- (a) **Anorexia nervosa** is excessive self-food restriction to avoid gaining weight. This is done mainly by teenagers.
 - (b) **Diarrhoea** – condition of in which faeces are frequently discharged in a liquid form following viral or bacterial infection.
 - (c) **Ulcers** – a condition of painful sores following the damage of the stomach walls or of small intestine by digestive juices. This happens if the mucus layer gets too thin or the stomach generates too much acid. Bleeding ulcers are the most dangerous.
 - (d) Of late there was another concept called A4. This concept encourages girls to have a waist that is the size of an A4.
 - (e) **Bulimia nervosa** is an eating disorder where one eats and forces themselves to vomit. The purpose of doing this is to be as lean as they possibly can.
 - (f) **Liver cirrhosis** is a condition that leads to loss of liver cells replaced by scar tissue following long term exposure to toxins like alcohol or viral infections preventing the proper functioning of the liver by limiting blood flowing through the liver.

14. What is a healthy eating diet?

-
- Healthy eating diet refers to eating right quantities of foods from all food groups such as fruits and vegetables, proteins, fat and sugar, dairy products and whole grains.

15. What are the four main food groups?

-
- fruits and vegetables, proteins, fat and sugar, dairy products and whole grains

16. What are the essential food nutrients?

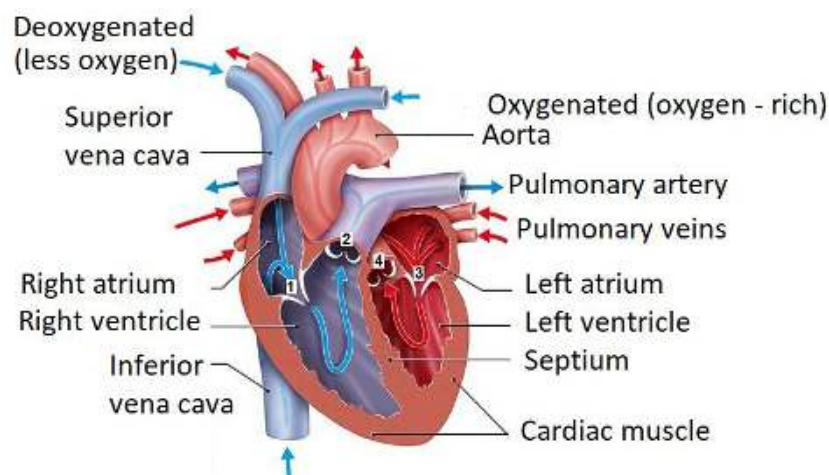
-
- Carbohydrates
 - Fats and oils
 - Vitamins and minerals
 - Proteins
 - Fibre and water

CIRCULATORY SYSTEM

- (a) The circulatory system allows the circulation of glucose, nutrients, water, waste products and the gases oxygen and carbon dioxide to the cells.
- (b) The organs that are part of the circulatory system are **the lungs** and **the heart**.
- (c) The circulatory system also assists in regulating body temperature.

THE HEART

- (a) The heart is a muscular organ that pumps blood through the circulatory system.
- (b) The heart is made of **cardiac muscle** and it works like a pump.
- (c) The heart has four chambers.
- (d) The upper chambers are called atriums and the lower chambers are called the ventricles.



- (e) The four heart chambers are; **the left atrium, right atrium, left ventricle and right ventricle**.
- (f) The **septum** separates the left and right parts of the heart.

- (g) The aorta is the main artery in the heart.
- (h) The aorta pumps oxygenated blood at high pressure from the heart to the body.
- (i) **Deoxygenated** blood is pumped from the heart to the lungs through the pulmonary artery.
- (j) **The right side of the heart contains deoxygenated blood.**
- (k) **Oxygenated** blood returns to the heart through the pulmonary vein.
- (l) The left side of the heart contains oxygenated blood pumped from **the lungs**.
- (m) Deoxygenated blood returns to the heart through the **vena cava**.
- (n) When the heart pumps, it produces pressure in the arteries called **blood pressure (BP)**.
- (o) The brain releases **neurotransmitters** which can lower or raise the pressure.
- (p) The circulatory system is known as a **double system** because it has two loops.
- (q) Maximum Heart Rate (MHR) is 220bpm (beats per minute).
- (r) A formula for calculating maximum heart rate is $222 - \text{age}$.

ACTIVITY

Answer the following questions:

1. What is the importance of the circulatory system?

 • The circulatory system allows the circulation of glucose, nutrients, water, waste products and the gases oxygen and carbon dioxide to the cells.
2. Which organs play a vital role in the circulatory system?

 • The lungs and the heart
3. What pumps the blood from the heart to the rest of the body?

 • The aorta
4. How many chambers does the heart have?

 • The four heart chambers
5. Which side of the heart do we have oxygenated blood?

 • The left side of the heart contains oxygenated blood pumped from **the lungs**

6. Which part separates the left and right part of the heart?

-
- The **septum** separates the left and right parts of the heart

7. Looking at the diagram, is the blood transported to the lungs oxygenated or deoxygenated?

-
- Deoxygenated

8. What is blood pressure?

-
- It is the pressure produced by the heart pumps in the arteries

9. What lowers or raises the blood pressure?

-
- When the heart pumps, it produces pressure in the arteries called **blood pressure**.

10. Why is the circulatory system known as the double system?

-
- The circulatory system is known as a **double system** because it has two loops.

BLOOD VESSELS

(a) The three types of blood vessels are: **arteries, veins** and **capillaries**.

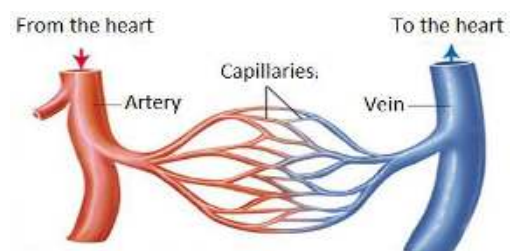
(b) Capillaries are very thin blood vessel just one cell thick.

(c) Capillary carries blood to and from the body's cells.

(d) The **veins** transport blood under **low pressure** towards the heart.

(e) Veins have **valves** that allow blood to flow in the correct direction but close if blood starts to flow in the wrong direction.

(f) **Arteries** transport blood under **high pressure** away from the heart.



BLOOD PLATELETS AND BLOOD CELLS

- There are two blood cells viz. **the red** and **white blood** cells.

(a) RED BLOOD CELLS

- Red blood cells are cells that contain haemoglobin (red colouring pigment) which allows them to transport oxygen and carbon dioxide.
- They are like a doughnut (disc shaped) but do not have a hole.
- They are the most abundant cells in the blood.
- They do not have a nucleus.
- They are found inside the bone in the **bone marrow**.
- They contain **haemoglobin** which absorbs oxygen from the lungs.
- They transport **oxygen** to all cells via the heart.
- They also remove carbon dioxide from the body.
- They can live up to 120 days before they die.



(b) WHITE BLOOD CELLS

- White blood cells act as the body's defence system.
- They produce antibodies to destroy or neutralise pathogens.
- There are different types and shapes of white blood cells.

(c) BLOOD PLATELETS

- Blood platelets help to repair tissues.
- Close internal and external wounds by plugging around a wound.

HEALTH ISSUES

- Heart attack** (Coronary thrombosis) occurs when one of the arteries supplying the heart with blood gets blocked by a blood clot.
- Stroke** is caused by a condition caused by bleeding from a **raptured artery** in the brain or the artery and is often the result of high blood pressure.

- (c) **High blood** (hypertension) is the measure of the force that blood exerts on the walls of the arteries while flowing through them. An increase in blood pressure puts on the heart and if prolonged, can damage the blood vessels and life threatening complications such as heart failure, stroke, kidney disease etc.

ACTIVITY

Answer the following questions:

1. How many blood vessels are there?

 • There are three types of blood vessels
2. Name all the blood vessels.

 • **arteries, veins and capillaries**
3. Discuss the difference between arteries and veins.

 • **Arteries** transport blood under **high pressure** away from the heart **whereas veins** transport blood under **low pressure** towards the heart.
4. Discuss what red blood cells are and their role.

 • Red blood cells are cells that contain haemoglobin (red colouring pigment) which allows them to transport oxygen and carbon dioxide.
5. Distinguish between white blood cells and red blood cells.

 • White blood cells act as the body's defence system whereas red blood cells are cells that contain haemoglobin (red colouring pigment) which allows them to transport oxygen and carbon dioxide.
6. What is the importance of blood platelets?

 • Blood platelets help to repair tissues.

- Close internal and external wounds by plugging around a wound.

7. Why is it necessary for veins to have valves?

-
- Veins have **valves** that allow blood to flow in the correct direction but close if blood starts to flow in the wrong direction.

8. What role is played by capillaries?

-
- Capillary carries blood to and from the body's cells

9. How big are blood capillaries?

-
- Capillaries are very thin blood vessel just one cell thick.

10. What is another word for heart attack?

-
- Coronary thrombosis

11. What is stroke?

-
- **Stroke** is caused by a condition caused by bleeding from a **raptured artery** in the brain or the artery and is often the result of high blood pressure.

12. What is another word for high blood pressure?

-
- Hypertension

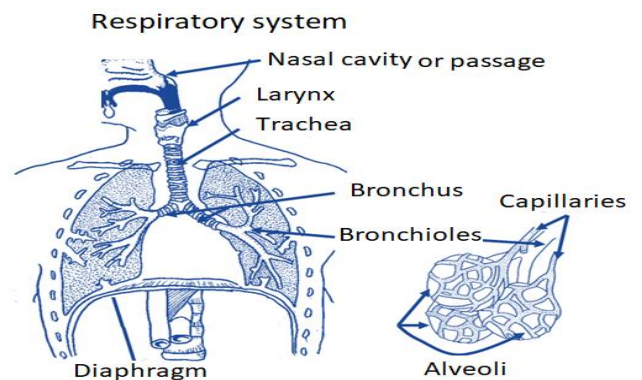
13. What leads to high blood pressure?

-
- An increase in blood pressure exerted on the walls of the arteries putting pressure on the heart.

RESPIRATORY SYSTEM

- (a) The air passage in the respiratory system allows air to pass through.
- (b) The air passage comprises the following: nasal cavity, pharynx, voice box, trachea, two bronchi and bronchiole.
- (c) Nasal cavities are lined with fine hairs known as the **cilia** and the **mucus membrane**.
- (d) The cilia and the mucus membrane **purify** the **inhaled air**.
- (e) The **cilia trap dust**.
- (f) The **mucus** traps and kills foreign particles entering through the nose.
- (g) The mucus membrane also **moistens** and **warms** up the air.
- (h) The mucous is antiseptic to kill bacteria on the inhaled air.
- (i) The diffusion of gases (oxygen and carbon dioxide) takes place on the surface of the **alveoli**.
- (j) During the diffusion, oxygen enters the blood stream and is transported to the **heart**.
- (k) Carbon dioxide, on the other hand, diffuses out of the blood stream and is transported to the **lungs** and exhaled.
- (l) The respiratory muscles include the **muscles between the ribs** and the **diaphragm** at the base of the lungs.
- (m) When you breathe in, the diaphragm **contracts** and as you breathe out it **relaxes**.
- (n) Breathing is controlled by a respiratory centre in the **medulla oblongata** at the base of the brain.

The singular for cilia is **cilium**



HEALTH ISSUES

Chronic – a health condition that persists or lasts longer or that comes with time.

(a) Asthma

- i. Asthma is an incurable **chronic** disease.
- ii. **Asthmatic** attack is the result of the tightening up of muscles which inflames and narrows the airways.
- iii. This results in very little air being able to pass through to and from the lungs.
- iv. It causes recurring whistling sounds during breathing, shortness of breath and coughing.
- v. Asthma can be deadly if there is no medical assistance.



(b) Smoking

- i. The smoke in cigarettes leads to over production of mucus.
- ii. It also affects the cilia resulting in toxic substances accumulating in the lungs.
- iii. Smoking affects the elasticity of the lungs.
- iv. It also causes lung cancer.

ACTIVITY

Answer the following questions

1. What is the function of the air passage?

- An increase in blood pressure puts on the heart and if prolonged, can damage the blood vessels and life threatening complications such as heart failure, stroke, kidney disease etc.

2. What are the parts of the air passage?

- nasal cavity, pharynx, voice box, trachea, two bronchi and bronchiole

3. What is the importance of the cilia?

-
- The **cilia** trap dust

4. What is the function of the mucus membrane?

-
- The **mucus** traps and kills foreign particles entering through the nose

5. Where does the diffusion of gases take place?

-
- The diffusion of gases (oxygen and carbon dioxide) takes place on the surface of the **alveoli**

6. What are the two gases involved during diffusion?

-
- oxygen and carbon dioxide

7. Discuss what happens during diffusion.

-
- During the diffusion, oxygen enters the blood stream and is transported to the **heart**. Carbon dioxide, on the other hand, diffuses out of the blood stream and is transported to the **lungs** and exhaled.

8. Identify respiratory muscles.

-
- The respiratory muscles include the **muscles between the ribs** and the **diaphragm** at the base of the lungs.

9. Discuss what happens to the diaphragm during breathing.

-
- When you breathe in, the diaphragm **contracts** and as you breathe out it **relaxes**.

10. Where is breathing controlled?

-
- Breathing is controlled by a respiratory centre in the **medulla oblongata** at the base of the brain.

11. Discuss what happens during an asthmatic attack.

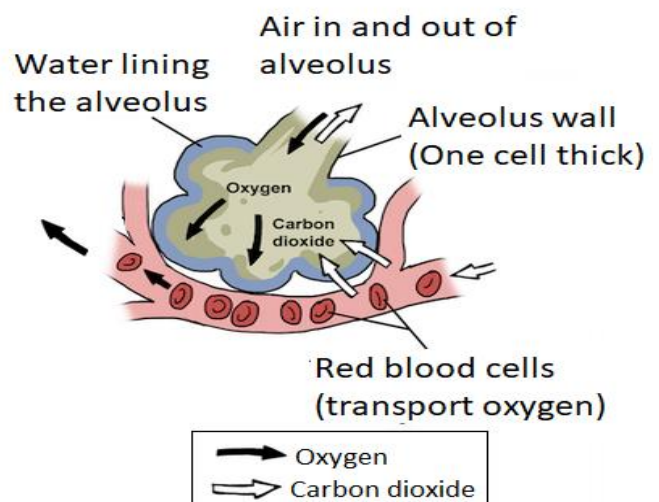
-
- Asthmatic** attack is the result of the tightening up of muscles which inflames and narrows the airways which results in very little air being able to pass through to and from the lungs causing recurring whistling sounds during breathing, shortness of breath and coughing.

12. What are the effects of smoking?

-
- The smoke in cigarettes leads to over production of mucus.
 - It also affects the cilia resulting in toxic substances accumulating in the lungs.
 - Smoking affects the elasticity of the lungs.
 - It also causes lung cancer.

BREATHING, GASEOUS EXCHANGE, CIRCULATION AND RESPIRATION

- Oxygen and carbon dioxide are exchanged on the surface of the alveoli by **diffusion**.
- The alveoli are tiny sacs within the lungs.
- Diffusion** is the movement of gas particles from the region of higher concentration to the region of lower concentration.
- The oxygen diffuses into the **blood stream**.
- Oxygen** is then transported to the cells.



- (f) Oxygen is used to break /release the energy in food and this is known as **respiration**.
- (g) Respiration is a chemical reaction in all organisms through which energy is released from food.
- (h) Respiration takes place in the organelle known as the **mitochondrion**.
- (i) During respiration **carbon dioxide** is released.
- (j) Carbon dioxide diffuses out of the blood stream into the **alveoli**.
- (k) Oxygenated blood is transported to the heart by the **pulmonary vein**.
- (l) **Pulmonary artery** transports blood under high pressure to the alveoli in the lungs.

ACTIVITY

Answer the following questions:

1. What is diffusion?

-
- **Diffusion** is the movement of gas particles from the region of higher concentration to the region of lower concentration.

2. What is respiration?

-
- Respiration is a chemical reaction in all organisms through which energy is released from food.

3. In which organelle does respiration take place?

-
- Respiration takes place in the organelle known as the **mitochondrion**

4. Discuss the role played by pulmonary veins and pulmonary artery during blood circulation.

-
- Oxygenated blood is transported to the heart by the **pulmonary vein** while **Pulmonary artery** transports blood under high pressure to the alveoli in the lungs.

EXCRETORY SYSTEM

- The excretory system is essential for removing body wastes from different systems.

ORGANS THAT ARE PART OF THE EXCRETORY SYSTEM

- (a) Skin – the skin is the biggest organ in the human system.
- (b) Lungs
- (c) Kidneys
- (d) Lower part of the alimentary canal

WASTES EXCRETED BY THE ORGANS

- (a) Skin – sweat
- (b) Lungs – Carbon dioxide and water
- (c) Kidneys – Urine (urea, sodium, ammonia, uric acid, oxalate and some minerals).
- (d) Lower part of the alimentary canal – faeces

HEALTH ISSUES

A. Kidney or Renal failure

- i. Kidney failure is when the kidneys cannot filter wastes.
- ii. This could mean that you might need a **dialysis** or **kidney transplant**.
- iii. In some cases treatment could get the kidneys back to their normal condition.
- iv. Causes include; exposure to poisonous substances, diabetes, high blood pressure, drug abuse and urinary tract problems.

B. Bladder infection

- i. It affects mainly women because they have a **shorter urethra** and bacteria can easily reach the bladder.
- i. It is also a result of insufficient fluid intake.
- ii. It is also caused by the **blockage** of **bladder** or **urethra**.
- iii. It is also a result of diabetes.
- iv. Can also be the result of a narrowed urethra.

C. Kidney stones

- i. Stone resembling lumps forming in the kidney.
- ii. The lump can be the size of a golf ball.
- iii. Is a result of high concentration of crystal forming substance such as calcium, uric acid and oxalate.

ACTIVITY

Answer the following questions:

1. Why is excretion important?

- The excretory system is essential for removing body wastes from different systems.

2. What are the organs responsible for excretion?

- skin, lungs, kidneys and lower alimentary canal

3. Identify the wastes secreted by the organs of the excretory system and mention the organ responsible for the waste product.

- Skin – the skin is the biggest organ in the human system.
- Lungs
- Kidneys
- Lower part of the alimentary canal

4. What is kidney failure?

- Is a condition of kidney failure where the kidneys cannot filter wastes

5. What are the possible causes of kidney failure?

- Causes include; exposure to poisonous substances, diabetes, high blood pressure, drug abuse and urinary tract problems.

6. Why does bladder infection mainly affect women?

- It affects mainly women because they have a **shorter urethra** and bacteria can easily reach the bladder.

7. What are the four possible causes of bladder infection?

-
- It is caused by bacterial infection as well as insufficient fluid intake.

8. What are kidney stones?

-
- Kidney stones are formation of stone resembling lumps in the kidney.

9. What are the possible causes of kidney stones?

-
- They are a result of high concentration of crystal forming substance such as calcium, uric acid and oxalate.

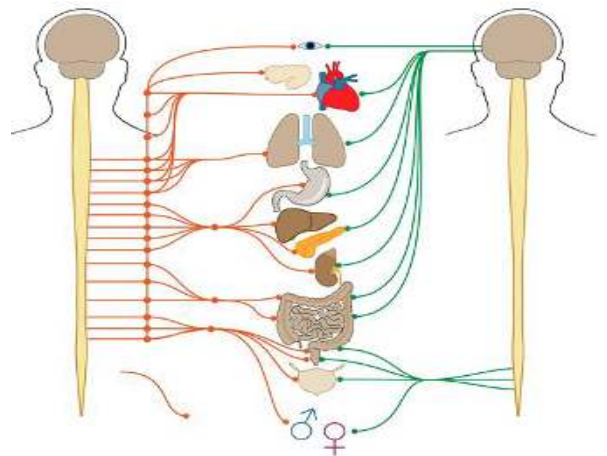
THE NERVOUS SYSTEM

(a) **The nervous system** is a network of neurons which send information between the brain and different parts of the body.

(b) It is comprises the brain, spinal cord and nerves.

(c) The nervous system coordinates actions and sensory information through signals.

(d) The nervous system comprises; the central nervous system (brain and spinal cord) and peripheral system (all the nerves of the body).



- The spinal cord – resembles a cable made up nerves that sends messages between the brain and the entire body system.

- The brain – works like a computer which controls all the activities of the body.

(e) The functions of the nervous system include controlled functions (somatic functions) and functions that cannot be controlled (autonomic functions), e.g. heartbeat.

(f) Sense organs respond to external stimuli and send impulses to the sensory nervous system (the part responsible for detecting, relaying and processing information).

(g) The five sense organs involved are: eyes – sight, ears – hearing, skin – touch, tongue – taste and nose – smell.

Health issues

- Deafness, blindness, short sightedness, effects of drugs and alcohol on the brain.

ACTIVITY

Answer the following questions:

1. What is the importance of the nervous system?

-
- **The nervous system** enables the body to react to stimulus within its environment.
 - The nervous system works like a network that sends messages to different parts of the body.
 - It also warns and informs the body of possible danger and telling the body how to react in each case.

2. What are the parts of the nervous system?

-
- The nervous system comprises; the central nervous system (brain and spinal cord) and peripheral system (all the nerves of the body).
 - The nervous system comprises; the central nervous system (brain and spinal cord) and peripheral system (all the nerves of the body).

3. Give details of the spinal cord.

4. What is the role of the brain?

5. Discuss the functions of the nervous system in relation to somatic and autonomic activities.

6. What are the five main sense organs?

-
- ear, eye, skin, tongue and nose

7. What is the function of each of the five sense organs?

-
- eyes – sight, ears – hearing, skin – touch, tongue – taste and nose – smell.

8. What are the health issues related to the nervous system?

HUMAN REPRODUCTION

- (a) Reproduction is important for the survival of all organisms.
- (b) Humans like all organisms also undergo reproduction for the same reason.
- (c) Sex organs are responsible for reproduction.

PUBERTY

- It is a stage at which one undergoes physical and emotional changes as they reach for adulthood.

Females	Males
(a) Oestrogen (Sex hormone released by ovaries)	(b) Testosterone (Main sex hormone released by testes)
(c) Sex cells – ovum or egg	(d) Sex cells – sperms
PHYSICAL CHANGES DURING PUBERTY	
(a) Developing breast	(b) Developing testes and scrotum
(c) Body shape changes (hips develop)	(d) Deepening voice
(e) Pubic hair develops	(f) Pubic hair develops
(g) Armpit hair grows	(h) Armpit hair grows
(i) First menstruation occurs	(j) Facial hair starts growing
(k) Rapid physical growth	(l) Rapid physical growth

REPRODUCTIVE ORGANS

- Reproductive organs are sex organs within an organism responsible for sexual reproduction.

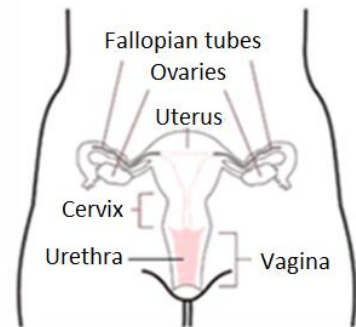
REPRODUCTIVE ORGANS

- Reproductive organs are sex organs within an organism responsible for sexual reproduction.

FEMALE REPRODUCTIVE SYSTEM

- The female reproductive system refers to a group of organs in a female that work together to enable reproduction.
- The female reproductive system is made of internal and external organs.
- Most of the female reproductive organs are internal.
- Parts of the female reproductive organs include the cervix, ovaries, uterus, vagina and fallopian tubes.
- Cervix**
 - Connects the uterus to the vagina.
 - Allows the flow of menstrual blood from the uterus to the vagina.
- Ovaries** – they release the egg or ovum.
- Fallopian tubes** (also known as uterine tube or oviduct):
 - They transport the egg from the ovaries to the uterus each month.
 - Fertilization takes place in the third end of the fallopian tube in the **Ampulla**.
 - Fertilization must occur within 12 – 24 hours after ovulation or the egg will die.
 - Ovulation** is when a mature egg is released from the ovary.
 - The egg must be mature before it can be fertilized.
 - The fertilized egg then travels through the fallopian tube to the uterus (womb).
 - The egg is then implanted in the uterus resulting in pregnancy.

Female Reproductive System

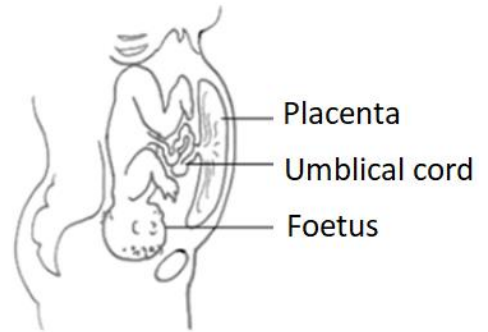


(h) Uterus (womb)**Functions of the uterus:**

- i. To accept the embryo.
- ii. To house the embryo while it develops into a fetus.
- iii. Uterus also delivers a newborn.

(i) Placenta

- i. The developing embryo is attached to the uterus by the placenta.
- ii. The placenta provides nutrients and oxygen to the fetus.
- iii. The placenta also removes waste products from the fetus blood.
- iv. The period from conception to birth is called **gestation**.
- v. On average gestation in humans is nine month (40 weeks or 280 days).



(j) **Urethra** – transports urine from the bladder to the outside of the body.

PREVENTION OF PREGNANCY:

- i. Contraceptives such as condoms, pills and injections can be used to prevent pregnancy and sexually transmitted diseases.
- ii. Abstaining is, however, the best method.

ACTIVITY

Answer the following questions:

1. What is puberty?

-
- Puberty is a stage at which one undergoes physical and emotional changes as they reach for adulthood.

2. What are the **TWO** differences between males and females during puberty?

Females	Males
• Oestrogen (Sex hormone released by ovaries)	• Testosterone (Main sex hormone released by testes)
• Sex cells – ovum or egg	• Sex cells – sperms
PHYSICAL CHANGES DURING PUBERTY	
• Developing breast	• Developing testes and scrotum
• Body shape changes (hips develop)	• Deepening voice
• First menstruation occurs	• Facial hair starts growing

3. What are the physical similarities between males and females during puberty?

-
- Rapid physical growth
 - Armpit hair grows
 - Pubic hair develops

4. What is reproduction?

-
- Reproduction is the process through which new organisms are produced from their parents.

5. What is the function of the cervix?

- Connects the uterus to the vagina.
- Allows the flow of menstrual blood from the uterus to the vagina.

6. What are the hormones released by females and males reproductive organs respectively?

- (a) Oestrogen (Sex hormone released by ovaries)
- (b) Testosterone (Main sex hormone released by testes)

7. What are the females and males sex cells?

- (a) Female sex cells – ovum or egg
- (b) Male sex cell – sperms

8. Where does fertilization take place?

- Fertilization takes place in the third end of the fallopian tube in the **Ampulla**

9. What is ovulation?

10. What are the functions of the uterus?

- (a) To accept the embryo.
- (b) To house the embryo while it develops into a fetus.
- (c) Uterus also delivers a newborn.

11. What are the functions of the placenta?

- (a) The placenta provides nutrients and oxygen to the fetus.
- (b) The placenta also removes waste products from the fetus blood.

12. What is gestation?

- Gestation is the period from conception to birth.

13. What is the period of gestation in human beings?

- On average gestation in humans is nine month (40 weeks or 280 days).

14. What is the function of the urethra?

- **Urethra** – transports urine from the bladder to the outside of the body in males and females and it also transports sperm cells in males.

15. How can pregnancy be prevented?

- (a) Contraceptives such as condoms, pills and injections can be used to prevent pregnancy and sexually transmitted diseases.
- (b) Abstaining is, however, the best method.

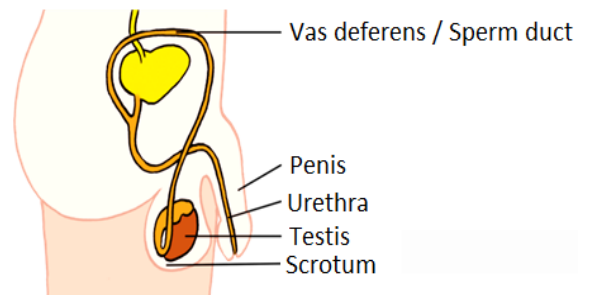
MALE REPRODUCTIVE SYSTEM

1. The male reproductive system is a group of organs males that are responsible for reproduction.
2. The male reproductive system is made of internal and external organs.
3. Most of the male reproductive organs are located outside the body.
4. The male reproductive organs are as follows: penis, sperm duct (vas deferens), testes, scrotum and urethra.

(a) Prostate

- i. It is the gland at the origin of the urethra.
- ii. The size of a prostate is that of a kiwi fruit.
- iii. It secretes prostate fluid that nourishes and protects sperms.
- iv. It helps make the semen fluid.
- v. It helps propel semen during ejaculation.

Male Reproductive System



(b) Epididymis

- i. It lies behind the testes.
- ii. It stores and transports sperms produced by the testes.

Semen is a white fluid produced by male sexual glands which might contain

(c) Testes

- i. If it is one is called a **testis** and **testes** is in plural form.
- ii. Testes produce sperms.
- iii. They produce hormones, especially **testosterone**.

(d) Scrotum

- i. The scrotum houses the testes.
- ii. They maintain the required temperature of sperms (below body temperature).

(e) Urethra

- i. It is a passage for urine from the bladder to the outside of the body.
- ii. It is also a passage for semen and sperms.

ACTIVITY

Answer the following questions:

1. What is a prostate?

(a) It is the gland at the origin of the urethra.

(b) The size of a prostate is that of a kiwi fruit

2. What is the importance of the prostate?

(a) It secretes prostate fluid that nourishes and protects sperms.

(b) It helps make the semen fluid.

(c) It helps propel semen during ejaculation.

3. What is the function of the epididymis?

- It stores and transports sperms produced by the testes

4. What is the name of the hormone produced in the testes?

- The hormone produced is **testosterone**

5. What are the functions of the following:

5.1 Scrotums

- The scrotum houses the testes.

5.2 Urethra

- It is a passage for urine from the bladder to the outside of the body.