ES KANOMBE/EFOTEC

S2 BIOLOGY TERM II HOLIDAYS ACTIVITY

Multiple choice questions

1. This organ helps fish to swim **/2 marks**

a) Mouth b) fin c) lung d) gill

2. animals which eat only the fresh of other animals are called **/ 2marks**

a) Herbivores b) carnivores c) omnivores d)all of these

3. Organisms that depend on green plants for food are called **/2marks**

a) Autotrophs b) omnivores c) carnivores d) saprotrophs

4. If red blood cell is placed in an isotonic solution. What will you observe? **/2 marks**

a) It will burst b) it will become turgid c) it will become flaccid d) no change

5. The fully expanded condition of a cell with its wall stretched due to excessive accumulation of water is called **/2 marks**

a) Turgidity b) flaccidity c) osmosis d) diffusion

6. Reducing sugar is **/2 marks**

a) Complex sugar b) simple sugar c) both (a) and (b) d) none of these

7. When PH is lower than 7, the solution is **/2 marks**

a) Acidic b) basic c) neutral d) none of above

8. An enzyme is a) mineral in nature b) protein in nature c) carbohydrate in nature d) none of these **/2 marks**

9. After being exposed to a high temperature, an enzyme cannot function because **/2marks**

a) It has been destroyed b) the shape has been changed c) it cannot separate from substrate d) all of these

10) Which group of chordate is both aquatic and terrestrial.**2marks**

A. Mammals B. Birds

c. Amphibians D. Reptiles

11) What type of skeleton is possessed by members of phylum chordate**? 2marks**

A. Endoskeleton B. Skeletal muscles

C. Hydro skeleton D. Exoskeleton

12. Using your knowledge on characteristic features of five classes of chordate, complete the table below, using(√)where the feature is present and(×) if is absent.**10marks**

Class of phylum chordate	Scales	External ear	Mammary gland	Features
Birds				
Reptilian				
Amphibian				
Mammalian				
Pisces				

13. Arthropods are both useful and harmful (Explain)**4 marks**

14. Do you agree begin with the statement ”all food chains begin with plant”(Explain your answer)**2 marks**

15. a) Compare active and passive transport. Give four points.**2 marks**
    b) List two importance of active transport in plant and in animals.**2marks**
    c) Mention two factors that affect active transport and explain how**?2 marks**
    d) Give and explain the types of active transport**2marks**

16. Xerophyte plants are adapted to live dry conditions. What features do these plants posses to enables them survive in certain conditions ?**3 marks**

17. a) Athletes are normally given glucose and no sucrose. Give reason for this.**1mark**
    b) Explain why babies need high proportion of protein than adults **1marks**

18. A student bought a chocolate bar and carried out several food tests on it. The following results were observed: Benedict’s test : an orange color
    Biuret test : no color change
    Iodine test :a blue black color

a) what two types of food are present in the chocolate bar **2 marks**
b) using the results given above ,give one reason to explain why a chocolate bar is not balanced meal.**2marks**

SECTION B: ATTEMPT ONLY 3 QUESTIONS IN THIS SECTION /30 MARKS

19) Experiment on photosynthesis may involve the following :
    a) Variegated leaves
    b) Sodium hydroxide
    c) Ethanol
    d) Iodine
    e) Starch
    f) Oxygen

Which would you use to:
i. To prevent leaves getting carbon dioxide?**2marks**
ii. Remove chlorophyll in leaves**2ma**rks
iii. Test whether chlorophyll is essential for photosynthesis?**2marks**
iv. Test decolorized leaf for starch?**2marks**
b) Name the factors that influence the rate of photosynthesis **2marks**

20) a. Define “transpiration’’**2marks**
    b) How do plants benefit from transpiration8marks

21) Government of Rwanda established a parastatal board known as “REMA”.
    a) In what ways our environment is being destroyed?**5marks**
    b) As your contribution, suggest how can we fight against environment destruction?5marks

22. A potted plant with healthy leaves was kept in the dark for 48 hours. One of the leaves was then partly enclosed in a wide test tube containing sodium hydroxide .The whole apparatus was then kept in sunlight for six hours. See figure below:

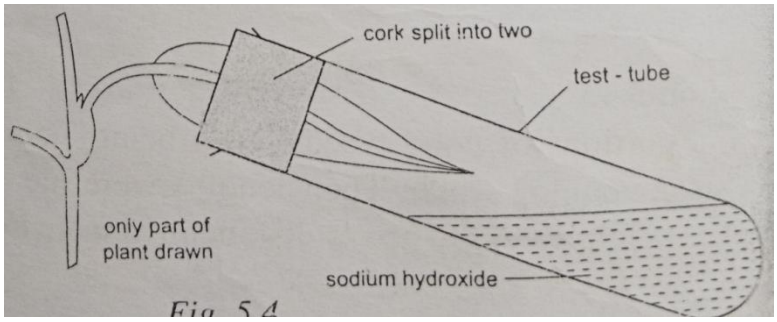
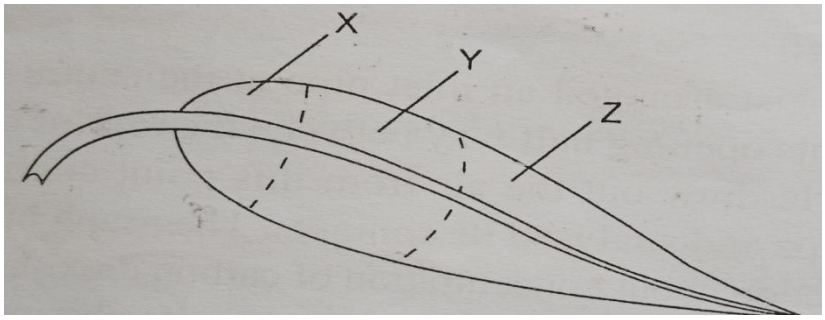


Fig. 5.4

(a) The apparatus set up was to demonstrate one of the necessities for the process of photosynthesis. State this necessity.

(b) Why was the plant first kept in the dark for 48 hours?

(c) The following leaf was removed from the flask after six hours.



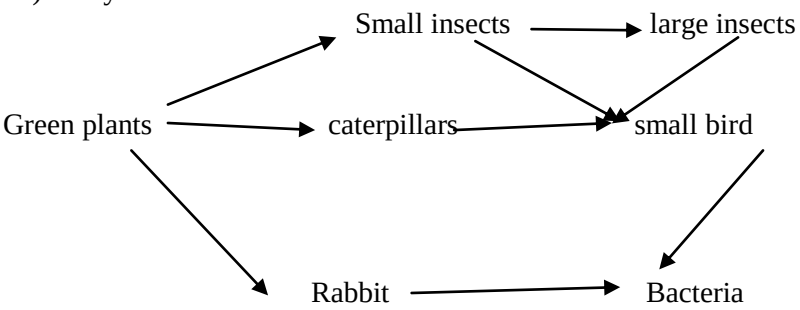
Name the colours of the three regions X, Y and Z of the leaf after six hours.

(d) The same leaf was the tested for starch. Name the colours of the three regions X, Y and Z after the starch test.

(e) Account for the result of starch test in each of these regions X, Y and Z.

(f) Which of the three regions serves as control?

23) Study the food web below



a) In this food web what is: Producer ,Primary consumers ,Secondary consumers , decomposer**8marks**
b) What happen if large insects are died?**2marks**

24.a) Define gaseous exchange**/2marks**

b) Explain the characteristic features of gaseous exchange surfaces**/4marks**

c)The following are events which takes places during expiration in a mammal **/2marks**

i)the diaphragm and intercostal muscles

ii)the diaphragm returns to its original dome shape

iii)the rib cage moves upwards

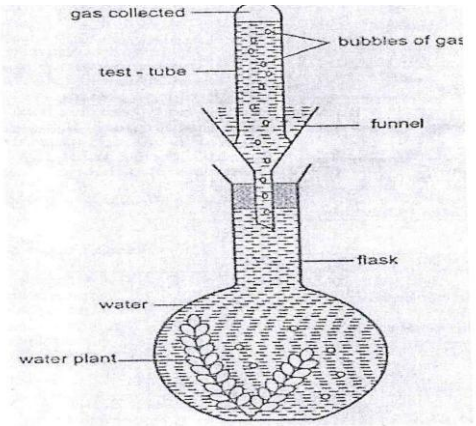
iv)the pressure in the thoracic cavity increases

list the correct sequence of events which take place during expiration

d)Explain why it is advantageous to breathe through the nose**2marks**

25.

Students carried out an experiment below to investigate how a gas is given out during a biological process.



a) Give the name of the gas that is collected in the test tube?**2marks**
b) Where does the gas in(a) above come from?**2marks**
c) During which process is the gas in (a) above produced?**2marks**
d)Write four conditions under which the mentioned gas in produced**.4marks**
e) What will happen if the apparatus used is in dark place?**2marks**
f) Explain why the process given in (c) above may be reduced if there is a deficiency in magnesium ions.**2marks**
g) Why was water plant needed in this experiment.**1mark**

NOTES

UNIT 9: GASEOUS EXCHANGE IN HUMANS AND PLANTS

Organisms such as plants need to take in or release oxygen and carbon dioxide at one time or another during respiration and photosynthesis. Animals, on the other hand, always take in oxygen and release carbon dioxide during respiration. Gaseous exchange therefore is:

(i) Exchange of respiratory gases in animals.
(ii) Exchange of photosynthetic and respiratory gases in plants.

Gaseous exchange is necessary because organisms are able to obtain useful gases from their environment and get rid of waste gases into the environment. The environments that organisms exchange gases with include: air for some organisms and water for others.

9.1 Respiratory surfaces

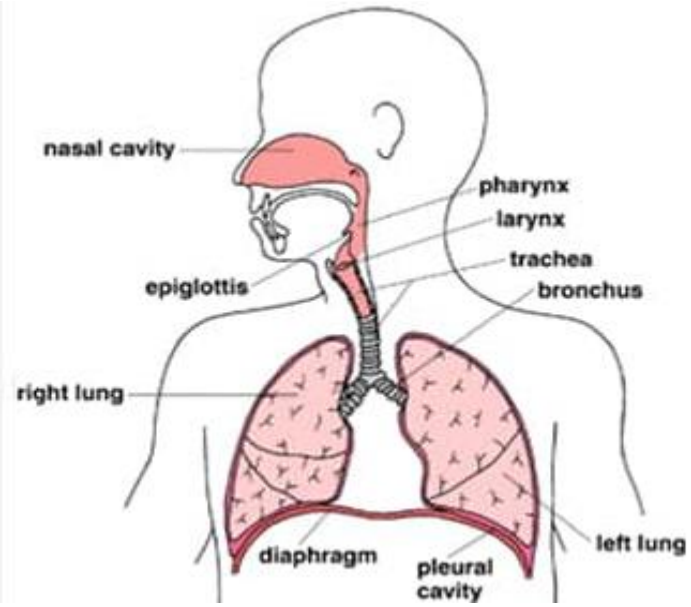
In large multicellular animals, the surface area to volume ratio is small. Many cells are deep inside the body of the animal, away from the surface.
Diffusion of gases alone is not efficient enough in moving gases to and from all the cells. Therefore, large multicellular animals have specialised structures or organs with special surfaces over which gaseous exchange takes place. These special surfaces are called **respiratory surfaces**.
Examples of specialised structures for gaseous exchange in animals include the following:

- Cell membrane
- Tracheal system in insects
- Buccal cavity in frogs
- Skin in frogs
- Gills in fish
- Lungs in mammals, birds, reptiles and amphibians.

A respiratory surface has a number of characteristics that make it efficient for gaseous exchange.
Some of these characteristics include:

- ✓ Thin walls for faster diffusion of gases across it.
- ✓ It is moist to dissolve gases as they diffuse across it.
- ✓ It has a large surface area for maximum gaseous exchange.
- ✓ In animals with a transport system, the respiratory surface has a rich supply of blood capillaries (highly vascularized) to quickly transport gases to and from the cells.

The human respiratory system

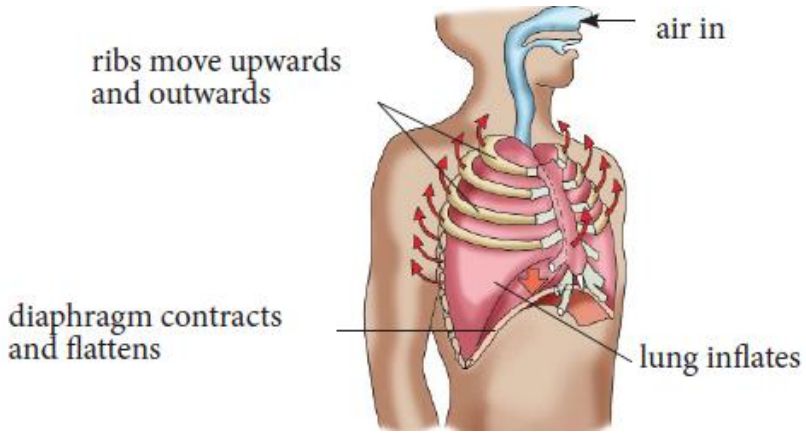


9.2 The mechanism of breathing mechanisms

The process of breathing (ventilation) is the first part of the gaseous exchange processes. The second part is the exchange of these gases between the lungs and blood. Breathing involves two phases called **inhalation** and **exhalation.**

a) Inhalation (breathing in)

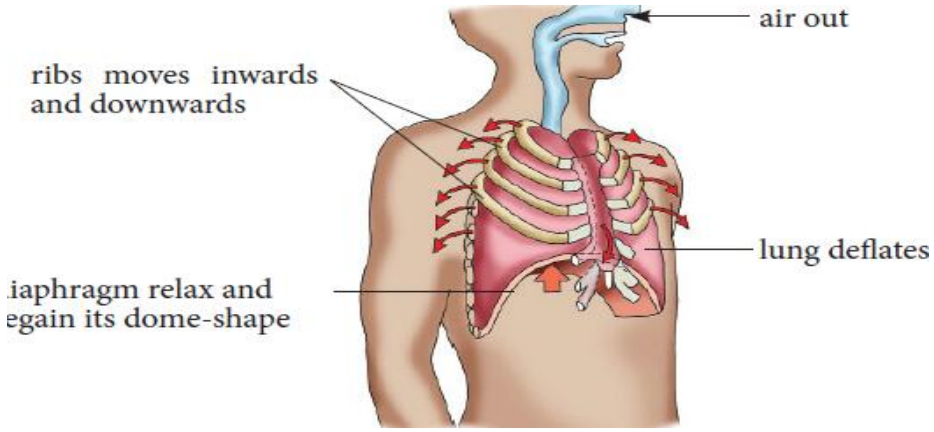
Inhalation is also known as inspiration. This is the active phase of breathing which draws air into the lungs. During inhalation, the diaphragm muscles contract causing it to flatten. In the ribs region, the external intercostal muscles contract while the internal intercostal muscles relax. This causes the rib cage to move upwards and outwards.



The contraction of the diaphragm and external intercostal muscles increases the volume in the chest cavity. However, it causes a decrease in the pressure of air inside compared to atmospheric air. Air rushes through the air passages into the lungs, forcing them to expand.

b. Exhalation (breathing out)

Exhalation is also known as expiration. This is the phase of breathing, which expels air out of the lungs. During exhalation, the diaphragm muscle relaxes making it to move upward and regain its dome shape. The external intercostal muscles relax and the internal intercostal muscles contract. This causes the rib cage to move downward and inwards. The volume of the chest cavity decreases and the pressure increases compared to the atmospheric air. Increased pressure forces air out of the lungs, which become deflated.



Differences between inhalation and exhalation

Inhalation	**Exhalation**
External intercostal muscles contract.	Internal intercostal muscles relax.

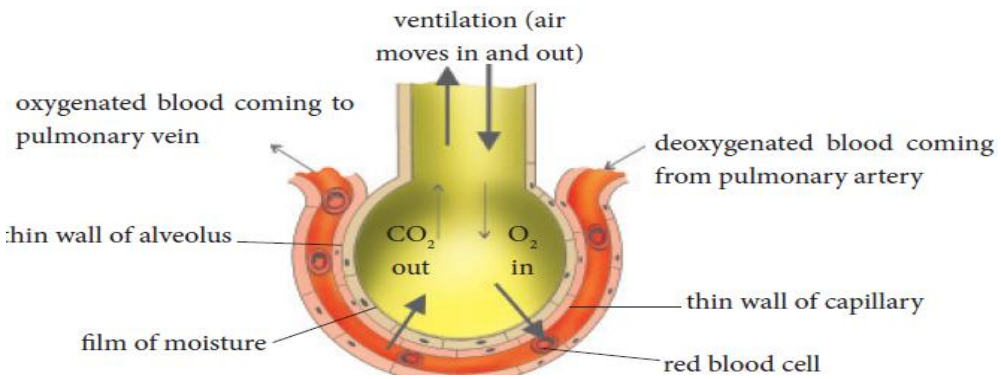
Internal intercostal muscles relax	External intercostal muscles contract.
Rib cage moves upwards and outwards	Rib cage moves downwards and inwards
The diaphragm contracts and flattens	The diaphragm relaxes
The volume of the thoracic cavity increases	Volume of the thoracic cavity decreases
Air pressure in the lungs and thorax decreases	Air pressure in the lungs and thorax increase

Composition of inhaled and exhaled air

Component of air	Inhaled air (%)	Exhaled air (%)
Oxygen	21	15
Carbon dioxide	0.04	4
Nitrogen	79	79
Water vapour	Variable	Saturated

9.3 Gaseous exchange at the alveoli

Gaseous exchange at the alveolus takes place between the phases of inhalation and exhalation. Gas exchange between the air within the alveoli and the pulmonary capillaries occurs by diffusion. Oxygen in air, in the alveolar space is at a higher concentration than that in the blood capillaries. It therefore first dissolves in the water layer in the alveolar lining then diffuses across the alveolus and then the capillary walls into the red blood cells. This becomes oxygenated blood, which is carried to the heart by the pulmonary vein. Carbon dioxide in the blood diffuses across the capillary and alveolus walls into the alveolar space and is eventually expelled during exhalation.



The alveolus is a suitable point for gaseous exchange because:

- It is supplied with blood, which carries the gases being exchanged.
- It has a very thin wall across which gases diffuse between it and the blood.
- It is lined with a thin film of moisture to dissolve the diffusing gases.
- A ventilation process brings in and takes away air containing the gases being exchanged.
- It has a very large number of alveoli to increase their surface area for gaseous exchange.

9.4 Respiratory diseases and smoking

Disease	**Causal agent**	**Symptoms**	**Prevention & Treatment**
Influenza	Influenza virus	Nose colour Difficult nasal breathing Cough, fever, sore throat, sneezing	Avoid contact with sick people Cover the nose and mouth in case of illness to avoid contaminating others
Asthma	**Many allergens**: They include pollen grains, some type of proteins in milk, pet hairs, dust and even flavours in food. It can also caused by stress and anxiety	- Difficulty in breathing. Breathing can feel so difficult or quick that the patient can faint. - Wheezing sounds when breathing.	-Avoiding contact with allergens. -Asthma patients are advised to carry inhalers that contain a drug, which pacifies the condition. -Quick-relief medicines relieve asthma symptoms that flare up.
Bronchitis	Bacteria or air pollutants such as smoke in inhaled air cause it.	-Secretion of excess mucus -Coughing -Difficulties in breathing.	-Avoid polluted air. -Avoid smoking whether directly or passively. -Take antibiotics every time they have a cold with a fever. -Getting plenty of rest, drinking lots of fluids and taking a cough syrup.
Tuberculosis	It is caused by bacteria called *Mycobacterium tuberculosis*.	-Dry cough followed by the spitting of blood, fever and sweating at night	-Use of antibiotics -Avoid taking raw milk. Boil all milk or drink pasteurized milk. -Immunization with B.C.G. vaccine in children.

		-Loss in weight occurs and finally death of the patient.	-Isolating patients
Common cold	It is an illness caused by a virus infection located in the nose. Colds also involve the sinuses, ears and bronchial tubes.	-Sneezing -Runny nose -Nasal obstruction -Sore or scratchy throat -Cough -Hoarseness -Mild general symptoms like headache, feverishness, chilliness, and not feeling well in general.	-Wash hands after contact with cold sufferers and objects and surfaces they may have contaminated. - Keep fingers out of the eyes and nose. -Avoid having cold patients cough and sneeze on you or in your direction.
Lung cancer	Cigarette	Chronic cough, hoarse voice, pain in the chest and fever.	Avoid smoking Avoid inhaling polluted air
Pneumonia	Pneumococci, viruses, chemical products	-Fever -Difficult in breathing -Pain in the chest	Vaccination

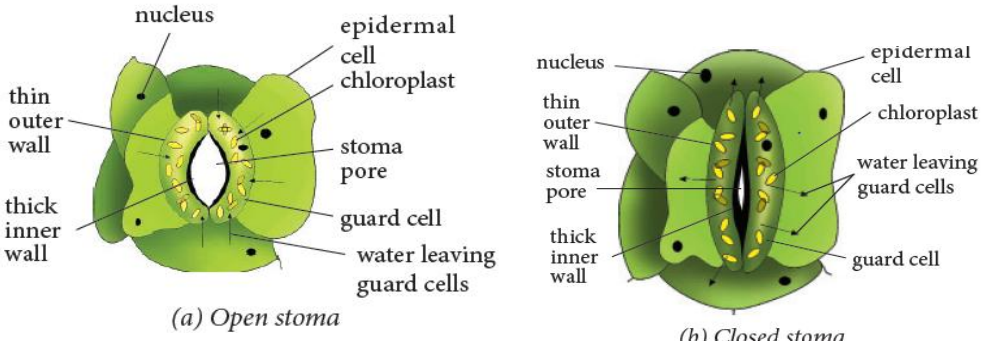
9.5 Effects of smoking on the respiratory system

Tobacco smoke increases the production of mucus in the air passages. When cigarette smoke is inhaled, about one-third of the particles remain in the alveoli. Phagocytic cells called macrophages can slowly remove many of the particles. However, an excess of particles from smoking or from other sources of air pollution breaks down the walls of the air sacs and causes the formation of inelastic tissue. This reduces the functional area of the respiratory surface and in severe cases may lead to a disease called emphysema. In some cases, **lung cancer** also develops. Inhaled cigarette smoke, both passively as well as actively, has been associated with chronic irritation and discomfort on the eyes, nose and oropharynx.

Cigarette smoking is addictive. Once you are an addict, it is hard to stop. Cigarette smoke also pollutes the environment in public places such as buses, shops and hotels. It also forces nonsmokers to inhale the smoke and become passive smokers.

9.6 Gaseous exchange in plants

The principal gaseous exchange surfaces for plants are the leaves. Plant leaves have stomatal pores on their surface where gaseous exchange occurs. Plants do not have a specialized respiratory system like animals. This is because they are metabolically less active than animals. Stomata allow gaseous exchange to take place in leaves.



Stomata allow:

- Entry of carbon dioxide into the leaf for photosynthesis.
- Exit of oxygen.
- Evaporation of water.

Stomata are the main structures for gaseous exchange in leaves of plants. With the exception of submerged plants, stomata are present in all the leaves of plants.

UNIT 10: EXCRETION IN HUMANS

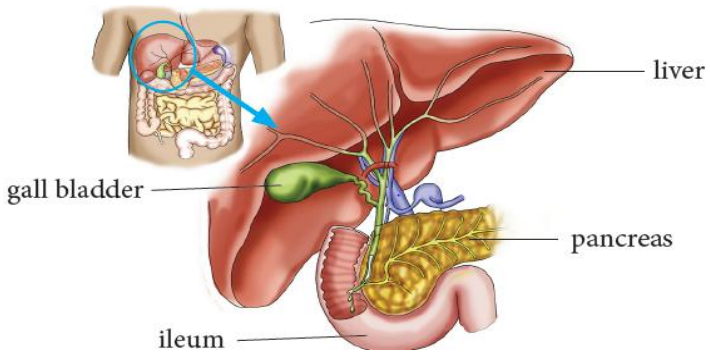
We can define excretion as the process by which organisms remove waste products of metabolism from the body. Through excretion, organisms control osmotic pressure. It also enables them to promote homeostasis; that is, the balance of the organism's internal body environment. The organs that remove the waste products are called **excretory organs.**

10.1 Excretory organs and their wastes

Excretory organ	Excretory product
Skin	Urea, lactic acid, excess salts and excess water in form of sweat.
Kidney	Excess salts, excess water and nitrogenous wastes in form of urine.
Lungs	Carbon dioxide and excess water in form of water vapour
Liver	Bile pigments
	Nitrogenous compounds such as ammonia, urea, uric acid and trimethylamine oxide.

10.2 The role of liver in excretion

The liver is the second largest organ in the body after the skin. It is described as the metabolic centre. The liver has many functions including maintenance of a constant internal environment (**homeostasis)** and excretion. The excretory functions of the liver are described below.



(a) Deamination

The body cannot store proteins or amino acids. This is because their breakdown forms toxic substances in the body. Surplus amino acids are broken down in the liver in a process called **deamination**.

From each amino acid, the amino group (NH_2) is converted to ammonia (NH_3). Ammonia should not be allowed to accumulate in the body because it is highly toxic. The ammonia produced from the amino group is quickly converted to a less toxic substance called **urea**. During this conversion, ammonia is first combined with carbon dioxide through a series of enzyme-catalysed reactions. The resulting urea is taken to the kidney in blood and is eliminated from the body in urine.

(b) Detoxification

The liver removes harmful substances such as drugs and hormones from the blood. These substances are converted into inactive or less dangerous forms, for instance, hydrogen peroxide, a highly toxic by-product of certain metabolic process is rapidly split into water and oxygen by enzyme catalase in the liver.

$$\text{Hydrogen peroxide} \xrightarrow{\text{catalase}} \text{water} + \text{oxygen}$$

$$2H_2O_2(aq) \longrightarrow 2H_2O(l) + O_2(g)$$

Thus, the liver purifies or detoxifies blood. The inactive substances formed in the liver are returned to the bloodstream and are finally excreted from the body by the kidneys.

(c) Elimination of Haemoglobin

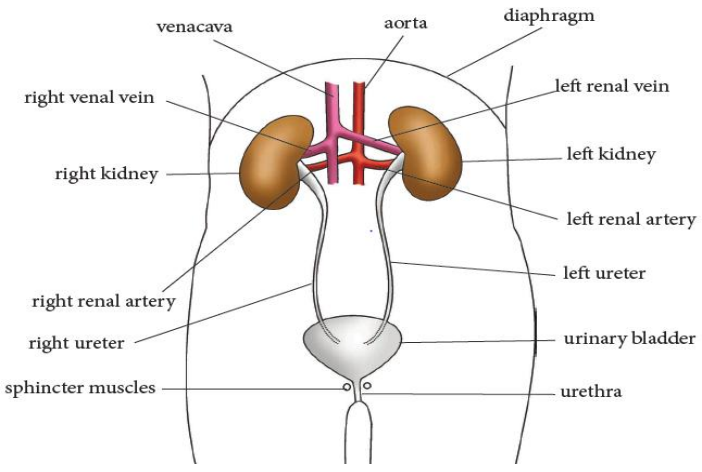
The liver breaks down haemoglobin from old worn out red blood cells into pigments. These pigments are further broken down and eliminated in the bile, giving urine its characteristic yellow colour.

(d) Elimination of sex hormones and cholesterol

After sex hormones have performed their functions, some are modified chemically by the liver cells. Others are sent to the kidney for renal excretion while others are expelled in bile. Excess **cholesterol** is also excreted in bile. If there is a considerable excess amount of cholesterol in the blood, some may be deposited in the walls of blood arteries obstructing flow.

10.3 The Structure of the human urinary system

The human urinary system is made up of two **kidneys**, **urinary bladder**, two **ureters** and a single **urethra**.



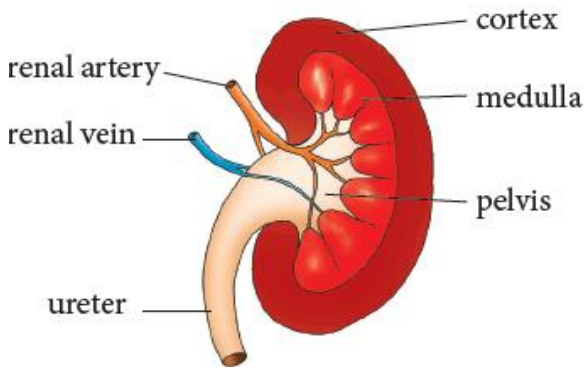
a) The kidneys

There are a pair of kidneys that are red-brown and are located below the ribs in the middle of the back. Their function is to:

- Remove waste from the blood in the form of urine.
- Keep substances stable in the blood.
- Make erythropoietin, a hormone, which helps make red blood cells.
- Make vitamin D active.
- Regulate blood pressure.

Internal structure of the kidney

A frontal section through the kidney reveals three main regions. The outerpart called **cortex**, inner part called **medulla** and the **pelvis**.



1. Cortex

This is the outer part, which is dark in colour. It contains a dense network of blood capillaries that form the **glomeruli of nephrons**. Nephron is the functional unit of the kidney.

2. Medulla

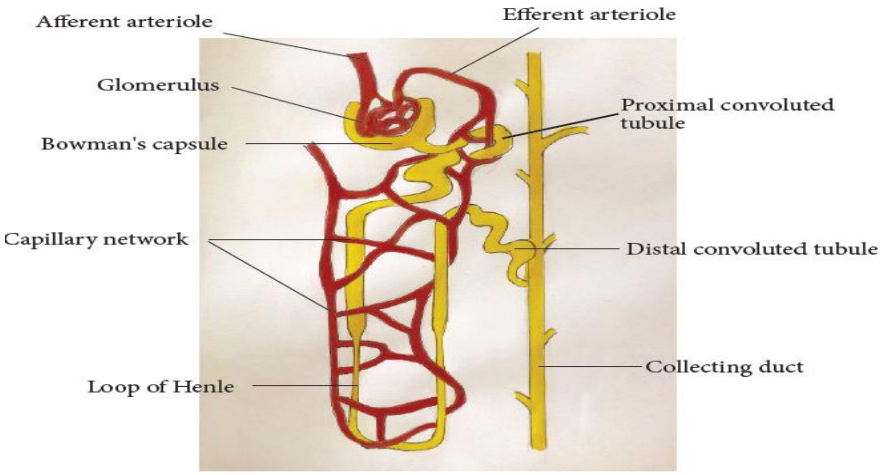
This part is pale red in colour and lies between the cortex and the pelvis. It contains several cone-like extensions called **pyramids.**

3. Pelvis

This part is white in colour. It narrows to form the ureter. Pelvis is a collecting space leading to the ureter, which takes urine to the bladder.

The nephron

The most important function of the kidney as an excretory organ is to filter wastes from the blood. This takes place in tiny units called nephrons or renal tubules. A nephron is therefore referred to as the functional unit of the kidney.



The nephron has three distinct coiled parts:

- The proximal convoluted tubule
- A U-shaped loop of Henle
- A distal convoluted tubule

Both the proximal convoluted tubule and the distal convoluted tubule are located in the cortex. The loop of Henle is in the medulla. One end of the nephron is modified to form a cup shaped structure called the **Bowman's capsule**.

b) Ureter

Each kidney has a narrow tube called a ureter, which carries urine from the kidney to the bladder. Muscles in the ureter walls tighten and relax forcing urine down this tube, away from the kidneys.

c) Bladder

The bladder is a triangle-shaped, hollow organ located in the lower abdomen. It is held in place by ligaments attached to the pelvic bones. The bladder's walls relax and expand to store urine, and contract and flatten to empty urine through the urethra.

d) Urethra

Urethra is the tube that allows urine to pass outside the body.

Urine formation

Excretion in the nephron is carried out in two stages: **ultrafiltration** and **selective reabsorption**.

(a) Ultrafiltration

Ultrafiltration takes place in the glomerulus. A high pressure of blood is created in the glomerulus. This pressure forces **water, mineral ions** and small molecules like **glucose, amino acids** and **urea** out of the glomerulus. The liquid collected in the Bowman's capsule is called **glomerular filtrate**.
The larger molecules in the blood, like **blood proteins, white blood cells, red blood cells** and **platelets** cannot pass through the capillary walls of the glomerulus. These remain in the blood and

continue to flow to the efferent arteriole. The glomerular filtrate flows down the nephron where re-absorption will take place as it flows along.

(b) Selective reabsorption

As the glomerular filtrate passes along the nephron, some substances that are useful to the body are selectively taken back or reabsorbed into the blood capillaries network surrounding the nephron.

- All **amino acids** and **glucose** are reabsorbed by active transport in the proximal convoluted tubule.
- Some **salts** and **water** are reabsorbed depending on how much of them the body still needs. Water is absorbed by osmosis and salts by active transport. Salts are absorbed mainly in the distal convoluted tubule. Water is reabsorbed in both the proximal and distal convoluted tubules. However, most of the water is reabsorbed in the region of the collecting duct.
- No **urea** is reabsorbed into the blood.
  By the time the filtrate from the glomerulus completes its movement down the nephron, it has a high concentration of **urea, some salts** and **water**. The liquid is now called **urine**.

Factors that affect urine production

The volume, colour, odour of urine and frequency of urination is affected by many factors. They include:

1. Amount of fluids taken

Large intake of fluids lowers the osmotic pressure of blood. This leads to reduced reabsorption of water in the kidney tubules resulting in the production of large amounts of dilute urine.

2. Amount of salt taken

Intake of a salty meal raises the osmotic pressure of blood. This leads to increased reabsorption of water in the kidney tubules resulting in the production of coloured, little and smelly urine.

3. Weather

In hot and dry weather conditions, the body tends to lose a lot of water through sweating thereby raising the osmotic potential of blood. In this case a lot of water is reabsorbed resulting in coloured, little and smelly urine. During cold weather the frequency of urination increases because sweating is so minimal.

4. Physical activity

During an exercise like running, jumping and playing, we sweat a lot. The kidney reabsorbs more water resulting in little, coloured and smelly urine.

5. Diseases

Certain diseases that affect the secretion of hormones that control reabsorption of water in the kidney tubules can either lead to production of large or small amounts of urine. An example is diabetes insipidus.

10.4 Practices that maintain healthy urinary system

- ✓ Drinking a lot of water, at least 10 glasses of water a day to flush out toxins in the body.
- ✓ Exercising regularly to keep fit. Maintain a healthy weight according to your age to avoid putting excess strain on all bodily systems.
- ✓ Avoid taking too many drugs especially pain killers. Stick to prescriptive drugs from a qualified medical officer.
- ✓ Visit a doctor (**urologist**) regularly to check the health of the urinary system.
- ✓ Eat healthy by avoiding junk food. Eat more fresh fruits and green vegetables. Choose foods low in sodium, sugar and fats but high in fiber content.
- ✓ Be informed about the causes and prevention methods of kidney diseases and urinal track infection causes.
- ✓ Avoid smoking and alcohol intake.

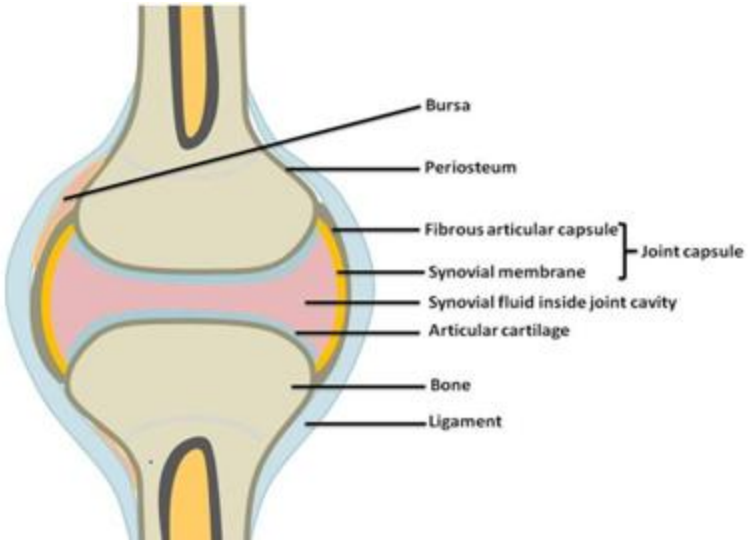
UNIT 11: JOINTS AND MOVEMENT

11.1 Types of joints

Joint is a point where a bone meets another bone or bones. Except for pelvic, sacral, skull and sternal bones, joints allow movement and provide mechanical support. Joints develop between adjacent bones. However, movement is important in determining the type of joint that develops.

Terms

- ✓ **Bone** – is a hard, tough connective tissue composed of mineral salts such as calcium and phosphate. It is abundant in all animal skeletons.
- ✓ **Cartilage** – this is a skeletal connective tissue which is softer than a bone. It supports the trachea, nose, oesophagus and pinna of the ear.
- ✓ **Ligament**-this is a fibrous tissue which join one bone to another. They are elastic to allow movement at a joint.
- ✓ **Tendon** –a tough connective tissue which attaches a muscle to a bone. They are inelastic.
- ✓ **Muscle-** this is a contractile tissue specialised for contraction and relaxation. They cover the skeleton. Muscles are responsible for locomotion and other type of movement in animals.



i. Structural classification

(a) Cartilaginous joint- the bones are connected by cartilage.

(b) Fibrous- the bones are connected by dense fibrous tissue rich in collagen.

(c) Synovial- there is a space between the bones called synovial cavity that is filled with a fluid known as synovial fluid.

ii. Functional classification

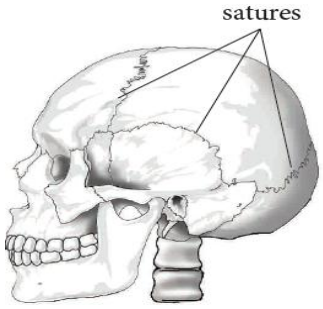
(a) Movable joints- allow some degree of movement. There are two categories;

- Those, which allow slight mobility.
- Those, which are freely movable.

(b) Immovable joints-permit very little or no mobility.

Fixed or immovable joints

These are joints that do not allow any movement, for example, joints in the cranium commonly known as **sutures.** These joints have seams between the bones of the skull. They are not smooth but rather have interlocking finger-like processes that increase stability. Between the bones are dense fibrous tissues.



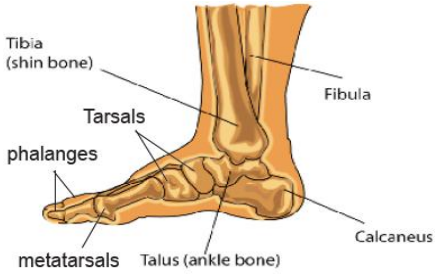
Fixed joints are also found in the pelvic girdle.

Movable joints

These joints allow movement of body parts to take place. Some movable joints allow only a small degree of movement while others allow a wide range of movement. There are several movable joints, which include:

(a) Gliding joints

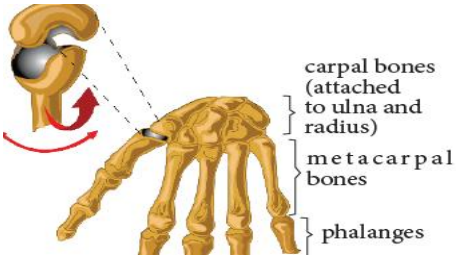
These joints consist of two opposing flat surfaces that allow slight amount of gliding motion. They occur between the vertebrae. They have no fluid between them but instead have a larger cartilage between them known as **intervertebral disc, which** reduces friction during movement. They are also found in the wrist and ankle.



(b) Synovial joints

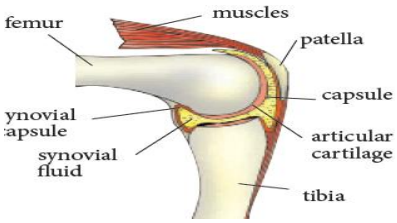
These joints are classified depending on the shape of the adjoining articular surface. They include: **(i) Saddle joints** - comprises of two saddle-shaped articulating surfaces that are oriented at right.

angles to each other. Example is the joint of the thumb.



(ii) Hinge joints- Hinge joints allow movement in one plane. The joints at the elbow, knee and

finger joints show this back and forth movement as the only type of movement.



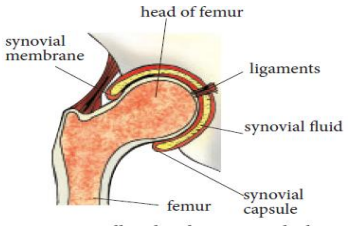
inge joint of knee

(iii) Pivot joints

It consists of a cylindrical like bony process of one bone that rotates within a ring partially composed of bone and cartilage. Examples include articulation of the axis with the atlas and the articulation between the head of radius and the proximal end of the ulna.

(iv) Ball and socket joint

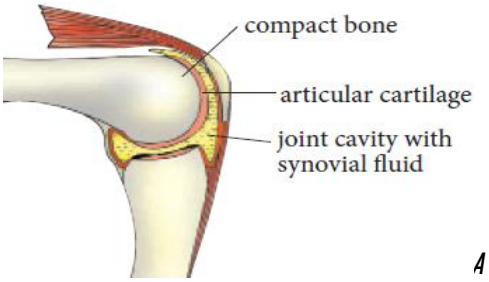
These types of joints allow the greatest flexibility of movement of all joints. It consists of a ball-shaped head end of one bone that fits into the cavity (socket) of an adjacent bone. This type of joint allows wide range of movement in almost any direction. The shoulder joint is an example of a ball and socket joint. The other is the hip joint.



Ball and socket of the hips

Structure of a synovial joint

The adjoining bones are enclosed within a synovial cavity that is surrounded by a **fibrous capsule** that holds the bones together. A **synovial membrane** lines the synovial cavity. The membrane produces **synovial fluid** that is a complex mixture of cells and nutrients such as proteins, polysaccharides and fats. The synovial fluid covers the surfaces of the joint and provides a lubricating film. Examples include: hip joint, shoulder joint and knee joint.

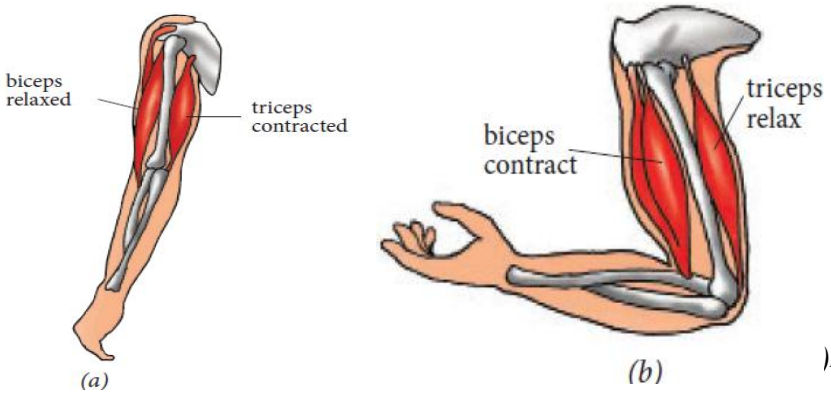


A synovial joint

11.2 Action of antagonistic muscles in the movement of a hinge Joint

The biceps and triceps are referred to as **antagonistic muscles**. They are found on the upper part of the forearm. To lift the arm, the biceps contracts while the triceps relaxes. The joint action in the upward movement of the arm is **flexion.** Biceps muscles are therefore called **flexor** muscles. To straighten the arm, triceps muscles contract while biceps relaxes; the joint action is **extension.**

Antagonistic muscles occur in pairs and oppose a specific movement such that when one muscle contracts, the other relaxes. This means that they never contract or relax at the same time.



)Extended arm (b) bent arm

11.3 Practices that promote healthy bones and joints

1. Eating healthy food appropriate for bone health, for example:

    (a) Incorporating more calcium rich foods into the diet.

    (b) Eating foods that contain Vitamin D.

    (c) Getting enough of Vitamin C, which is necessary in repairing tissues, including the

cartilage in joints.

2. Avoiding alcohol consumption. Taking alcohol interferes with the body's ability to absorb vitamins and minerals. It also results in an increase in hormones that deplete bone density.

3. Weight bearing exercises, which helps the body to build more, bone mass and maintain the: bone density. Some examples of weight bearing exercises include

- Walking
- Running
- Dancing
- Playing soccer
- Playing basketball
- Playing tennis

4. Avoiding smoking. Smoking has been shown to cause bone mass depletion.

5. Maintaining a healthy body weight and posture

If you are underweight, you are at a higher risk of bone loss. If you are overweight, you may be causing extra stress on your joints.