**LESSON NOTE 1**

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| **TISSUE AND SUPPORTING SYSTEM**    To carry out life processes, all organisms (plants and animals) need tissues. Tissues are group of similar cells that carry out specific functions. Skeleton is the framework of the body which provides support, shape and protection to the soft tissues and organs in animals. It forms the central core of human body and it is covered by muscles and blood vessel and skin.  FORMS OF SKELETAL MATERIAL  There are 3 forms of skeletal materials found in animals. They are;     1. Chitin: this is a tough, light and flexible non-living material present in arthropods (invertebrates). It acts as cover to the animal and it is made of series of plates covering or surrounding. Chitin can be made harder or strengthened by impregnation with tanned proteins especially in aquatic crustaceans.      1. Cartilage: this is a tissue present in the skeleton of complex vertebrates. It consists of hard matrix penetrated by numerous connective tissue fibers. Cartilage acts as shock absorber in between bones during movement because it is tough and flexible with great tensile strength. Found predominately in mammals and cartilaginous fishes e.g shark. Three main types exist in mammals; hyaline, white fibrous and yellow elastic cartilages.      1. Bone: this is the major component of the skeletal system and it consists of living cells (osteocytes), protein fibers (collagen), minerals such as calcium carbonate and calcium phosphate. Bones are highly vascularized. The skeleton of a young vertebrate embryo is made up of cartilage which are replaced by bones as the embryo grows. The hardening of the cartilage tissue into bone through the additions of minerals is called OSSIFICATION.   **DIFFERENCES BETWEEN BONES AND CARTILAGE**   |  |  | | --- | --- | | BONES | CARTILAGE | | Bones produce red and white blood cells | Cartilages do not | | Made up of both living and dead cells | Made up of mainly living cells | | Bones are often rigid | Cartilages are often flexible | | Can never be replaced by cartilage | Can be replaced by bone | | Made up mainly of mineral substances such as calcium | Mineral substances are absent |   **TYPES OF SKELETON**     1. Hydrostatic Skeleton: present in soft-bodied animals e.g. earthworm, sea anemones etc. which use pressure to support themselves. They have a muscular body wall filled with fluid which presses against the muscular wall causing them to contract and exert force against the fluid. 2. Exoskeleton: the outer skeleton present in arthropods. Its main component is chitin. Exoskeleton supports animals against gravity and enables them to move about. Animals with these skeleton type periodically shed the old skeleton, grow rapidly in size when the new skeleton is still soft and extensible. The shedding process is called MOULTING OR ECDYSIS 3. Endoskeleton: internal skeleton present in all vertebrates and are composed mainly of bones which grow steadily as the animal grows.   **FUNCTION OF SKELETON**   1. Supports the body of organisms. 2. Acts as framework of the body 3. Protect delicate organs e.g. heart, brain etc. 4. Used for locomotion through the limbs in action 5. Production of blood via bone marrows.   **HOME FUN**  Identify the location of the 3 cartilage that exist in mammals   1. Hyaline 2. White Fibrous 3. Yellow Elastic cartilage |

**LESSON NOTE 2**

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| **VERTEBRATE SKELETON**  The vertebrate skeleton is found in vertebrate animals. Animals with back bone. Example man, rat, lizard, cattle, etc. This is of two parts   1. Axial Skeleton 2. Appendicular skeleton   **AXIAL SKELETON**consists of the skull, ribs, sternum and the vertebral column.    **The skull** is made up of flat bones joined together by suture joint which has 3 parts: Cranium (brain box), facial skeleton and the jaws. If offers protection to the brain as well as give shape to the head.  **The vertebrate column** is the central supporting structure of the skeleton which forms the backbone. It is made up of five group of bones called vertebrae in mammals which is 33 in number. The five groups of bones include;     1. cervical (located in the neck) 2. thoracic (located in the chest) 3. lumbar (located in the upper trunk) 4. sacral (located in the lower trunk) 5. caudal (located in the tail)   **The ribs**    These are long semi-circular rods which connects the thoracic vertebrates to the sternum. They are found in the chest region of the body. In man, they are 12 pairs. A typical rib has a head, a neck and a body. The first seven ribs are connected directly to the sternum through coastal cartilages. They are therefore called **true ribs**. The next five are called false ribs. The eighth to tenth ribs have a common articulation to the sternum, each one attached to the coastal cartilage to the one above. The eleventh and twelfth pairs of ribs are called floating ribs because they have no connection to the sternum. They form a cage protecting the lungs and the heart and they assist in breathing.    **APPENDICULAR SKELETON**: made up of limb girdles (pectoral and pelvic girdles), and the limbs (fore and hind limbs)     1. **Pectoral girdle**: found around the shoulder in man and it consists of two halves which are held by muscles. Each halve is made up of three bones namely;    * Scapula    * Clavicle    * Coracoids   The **scapula** and **coracoids** are fixed together as the scapula is flat and triangular with a hollow called GLENOID CAVITY at its tip. This cavity articulates or joins with the head of humerus to form the shoulder joint. The clavicle is a small rod of bone attached to a ligament joining the sternum to the scapula. The pectoral girdle gives attachment to muscles and ligaments and provides support to the fore limbs.   1. **Pelvic girdle:** This isfound around the waist in man and it consists of two halves which are joined to each other ventrally and to the sacrum dorsally. Each halve of the pelvic girdle is made up of three bones. They are:    * Illium    * Ischium    * Pubis   These three bones form a depression (on their outer surface) called ACETABULUM which articulates with the head of the femur to form the hip joint.  **LIMBS**    The limbs include the fore (upper) and the hind (lower) limbs. In most vertebrates, both limbs have the same basic plan i.e. each limb has a long bone followed by a pair of two long bones next to this is a set of small bones terminating with five digits.   1. **The fore limbs-** This is made up of an upper arm bone called humerus which joins with two other long bones at its lower end (radius and ulna) to form the elbow joints. 2. **The hind limbs**-This is made up of thigh bones called femur (which is the largest and longest bone in the body). Its round upper end is the end that terminates at two rounded projections called **condyles** which forms the knee joint together with tibia.   **HOME FUN**  Write short notes on the 5 types of vertebrate columns and state their function respectively. |

**LESSON NOTE 3**

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| **SUPPORTING TISSUES IN PLANTS**    Plants have various supporting tissues that make them up. Like animals, these tissues help them to stand some meters above the ground without falling. They have definite shape, strength and rigidity to resist eternal force like wind and water.  **TYPES OF SUPPORTING TISSUE**   1. Parenchyma Tissue: 2. Collenchyma Tissue 3. Sclerenchyma Tissue 4. Xylem Tissue 5. Phloem Tissue   **FUNCTIONS OF SUPPORTING TISSUE**    Parenchyma Tissue: They are made up living cells with cellulose and many air spaces between within them. This is the most common and abundant plant tissue. Functions include;   * + It gives firms and turgidity to the stems of hibiscus   + Stores food and water   + Takes part in food synthesis in leaf mesophyll   **Collenchyma Tissue**: Made up of living cells which are elongated and thickened at the corners that contain cellulose, hemicellulose and pectic materials. They are found in young stems, leaf veins, petioles and immediately under the epidermis. Functions include;   * + Provides strength and support in young growing plant.   + Gives flexibility and resilience to plant.   **Sclerenchyma Tissue:** they are made up of dead cells with thicken cell walls containing cellulose and lignin which are fibers. They are found in non-growing regions of plants such as mature stem and bark. Functions include;   * + gives flexibility to plant   + provides strength, rigidity ,hardness and support to plant   **Xylem Tissue**: Xylem tissues are found in vascular tissues of stems, roots and leaves. Functions include;   * provides support strength and shape to the plant * Helps to conduct water and mineral salt from the roots to leaves.   **Phloem Tissue**: Also located in the vascular bundles of all plants in their roots, stems and leaves. Functions include;   * + Conduction of manufactured food from site of production to site of consumption and storage.   + Assist to provide support to the entire plant.     **IMPORTANCE OF SUPPORTING TISSUE IN PLANTS**   * 1. For plants to have definite shape;   2. For strength;   3. For rigidity;   4. For resistance against external force such as wind and water. |

**LESSON NOTE 4**

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| **NUTRITION IN ANIMALS**  All living organisms need food for their survival and daily activities. Plants manufacture their food through the process called photosynthesis; hence they are called autotrophs. On the other hand, animals cannot manufacture their own food as they depend on plants directly or indirectly for their food, hence they are called heterotrophs.  Animals sometimes are classified according to the type of food they eat. On this basis, they are classified into 3 groups;   1. **Carnivorous animals:** feed only on flesh or other animals e.g. dog, lion. Lizard snake, cat etc. 2. **Herbivorous animals**: feed on plants e.g. goat, sheep, rabbits etc. 3. **Omnivorous animal:** feed on both plants and animals e.g. man, pig etc.   **CLASSES OF FOODS**    Food is a complex energy-rich organic matter which living organism feed on to obtain nutrients and substance necessary for life. There are seven major classes of food substances: 1. **Carbohydrates**: made up of carbon, hydrogen and oxygen with a general formula (CxH2O)y. they consist of simple sugar, starch, cellulose and glycogen. They are grouped into simple sugar monosaccharide, double sugar/disaccharides and polysaccharide. Sources include yam, cassava, potatoes, bread cereals (rice, maize etc.)   1. **2. Proteins:** are complex molecules made up of smaller unit called amino acids. They have to be digested to amino acids before the body can absorb them. Protein is composed of carbon, hydrogen, oxygen, phosphorus and sulphur. Sources of protein include both plant source (beans, groundnut, soya beans and melon) and animal source (milk, egg, fish, chess, meat and chicken). 2. **3.** **Fats and Oils:** they are also called lipids. They consist of only carbon, hydrogen and oxygen. However, the amount of oxygen in each lipid is very little. Fats and oils re hydrolysed during digestion to fatty acid and glycerol. Sources of fat include, butter, fish or cod oil. 3. **4.** **Mineral salt:** food substances that are required in traces or very small quantity for vital body process. They are taken in their ionic forms. Mineral elements or salts include phosphorous, calcium, manganese, fluorine, copper and cobalt. 4. **5.** **Vitamins:** organic food substances needed in small quantities also for body normal growth and healthy development in man and other animals. They are grouped into fat soluble vitamins (vitamins A, D, E AND K) and water soluble vitamins (vitamin B-complex and vitamin C. 5. **6.** **Water:**  composed of 2 elements, hydrogen and oxygen and is important to animals to carry out metabolic process. Sources include drinking water from rivers, rain etc.   **BALANCED DIET**    This is a diet that contains the correct proportion or the right amount of all the classes of food substances required by an organism. Balanced diet is important in the following ways   * Makes us healthy and by so doing, makes us resistant to diseases * Encourages growth and normal development of the body * Provides the energy required for normal activities * Prevents malnutrition, deficiency or diseases causes by lack of certain food substances e.g. kwashiorkor caused by protein deficiency in children.   **FOOD TEST**   1. **Test for Carbohydrates: (simple sugars) –**put a small quantity of glucose in a test tube  * Add an equal amount of Benedict solution and boil for 4-6mins. * A brick-red or orange precipitate indicated the presence of glucose. * **(complex sugars);** - put a small quantity of sucrose solution in a test tube * Add few drops of dilute hydrochloric acid to the solution (hydrolyses the complex sugar to simple sugar) and place the solution in boiling water for few mins * Add a few drops of dilute caustic soda ( to neutralize the excess acid) * Add Fehling’s solution and place the test tube in a boiling bath. An orange-red precipitate/yellow precipitate indicates the presence of sucrose  1. **Test for Protein ( Million’s test) -**  put 3cm of egg white or colloidal solution of protein into a test tube  * Add 3cm of Million’s reagent and warm the mixture in a water bath for a few minutes * A deep red color or precipitate shows the presence of protein * **Xanthoproteic test-** put 2cm of egg white or milk solution in a test tube. * Carefully add about 1cm concentrated trioxonitrate (v) acid. A white precipitate forms which turns yellow on heating. * Cool the contents and add about 3cm of ammonium hydroxide solution. Heat the solution and allow to cool. The colour of the precipitate deepens to orange indicating the presence of protein.  1. **Test for Fats and Oils: Translucent mark test-** drop oil on a spot, on a piece of paper or rub the surface of a fatty food against the surface of a piece of white paper. A translucent mark shows the presence of fat.  * **Sudan III test:** add a few drops of Sudan iii solution to some oil in a test tube. The red coloration is obtained * boil the solution and a black precipitate is formed. |

**LESSON NOTE 5**

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| **DIGESTIVE ENZYMES**    Enzymes are chemical catalysts which are manufactured by living cells. They accelerate metabolic reactions without changing their composition in the process. They are produced by both plants and animals.  **CHARACTERISTICS OF ENZYMES**   1. They are specific in nature 2. They are needed in small quantity 3. They operate at a specific temperature (37ͦC) and are denatured/ rendered inactive at higher or lower temperature range 4. They do not lose their chemical composition at the end of a reaction 5. They affected by the acidity and alkalinity (PH) of a medium. 6. They are involved in reversible reaction 7. They are produced by glands of the system that require that activities e.g. digestive enzymes are produced by various glands of digestive system   **CLASSES OF ENZYMES**   1. Protease: they are digestive enzymes that are present in the stomach e.g. Renin and Pepsin. They digest and break proteins down into smaller units 2. Amylase: they are also digestive enzymes that convert starch and sugars to glucose. Ptyalin or salivary gland is produced by salivary gland in the mouth and converts starch to maltose. 3. Lipases: they convert oils to fatty acid and glycerol. They are produced in the pancreas and ileum.   **MAMMALIAN TOOTH**    Humans have two set of teeth in their lifetime; milk teeth which fall off after a while and the permanent teeth which replaces the milk teeth.  TYPES OF TEETH  There are 4 major teeth types in mammals;   1. **Incisors:** flat, chisel shaped with sharp edge. Used for bitting food, cutting and holding onto a prey to prevent its escape. 2. **Canine:** sharp and pointed at the tips and are used for tearing flesh and catching prey 3. **Premolars:** large with rigid flat surfaces used for chewing food 4. **Molars:** used for grinding and chewing food.   **STRUCTURE OF A TOOTH**    The center of the tooth consists of pulp cavity with blood vessels and nerves and are extremely sensitive to heat or cold. Dentine which is hard and bone-like encloses the pulp. The enamel, the hardest part, is a white layer covering the dentine and it protects the pulp and the dentine. A layer of cement covers the dentine in the root region.  DENTITION AND TYPES    Dentition is the number and arrangement of teeth of an organism. Two types exist  Homodont dentition: organism have same teeth type, with no specialized function for certain teeth. All teeth have same size, shape and function. Examples are fishes, reptiles.  Heterodont dentition: organisms have teeth different is shape, size and functions. Examples are mammals.  **DENTAL FORMULAR**  This is a formula expressing the number and kinds of teeth possessed by a mammal. Different mammals have different dental formula depending on their diet. Examples include  Man----------- 2(I=2/2, C=1/1, P=2/2, M=3/3) = 32  Dog------------- 2(I=3/3, C=1/1, P=4/4, M=2/3) =42 |