

### THIRD TERM SCHEME OF WORK FOR SS1 BIOLOGY

WEEK	TOPICS	CONTENT
1	Effect of agricultural activities on the ecosystem	-Effect of bush burning, tillage, farming methods, fertilizer, pesticides and herbicides application on the ecosystem.
2	Pests and diseases of agricultural importance	-Definition, types and classification of insect pests. -Economic importance of insect pests in crop production. - parasites of farm animals, lifecycle, diseases of farm animals, effects of diseases. -The control of pests and diseases.
3	Food production and storage	-Relationship between availability of food and human population, food shortage, role of government in increasing food production. - Factors required for food production (edaphic and climatic factors), ways of improving crop yield. - Food wastage, food spoilage, preservation and storage of food (food storage).
4	Population growth and food supply	-Effect of food shortage on population growth.

5	Micro- Organisms around us, Biotechnology, industrial biotechnology	Definition, classification and carriers of microorganisms, food and water borne disease, disease spread and vectors, control of vectors, Beneficial and harmful effects of microorganisms, maintenance and public health, biotechnology.
6	Aquatic Habitat	Marine, fresh water, estuarine; Characteristics and adaptative features of organisms in these habitats, major ecological zones.
7	Terrestrial Habitat	Marsh, savannah, rainforest, arid land; characteristics and adaptive features of organisms in these habitats, food chain.
8	Digestive system 1	Description, parts and types of alimentary tract in animals e.g. tapeworm, earthworm, bird, grasshopper. Difference between that of bird and grasshopper.
9	Digestive system 2	Modifications and mechanisms of feeding, feeding habits.
10	Transport system 1	Definition, need for transport, materials for transport in lower and higher organisms, transport in flowering

		plants, transpiration, translocation, water, minerals, O <sub>2</sub> and CO <sub>2</sub> uptake.
11	Transport system 2	-Types of Circulatory system in mammals, mechanism of transport in higher animals.
12	Homeostasis	-Maintenance of internal environment, organs involved in maintenance of homeostasis in the human body.
13	Drugs	Drug use and abuse.
14	Revision	
15	Examination	

## WEEK 1

**Topic: Effect of agricultural activities on the ecosystem.**

**Specific Objectives: at the end of this lesson, students should be able to:**

**-Describe the effect of various agricultural activities or farming methods on the ecosystem.**

Agricultural activities or farming practices carried out by farmers have some effect on the ecosystem. These agricultural practices/farming types and their effects include:

S/N	Agricultural activity	Effect on the ecosystem
1	Bush burning: This involves the use of fire to clear vegetation.	-It destroys the soil organic matter and microorganisms. -It reduces water holding capacity of the soil. -it helps to break dormancy of some seeds. -it leads to succession.

		<ul style="list-style-type: none"> <li>-It pollutes the atmosphere and expose the soil to erosion.</li> <li>-Ash produced deposits minerals in soil and also increase the alkalinity of the soil.</li> <li>- it leads to extinction of animals.</li> <li>-It disrupts the food chain.</li> </ul>
	<p>2) Overgrazing: a situation where the animals grazing a land exceed the number that can be supported by the land.</p>	<ul style="list-style-type: none"> <li>-Removes vegetative cover, destroy soil structure and exposes the soil to erosion.</li> <li>- Compactness of soil as a result of trampling.</li> <li>-Eradicate weeds</li> <li>- Serve as a means of fertilizing the soil with animal droppings.</li> </ul>
	<p>3) Fertilizer/Herbicides/Pesticides application.</p>	<ul style="list-style-type: none"> <li>- This can cause pollution of an environment.</li> <li>-Fertilizer destroys soil structure, reduce soil humus and increase porosity.</li> <li>- Fertilizer promote growth of vegetation which minimize erosion.</li> <li>-Excessive fertilizer can cause soil acidity.</li> <li>-It affects the life of plants and animals.</li> <li>-Fertilizer supplements the nutrients if the soil.</li> <li>-Pesticides reduce the population of targeted</li> </ul>

		<p>organism and may also destroy crop plants.</p> <ul style="list-style-type: none"> <li>-Pesticides can leave undesirable residues in the environment which can affect organisms when washed into water bodies.</li> </ul>
4	<p>Tillage: this is the breaking of the soil in preparation for planting.</p>	<ul style="list-style-type: none"> <li>-It loosens the soil and encourages soil erosion and leaching.</li> <li>-Enhances aeration of the soil.</li> <li>-It can lead to loss of soil fertility and poor vegetation.</li> <li>-Exposes and kills soil organism.</li> <li>-increases porosity of soil and reduces soil capillarity.</li> </ul>
5	<p>Deforestation: indiscriminate felling of trees without replacing them.</p>	<ul style="list-style-type: none"> <li>-Encourages soil erosion and water percolation.</li> <li>-loss of soil nutrients and leaching.</li> <li>-destroys water shade and reduce soil humus.</li> <li>-Hinders activities of microorganisms and also reduce wildlife population in the area.</li> <li>- It can lead to desertification.</li> </ul>
6	<p>Bush Clearing/Clean Clearing: removal of the whole vegetation in a land, hence leaving the land bare and clean.</p>	<ul style="list-style-type: none"> <li>-Removes top rich soil, exposes the soil to sunlight which increases temperature and encourage evaporation of water.</li> </ul>

		<ul style="list-style-type: none"> <li>-Exposes soil to erosion and leaching.</li> <li>-It gets rid of weeds on the land.</li> <li>-Destroys organic matter of the soil.</li> <li>- Leave the land free of obstacles.</li> </ul>
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### EFFECTS OF DIFFERENT TYPES OF FARMING ON THE ECOSYSTEM

S/N	Farming Type	Effects on the ecosystem.
1	<b>Monocropping:</b> a system of farming that involves the cultivation of one crop every year.	<ul style="list-style-type: none"> <li>-Increase pest population of the vastly cultivated crops.</li> <li>- Increase in pest population affects crops and animals.</li> <li>- It depletes the soil nutrient.</li> </ul>
2	<b>Continuous Cropping:</b> this is the repeated cultivation of crops in one area of land.	<ul style="list-style-type: none"> <li>-Reduce mineral content of soil and aid in the multiplication of germs, parasites and pest.</li> <li>-Reduce crop yield</li> </ul>
3	<b>Shifting Cultivation:</b> This involves the cultivation of crops on a piece of land for one year or two years after which it is abandoned for another.	<ul style="list-style-type: none"> <li>-Waste valuable land, plants and animals.</li> <li>-It depletes soil nutrients.</li> </ul>
4	<b>Crop Rotation:</b> this involves the cultivation of different crops on the same piece of land in a specific/definite manner, to maintain the fertility of the soil.	<ul style="list-style-type: none"> <li>-This adds nutrients to the soil.</li> <li>-maximizes the use of land.</li> <li>-Helps to control pests, weeds, diseases and erosion.</li> </ul>
5	<b>Mixed Farming:</b> this is the cultivation of crops and rearing of animals on the same piece of land.	<ul style="list-style-type: none"> <li>-This adds nutrients to the soil by means of animal droppings.</li> <li>-Maximizes the use of available land</li> <li>-Diseases, pests and pollution can build up.</li> <li>Cultivated crops may be eaten by animals.</li> </ul>

## TASK

-State and explain four ways in which modern agricultural activities may threaten the survival of species (WASSCE JUNE 2014)

-Briefly explain the effects of bush burning and tillage on the ecosystem (SSCE NOVEMBER 1996)

## WEEK 2

**Topic: Pests and diseases of agricultural importance**

**Specific Objectives: at the end of this lesson, students should be able to:**

-State and describe pests and diseases of agricultural importance.

-discuss methods of controlling pests and diseases of agricultural importance.

**PEST OF CROPS:** a pest is described as an organism capable of causing damage to crop plant.

### TYPES OF CROP PEST

(I) Rodents (ii) Insects (iii) Birds (iv) Monkeys (v) Nematodes (vi) Man

### CLASSIFICATION OF INSECT PESTS (BASED ON THE MODE OF FEEDING)

**1) Biting and chewing insects:** these insects bite and chew plant parts. They possess mandible and maxillae e.g. grasshoppers, leaf worms, mantids, locust and beetles.

**2) Piercing and sucking insects:** these insects possess proboscis for piercing and sucking fluids from plants e.g. aphids, cotton strainers, mealy bugs and white flies.

**3) Burrowing insects:** these insects are capable of burrowing into plant parts e.g. bean beetles, maize weevil, rice weevils, stem burrowers.

## ECONOMIC IMPORTANCE OF INSECT PESTS IN CROP PRODUCTION

- 1) They destroy crops in the field.
- 2) Injuries made on crops can expose them to diseases.
- 3) Reduce the viability of stored produce and increase cost of production.
- 4) They render vegetables and fruits unattractive
- 5) Reduction of crop yield and quality of produce.
- 6) The profits of farmers are reduced.

## PREVENTION AND CONTROL OF PESTS

S/N	CONTROL METHODS	EXAMPLES
1	<b>Physical control:</b> this involves the physical removal of pests.	-handpicking, trap setting, fencing and shooting.
2	<b>Cultural control:</b> this is the use of farm practices to control pests.	-Practicing crop rotation, proper tillage, timely harvesting, proper weeding and sanitation. -Planting pest resistant variety of crops.
3	<b>Biological control:</b> this involves the introduction of the natural enemies of pests to control pests.	-this can be done by introducing an animal that feeds on the pests or its larvae.
4	<b>Chemical control:</b> this involves the use of chemicals	-Pesticides, insecticides, rodenticides, avicides and nematicides.

**DISEASES OF CROPS:** This is the deviation of a plant from the normal state of health and it is caused by several agents which include the following:

- i) Viruses ii) Bacteria iii) Fungi iv) Nematodes v) Nutrient deficiency.

**Examples of such diseases include;**

Name of disease	Causal organism	Method of transmission	Symptoms and economic importance
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Maize Smut	Fungus	Airborne	-Galls leaves which eventually turns black. -Reduced yield
Rice Blight	Fungus	Airborne	--Red spots on leaves which turn grey or brown -Reduced yield
Maize Rust	Fungus	Airborne	-Red spots on leave, reduced yield and death of crops.
(Cercopora) a leaf spot of cowpea	Fungus	Airbone	-Reddish brown spots on leaves, lesions on leaves, chlorosis and falling of leaves.
Rosette disease of groundnut	Virus	By piercing and sucking insects e.g. aphid	-Yellow leaves -Stunted plants -Death of plant -Shortening of internodes
Cocoa black pod disease	Fungus	Rain splash and insects	-Pod turns black and rotten. -Reduced crop yield.
Cassava Mosaic	Virus	Infected plant cuttings and piercing insects.	-Stunted growth -mottling of leaves -Distortion of leaves -Vein clearing - yellow patches alternate green patches on the leaves (mosaic pattern)
Leaf Blight of cassava	Bacterium	Rain splashing, insects, tools, infected cuttings.	-Blighting of leaves. -wilting of plant -falling of leaves -stem damage -Reduced yield
Coffee leaf rust	Fungus	By wind and rain splash	-yellow or brown spot on leaf alongside an orange powdery mass. -Reduced yield -Dropping of leaves
Black arm (bacteria blight of cotton)	Bacterium	Through leaves and stems near the ground	-Angular spots on leave.

			-Retarded growth and death of plant.
Root knot of varieties e.g. in tomato and okro	Nematodes	Infected soil	-Knotting of roots -Retarded growth -death -Reduced yield
Onion twister disease	Fungus	Infected soil, water splash and bulb	-Twisting leaves -Grey patches on leaves -Reduction in yield. -Death of plants
Damping off disease of okra	Fungus	Infected soil	-Retarded growth -water logged cells -wilting of plant

### GENERAL EFFECTS OF CROP DISEASES ON CROP PRODUCTION

- 1) Reduction of yield or productivity of crops.
- 2) They Reduce quality of crops.
- 3) They retard plant growth and cause the malformation of plant parts.
- 4) They lead to death of crop plant.
- 5) They reduce the farmers income and increase the cost of production.

### GENERAL CONTROL MEASURES OF DISEASES OF CROPS

Crop diseases can be controlled using the following methods of control:

- 1) Cultural method: use of farming practices e.g. crop rotation, regular weeding etc.
- 2) Biological control: using a natural enemy of the disease.
- 3) Chemical control: use of chemicals e.g. fungicides. Nematicides etc.

#### Other control measures include:

- Destruction of crop residues after harvest.
- Burning of infected plants
- practice seed dressing with chemicals.
- plant disease resistant varieties.

### PARASITES OF FARM ANIMALS

A parasite is and organism that lives in(endoparasites) or on(ectoparasites) another organism called the host. The parasite feeds on the host and derives nutrient at the detriment of the host. The host is usually bigger and stronger.

S/N	Parasites	Economic importance	Control
<b>Endoparasites</b>			

1.	<p><b>Tapeworm (<i>Taenia solium</i>):</b> This is a flat worm belonging to the group platyhelminthes. The secondary host is pig and the primary host is man. They reside in the intestine; from man the eggs are secreted in the faeces of man and this is picked up by the pig whose enzymes liberate the embryo. The embryo transported within the blood stream of the pig resides in form of a cyst which become bladder worm. When pork is eaten raw or fairly cooked the bladder worm is eaten by man and it develops into a young tapeworm.</p>	<p>-Abdominal pain, anaemia, weakness, indigestion and vomiting.</p>	<p>- Examine all meat for bladder worm before selling to the public.          -Make sure meats are properly cooked.          -Adopt good sanitary measures to prevent contact with human fecal waste.          -Treat infected people by regular deworming.</p>
2.	<p><b>Liver fluke:</b> this is a brown and flat organism. Farm animals are the primary host while the snail is the secondary host. Fertilized eggs are passed out with faeces from farm animals and the eggs develop into a larvae (miracidia). The larvae swims in water and is attracted to water snail, on entering the body of the snail the larvae losses its cilia and develop into a sporocyst which gives rise to a new larvae(rediae) which develop into a minute worm that enters the water body and is ingested by animals during water uptake.</p>	<p>-Causes bilharzia disease or schistosomiasis.          -excretory products of flukes have a poisoning effect on the sheep.          -it affects digestion and results in liver rot, leading to drowsiness and death.</p>	<p>- biological control by means of duck and geese.          -Drain pasture as wet pastures harbour snails.          - use lime on the pasture to prevent the eggs of liver flukes from hatching (this is due to alkalinity)</p>
3.	<p><b>Roundworm (<i>Ascaris lumbricoides</i>):</b> this is a cylindrical worm with smooth body. The eggs are deposited from the intestine of pigs from which igs they are deposited into the soil where the can stay for years. During feeding or drinking the eggs are picked up by the pigs and their digestive enzymes release the larvae which pierce the intestinal wall to the blood and then the liver, to the heart and lungs from which they pierce the mouth and throat of the pig through which they are swallowed into the intestine and the cycle is repeated.</p>	<p>-Reduce growth of the host.          - Affects respiration.          -Cause indigestion and constipation.          -results in loss of appetite and weakness.</p>	<p>-Deworm pigs regularly using piperazine drugs.          -Maintain good sanitation of the environment.          -Provide clean and uncontaminated water and feed to animals.</p>

## Ectoparasites

1.	<b>Tick:</b> this insect consists of a head region and abdomen. It possesses a piercing organ for sucking the blood of the host. The tick exhibits complete metamorphosis; hence the egg develops into larvae, then nymph and the nymph gradually moults into an adult.	<ul style="list-style-type: none"> <li>-They act as vectors of diseases.</li> <li>-They can cause anemia, weight loss and death.</li> <li>-Injuries expose host to diseases.</li> </ul>	<ul style="list-style-type: none"> <li>- Hand-picking</li> <li>-Regular dipping or spraying of host with ascaride solution.</li> <li>-Isolation of new stocks.</li> <li>-change animal beddings regularly and maintain a clean surrounding.</li> </ul>
2.	<b>Lice:</b> this is a wingless insect with three pairs of legs. The body is divided into three: head, thorax and abdomen. They exhibit incomplete metamorphosis, hence their eggs called nit develops into nymphs which develop into adults.	<ul style="list-style-type: none"> <li>-They bite and cause irritation</li> <li>-Cause sores as a result of scratching.</li> <li>-they are vectors of diseases.</li> <li>-They can cause anemia.</li> </ul>	<ul style="list-style-type: none"> <li>-keep animals in clean environment.</li> <li>-avoid overcrowding of plants and animals.</li> </ul>

## DISEASES OF FARM ANIMALS

S/N	Diseases	Animals affected	Symptoms	Method of transmission	Control
<b>Viral diseases</b>					
1	<b>Foot and Mouth disease</b>	Cattle, sheep and goat.	<ul style="list-style-type: none"> <li>-Blisters on mouth, skin and hoof.</li> <li>-Inflammation of teats and udder.</li> <li>-Salivation.</li> <li>-lameness and loss of weight.</li> </ul>	Infected materials like urine, faeces and milk.	<ul style="list-style-type: none"> <li>-Isolation of infected animals.</li> <li>-Burning and burying of contaminated materials.</li> <li>-regular vaccination.</li> </ul>
2	<b>Rinder-Pest disease</b>	Cattle, sheep and goat.	<ul style="list-style-type: none"> <li>--High fever, weakness, difficulty in breathing, loss of appetite and weight.</li> </ul>	- By contact and contaminated feed, water, urine and faeces.	<ul style="list-style-type: none"> <li>-Regular vaccination</li> <li>-Isolation of infected animals.</li> <li>-Restriction of infected</li> </ul>

					animal's movement.
3	<b>Newcastle Disease</b>	Domestic fowls, turkey, ducks, guinea fowl and goose.	-Respiratory symptoms which include; sneezing, coughing, nasal discharge. -Nervous symptoms include paralysis, somersaulting, muscle tremor, cycling movements. - Digestive symptoms include lack of appetite and diarrhea.	- Contaminated feed, water, breeds and litter.	-Vaccination, proper sanitation, disinfection. -Burning and burying infected birds.
<b>Bacterial diseases</b>					
1	<b>Anthrax</b>	Cattle, sheep, goat And pig.	-High fever, depression, lack of appetite and loss of weight. -Blood oozes from openings.	Contaminated water, feed and animals.	-Vaccination and proper sanitation. -Isolation of infected animals.
2	<b>Brucellosis (Contagious Abortion)</b>	Cattle, sheep and goat.	-high fever, diarrhea, still birth, premature abortions, retention of placenta, reduction in milk production, inflammation of scrotum and uterus.	Contaminated feed, water and animals.	-Vaccination, sanitation and isolation of the infected animal.
3.	<b>Tuberculosis</b>	Cattle, poultry birds, sheep and pigs	-Breathing difficulty, constant coughing, loss	By inhalation of contaminate feed, litters	Vaccination, isolation and proper sanitation.

			of weight and appetite. -paled comb and wattles, milk reduction.	and droppings.	
<b>Fungal diseases</b>					
<b>1</b>	<b>Aspergillosis</b>	Poultry birds, pig, cattle.	-Difficulty breathing, loss of appetite, irritation of skin, respiratory disorder, high body temperature, weight and general thriftiness of the animal.	-Through contaminate mouldy liter, mouldy feed and incubator.	-Disinfection. -Avoid the use of mouldy feed and litter.
<b>2</b>	<b>Ring worm</b>	Pigs, sheep, goats, cattle and rabbits.	-Lesions on skin, irritation of the skin, loss of appetite and weight.	-Through contact with infected person and feeders.	-Disinfection, use of Sulphur and iodine solution.
<b>Protozoa Disease</b>					
<b>1</b>	<b>Trypanosomiasis</b>	Cattle, sheep and goat.	-Rise in body temperature, dullness in appearance, -Anaemia, sleepiness.	By the blood sucking tsetse fly.	-clearing of bush around farm. - use of drugs like trypanosomide and antimosan
<b>2</b>	<b>Coccidiosis</b>	Domestic fowl, turkey, ducks, goose and rabbits.	-Alopecia, loss of appetite, blood stained diarrhea, huddling, rough feathers.	Contact with contaminated animal, wet feed and filter.	-Avoid wet feed and litter. -Use suitable drugs such as nitrofurazone.
<b>3</b>	<b>Red Water Fever (Piroplasmosis)</b>	Cattle, sheep, goats and pigs.	Pale red colour of urine, diarrhea, emaciation, death, rise in body temperature.	Bite of an infected animal and by a vector called blue tick.	-Use of insecticides to kill the vector (Blue tick)

## **WEEK 3**

### **Topic: food production and storage**

**Specific objectives: at the end of this lesson, students should be able to:**

- Define food production**
- state the role of government in agricultural production**
- state environmental factors required for food production and ways of improving crop production.**
- describes method of preserving and storing food.**

**Food production** refers to the processes that makes food resources available for the population. The availability of food increases population growth and the scarcity of food resources results in a reduced population.

Food production will be discussed in three ways:

- 1) Role of government in agricultural production.
- 2) Environmental factors required for food production.
- 3) Ways of improving crop production.

### **Roles of government in agricultural production**

- 1) Production of financial assistance, storage-processing facilities agrochemicals, tractors and high planting materials.
- 2) Provision of extension services.
- 3) Establishment of river basin authorities.
- 4) Provision of effective transportation network.
- 5) Establishment of research institutes e.g.
  - Cocoa research institute of Nigeria (CRIN), Ibadan.
  - Nigerian Institute for Oil Palm research (NIFOR), Benin.
  - National Root Crops Research Institute (NCRI), Umudike.
  - National Institute of Oceanography and Marine Research (NIOMA), Lagos.
  - International Institute of Tropical Agriculture (IITA), Ibadan.
  - National Veterinary Research Institute (NVRI), Jos.
- 6) Efficient Quarantine measures.

## ENVIRONMENTAL FACTORS REQUIRED FOR FOOD PRODUCTION

S/N	Environmental Factor	Effect on agricultural Production.
	<b>Climatic Factors</b>	
1	<b>Rainfall:</b> release of condensed water vapour in the atmosphere into the earth	<ul style="list-style-type: none"> <li>-This determines the kind of vegetations and animals in an area.</li> <li>-It is necessary for seed germination.</li> <li>-It makes nutrients in soil available for uptake by plants.</li> <li>-It can lead to leaching of nutrients and soil erosion.</li> <li>-The seasons determine what crops will be planted.</li> <li>-Insufficient rainfall will lead to low crop yield.</li> </ul>
2	<b>Temperature:</b> this is the degree of hotness or coldness of a place.	<ul style="list-style-type: none"> <li>-It affects the distribution of crops and animals.</li> <li>-It is necessary for seed germination.</li> <li>-High temperature can lead to volatilization of soil nutrients.</li> <li>-It affects microbial activities.</li> <li>-High temperature leads to premature falling of fruits and sudden death of livestock.</li> <li>- Too hot or too cold temperature can create an unfavorable environment for</li> </ul>

		livestock and reduces their performance.
3	<b>Wind:</b> air in motion	<ul style="list-style-type: none"> <li>-High wind causes damages and wind erosion.</li> <li>-It aids seed and fruit dispersal.</li> <li>-It can aid pollination and spread of disease.</li> <li>-It helps in distribution of rainfall and changes in seasons NB; in Nigeria the South West wind brings rain while the North -East wind brings harmattan or dry season.</li> </ul>
4	Sunlight/ Solar radiation: amount of heat or sunrays received at a place.	<ul style="list-style-type: none"> <li>-It is necessary for photosynthesis and affects evapo-transpiration.</li> <li>-It affects productivity of crops due to length of day, i.e. photoperiodism e.g. long day plants (millet), short day plants(cocoa), neutral plants like tomato.</li> <li>-It affects rate of production in poultry.</li> <li>-determines productivity of cultivated crops.</li> <li>High intensity radiation causes heat stress in animals.</li> <li>-It increases cost of production because</li> </ul>

		shades have to be provided for animals.
5	<b>Relative Humidity:</b> amount of moisture in the atmosphere.	<ul style="list-style-type: none"> <li>-It results in the formation of rain.</li> <li>-It affects the performance of crop and animals.</li> <li>- High humidity leads to mouldiness of feed and liters which can cause diseases.</li> <li>-It affects growth rate of crops and productivity of farm animals.</li> </ul>
<b>Biotic factors</b>		
1	<b>Soil Organisms:</b> bacteria, fungi, earthworm, rodent and termite.	<ul style="list-style-type: none"> <li>-They cause diseases</li> <li>-They aid aeration, percolation and fertility.</li> <li>-Some organisms fix nutrients in plants (e.g. bacteria in root nodule fixes nitrogen).</li> <li>-Aids decomposition</li> <li>-They open up wounds of plants and animals.</li> </ul>
2	<b>Parasites:</b> ticks, dodder, mistletoe, liver flukes, tapeworm, lice.	<ul style="list-style-type: none"> <li>-They transmit diseases</li> <li>-They reduce quality of produce and production capacity of livestock.</li> <li>-Control of parasites increase cost of production.</li> <li>-May cause death.</li> <li>-Decrease the quantity of produce.</li> </ul>
3	<b>Weeds</b>	-Some may harbor diseases

		<ul style="list-style-type: none"> <li>-They reduce crop yields.</li> <li>-Control of weed increases the cost of production.</li> <li>-Weed causes poor growth of crops.</li> </ul>
4	<b>Diseases:</b> these may be caused by virus, bacteria, fungi, protozoa etc.	<ul style="list-style-type: none"> <li>-Causes death and reduction of crop yield.</li> <li>-Reduces farmers income.</li> <li>-increases cost of production to be controlled.</li> </ul>
5	<b>Predators:</b> pests, rodent, birds, preying mantis etc.	<ul style="list-style-type: none"> <li>-Some predators are beneficial in agricultural production (biological control).</li> <li>-Some may feed on farm animals.</li> </ul>
<b>Edaphic Factors</b>		
1	<b>Soil Structure</b>	<ul style="list-style-type: none"> <li>-It determines fertility, porosity, level of soil organism, level of soil aeration and percolation.</li> </ul>
2	<b>Soil pH</b>	<ul style="list-style-type: none"> <li>-It affects the growth of plants, availability of soil nutrients to plants, and the presence of soil microorganism.</li> <li>- It causes toxicity to plants and animals in soil.</li> </ul>
3	<b>Soil texture</b>	<ul style="list-style-type: none"> <li>-This determine the type of soil, level of soil fertility and the type of crops to be grown in a given area.</li> </ul>

		-It affects the level of leaching and erosion.
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### WAYS OF IMPROVING FOOD PRODUCTION

- 1) Control of weed, pests and diseases.
- 2) Crop improvement methods.
- 3) Proper timing of planting
- 4) Use manures and fertilizers.
- 5) Adoption of proper and better cultivation methods.
- 6) Use of resistant varieties and good crop varieties.

### METHODS OF PRESERVING AND STORING FOOD

S/N	Method of preserving food	Principle involved/Advantage
1	<b>Salting:</b> this involves the addition of salt to food to preserve it e.g. for meat and fish.	-Salt raises the osmotic concentration of the food which leads to dehydration of the food. The reduced moisture creates an unfavorable environment for microorganisms that cause spoilage. This method also retains the taste and flavor of the food.
2	<b>Irradiation:</b> subjecting food to ultraviolet rays e.g. for meat, fruit juice, can foods, tubers and seeds.	-It kills and prevents microorganisms from entering food.
3	<b>Freezing/Refrigeration:</b> This is the preservation of food with cold storage facilities like the refrigerators and deep	-Low temperature slows down spoilage processes. It may also

	freezers e.g. for fruits, fish, meat and vegetables.	kill some microorganisms.
4	<b>Drying/Sun drying</b> : drying of some products using the heat from the sun e.g. for meat, fish, groundnut, yam and plantain chips.	-preserves the food by dehydration.
5	<b>Smoking</b> : drying farm products over smoke of naked fire e.g. for meat and fish.	-preserves the food by dehydration and suffocation of microorganisms.
6	<b>Chemicals</b> : addition of harmless chemicals termed preservatives e.g. for cakes, soft drinks and vegetables.	-Toxicate spoilage organisms.
7	<b>Heating/Boiling/Frying</b> e.g. yam, soup, meat, fish.	-Provides high temperature for killing spoilage organisms. -Cause dehydration.
8	<b>Canning/Bottling</b> : storing of food in can and bottles e.g. fruits, beans, meat, sauce.	-Ensures long term storage of food substances by preventing the entrance of spoilage organisms.
9	<b>Pasteurization</b> : heating of food products to about 72°C for 15 minutes and cooling immediately for storage e.g. milk, cheese, beer.	-High temperature kills microorganisms,

#### WEEK 4

**Topic: Population Growth and food supply**

**Specific Objectives: at the end of this lesson, students should be able to**

**Outline factors affecting population growth.**

**State the problems associated with human overpopulation.**

**State and discuss the factors affecting the availability of food**

It is no news that the population of the world is growing rapidly. If the quantity of food produced/available does not increase to satisfy the demanding and

growing population. Several ills will be seen in the society at large. To tackle the issue of population growth and food supply, underlying factors responsible for population growth and food supply must be understood.

### **FACTORS AFFECTING POPULATION GROWTH**

- 1) **Availability of food:** the availability of food leads to an increase in the population and food shortage decreases population growth.
- 2) **Availability of water:** lack of water for domestic and industrial purpose decreases population growth, while the availability of water will result in an increase in population.
- 3) **Natural disasters:** natural phenomenon's that pose a threat to human environment and life leads to a decrease in population.
- 4) **Birth rate or natality and death rate:** increase in birth rate increases population and an increase in death rate reduces population growth.
- 5) **other factors include war, famine and drought.**

### **THE FOLLOWING PROBLEMS ARE ASSOCIATED WITH HUMAN OVERPOPULATION:**

- 1) Pressure on natural resources (overexploitation of natural resources).
- 2) Increase in crime wave
- 3) Inadequate access to health services.
- 4) Inadequate housing,
- 5) Unemployment/Underemployment.
- 6) Environmental pollution and traffic congestion.
- 7) Insufficient food supply.
- 8) High pressure on social amenities.

### **FACTORS AFFECTING THE AVAILABILITY OF FOOD**

- 1) **Over population:** as total population increase so does the demand for food.
- 2) **Poor storage facilities:** inability to efficiently store food produced can lead to spoilage which in turn reduces the food available.
- 3) **Pests and diseases:** pests as well as diseases of farm animals and crops can lead to death of crops and animals which will result in a decrease in food production and availability.
- 4) **War:** during periods of war, agricultural activities are not been carried out hence food becomes scarce and expensive.
- 5) **Soil infertility:** the inability of the soil to support proper crop growth due to insufficient soil nutrients results in food scarcity.
- 6) other factors include flood, poor harvest, drought, and bush burning.

## **REVISION TASKS WEEK 1-4:**

**(WASSCE JUNE 1999)**

**1-State the principles involved in the following methods of food preservation: i) salting ii) refrigeration iii) drying iv) smoking v) chemicals**  
**a. State four problems that may be caused by human over population.**  
**b. Explain three ways by which government may increase food production.**

**2-Briefly explain the effects of bush burning and tillage on the ecosystem (SSCE 1996)**

**3-Explain two diseases of farm animals under the following**

- causal organism**
- means of transmission**
- symptoms and economic importance**
- prevention and control measures**

## **WEEK 5**

**Topic: Microorganisms around us and biotechnology**

**Specific objectives: at the end of this lesson students should be able to:**

- identify some microorganisms stating their effects and importance.**
- state the vectors of some microorganisms, the diseases caused and the means of transmission.**
- discuss the relevance of biotechnology in the exploitation of microorganisms.**

Microorganisms refers to tiny organisms that cannot be seen with the naked eye except with the aid of a microscope. They are found everywhere. The study of such organisms is termed microbiology. Microorganisms are harmful as they cause diseases and they are transmitted or transported by some living agents( e.g. animals) which are called vectors e.g. *Plasmodium falciparum* (microorganism) a protozoa is carried by the female anopheles mosquito ( vector) which transmits the organism into the blood stream of humans and cause malaria.

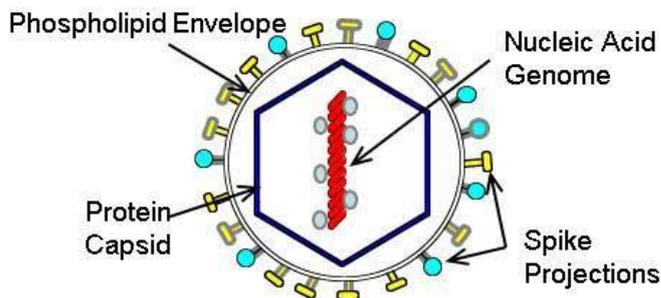
Despite the harmful effects of microorganisms, there are non- pathogenic microorganisms that are useful in the human body and in production of useful products by means of biotechnology and genetic engineering.

## GROUPS OF MICROORGANISMS

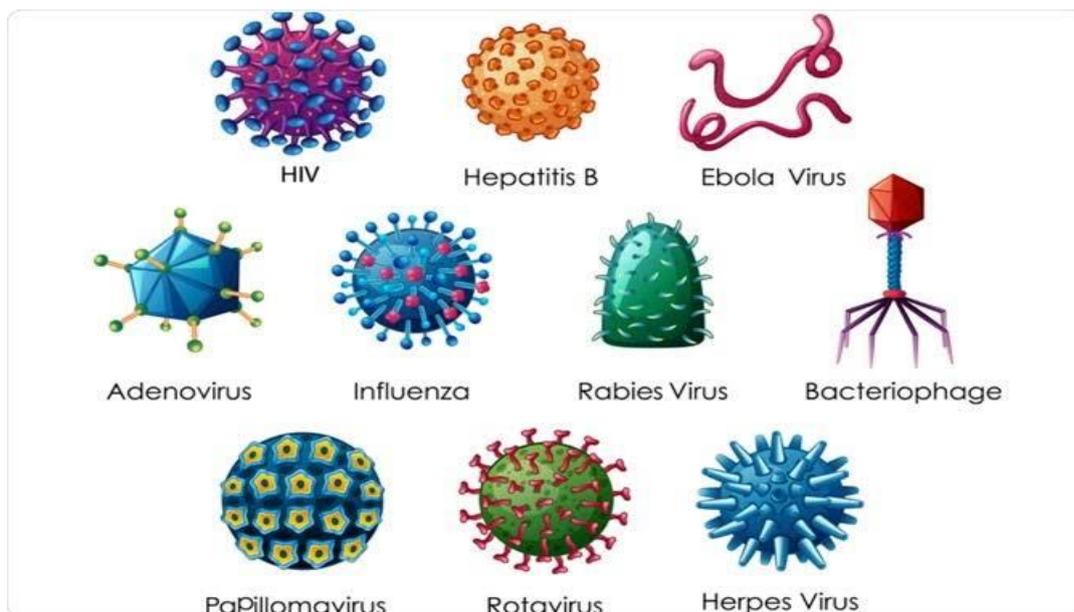
i) Viruses ii) Bacteria iii) Protozoa iv) Fungi v) Algae

### VIRUSES

Viruses are microorganisms that can only be seen with the aid of an electron microscope. They lack a cell structure as such they are rod like consisting of a strand of nuclear protein. They contain either DNA or RNA molecule within them which they seek to transmit into the gene of their patient to facilitate their replication. E.g. Adenovirus, Retrovirus, Corona Virus, Togavirus and Picornavirus.

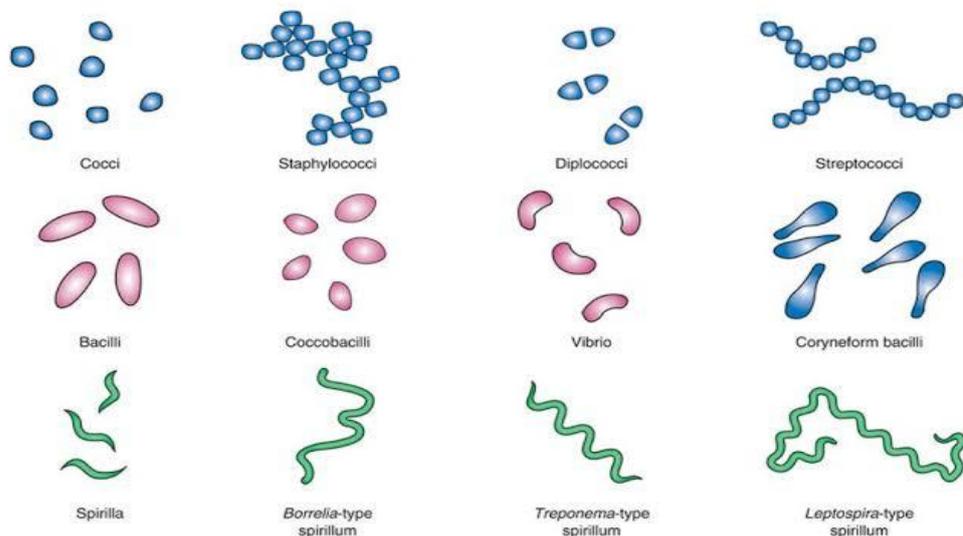
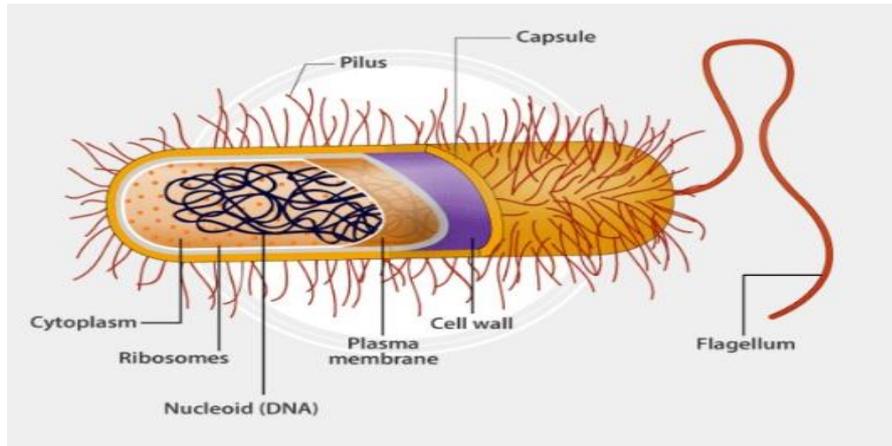


**A typical enveloped virus**



## BACTERIA

These organisms can easily be seen with a light microscope. They possess a cell structure and cell wall but lack a definite nucleus. They possess DNA (deoxyribonucleic acid) which spreads through the cell. Bacteria can be classified based on oxygen use and shape.



## CLASSIFICATION OF BACTERIA

**-BASED ON OXYGEN USE:** aerobic bacteria (use oxygen), anerobic bacteria (no use of oxygen) and facultative bacteria respire in aerobic or anerobic conditions)

**-BASED ON SHAPE: i) Cocci (circular in shape):** when cocci form chains they are called streptococci(pneumonia) and when they are clustered in mass, they are called staphylococci (e.g. boil bacteria)

**ii) Bacilli (rod-like in shape e.g. *Salmonella typhi*)**

**iii) Vibrio (comma shaped e.g. *Vibrio cholerae*)**

**iv) Spirillae (twisted in shape e.g. *Treponema pallidum*)**

## PROTOZOA

These microorganisms are free living and unicellular organisms e.g. Amoeba and Paramecium. Some are parasites e.g. Trypanosome (causes sleeping sickness) and plasmodium (causes malaria)

## FUNGI

These are saprophytic (usually beneficial as they cause decomposition) or parasitic (harmful ones) non-green plants e.g. mushroom, mildews.

## ALGAE

These are microscopic green plants normally found in an aquatic environment e.g. diatoms, Spirogyra, Volvox.

## CARRIERS OF MICROORGANISMS

Carriers of microorganisms are agents which are capable of transferring or carrying microorganisms from one place to another. Carriers can be non-living(e.g. wind and water) and living( animals). Living carriers are called vectors.

Diseases are not spread by vectors alone, microorganisms can be transmitted through the following; Air (i.e. air borne pathogen), water (i.e. water-borne pathogen), food( food-borne pathogens), direct contact/sexual transmission.

<b>Vector or Carriers/mode of transmission</b>	<b>Microorganism</b>	<b>Disease caused</b>
Anopheles(female) mosquito	Plasmodium	Malaria
Tsetse fly	Trypanosome	Sleeping sickness
Housefly	Vibrio cholerae	Cholera and Typhoid fever
Rat flea/ body louse	Rickettsia	Typhus

Aedes mosquito	Virus	Yellow fever and dengue fever
Rat fleas	Bacterium	Plague
Water borne	Virus	Polio myelitis (infant paralysis)
Food and water	Protozoan	Amoebic dysentery
Air-borne and food	Bacterium	Tuberculosis
Air and body contact	Virus	Measles
Air-borne	Bacterium	Pneumonia
Air-borne	Virus	Chicken pox
Sexual intercourse, blood transfusion	Virus (Human Immunodeficiency virus (HIV))	AIDS
Sexual intercourse	Bacterium	Staphylococcus
Sexual intercourse	Bacterium ( <i>Neisseria gonorrhoea</i> )	Gonorrhoea

### **HARMFUL EFFECT OF MICROORGANISMS**

- 1) They cause disease, spoilage of food and even death.
- 2) Reduce quantity and quality of products.
- 3) deteriorate materials.
- 4) Reduce yield

### **BENEFICIAL EFFECT OF MICRORGANISMS**

- 1) In Nature: compost formation, nitrogen fixation, maintenance of soil fertility, digestion of cellulose, sewage treatment decomposition and silage making,
- 2) In Medicine: drug manufacturing, source of vitamin B and enzymes.
- 3) In Industries: production of alcoholic drinks and yoghurt, curing of tobacco(ripening), retting of jute, tanning of hides and skin.
- 4) Biotechnology refers to the use of biological systems and microorganisms in the production of useful products. e.g. a bacterial cell can be genetically engineered to produce insulin.

### **MAINTENANCE OF PUBLIC HEALTH**

It is important to keep our environment healthy and clean. To achieve a healthy environment the whole communities, nations, world needs to be involved in the maintenance of the environment. This can be achieved in several ways:

- 1) Refuse disposal
- 2) Sewage treatment and disposal
- 3) Protection of water and food
- 4) control of diseases.
- 5) Functions of public health authorities.
- 6) Establishment of local and international health organizations e.g.
  - World Health organization (WHO)
  - United Nations Children's Education Funds, (UNICEF)
  - International Health cross Society
  - The major health organization in Nigeria is the Nigerian Medical Association (NMA)

## **WEEK 6**

### **Topic: Aquatic Habitats**

**Specific Objectives: at the end of this lesson, students should be able to**

- Describe the various types of aquatic habitats.**
- Describe the adaptive features of plants and animals in various aquatic habitats**
- identify major ecological zones in various aquatic habitats**

An aquatic habitat is a body of water in which organisms live naturally. Examples of aquatic organisms include: crabs, fish, toad, and plants. The aquatic habitat can be classified into 3 major types. i.e. marine or salt water habitats, estuarine or brackish water habitats and the fresh water habitats.

### **MARINE HABITATS**

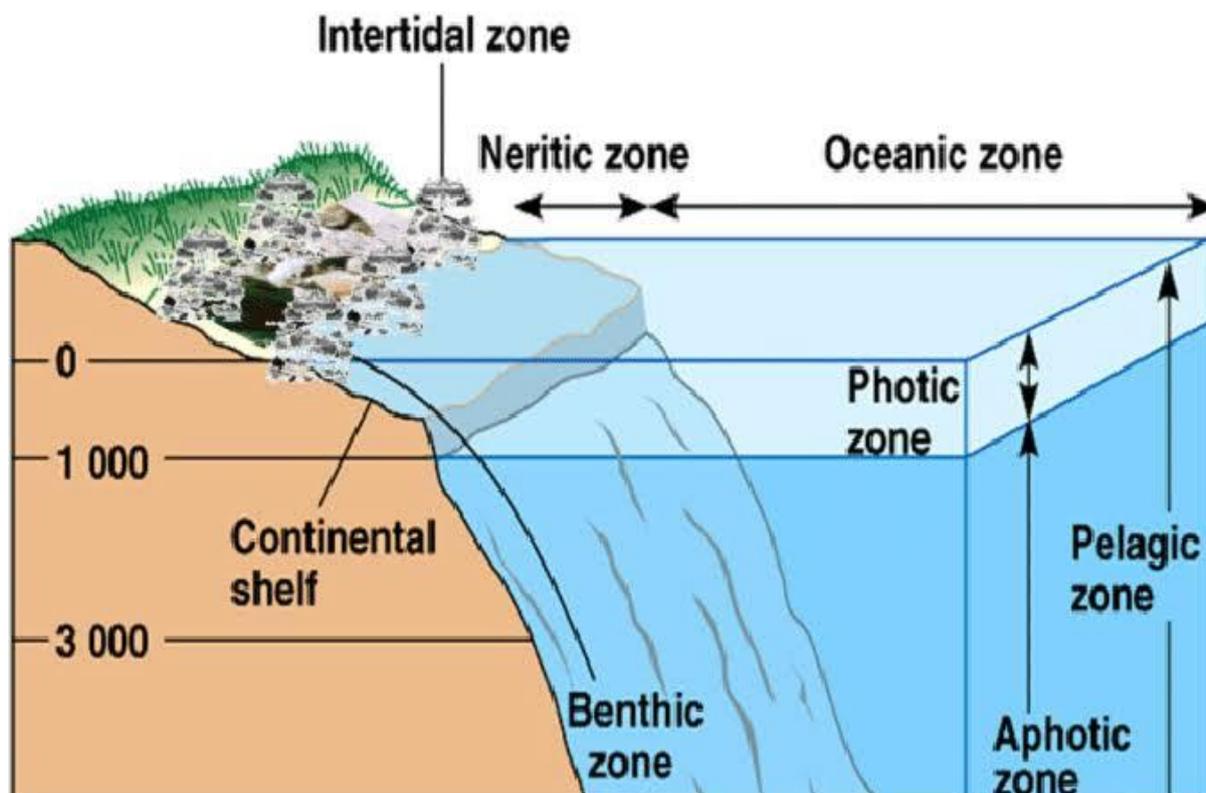
This refer to aquatic habitats which contain salt water. This habitat is characterized with high salinity, high density, pressure difference (1atm at surface to 1000atm at the greatest depth, large size, currents, tides, waves, alkaline water. Organisms in marine habitat include tilapia, crab, starfish, squid, plankton.

### **FOOD CHAIN IN MARINE HABITAT**

Diatoms ----> Zooplanktoon ----> Tilapia ----> Shark

Diatoms----> Crabs -----> Tilapia

## MAJOR ZONES OF THE MARINE HABITAT



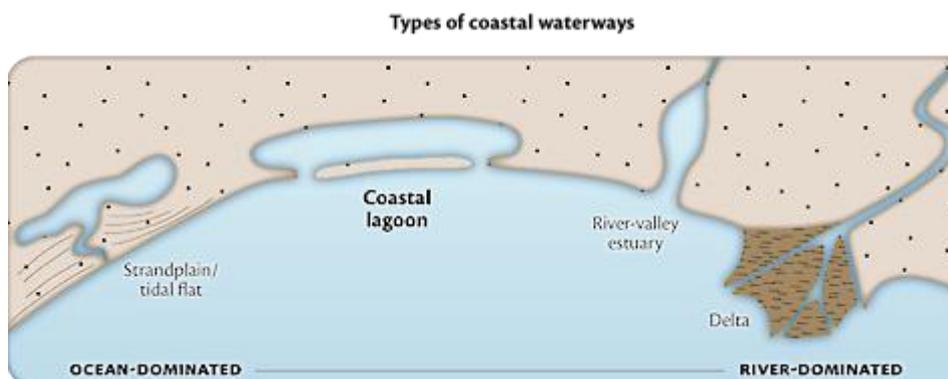
## ADAPTIVE FEATURES OF PLANTS AND ANIMALS IN MARINE HABITAT

S/N	Adaptive features of plants	Adaptive features of animals
1	Succulent stem or root to store water and dilute salt.	Formation of barnacles for attachment to rock.
2	Presence of breathing roots or pneumatophores.	Cartilaginous fishes can retain urea which hence they can cope with high salinity.
3	Presence of stilt root for anchorage.	Bony fishes possess salt secreting glands which enable them to maintain osmoregulation or salt balance.

4	Some excrete salts to maintain balance of body salt.	Tube feet of star fishes enable them to hold on to rock shores
5	Presence of viviparous seedling to ensure survival. Examples of such plants include sea weeds, algae, planktons, diatoms, sesuvium.	Crabs are capable of burrowing fast into the ground for safety.

### ESTUARINE HABITATS

This habitat is formed at coastal regions where salt water from the sea mixes with fresh water from land to form brackish water. There are several estuaries that can be found in this region and they include, delta(multiple division of a river before entering the sea or ocean), lagoon (ocean water that enters land through a canal ) and Bay( small portion of sea water which enters into the land). This habitat is characterized with shallow water, fluctuation in salinity, turbidity, high level of nutrients, low species diversity, low oxygen concept.



### FOOD CHAIN IN ESTUARINE HABITATS

Detritus → Worms → Snails → Birds  
 Diatoms → Shrimps → fishes  
 Phytoplankton → barnacles → fish

### ADAPTIVE FEATURES OF PLANTS AND ANIMALS IN ESTUARINE HABITAT

S/N	Adaptive features of plants	Adaptive features of animals

1	Algae possess chlorophyll for photosynthesis	Mosquito larva possess breathing trumpets for gaseous exchange
2	Silt roots of red mangrove	Crabs Burrow fast into muds.
3	Planktons/diatom possess air space and air bladder for buoyancy.	Fishes have fins and air bladder for movement and buoyancy.
4	White mangroves possess breathing roots for gaseous exchange.	Worms have protective covering to withstand high salinity

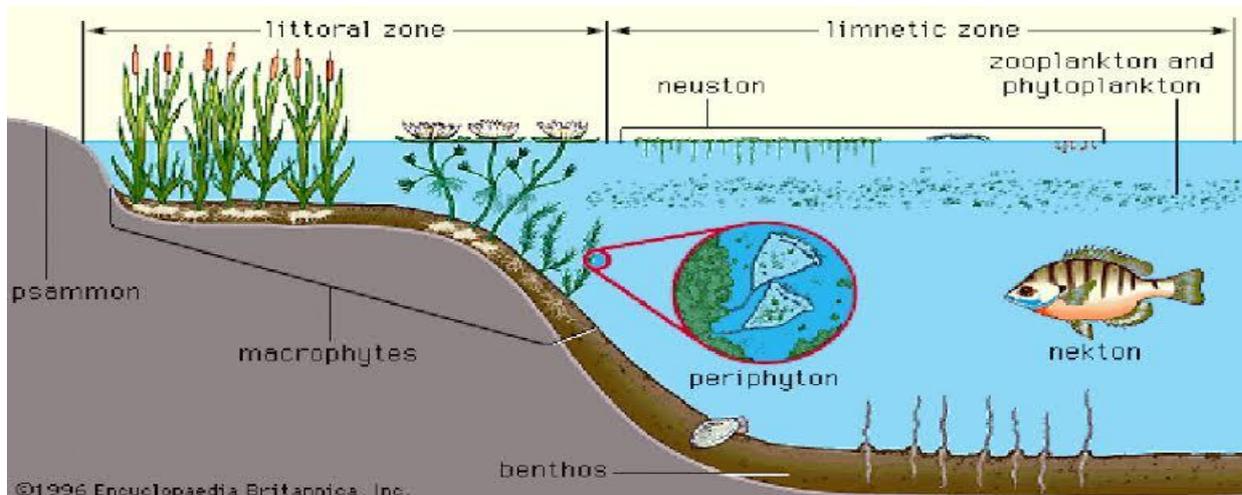
### FRESH WATER HABITATS

These are water bodies formed by inland waters and contain very low level of salinity e.g. rivers, lake, ponds, spring. Fresh waters that run are called lotic freshwaters and standing waters such as the lakes are called lentic freshwaters, these are the two types of fresh waters. This habitat is characterized by low salinity, small size, shallow waters, seasonal variations.

### FOOD CHAIN IN FRESH WATER HABITAT

Diatoms ---→ fish fry---→ tilapia  
 Detritus-→ worms--→ shrimps----→ birds

### MAJOR ECOLOGICAL ZONES OF THE FRESH WATER HABITAT



### ADAPTIVE FEATURES OF PLANTS AND ANIMALS

S/N	Plant adaptive features	Animal adaptive features
1	Water lily possess air bladders which keep it afloat.	Protozoa possess contractile vacuole for the removal of excess water
2	Spirogyra possess mucilaginous cover which protect them in water.	Duck possess webbed feet fo locomotion.
3	water weed possess a long and flexible petiole.	Hydra has a slippery surface.
4	Water hyacinth consist or air spaces internally which enable flotation.	Water boatman can carry air bubbles beneath water for respiration.
5	Water lettuce possess hair on leaves which trap air and enable them to float.	Lung fish has the ability to use the lungs for gaseous exchange during dry seasons.

## **WEEK 7**

### **Topic: Terrestrial habitat**

**Specific Objectives: at the end of this lesson, students should be able to**

- Describe the various types of terrestrial habitats.**
- Describe the adaptive features of plants and animals in various terrestrial habitats.**
- identify major ecological zones in terrestrial habitats**

Terrestrial habitat refers to land environment and it is divided into four types:  
i) Marsh ii) Rainforest iii) Savanna or Grassland iv) arid land

### **MARSH HABITAT**

This refers to lowlands where drainage is poor hence the land is usually water logged and flooded. There are two types of marshes i.e. the fresh water marsh formed by freshwaters and the salt water marshes formed by sea or ocean water. The habitat is characterized with water logged soil, wet soil, poorly aerated soil, continuous flooding, stagnant water, high organic decomposition and high humidity.

Animals found in marshes include: frogs, turtle, oysters, snakes, lizard, crocodile and mammals.

### **FOOD CHAIN IN MARSHES**

Flowering plants---→ insect---→Frogs---→Crocodile.

Detritus---→worms---→Fishes

Humus -----→earthworm -----→Frogs snake.

### **FOREST HABITATS**

This is an extensive community of plants dominated by tall trees of different species or height. This habitat is characterized by broad leaves, buttress roots, tall trees, canopies, arrangement of tree in layers, presence of epiphytes. Plants in such habitats adapt by possession of buttress roots and extensive tap root system, parasitic plants and epiphytes are capable of climbing trees by using their haustoria. Animals in the forest possess strong and powerful limb for climbing, bats possess joint fore and hind limb which forms their wings for flight, colouration of green snake disguises the organism from predators.

### **FOOD CHAIN IN A FOREST HABITAT**

Green plants --→ Grasshoppers ----→toads----→ hawk

Green plants-----→Monkey---→ lions.

## **GRASSLAND OR SAVANNA HABITATS**

This refers to a plant community dominated by grass species with short and scattered tree and shrubs. There are two major types of grassland i.e

**1) Tropical grassland (grass land in Brazil and South)**

**2) Tropical grassland (grassland in central Europe and Russia)**

Grasslands possess the following characteristics: predominance of grasses, presence of short and scattered trees, presence of drought resistant plants, deep rooted plants, small size of the liver. The plants and animals in such habitat possess several adaptive features e.g. possession of long and extensive root to search for ground water, animals like rat possess ability to burrow the soil, the stripes of zebra serve as camouflage, lions and tigers possess strong jaws and teeth for attack.

## **FOOD CHAIN IN A GRASSLAND HABITAT**

Grass----→ grasshoppers-----→ toads ----→ birds

## **ARIDLAND OR DESERTS**

This refers to areas of very low rainfall and high evaporation rate.

There are two types of arid lands:

1) Hot deserts

2) cold deserts

Plants are adapted to this habitat by reduction of leaf to thorns, possession of extensive root system to obtain soil water, cuticles on leaf to reduce transpiration. Animals possess scales to prevent loss of water.

## **FOOD CHAIN IN ARID LAND HABITAT**

Plants---→ Desert rats ----→ snakes.

Plants---→ Locust----→ Wasps --→ Lizards

## WEEK 8

### Topic: Digestive System

**Specific Objectives: at the end of this lesson, students should be able to :**

**-define the digestive system**

**-describe the parts and types of alimentary tracts found in various organisms.**

The digestive system includes the alimentary tract or canal and all the organs and glands associated with the digestion and assimilation of food in animals. Digestion is the breakdown of large molecules of food into simple absorbable form for use by the animals. The alimentary tract differs from one organism to another as it advances with complexity. The table below shows this difference as it relates with the stated organisms.

Animal	Mouth	Pharynx	Gullet	Crop	Stomach	Small intestine	Large intestine	Caecum	Rectum	Anus
Planaria	P	P	A	A	A	P	P	A	A	A
Earthworm	P	P	P	P	A	P	A	P	P	P
Cockroach	P	P	P	P	A	P	A	P	P	P
Fish	P	P	P	A	P	P	A	A	P	P
Toad	P	P	P	P	A	P	A	A	P	P
Lizard	P	P	P	A	P	P	A	P	P	P
Bird	P	P	P	P	P	P	A	P	P	P
Rabbit	P	P	P	A	P	P	P	P	P	P
Cow	P	P	P	A	P	P	P	P	P	P
Man	P	P	P	A	P	P	P	P	P	P

Parts of the alimentary canal of animals.

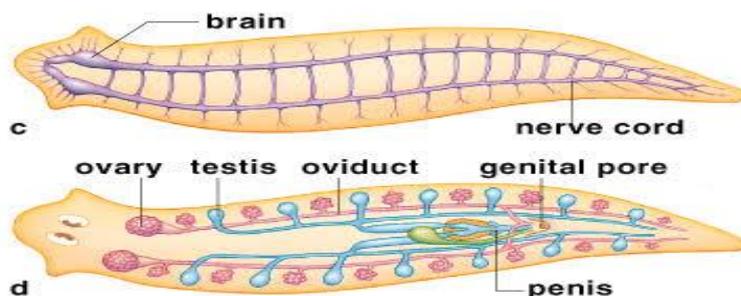
NB: P= present

A=Absent

## TYPE OF ALIMENTARY TRACTS OF SOME ORGANISMS

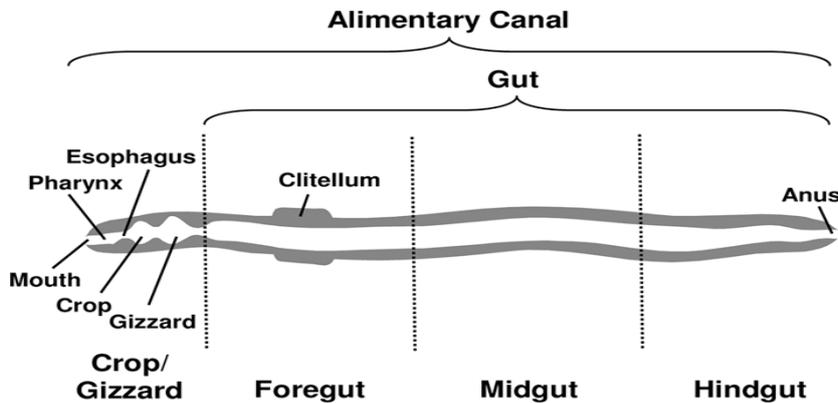
### PLANARIA

This is a free-living flatworm that feeds on zooplankton. It digests food intracellularly and has an alimentary tract with one opening. The mouth opens to the buccal cavity which leads to the pharynx. The pumping action of the food sucks in food pieces which enters pharynx and leads to the small intestine. Digested food leaves the small intestine via three channels to enable food nutrients diffuse to all parts. Undigested food is egested through the mouth.



## TAPEWORM

The alimentary canal has two opening, the mouth through which food enters and the anus from which undigested food is eliminated. The tapeworm possess the following parts: mouth, pharynx (lubricate food with mucus), crop (temporary storage of food), gizzard (grinding of food), intestine (digestion and absorption of food), caecum, rectum, anus.



## GRASSHOPPER AND BIRD

<b>Grasshopper</b>	<b>Bird</b>
<p>Description: they feed on vegetables and their alimentary canal of grasshopper as well as cockroach consist of mouth (mandibles), salivary gland, esophagus, crop, gizzard, mid gut, caecum, ileum, rectum, hind gut, Malpighian tubule anus. The mouth grinds the food, the saliva introduces enzymes for digestion and via the esophagus the food is temporarily stored in the crop from which it is further grinded in the gizzard. The vascularized mid gut absorbs the digested food and the undigested food</p>	<p>Description: The digestive system of birds includes beak, mouth, pharynx, esophagus, crop, proventriculus, gizzard, intestine, caecum, rectum and anus(cloaca). The bird has no teeth, hence grains picked move through the esophagus to the crop where the food is temporarily stored, in the crop they are moistened and fermented by some bacteria. The food moves to the proventriculus (glandular stomach) where digestive enzymes (pepsin and renin) are secreted on the food. The food moves to the gizzard for grinding then the duodenum and the intestine where digestion and absorption takes place. Undigested food substances move through the rectum and is eliminated via the cloaca or anus.</p>

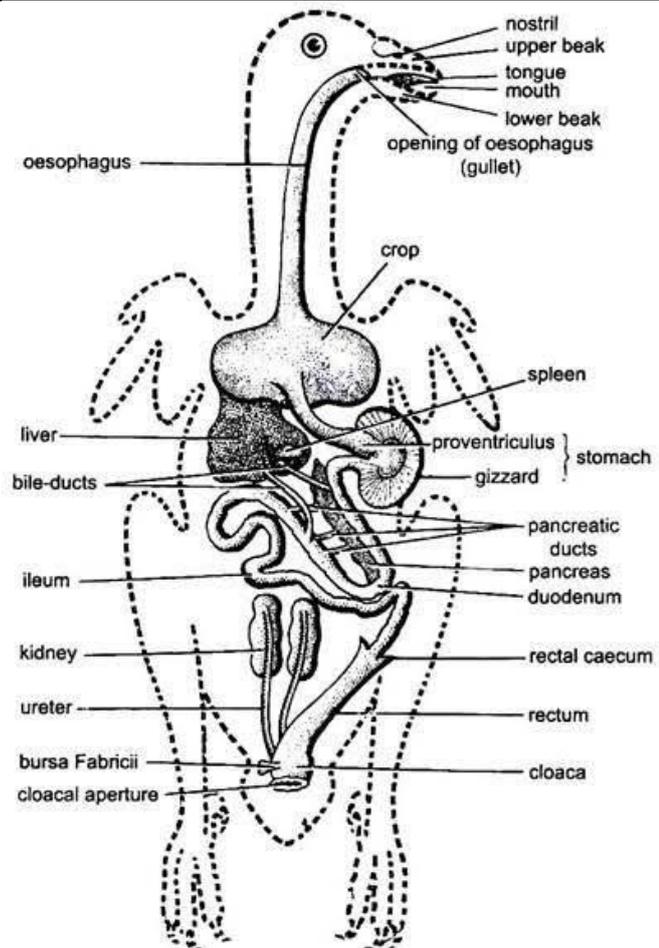
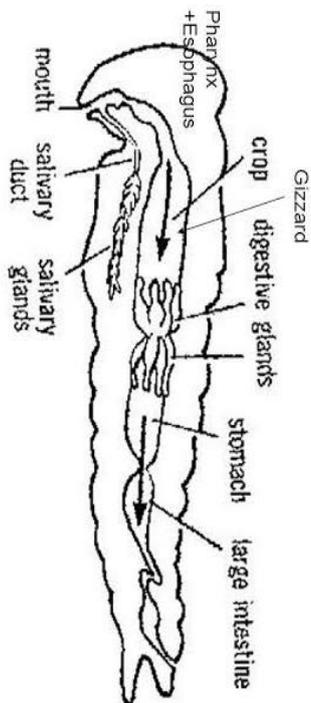
leaves the hind gut as finely shaped pellets.

**SIMILARITIES BETWEEN THE ALIMENTARY CANAL OF GRASSHOPPER AND BIRD**

Both have narrow esophagus, crop, gizzard, caecum and mid-gut.

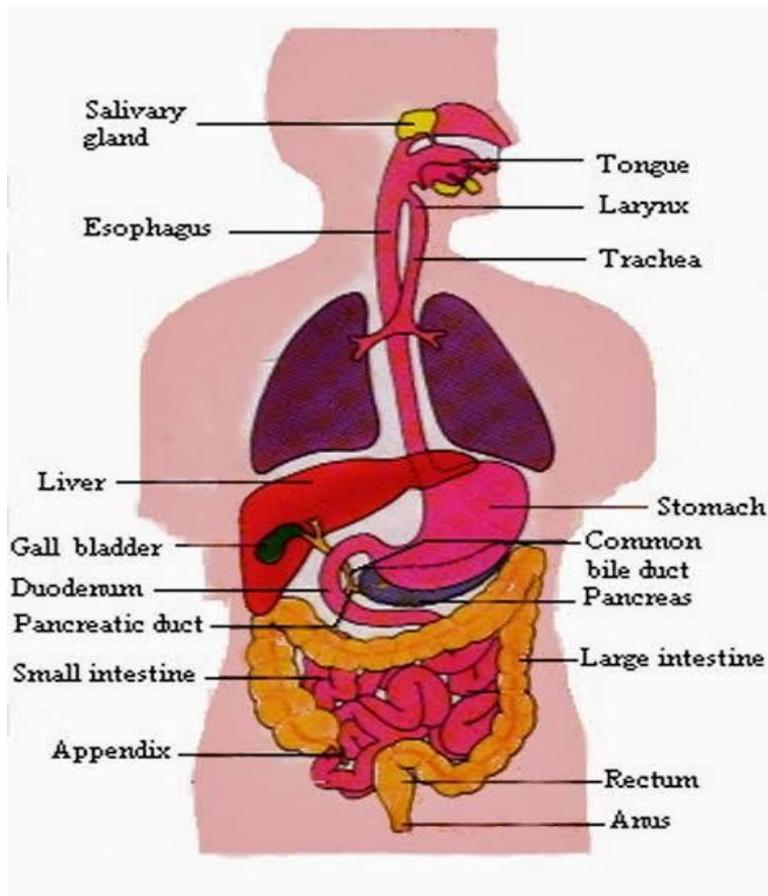
**DIFFERENCES BETWEEN THE ALIMENTARY CANAL OF GRASSHOPPER AND BIRD**

Grasshoppers	Birds
i) Tongue and pancreas absent	Tongue and pancreas present.
ii) mouth is modified into mandibles and maxillae	Mouth is modified into a beak
iii) Short alimentary canal	Long alimentary canal
iv) Hind gut ends in anus	Hind gut end in cloaca
v) Duodenum is absent and Malpighian tubules are present.	Duodenum is present and Malpighian tubules are absent

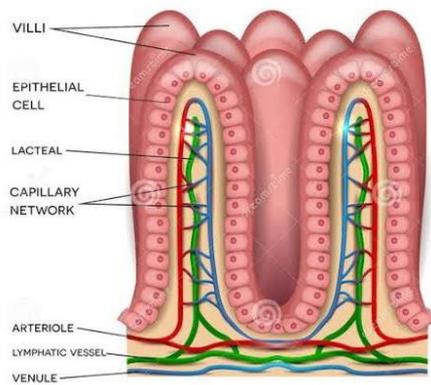


## MAN

The alimentary canal of man consists of the following parts, mouth (consists of the tongue, teeth and salivary gland), esophagus, stomach, duodenum (connected to the gall bladder and pancreas via the bile duct and pancreatic duct respectively), small intestine (the wall is lined with fingerlike structures termed villi), caecum and appendix, large intestine, rectum and anus. Once food is digested the teeth grind the food and then saliva is added for lubrication and it contains the enzyme ptyalin which digests starch to maltose. The tongue molds the food into a bolus that moves through the esophagus to the stomach for temporary storage. While the food resides in the stomach gastrin stimulates the stomach walls to secrete gastric juice which contains hydrochloric acid (this acid provides a conducive environment for the action of pepsin enzyme, this also kills germs and bacteria), pepsin (this enzyme converts proteins to peptones) and renin (this coagulates milk). The food is converted to a semi-liquid state called chyme. The food moves to the duodenum where the acidic nature of the food triggers a shock that causes the production of pancreatic juice (contains bicarbonate for neutralizing the acidic environment for function of the enzymes, contain amylase, lipase and trypsin). The amylase digests starch to maltose, the lipase digests lipids to fatty acid and glycerol and the trypsin digests proteins and peptones to polypeptides. It is important to note that bile is secreted to enable emulsification of lipids (i.e. lipids are made soluble in water for easy digestion). From the duodenum the food (now in a liquid form termed chyle) moves to the small intestine where digestion is finalized, and food nutrients are absorbed. In the small intestine digestion is finalized by the following enzymes; Erepsin (polypeptides to amino acids), Lipase, maltase (digest maltose to glucose), sucrase (digest sucrose to glucose and fructose) and lactase (digest lactose to galactose and glucose). Absorption of nutrients in the small intestine is via the villi. The villi are fingerlike structures that are vascularized and as such serve as the channel through which the nutrients get into the blood stream by means of diffusion and active transport. Sugars and amino acids are taken up into the capillaries and transported to the liver while fatty acids and glycerol are absorbed via the lacteal.



### INTESTINAL VILLI



## WEEK 9

### Topic: Digestive system 2

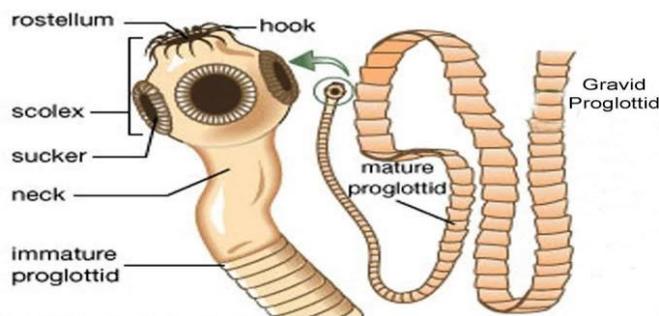
#### Sub-topic: Feeding Mechanisms and Feeding Habits

**Specific Objectives: at the end of this lesson, students should be able to -describe the modifications and feeding associated with some organisms**

### FEEDING MECHANISMS IN HOLOZOIC ORGANISMS

There are five modifications and mechanisms of feeding associated with some organisms. These include:

**1) Absorbing mechanisms:** e.g. tapeworm is an endoparasite in the alimentary canal of man that feeds by absorption of digested food from the intestine of man. Tapeworm has hooks and suckers for attachment to the intestine of its host to avoid dislodgment, it has a thick cuticle that protects it from digestive enzymes and a large surface area for absorption of food.



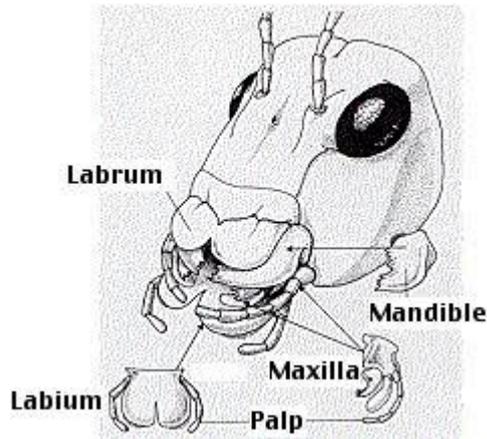
**2) Biting and chewing mechanism:** e.g. grasshopper and cockroach have four different mouth parts modified and adapted for biting or chewing. These mouth parts are:

**(i) Labrum (upper lip):** this prevents food from falling of the mouth.

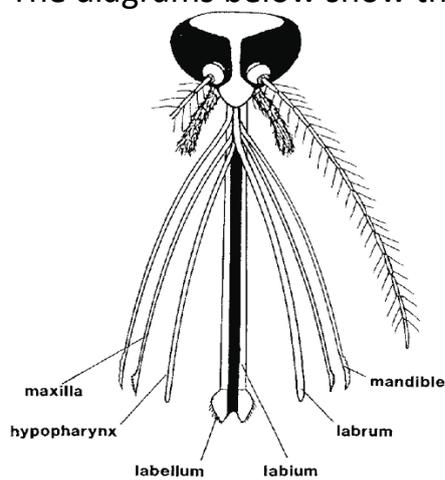
**(ii) Mandibles:** these are heavy toothlike structures used for cutting and chewing food materials.

**(iii) Maxillae:** these are biting blades that break down the food the mandibles have chewed into smaller particles.

**(iv) Labium (lower lip):** this prevents wasted of food from the mouth.



**3)Sucking mechanisms:** e.g. mosquito, butterfly and housefly are insects that have different modifications of mouth parts adapted for sucking their food. The diagrams below show this mouth parts.



**4)Grinding mechanism:** e.g. goat, sheep, man etc. these animals can grind their food before swallowing. These organisms possess a set of teeth; incisors for cutting food to bits, canine for tearing and the molars for grinding.

**5)Trapping and absorbing mechanism:** e.g. insectivorous or carnivorous plants like sundew and bladderwort have modified parts that enable them to trap insects and digest them. The sundew possesses curly extensions that traps an insect when touched and secretes enzymes to release the protein for absorption.

## FEEDING HABITS

Organisms exhibit different feeding habits, and these are:

**-Filter Feeding:** filter feeders or microphagous feeders feed on very tiny organisms that cannot be picked to the satisfaction of the feeder, hence they wallow in water and through their sieve-like body structures they obtain a reasonable quantity of food. E.g. mosquito larva, ducks, prawn, and mussel. Filter feeding in mosquito larvae for example has horny jaws and two small ciliated appendages or mouth brushes. They are used to create a current of water. The small colloidal particles or planktons are filtered from water and ingested into the mouth as food.

**-Fluid feeding:** these are organisms that feed on any fluid material. They can either wallow in their food to absorb it (e.g. tapeworm) or use suckers in sucking the fluid (e.g. butterfly) hence fluid feeders consist of two groups, the **wallowers** and the **suckers**.

**-Parasitic feeding:** these organisms depend wholly or partially on another organism for survival.

**-Saprophytic feeding:** these are non- green plants that feed on dead and decaying organic matter from which they derive nutrients. They possess hyphae instead of roots and through this structure they release digestive enzymes that digest their food externally for easy absorption.

### **TASK**

**-explain how each of the following organisms are adapted for obtaining their food (i) mosquito larva (ii) grasshopper.  
(WASSCE JUNE 2016)**

### **WEEK 10**

#### **Topic: Transport System**

**Specific objectives: at the end of this lesson I should be able to:**

- Define transport system stating the need for transport.**
- outline the materials for transport in lower and higher organisms.**
- discuss transport in flowering plants (transpiration and translocation)**
- describe the uptake of water, minerals, oxygen gas and carbon dioxide.**

**Transport** in plants and animals refers to the movement of metabolic materials from one part of the organisms where they are produced or obtained to the parts where they are either used, stored or removed from the body.

## **NEED FOR TRANSPORT IN PLANTS AND ANIMALS**

- 1) Movement of materials round the body of the organism.
- 2) There are several substances that require transportation e.g. digested food nutrients in the small intestine and oxygen in lungs.
- 3) Materials like oxygen, nitrogenous waste, amino acids, glucose, lipids, hormones (auxin), mineral salts such as nitrates and phosphate found in plants, need to be transported.
- 4) Through transport system metabolic waste products/excretory products are eliminated /removed via the kidney /lung/skin.
- 5) To enable the transport of hormones produced from endocrine glands to target organ.
- 6) Mammals are complex and as such their surface area to volume ratio is low and diffusion alone will be insufficient for the transport of materials.
- 7) Photosynthetic product in the leaves of plants need to be transported to various storage organs within the plants.
- 8) soil water absorbed by plants need to be transported to the leaves and other parts of the plant for photosynthesis and other functions.

It is important to note that the blood is the main medium of transport in mammals assisted by the lymphatic system/lymph.

From the points outlined above it is undeniable that an efficient transport system is required to cope with the problem.

## **Materials for transport in higher and lower organisms**

- 1) Oxygen
- 2) Carbon dioxide
- 3) Urea
- 4) Excess salt
- 5) Water
- 6) Amino acids
- 7) Sugars
- 8) Fatty acids and Glycerol
- 9) Mineral salts
- 10) Vitamins
- 11) Excretory products
- 12) Manufactured food.
- 13) hormones

## **MEDIA OF TRANSPORTATION**

This refers to the medium of transportation in living organisms, in all organism it is a liquid or fluid medium. Generally there are four media of transportation.

- 1) **Cytoplasm** (utilized by unicellular and lower organisms like paramecium, and amoeba. nutrients are transported via diffusion)
- 2) **Cell sap or latex:** this is the media of transport in plants.
- 3) **Blood:** This is the medium of transportation in most animals.
- 4) **Lymph:** Lymph is one of the mediums of transportation in higher animals.

## **TRANSPORT IN FLOWERING PLANTS (TRANSPIRATION AND TRANSLOCATION)**

The medium of transport in plants is the latex or cell sap. Materials required for transport by plants are numerous. Unicellular plants obtain oxygen by diffusion. In multicellular flowering plants, gases absorbed via the stomata (found in the leaf) and lenticel (found in the stem). Minerals, water and food are absorbed into the vascular tissues. These tissues are made up of vascular bundles which consist of Xylem, Phloem and cambium, the cambium is only present in a dicot plant.

### **PROCESSES WHICH AID TRANSPORT IN PLANTS:**

- 1) **Transpiration:** This is the removal of excess water from plants into the atmosphere in form of water vapour. Plants can lose water via the stomata (stomata transpiration), lenticel (lenticular transpiration)
- 2) **Translocation:** This is the movement of nutrients or food materials of photosynthesis Through network of the sieve tubes and via the phloem. Substances translocated include amino acids, sugars, hormones, closer catch you all.
- 3) Absorption of mineral salts.
- 4) Transport of water in the xylem tissue.

## **WATER, MINERALS OXYGEN GAS AND CARBON DIOXIDE UPTAKE**

Oxygen and carbon dioxide are absorbed via the stomata and lenticels. Absorption of water is via the root of the plant. The young root hairs of flowering plants penetrate the soil. The cell of root hairs is more concentrated than the surrounding, hence water from soil flow into the membrane and fill the vacuole. Tugor pressure is raised and osmotic pressure reduced. Water fills cell and reaches the cortex where it flows into the xylem. And the xylem by means of transpiration pull, root pressure and capillary action conducts and transports water. It is important to note that mineral salts are dissolved in soil water, hence transported alongside water.

<b>Differences between transport in plants and animals</b>		
<b>Features</b>	<b>Plants</b>	<b>Animals</b>
Medium	Water, latex/sap	Blood
Transport vessels	Xylem, phloem	Arteries, veins and capillaries
Substances transported	Starch	
Environmental factors	Transport depends on environmental factors	Transport is internal and is rarely affected.
Mechanism	Osmosis and transpiration, translocation.	Pumping of the heart.

## **WEEK 11**

### **Topic: Transport system2**

**Specific objectives: at the end of this lesson, students should be able to:**

- state the types of circulatory system**
- describe the types of circulatory system.**
- discuss the mechanism of transport in higher organisms (i.e. the process of circulation of blood )**

**The circulatory system** refers to organs and structures responsible for moving blood around the body.

### **TYPES OF CIRCULATORY SYSTEM**

- (A) Closed and open circulatory system.
- (b) Single and double circulatory system
- (c) Pulmonary and systemic circulatory system

### **Closed and open circulatory system**

In a **closed circulatory system**, the cavity of the blood vessels never meets the cells of the body. The blood vessels grow smaller to form capillaries to enable diffusion from blood vessels. Hence there is no mixture between oxygenated

(this is confined to the left part of the heart) and deoxygenated blood (this is confined to the right part of the heart) e.g. the circulatory system Of mammals.

An **open circulatory system** is one in which blood vessels leads out of the hear to an open space called haemocoels within the body cavity. In these spaces the blood comes in direct contact with the cells after which it is returned to the heart. Anthropods and some molluscs have open circulatory systems.

### Single and double circulation

In **single circulation** the blood passes through the heart once after making a complete movement round the body. This is common with fishes as they possess a two chambered heart.

**Double circulation** is the movement of blood through the heart twice every time it makes one complete revolution round the body. The double circulation is due to the pulmonary and systemic circulation of blood.

### Pulmonary and systemic circulation

Pulmonary is the circulation of blood between the heart and the lungs while systemic is the circulation of blood between the heart and all parts of the body excluding the lungs.

Pulmonary = heart + lungs

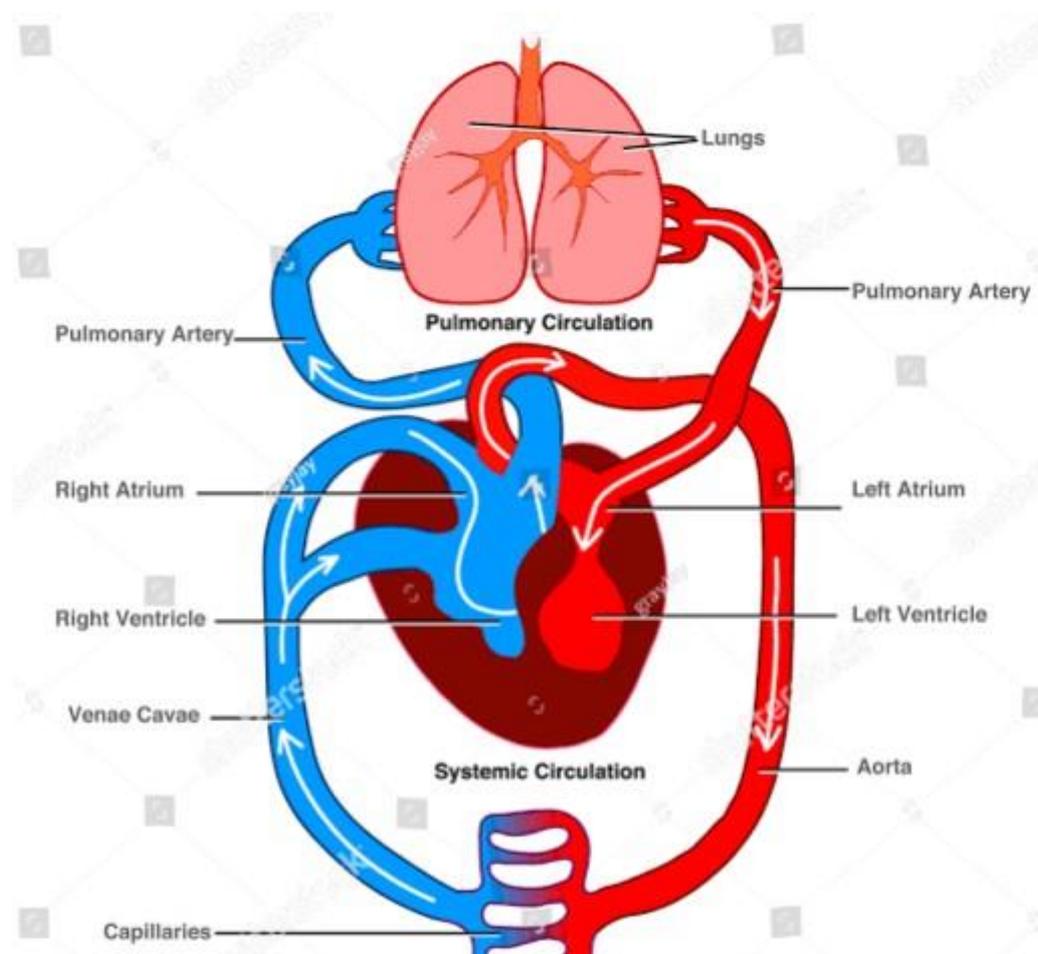
Systemic = Heart + body

### This circulatory system consists of two main parts:

**-The blood vessels:** these ducts carry blood round the body (they include the veins, arteries and capillaries). The artery is thick walled muscular elastic duct with narrow lumen of high pressure that transports oxygenated blood to the body tissues (except the pulmonary artery which transports deoxygenated blood to the lungs during pulmonary circulation)

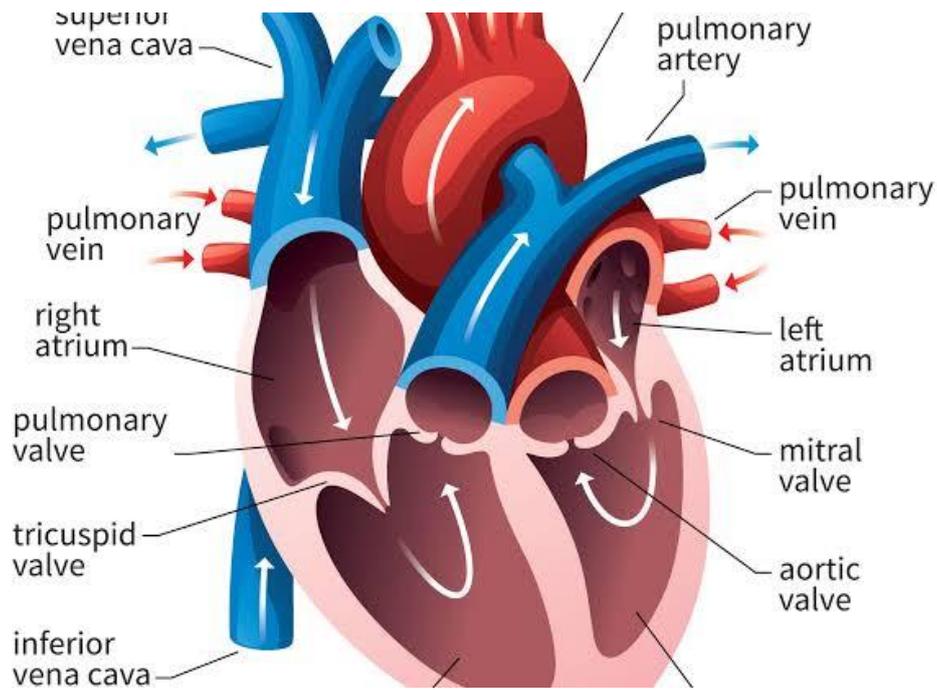
The vein is a slightly muscular inelastic duct with a large lumen of low pressure that transports deoxygenated blood from body tissues to the heart (except the pulmonary vein which transports oxygenated blood to my heart). The artery

narrows into arterioles and the vein narrow into venules, the network of blood vessels formed at the junction of a body tissue is the capillaries, these are very thin walled ducts that allow substances diffuse in and out.



**NB: The diagram above describes the mechanism of transport in higher animals. It consists of pulmonary and systemic circulation.**

**-The Heart:** This organ pumps blood through the blood vessels and this causes blood to flow round the body. It is four chambered.



## COMPOSITION OF BLOOD

Blood is the liquid tissue that serves as the transport medium of the body and it consists of blood cells and a watery liquid containing food molecules called plasma.

There are three blood cells namely and each performs functions beyond transportation, they include:

**1) Red blood cells:** These cells bind to oxygen and carbon dioxide; this facilitates the transport of these molecules. They contain a chemical substance called hemoglobin which is the binding molecule. The red blood cells are called the erythrocytes.

**2) White blood cells:** These cells defend the body from infection and toxins, they form the immune or defense system of the body. They defend by producing molecules called antibodies that bind to the toxins for destruction. White blood cells are called leucocytes and these leucocytes defend the body by engulfing invaders (these are called phagocytes and the process is phagocytosis) and by producing antibodies which neutralize toxins (these cells are called the lymphocytes (T lymphocytes are produced in the thymus and B lymphocytes are produced in the bone marrow)).

**3) Platelets:** These cells that aid blood clotting when an injury occurs. These are also called thrombocytes.

## **THE HEART, BLOOD VESSELS AND CIRCULATION**

The heart is a muscular organ which has four chambers. The two upper ones are called the right and left auricles and the lower ones are called the right and left ventricles. Every time the heart beats it pumps blood round the body. The number of beats per minute determines a person's pulse rate. Blood moves around the body through ducts called blood vessels which perform different functions; the arteries carry oxygenated blood away from the heart to the body tissue ( except the pulmonary artery which carry deoxygenated blood to the lungs), the veins carry deoxygenated blood from body tissues to the heart ( except the pulmonary vein which carry oxygenated blood to the

**Two fluids are used as a medium of transport in mammals: the lymph and the blood.**

### **Functions of the lymph**

- Absorption of fatty acids and glycerol.
- Body defense

### **Function of the blood**

- Transport of oxygen, excretory products, hormones, digested food, water and mineral salts.
- Blood clotting
- production of antibodies
- Temperature regulation.

## **WEEK 12**

### **Topic: HOMEOSTASIS**

**Specific Objectives: at the end of this lesson students should be able to:**

- define homeostasis**
- describe how homeostasis is achieved in lower and higher organisms**
- outline the parts of the mammalian body involved in homeostasis.**

When we consume food substances and our body cells utilize the nutrients to achieve several metabolic processes. It is also noticed that substances which are not needed are also generated in the cells (wastes of metabolism), even the useful nutrients must be present in levels that are conducive for the body.

From such balance to be achieved in the internal environment of mammals homeostasis must take place.

**Homeostasis** is the maintenance of a fairly constant internal environment in an organism. This is essential for healthy growth and proper functioning of the body cells. It involves maintenance of a fairly constant body temperature, blood glucose level, salt and water level in blood and cells (osmoregulation)

### Homeostasis in lower organisms

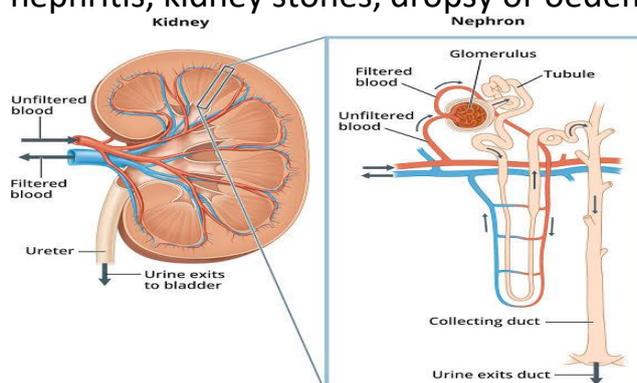
In unicellular organisms such as amoeba and paramecium possess contractile vacuole which enables them to carry out osmoregulation. When cell is placed in a hypertonic solution water enters the cytoplasm and in order to prevent turgidity and eventual bursting of the cell, the contractile vacuole collects excess water and discharges some to the external environment to achieve salt and water balance (osmoregulation).

### MAMMALIAN PARTS INVOLVED IN HOMEOSTASIS

- 1) Kidneys
- 2) Liver
- 3) Skin
- 4) ductless glands (hormones)
- 5) Brain

**Kidney** : this organ consist of tubules called nephrons that filter the blood and in the process obtain a liquid residue called the urine which is formed from the blood by extraction of excesses of water, nitrogenous wastes, salt, sugar, amino acids etc. this process is also termed urine formation and involves three key processes termed ; ultrafiltration, selective reabsorption and hormonal secretion. The kidney through this process performs the function of osmoregulation, excretion (urine generated as waste and excreted) and maintenance of acid-base balance.

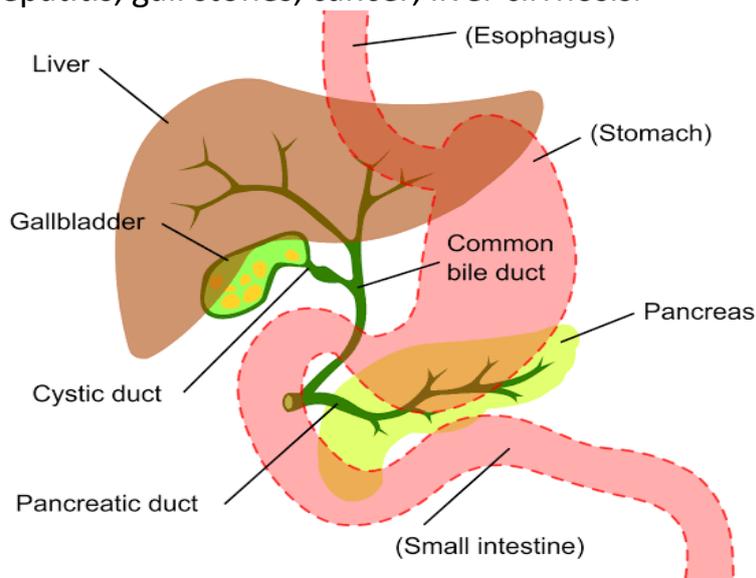
Diseases of the above organ which may lead to impairment include diuresis, nephritis, kidney stones, dropsy or oedema.



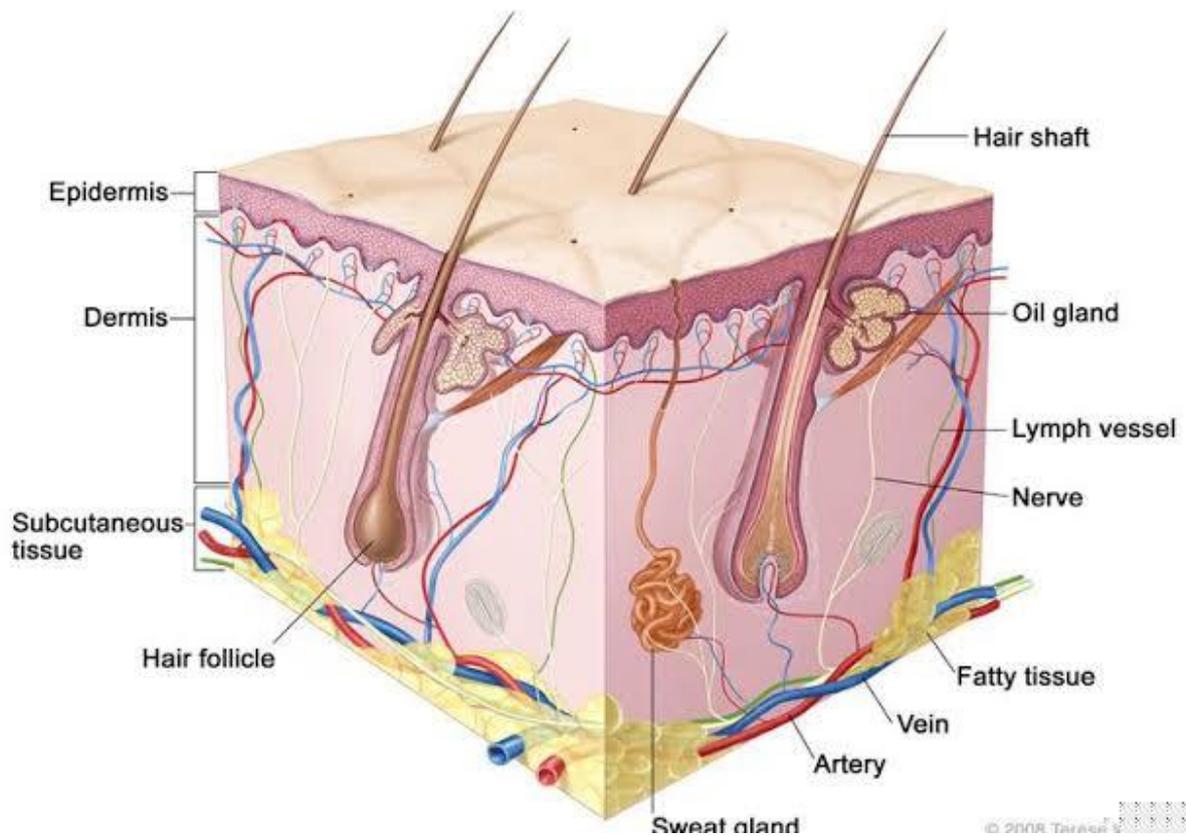
**The liver:** this is a large organ located below the diaphragm by the right side of the abdomen. The gall bladder which stores the bile is connected to the duodenum by the bile duct. The liver secretes the bile responsible for emulsification of fat. The liver receives blood nutrients from the intestine and performs the following function which maintains the internal environment:

- Regulation of blood sugar
- detoxification
- Regulation of blood proteins
- production of bile
- Formation of red blood cells
- production of heat
- Regulation of lipids.
- Manufacture of essential proteins
- breakdown of red blood cells to form bile
- storage of vitamins, iron and blood.

The liver function can be impaired by diseases which include: Diabetes melitus, hepatitis, gall stones, cancer, liver cirrhosis.



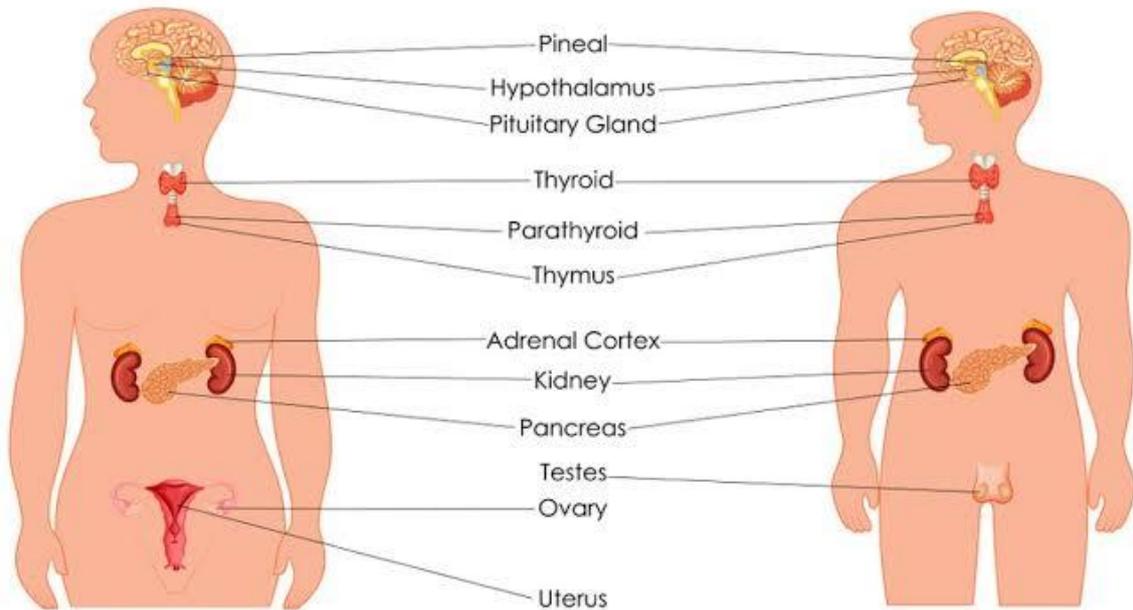
**The skin:** this is the largest organ of the body that covers the surface of the body. Apart from the bones and cartilage it is the toughest organ in the body. The skin is made up of two layers i.e. the epidermis and the dermis. The skin performs several functions that also aid in attaining homeostasis. Some functions of the skin include protection, excretion, sensitivity, vitamin D production, production of milk, storage of food and body temperature regulation (vasodilation, lowering hair and sweating on a hot day and vasoconstriction, raising of hairs on a cold day)



## The skin

**Endocrine glands:** these are ductless glands that secrete hormone into the blood stream to be transported to target organs where specific actions are stimulated to aid life processes and general body function. In these processes and actions stimulated, homeostasis is also achieved.

## Endocrine System Male-Female



**NB:** hormones are chemical substances secreted by the endocrine glands directly into the circulatory system to a target organ where they stimulate an activity within the organ. Hormones are necessary for sexual maturity, homeostasis, cell changes, co-ordination, growth stimulation among many others. The following are endocrine glands in the human body.

Endocrine gland/location	Hormones
Pituitary gland( mid-brain)	Prolactin, oxytocin, antidiuretic hormone(ADH), somatotropin, topic hormones.
Thyroid gland( anterior region of the neck)	Thyroxine
Parathyroid gland( near the thyroid)	Parathormone
Pancreas /Islets of Langerhans (loop of duodenum)	Insulin
Adrenal gland (top of the kidneys)	Adrenaline
Stomach	Gastrin

Testes	Testosterone
Ovaries	Estrogen and progesterone

NB: plants also produce hormones e.g. cytokinins, ethylene, auxin, gibberellins, abscisic acid, floregens etc.

**Brain:** this is a highly specialized organ consisting of three main parts (fore, mid and hind brain). the brain controls several voluntary and involuntary processes that maintain homeostatic balance. It is part of the nervous system, specifically the central nervous system and this system in conjunction with the endocrine system controls the coordination of body activities.

### WEEK: 13

#### Topic: Drug use and abuse

**Specific Objectives: at the end of this lesson, I should be able to:**

- define drug stating its various types and uses.
- define drug abuse stating the effects.
- state the function of some drug agencies in Nigeria.

**A drug** is any substance apart from food that is taken into the body to stimulate body functions. We have eight classification of drugs based on function:

- Stimulants (speed up the nervous system)
- Inhalants (drugs that are sniffed)
- Depressants (slow down the activity of the nervous system)
- hallucinogens (stimulates hallucination)
- Opioids (stimulates feeling of euphoria)
- Steroids (Stimulates physical performance and struct
- Prescription drugs (drugs used under guidance of a physician)
- Analgesics (drugs for reducing pain)

### DRUG ABUSE

This is the misuse of drugs and it involves the following;

- 1) Defying doctors' prescriptions.
- 2) Using a drug for what it is not meant for.

### EFFECTS OF DRUG ABUSE

- Physical and physiological damage.
- Addiction

- Impairment of acquired skill.
- Inability to control actions.
- Distorts the perception of reality.

### **ACTIVITIES OF DRUG CONTROL AGENCIES IN NIGERIA**

- 1) National Drug Law Enforcement Agency (NDLEA) ; In charge of arresting and arraigning drug traffickers and their sponsors,
- 2) National Agency for Food and Drug Administration and Control: In charge of regulating the quality of drugs and food by means of quality control and quality assurance.
- 3) Advertising Practitioners Council of Nigeria (APCON); In charge of regulating all advertisement of products and services be it drugs and food.

### **Attempt the following questions**

**1a.-state one function each of the following: arteries, capillaries, veins, xylem, phloem**

**b. describes the changes in the composition of blood as it passes through the i) lungs ii) kidney iii) small intestine**

**c) list the cellular components of blood. (WASSCE JUNE 2008)**

**2- What is translocation?**

**-State three differences between the transport system of flowering plants and mammals. (WASSCE JUNE 2011)**

**3-What is homeostasis?**

**-List five parts of the mammalian body that are involved in homeostasis.**

**RESEARCH TASK: Describe an experiment to show that water is conducted in the xylem tissue of flowering plants. (WASSCE JUNE 2009)**