

THIRD TERM: E-LEARNING NOTES

SUBJECT: BIOLOGY

CLASS: SS 1

SCHEME OF WORK

WEEKS

TOPICS

1.Revision of work done in second term

2.Micro-organism in action: (a) Growth of micro –organisms: ways of measuring the growth of microorganism(b) Beneficial effects e.g. in nature, medicine and industries (c) Harmful effects of some microbes (i) Types of disease-causing microorganism (ii) Diseases caused by microorganisms (iii) Ways in which disease causing microorganisms spread and are transmitted.

3.Towards better health: (a) Control of harmful microorganisms (b) Vectors (i) definition (ii) ways of controlling vectors (c) Students' health: Maintenance of good health.

4.Aquatic Habitat- Marine Habitat: (a) Characteristics of a marine habitat (b) The major zones (i) Splash zone (ii) Inter-tidal zone (iii) Sub-tidal zone (c) Distribution of the organisms in the habitat (d) Adaptive features of marine organisms

5.Aquatic Habitat- Estuarine Habitat: (a) Characteristics of estuarine habitat (b) Types of estuary (c) Distribution of the plants and animals in estuarine habitat (d) Adaptive features of plants and animal in estuarine habitat.

6.Aquatic-Freshwater Habitat and Terrestrial Mash: (a) Characteristics of freshwater habitat (b) Types of freshwater (i) Stagnant ones (ii) Running water (c) Fresh –water organisms (d) Terrestrial Mash.

7.Mid-Term Break.

8. Terrestrial Habitat-Marsh and Forest: (a) Forest (i) Characteristics of a forest (ii) Strata in the forest (iii) Distribution of plants and animals that inhabit a forest (iv) Adaptive features of the plants and animals (b) Grassland (i) Characteristics of grassland (ii) Types of grassland (iii) Distribution of plants and animals in a grassland (iv) Some adaptations of grassland communities (c) Arid land (i) Characteristics of arid lands (ii) Types of arid lands (iii) Distribution of the organisms in the habitat (iv) Some adaptation of organisms to arid lands.

THEME: CONTINUITY OF LIFE

9. Reproduction in unicellular organisms and invertebrates: (a) Reproduction in Amoeba by asexual reproduction (i) Binary fission (ii) Multiple fission (b) Reproduction in Paramecium by: (i) Asexual reproduction (ii) Sexual reproduction (c) Reproduction in Spirogyra by (i) Asexual or vegetative reproduction (ii) Sexual reproduction or conjugation (d) Reproduction in the Earthworm (i) sexual reproduction only.

10. Reproduction in invertebrates: (a) Reproduction in cockroach (b) Reproduction in housefly (c) Reproduction in the snail .

11. Revision.

12. Examination.

THEME: THE ORGANISM AND ITS ENVIRONMENT

WEEK 1

Activity: Revision of work done in second term

WEEK 2

TOPIC: MICRO-ORGANISMS IN ACTION

CONTENT:

1. Growth of micro-organisms: ways of measuring the growth of microorganisms.
2. Beneficial effects in nature, medicine and industries.
3. Harmful effects of some microbes

Sub – Topic 1: MICRO-ORGANISMS IN ACTION

Micro-organisms are very small living things which are normally not visible to the naked eye but can be seen with the help of a microscope.

TYPES OF MICRO-ORGANISMS

Micro-organisms include;

- (i) All Viruses e.g. Polio virus, Smallpox virus, etc.
- (ii) All bacteria e.g. Salmonella, Clostridium, Treponema, Escherichia coli, etc.
- (iii) All protozoans e.g. Plasmodium, Trypanosoma, etc.
- (iv) Some fungi e.g. Rhizopus (mould) and Yeast (e.g. Saccharomycetes).
- (v) Some algae e.g. diatoms, dinoflagelletes, etc..
- (vi) Blue - green algae e.g. Nostoc

Micro-organisms live everywhere, in water, air, soil, inside and outside of plants and animals including human beings. There are many more microorganisms than visible plants and animals in the world. They may have beneficial or harmful effects. Micro-organisms that cause disease are referred to as pathogens and are usually parasitic.

Anthrax Bacteria

An electron micrograph shows a cluster of bacteria, Bacillus anthracis, in a capillary of a lung. The bacteria cause anthrax, a disease in humans and animals that can result in death. Anthrax can be cured when treated early with antibiotics.

Growth of Microorganisms

Culturing is the growing of micro-organisms in prepared media in the laboratory. The prepared medium is called the 'culture medium'. Bacteria, fungi and algae grow easily in test-tubes, flasks or Petri dishes of culture media. Virus on the other hand, can only grow and multiply inside living cells, so they cannot be grown in a culture medium.

Micro-organisms are able to increase in size and multiply in number of cells. The growth of micro-organisms is measured based on increase in population size rather than increase in cell size. Under favourable conditions (food, adequate temperature and humidity) micro-organisms reproduce asexually by binary fission. Generation time varies from species to species e.g. rapidly growing specie like *Escherichia coli* can divide every 30minutes.

Two methods are used to measure the growth of micro-organisms;

(i) First Method: This involves inoculating a bacterial sample into a nutrient broth. As the bacterial population increases, the clear liquid medium becomes cloudy / turbid. Increase in turbidity indicates an increase in number of bacterial cells. Turbidity can be measured using a spectrophotometer. Thus by measuring the turbidity of a bacterial culture in nutrient broth at regular intervals, the growth of a bacterial population can be measured.

(ii) Second Method: This involves taking small samples of bacteria from a nutrient broth at regular intervals of time and diluting the samples several times. Each diluted sample is then inoculated onto a nutrient agar medium in a petri dish and incubated. The number of colonies formed in each petri dish is counted and this indicates the number of living bacterial cells in the diluted sample. From this, the actual number of bacteria in the original sample can be calculated.

EVALUATION

1. Mention five microorganisms
2. How is the growth of microorganisms measured?
3. Describe two ways of growing microbes in the laboratory.

Bacterium Showing Flagella

Although many forms of bacteria are not capable of independent movement, species such as the *Salmonella* bacterium pictured here can move by means of fine threadlike projections called flagella. The arrangement of flagella across the surface of the bacterium differs from species to species; they can be present at the ends of the bacterium or all across the body surface.

Forward movement is accomplished either by a tumbling motion or in a forward manner without tumbling.

Sub – Topic 2: BENEFICIAL EFFECTS

- (i) Bacteria in the large intestine of man synthesize the vitamin K that is needed.
- (ii) Yeasts are used in baking and preparation of alcoholic drinks. Yeasts are an important source of vitamin B.
- (iii) Some bacteria are used in curdling of milk, brewing of wine and in butter and cheese making.
- (iv) It is used in the production of antibiotics e.g. penicillin from the mould called penicillium.
- (v) Saprophytic micro-organisms decompose sewage into harmless inorganic compounds.
- (vi) Most decomposers are micro-organisms and they help to maintain soil fertility.
- (vii) Some bacteria living in the rumen of ruminants like sheep, goat, cattle help to digest cellulose in their food (grasses / vegetation).
- (viii) Micro-organisms help in maintaining some cycles in nature e.g. the nitrogen cycle and carbon cycle. They also help in recycling phosphates and sulphate.

EVALUATION

Name two beneficial microorganisms and state their benefits to man.

Sub-Topic 3: HARMFUL EFFECTS OF MICRO-ORGANISMS

- (1) Most diseases in animals and plants are caused by micro-organisms especially bacteria, viruses and protozoans.
- (2) Huge amounts of food are spoiled annually by saprophytic fungi and bacteria.
- (3) They also cause deterioration / damage to materials such as paper, wood, cotton, leather, etc.
- (4) Micro-organisms can also cause the death of plants and animals.

Cholera Bacterium

An electron micrograph shows the bacterium *Vibrio cholerae*, which can cause cholera, a serious infectious disease in humans. The bacterium produces a toxin that causes the small intestine to secrete large amounts of fluid, leading to diarrhea, vomiting, muscle cramps, and sometimes death. A vaccine made from dead bacteria offers partial protection.

Disease-Causing Micro-Organisms

Micro-organisms are spread through the following;

(i) Air: Dust and water droplets in our air contain micro-organisms such as polio virus, measles virus, pox virus, common cold virus, Pneumococci

(a bacteria), *Penicillium* (a fungus), etc.

(ii) Water: Bacteria found in water include *Bacillus*, *Pseudomonas*, *Vibrio*, *Azotobacter*, Coliform micro-organisms (e.g. *Escherichia coli*, *Vibrio cholerae*, *Salmonella typhi*), etc. Blue-green algae found in water include *Nostoc*, *Anabaena* and *Oscillatoria*. Protists in water include *Chlamydomonas*, *Euglena*, *Amoeba*, etc. Algae include *Spirogyra*, *Volvox*. Fungi include moulds and mildews.

(iii) Food: Most micro-organisms in food get in through faeces, dirty utensils and equipment, unhygienic habits and vectors like flies and cockroaches. Examples are *Shigella* sp, *Salmonella enteritidis*, *Aspergillus flavus*, etc.

(iv) Animal vectors or carriers.

(v) Personal or direct skin contact with a sufferer.

Disease-causing micro-organisms can enter the body through body openings like the mouth, nose or reproductive opening, through wounds, through bites of other animals and through blood transfusions.

Some important diseases, their causative micro-organisms, mode of transmission, host and symptoms are outlined in the following tables.

AIR-BORNE DISEASES

Disease Causative organism Mode of transmission

Host

Major symptoms

- 1) Common cold Virus Airborne Man High fever, headache running nose.
- 2) Chicken pox Pox virus Airborne Man Itchy skin rash
- 3) Measles Paramyxo- virus Airborne and close contact Children High fever, skin rashes, headache, head cold, cough, body pain.
- 4) Pneumonia Bacteria Air Man, birds, pigs, cows High fever, difficult breathing and cough
- 5) Tuberculosis Myco bacterium tuberculosis (bacterium) Airborne, food Man, cow Persistent dry cough and profuse sweating at night.
- 6) Meningitis Meningo coccus (Bacterium) Airborne Man High fever, headache, vomiting and stiffness of the neck.

Streptococcus Bacteria

This scanning electron micrograph shows disease-causing Streptococcus bacteria, commonly found in the human mouth, throat, respiratory tract, bloodstream, and wounds. Often airborne in hospitals, schools, and other public places, Streptococcus bacteria are responsible for infections such as strep throat, scarlet fever, and some types of pneumonia.

FOOD AND WATER BORNE DISEASES

Disease Causative organism Mode of transmission Host Major symptoms

1) Typhoid Salmonella

typhi (bacteria) Contaminated food and water Man High temperature, followed by bloody diarrhea

2) Cholera Vibro cholerae (bacterium) Food and water Man Vomiting and diarrhea

3) Food poisoning Salmonella sp. (bacteria) Infected meat, Poultry, eggs, milk and contaminated food Man Diarrhea and

Vomiting

4) Amoebic dysentery *Entamoeba histolytica* (protozoan) Contaminated food and water Man
Abdominal pain, and

Diarrhea

5) Poliomyelitis (infantile paralysis) Picornavirus (virus) Infected food and water, direct contact
Children High fever, headache nausea, fits and stiffness of limbs

Spirochete

Bacteria, included within the kingdom Prokaryotae, are single-celled organisms lacking a well-defined internal cellular organization. The bacterium *Leptospirilla icterohemorrhagiae*, pictured here, exhibits the spirochete, or spiral, structure characteristic of many of the 1600 species of bacteria.

VECTOR-BORNE DISEASES

- 1) Malaria *Plasmodium* sp. (protozoan) Bite of infected female *Anopheles* mosquito Man High fever, shivering and sweating
- 2) Sleeping sickness (Trypanosomiasis) *Trypanosom agambiense* (protozoan) Tsetse fly bite Man and domestic animals Fever, headache, sluggishness, drowsiness and un- controllable sleep
- 3) Yellow fever Arbovirus Bite of infected *Aedes* mosquito Man High fever, headache, backache followed by low body temperature and jaundice
- 4) Plague Bacterium Bite of infected Rat flea Man Shivering fever, cough and difficult breathing
- 5) River blindness (onchocerciasis) *Onchocerca volvolus* Bite of infected black fly Man Severe headache, high fever and gradual blindness

DISEASE SPREAD BY CONTACTS

- 1) Tinea versicolor Dermatophytes Direct skin contact Man Yellow patches on chest, neck, face and back
- 2) Athlete's foot Fungi Direct skin contact Man Itching, smelly patches between toes

3) Gonorrhoea *Neisseria gonorrhoea* (bacterium) Sexual intercourse Man Inflamed urethra burning sensation during urination and thick yellowish discharge in male. In females there may be pain during urination, redness around the urinary opening and vaginal discharge.

4) Syphilis *Treponema pallidum* (bacterium) Sexual intercourse Man A small painless sore or chancre on the penis or vulva. Mild fever, skin rashes, mouth ulcers and aches in lymph node regions. It may lead to abortion, attack the brain and cause blindness and insanity

5) Aids Human immunodeficiency virus. HIV Sexual intercourse, blood transfusion, infected sharp instruments, mothers to unborn child Man Susceptibility to all microbial infections, high fever, loss of weight, chronic diarrhoea, skin rashes, wasting away of muscles.

EVALUATION

Mention two disease causing microbes, state the diseases caused, the host, the mode of transmission and the symptoms of the disease.

OBJECTIVE TEST.

1. The growth phase in bacteria in which bacterial cells divide steadily at a constant rate is called phase. (a) decline (b) dividing (c) exponential (d) stationary
2. Which of the following microbes causes cholera ? (a) Bacterium (b) Fungus (c) Protozoan (d) Virus
3. Which of the following diseases is caused by a protozoan? (a) Cholera (b) Gonorrhoea (c) Malaria (d) Measles
4. A disease characterized by high fever loss of weight, chronic diarrhoea, skin rashes and wasting away and final death is (a) AIDS (b) gonorrhoea (c) staphylococcus (d) syphilis

ASSIGNMENT

1. How do microorganisms gain access into the body?
2. Describe the stages involved in the growth of inoculated microorganisms (graphical illustration is important).

3(a) What is a venereal disease?

(b) Mention four venereal diseases

(c) Outline five ways of controlling venereal diseases.

4. Read up on towards better health.

WEEK 3

TOPIC: TOWARDS BETTER HEALTH

CONTENT: 1. Control of harmful microorganisms

2. Vectors (i) definition (ii) ways of controlling vectors

3. Student's health: maintenance of good health

Sub – Topic 1: TOWARDS BETTER HEALTH: CONTROL OF HARMFUL MICRO-ORGANISMS

Better health can be achieved basically by controlling disease-causing micro-organisms and their animal vectors and also by improving health facilities.

Harmful microorganisms can be controlled by;

(1) Use of high temperature e.g. sterilization by boiling, autoclaving or heating of food, water and other products to kill micro-organisms.

(2) Use of drugs / antibiotics e.g. chloroquine kills plasmodium parasites.

(3) Use of antiseptics which kill or inhibit the growth of pathogenic micro-organisms.

(4) By immunization or vaccination against diseases such as measles, tuberculosis, polio, etc.

(5) Covering of food and water always to prevent contact with vectors.

(6) Destruction of vectors such as mosquitoes, flies, rats, etc.

(7) Use of disinfectants e.g. Lysol, carbonic acid, etc.

(8) Use of salt; this inhibits the growth of microbial cells and prevents their multiplication. Salt can be used to preserve food and wash cuts and wounds to prevent infection.

(9) Dehydration inhibits the growth of microbes; food can be preserved by drying. Drying in the sun can be used to kill micro-organisms in bedding blankets and clothes.

(10) Promoting health education.

(11) Quarantine services.

(12) Personal hygiene such as regular bathing, brushing of teeth, washing of hands before meal and after defecating, etc.

(13) Maintaining good health: This helps us to resist most pathogenic micro-organisms.

(14) Use of ultra-violet radiation to kill bacteria

EVALUATION

1. List six ways by which you can control harmful microorganisms

2. Explain 4 ways by which one can maintain good health.

Sub –Topic 2: VECTORS

Non-living agents that carry micro-organisms from one place to another include air, water and food.

Living agents that carry micro-organisms from place to place are animals. These animals that carry pathogenic (disease causing) micro-organisms are known as vectors.

Examples of vectors are cockroaches, fleas, mosquitoes, tsetse-flies, black flies, house flies, bed-bugs, ticks, rats, dogs, cats, etc. Vectors may transmit micro-organisms from place to place or person to person either mechanically or biologically.

(a) Mechanical Method: The vectors carry pathogens on various parts of their bodies e.g. legs, wings, mouthparts, hairs, etc. The pathogens do not grow or multiply on the body of the vectors. Pathogens carried in this way include *Salmonella typhi*, *Vibrio cholerae* and *Entamoeba histolytica*.

(b) Biological Method: The vector in this case becomes infected with the pathogen when it feeds on the body fluid of an infected person or animal. The pathogen develops and multiplies in the body of the vector which then infects a healthy person when it goes to feed. Thus part of the pathogen's life cycle takes place in the body of the vector. Examples of such vectors and the pathogen they carry are;

(i) *Anopheles* mosquito (female) carries *Plasmodium* (protozoan) that causes malaria.

(ii) Tsetse fly carries *Trypanosome* (protozoan) which causes sleeping sickness (*Trypanosomiasis*).

(iii) Aedes mosquito carries a virus that causes yellow fever / dengue fever.

Tapeworm; an endoparasite

Tick; an ectoparasite

Blood fluke; an endoparasite

Life cycle of human blood fluke

Control of Vectors

Vectors can be controlled by;

- (i) Killing the vectors e.g. by spraying with insecticides, use of traps and poisons for rats, etc.
- (ii) Use of larvicides to kill larval stages.
- (iii) Clearing bushes around houses.
- (iv) Destruction of breeding spots e.g. stagnant water should be drained to prevent mosquitoes from breeding.
- (v) Use of drugs to kill the micro-organism in the host.
- (vi) Keeping the environment clean etc.

EVALUATION

1. Define the term 'vector'
2. Enumerate four vectors, the pathogens they carry and the diseases caused by these pathogens
3. State three ways by which vectors can be controlled

SUB-TOPIC 3: STUDENT'S HEALTH: MAINTENANCE OF GOOD HEALTH

Maintaining the health of students and the people in a community is the responsibility of the individuals, the community, the government and health organization. Ways of maintaining good public health include;

1. Proper observance of personal hygiene. Keep yourself and your environment clean.
2. Proper refuse disposal e.g. burning in incinerators, burying in sanitary landfills, etc.
3. Proper sewage disposal e.g. use of pit toilets and water-closet toilets.
4. Protection of water supply by boiling, filtration, addition of chlorine, storage in clean containers, etc.
5. Protection of food by keeping them in clean containers, boiling or cooking properly before eating, washing of fruits, vegetables and hands before eating, etc.
6. Health organizations such as United Nations Children's Education Fund (UNICEF), World Health Organization (WHO), International Red Cross Society, etc. help to maintain the health of people in a country through their corporate activities.

OBJECTIVE TEST

1. Which of these is not a vector? (a) Black fly (b) Dog (c) Snake (d) House fly
2. Deficiency of proteins in the diet of young children will result in a disease called.....
(a) Kwashiorkor (b) marasmus (c) night blindness (d) river blindness
3. Which of these is not one of the uses of bacteria? (a) Production of amino-acids (b) manufacture of lactic acid (c) Production of vinegar (d) leavening agent
4. The health organization that is saddled with the responsibility of providing for the emergency needs of children in devastated areas is(a) International Red Cross Society (b) Nigerian Medical association (c) United Nations Children's Fund {UNICEF} (d) World Health Organization.
5. A way of providing good health in a community is.....(a) healthy living (b) control of diseases (c) sewage disposal (d) all of the above

ASSIGNMENT

1. Malaria is one of the most common diseases in the tropics. Explain clearly, how a bite from a mosquito can cause malaria.
2. Describe the functions of the following health organizations
(a) World Health Organization.

(b) United Nation Children's Fund (UNICEF)

(c) International Red Cross

3. Read on marine habitat.

WEEK4

TOPIC: AQUATIC HABITAT; Marine Habitat

CONTENT: 1. Characteristics of a marine habitat

2. The major zones

3. Distribution of the organisms in the habitat and their adaptive features.

Sub-Topic 1: MARINE HABITAT

An aquatic habitat is a body of water in which organisms live. Such organisms are called aquatic organisms e.g. fish, algae, crabs, etc.

There are three types of aquatic habitat namely,

1.the marine/salt water habitat;

2.the estuarine/brackish water habitat and

3.the freshwater habitat.

The marine habitat is a body of salty water. It is made up of the shore and open sea. Examples are the oceans and seas.

Characteristics of Marine Habitat

a.High salinity; about 35.2 parts of salt per 1000 parts of water.

b.High density of about 1.028; this enables organisms float in it.

c.Pressure increases with depth.

d.It is the largest of all habitats. It occupies over 70% of Earth's total area.

e.There is action of waves.

f. There is tide action i.e. alternate rise and fall in level of sea water twice a day.

g. The water is alkaline with pH of 8.0 – 9.0 near the surface

h. Oxygen concentration decreases with depth.

1. Light penetration decreases with depth.

j. Currents are always produced by winds at the surface of the ocean.

EVALUATION

1. What is a marine habitat?
2. State five characteristics of a marine habitat.

Sub – Topic 2: MAJOR ZONES OF A MARINE HABITAT

It has two major zones

(i) Littoral zone

(ii) Benthic zone

1. LITTORAL ZONE (Continental shelf)

This zone is sub divided into:

a. splash zone

b. intertidal zone

c. sub-tidal zone

1. Splash zone: this zone is just above the high tide mark, and is wetted by the spray from breaking wave. It has occasional moisture since it is the area where water splashes when the waves break at the shore.

1. Intertidal Zone: This covers the shoreline between the high and low tides. The zone is covered with water during high tide and exposed to air during low tide. This happens twice daily. The zone is exposed to wave action and has high photosynthetic activities because of abundant sunlight.
2. The Sub-tidal zone: This is the zone that extends over the continental shelf to a depth of about 200metres. The zone experiences more variations in temperature, water turbulence, salinity and lightning more than any other zone. It is the main site of commercial fish harvest. Its high productivity is attributed to its richness in nutrients, a large part of it being in the lighted (photic) part of the ocean.

1. BENTHIC ZONE (Continental slope)

This zone is characterized by:

A.Benthic zone: This consists of the deep water that extends beyond the continental shelf, from about 500m to the very depths of the ocean. It has very low light penetration and low nutrients.

B.Pelagic or abyssal zone: this zone is about 3000m, and has low light penetration, high pressure, low photosynthetic activities and the primary production of food is by chemosynthesis.

C.Hadal or aphotic zone: it is the deepest zone, ranging from 7000m, The water is dark and cold, i.e no light penetration, and on photosynthetic activities.

EVALUATION

1. Mention the two major zones of the marine habitat.
2. What are the characteristic features of each zone?

Sub-Topic 3: DISTRIBUTION OF THE ORGANISMS IN THE HABITAT AND THEIR ADAPTIVE

FEATURES

1. Splash zone/Shore organisms: On rocky shores, periwinkles and shore slaters are found in the area that water splashes when waves break (also called splash zone). Barnacles,

oysters, mussels and limpets are found on the intertidal zone of the rocks. Anemones, sponges and seaweeds are found on sheltered parts of rocks. Sea urchins, sea cucumbers and seaweeds are found in rock crevices. Most of these organisms have adhesive structures so as to be able to withstand wave and tide action. Example;

(i) Sargassum (a seaweed) is attached to rocks by holdfasts.

(ii) Barnacles are cemented to the rocks

(iii) Limpets have feet with which they hold onto rocks.

Sandy shore organisms include starfish, ghost crabs, bivalves and annelids. Their major adaptation is to burrow into the sand so as to escape being washed away by waves and tides.

(i) The shell of the starfish prevents it from drying up and it has tube feet which enable it to hold onto rocks.

(ii) Periwinkles have lungs to breathe and foot for attachment.

(iii) The ghost crab has gills for breathing in water and a spongy structure for breathing on land.

(iv) Crabs can burrow into the mud quickly to protect themselves against predators, strong waves and tides.

Star fish holding onto a rock.

Mussels in a tide pool.

2. Intertidal organisms: These include bivalves, mollusks, barnacles, anemones, worms, etc.

These organisms face the challenge of exposure and drying out. To overcome this;

(i) Barnacles, mollusks and worms on rocky areas withdraw into their shells or tubes which hold some water.

(ii) Bivalves have special feet for digging into the sand or mud.

3. Sub-tidal organisms: These include lobsters, crayfish and fishes like the sting ray and sole.

The sting ray's body is flattened from top to bottom and so it lives on the sea floor. The sole is also flat, it lies on its lower side and has both eyes on the upper side. These fishes lie buried in the sandy sea floor and hunt for small animals there.

The lobsters and crayfish have claws for seizing prey.

Crayfish

Lobster

4. Benthic organisms: These are mainly consumers and decomposers. Fishes that live in the deep sea are adapted to live under conditions of great pressure. Some have expandable mouths and stomachs for swallowing large prey. Most live on dead remains of organisms from surface waters above.

The open waters support planktons and nektons.

Planktons are microscopic organisms which float, drift or swim slowly on the surface waters. They include producers like diatoms and seaweeds and consumers such as protozoa, copepods, worms, larvae and mollusks. Adaptations of planktons that help them stay afloat include; oil globules inside the body; gas-filled external floats and bubble rafts; external spines and hair which (provide friction and prevent sinking).

Nektons are actively swimming animals e.g. fishes, whales, prawns and squids. Adaptive features of fishes include;

- (i) a streamlined muscular body coupled with fins which help them move swiftly in water.
- (ii) bony fishes have gas-filled swim bladders which help them to move to different depths in water.
- (iii) Sharks and dogfish have the ability to retain urea in their body to cope with high salinity.
- (iv) The herring take in salt water to maintain osmotic balance between their tissue fluids and the salt water.
- (v) Some bony fishes possess salt secreting glands in their gills for osmoregulation.

Squid

Ragged-tooth shark

EVALUATION

1. Mention four organisms found in the marine habitat.
2. Identify two organisms in the Benthic zone and state their adaptive features.

OBJECTIVE TEST

1. The surface of the marine habitat is called the..... zone.
(a) aphotic (b) splash (c) littoral (d) sub-tidal
2. Floating plants are called..... (a) benthos (b) newtons (c) phytoplanktons (d) zooplanktons
3. The largest and deepest aquatic habitat is the..... (a) lake (b) ocean (c) river (d) sea
4. The benthos are found at the of an aquatic habitat (a) bottom (b) middle (c) side (d) surface.
5. Starfish possess..... which help them hold unto rocks (a) cemented shells (b) Hard shells (c) tube feet (d) tube shells

ASSIGNMENT

1. Make a food chain with six of the organisms in a marine habitat.
2. Describe the structure of a named marine habitat.
3. From page 343 of the Modern Biology for Senior Sec. schools, draw the Zones of a marine habitat.

WEEK 5

TOPIC: AQUATIC HABITAT : ESTUARINE HABITAT

CONTENT:

- 1.Characteristics of Estuarine Habitat,
- 2.Types of Estuary
- 3.Distribution of the plants and animals in estuarine habitat

4.Adaptive features of the plants and animals in the estuarine habitat.

Sub-Topic 1: CHARACTERISTICS OF ESTUARINE HABITAT:

An estuarine habitat is ecological zone where river and sea water meet, thus to establish brackish conditions. Brackish water has a salinity which fluctuates with the tides and the wet and dry seasons. It is neither salt water nor freshwater, but the intermediary between both. It occurs where freshwater interact with salt water.

Characteristics of Estuarine Habitat

Some characteristics of estuarine habitat include:

- i.It has a fluctuating salinity
- ii.It has Poor aerated substratum or saturated soil that lack oxygen.
- iii.There is mild wave action.
- iv.There is high and low tidal influence.
- v.Soil erosion is prominent.
- vi.It is exposed and prone to flood periodically.

EVALUATION

- 1.Define estuarine habitat.
- 2.Outline three characteristics of estuarine habitat.

Sub-Topic 2: TYPES OF ESTUARY

- 1.Mashes
- 2.Deltas
- 3.Lagoons
- 4.Bay
- 5.Swamps

1. Marshes: brackish water marsh is usually found in intertidal areas which are periodically flooded and drained by the tides. They are especially common along the coastal areas near estuaries

2. Deltas: this is where a river divides into many channels before entering into oceans or sea. it is formed at the mouth of a river as it enters the sea.

3. Lagoon: a body of ocean water that enters into the land through a canal therefore has the opportunity of mixing with fresh water from rivers and streams.

4. Bay: it is a small body of sea water which enters into land and mixes up with fresh water from rivers and streams.

5. Swamps: a swamp is wetland with vegetation found in temperate and tropical regions. Brackish water marsh is usually found along coastal areas or intertidal areas which are periodically flooded and drained by the tides.

Types of Estuary based on salt mixing

We have the following:

a. Salt wedge estuary.

b. Vertically homogeneous estuary.

c. Partially mixed estuary.

Estuary

This diagram illustrates the three main types of estuarine mixing. Tides, wind, wave motions, and river runoff all contribute to create various water conditions within estuaries. Salt wedge estuaries, such as the Mississippi Delta, exist where the river current exceeds the tidal current. Equal river and tidal currents, such as those in the Chesapeake Bay, create a partially mixed estuary. Where the tidal range exceeds the freshwater inflow, as in the Bay of Fundy, mixing is more complete and a vertically homogeneous estuary is created.

EVALUATION

Mention three types of estuary.

Sub-Topic 3: DISTRIBUTION OF ORGANISMS IN AN ESTUARY

Plants: we have

- a. Red mangrove, *Rhizophora* sp. which is the main species of flowering plant in the lagoons or estuaries and
- b. White mangrove, *Avicennia* sp. occur in areas of higher salinity and drier land than the red plants.
- c. Plankton protists such as diatoms, and filamentous algae.
- d. Fern plant, *Acrostilchumaureum* (the only fern able to withstand salt water) grows in this habitat, so also are
- e. Numerous grasses (*Paspalum* sp.)

Animals:

- a. Invertebrates: mitten crabs, starfish, arenicola, mudskipper, lancelet and barnacles. The animals commonly found in the estuaries or lagoons are those that can withstand salinity variations and they include the bloody clam, common lagoon crab, hermit crab, the hairy mangrove crab, the fiddler crab, cichlids, the prawns, *Ethmalosa*, Arins, and the grey mullet (*Mugil*).
- b. Birds: such birds as the herons, waders and palm nut vulture are found here.
- c. Mammals include bats and monkeys.

Sub-Topic 4: ADAPTATIONS OF ESTUARINE ORGANISMS

PLANTS:

White mangrove has breathing roots to permit intake of atmospheric air and their leaves can excrete salts.

The red mangrove has still roots to enable it to withstand strong ocean winds

To ensure development of the seedlings and to avoid being swept off by ocean current, some seeds germinate on the parent plant.

ANIMALS:

Crabs have air-breathing lungs-like structures for breathing.

Starfish have tube feet to hold fast.

Barnacles and starfish have shell- like covering to protect them from drying up.

Food Chain in Estuarine Habitat

1. Diatoms Small fish Shark Man.
2. Detritus Shrimp Fish Bird.

EVALUATION

List some organisms of the brackish water.

Write two each of the adaptation of plants and animals in estuarine habitat.

GENERAL EVALUATION

1. One of these is a characteristic of the partially mixed estuary (a) equal tidal current (b) Lesser tidal counter-current (c) Greater river current (d) Lesser river current (e) Greater tidal current.
2. Characteristics of estuarine habitat include all these except (a) fluctuation salinity (b) poor substratum (c) soil erosion (d) mild wave action (e) constant high tidal influence.

ASSIGNMENT

1. Write a short note on the types of estuarine with examples.
2. List five types of freshwater bodies.
3. Briefly explain three types of estuary.

WEEKEND ACTIVITY

Visit a nearby freshwater and list all the organisms you find in it.

WEEK 6

TOPIC: FRESHWATER HABITAT AND TERRESTRIAL MASH

CONTENT:

1.Characteristics of freshwater habitat and Types of freshwater

(i) Stagnant water

(ii) Running water

2.Freshwater organisms.

3.Terrestrial mash

Sub-Topic 1: CHARACERISTICS OF FRESHWATER HABITAT

The freshwater habitat includes the lakes, ponds, streams, springs, and rivers. These water bodies are known for low salt content or low salinity. The animals and plants in freshwater habitat vary from the ones in the estuarine habitat. This is due to the salinity factor.

Some characteristics of freshwater habitat include:

1.It has low salt content.

2.Relatively small body of water.

3.The water is shallow.

4.Its temperature varies with depth and season.

5.Low density water.

6.Turbidity depends on season.

7.There is available oxygen in all parts of water but more at the surface.

8.Freshwater habitat accommodates bony fishes like tilapia.

TYPES OF FRESHWATER

Freshwater is divided into two broad types:

1. Stagnant water (lentic): pools, pond, puddles, and lakes.
2. Running water (lotic): Springs, streams, and rivers.

Tidal Pool

The fluctuation of the tide allows for a unique environment along shorelines. The current continually circulates and replenishes a rich supply of nutrients along beaches, but organisms living there must be adapted to both buffeting waves and frequent shifts from open air to complete submersion. Marine organisms adapt to the constantly changing surroundings in a variety of ways. Starfish use suction-cup feet, barnacles fix permanently to large objects like rocks and boats, and seaweed anchors firmly to the ocean floor. When the tide goes out, pockets of water remain trapped in rocks, depressions in the sand, and natural basins called tidal pools, like the one shown here during low tide.

EVALUATION

1. Mention five water bodies that can be categorise as freshwater habitat.
2. List two major types of freshwater habitat with three examples each.

Sub-Topic 2: FRESH WATER ORGANISM

Zones in Fresh Water Habitat

In freshwater habitat, four major zones are considered:

1. The edge of the water.
2. Water surface.
3. Body of water.
4. Bottom of water.

Fresh Water Organism

Some organisms in freshwater habitat include:

PLANTS: grasses, raffia palm, algae, bamboos, sedges, water lettuce, duckweed, microscopic plankton, water hyacinth, submerged plants such as phytoplankton(algae), ceratophylum, , bacteria, water lilies, spirogyra, hornwort and bladderwort.

ANIMALS: crabs, water snails, dragon flies, water snakes, toads, frogs, mosquito larvae/pupae, water scorpion, tadpoles, water bugs, diving beetles, fishes such as tilapia, flatworms, insect larvae, molluscs, worms, copepods, water skaters, water beetles, mud fish and cat fish, planarian, and dragonfly nymph.

Stream Life

(Left): At the stream's source, animals must be able to withstand both the cold and the rapid current of the strong headwater. Some organisms, especially the smaller ones, have hooks and suckers to help them cling to the rocks; most have streamlined bodies that minimize drag.

(Right): Free-swimming organisms populate the lower, slower areas of the stream.

Adaptation of Organisms to Fresh Water

Those features of organisms which structurally, physiologically, and behaviorally fit them for life in their particular habitats and improve their chances of survival are known as adaptations. They are adapted to the environment in the following ways:

1. Some animals attach to stationary objects by adhesive structures like suckers (leech), foot (water snail) and hooked claws (mayfly nymph).
2. Most submerged water plants have extensive parenchyma with large air spaces which enable oxygen to diffuse to all parts of the plants during photosynthesis.
3. Crustaceans use antennal gland as osmo-regulatory organ.
4. The lung fishes (protopterus) use gills for respiration but when the water dries up, they dig into the mud and breathe with lungs until the rains.
5. The presence of chloroplasts even in the epidermal cells of leaves and stems of submerged plants for photosynthesis.
6. A streamlined body is typical of many animals from insect larvae to fish for swimming

7. Roots are shorter and less branched, while rootless are devoid of root hairs for support.
8. Submerged plants absorb water and nutrients directly due to lack of cuticle.

Pond and Lake Life

Still water, in general are much warmer than rivers and streams, and can support many different kinds of plant and animal life. The silty bed of ponds and the shallower parts of lakes support rooted plants and burrowing larva, food for free-swimming animals such as fish and frogs. In deeper zones, where oxygen is less abundant, only animals adapted to the cold environment exist. Plankton develop at all levels.

EVALUATION

1. Outline four zones or areas of freshwater habitat.
- 1 List ten plants and animals of freshwater habitat.
- 2 Enumerate five adaptive measures of plants and animals.

OBJECTIVE TEST:

1. Which of the following is not a freshwater habitat? (a) pond (b) puddle (c) swamp (d) lake (e) pool.
2. The following characteristics are of fresh water habitat except (a) low salt content (b) high salinity (c) shallow water (d) low density (e) small body of water.
3. Which of the adaptive feature in a marine habitat? (a) Bladder for floating (b) hold fast for attachment (c) mucilaginous cover to minimise desiccation. (d) Fur to prevent loss of water (e) Retention of urea in the blood for osmoregulation.

ASSIGNMENT

1. (a) Outline four characteristics of freshwater habitat.
(b) When is the freshwater turbidity likely to be high?
2. Mention two plants and two animals that live in freshwater and how they adapt to

the habitat.

3. List all the characteristics of the four zones or areas of the freshwater habitat.

SUB-TOPIC 3: TERRESTRIAL HABITAT-MARSH

Marshland is a treeless land in which the water table is at, above, or just below the surface of the ground; it is dominated by grasses, reeds, sedges, and cattails. These plants typify emergent vegetation, which has its roots in soil covered or saturated with water and its leaves held above water.

Llanrhidian Marsh

The salt marsh channels on Llanrhidian Marsh in South Wales slowly fill with water on the incoming tide, watched by a flock of oystercatchers and gulls. The diurnal cycle of the tides flooding and exposing the flats generates a unique ecosystem rich in marine life. Salt marshes are found in the intertidal zone along low-energy coastlines, forming along the margins of estuaries, where freshwater from the land mixes with sea water. The extensive root systems of salt marsh plants enable them to withstand strong winds, waves, and flooding from storms, and act as natural buffers against storm damage to upland development.

Marshes may be freshwater or salt. Freshwater marshes develop along the shallow margins of lakes and slow-moving rivers, forming when ponds and lakes become filled with sediment. Salt marshes occur on coastal tidal flats. Inland salt marshes occupy the edges of saline lakes. The nature of a marsh—its plant composition, species richness, and productivity—is strongly influenced by its relationship to surrounding ecosystems. They affect the supply of nutrients, the movement of water, and the type and deposition of sediment.

In the prairie pothole country of glaciated central North America, freshwater marshes undergo a cyclic renewal that is induced by periodic drought and dependent on the feeding habits of muskrats. The cycle begins with a nearly dry marsh in which seeds of aquatic plants germinate in the mud. When the marsh fills, the aquatic plants grow densely. Muskrats eat large areas of the emergent vegetation, creating patches of open water. This causes the shallow-water emergent to decline, but the submerged and floating species persist. When the next drought comes, the cycle begins again.

Salt marshes are best developed on the Atlantic coasts of North America and Europe. In eastern North America the low marsh is dominated by a single species, salt-marsh cord grass. The high

marsh consists of a short cord grass called hay, spike grass, and glasswort. Glasswort is the dominant plant of Pacific Coast salt marshes.

WATER AND VEGETATION PATTERN

In some marshes, such as the saw-grass wetlands of the Everglades or in salt marshes that are swept twice daily by tidal floods, water flows like a sheet across the surface, and the terrain is typically dominated by one or two species of emergent vegetation. In other marshes the water flows in channels rather than in sheets, flooding only at times of snowmelt and heavy precipitation and bringing in nutrients and sediment. Such irregular deposition of sediments provides variations in water depth, thus creating conditions favourable for a variety of wetland species. Deep marsh water is colonized by aquatic submerged plants (pond weeds) and floating plants (pond lilies). Shallower water supports reeds and wild rice. Very shallow water supports sedges, bulrushes, and cattails.

As sediments and organic deposits raise the bottom of a marsh above the water table, aquatic vegetation is gradually replaced by shrubs and eventually by a terrestrial ecosystem of upland grasses or forest trees.

IMPORTANCE

Freshwater marshes provide nesting and wintering habitats for waterfowl and shorebirds, muskrats, frogs, and many aquatic insects (see Freshwater Life). Salt marshes are wintering grounds for snow geese and ducks, a nesting habitat for herons and rails, and a source of nutrients for estuarine waters (see Estuary). Marshes are important in flood control, in sustaining high-water tables, and as settling basins to reduce pollution downstream. Despite their great environmental value, marshes are continually being destroyed by drainage and filling.

Marsh Deer

Blastocerus dichotomus A female marsh deer shows off her summer colour of bright chestnut brown. The unique colour and large ears of this deer distinguish it from smaller South American deer. As its name suggests, the marsh deer lives in marshy areas with dense brush where it can feed on grasses and legumes. The species is rare throughout its range because of habitat destruction, overhunting, and susceptibility to diseases contracted from agricultural livestock.

Characteristics of Marshland

- i. Marshes are low-lying wetlands covered under shallow waters for long periods of time.
- ii. They are usually formed in lowlands and plains near lakes and creeks, river banks or river mouths where water drainage is poor.
- iii. They consist of grass-like vegetations which is able to grow in a waterlogged soil.
- iv. Due to abundance of nutrients and mineral present in the water, marshes are breeding and nursing grounds for wide variety of organisms.
- v. The relative humidity in the atmosphere over the habitat is usually high.
- vi. The water bodies usually contain much decaying organic matter.
- vii. The decay of organic matter takes place on a large scale in a marsh and this causes a decrease in the oxygen content of the water. Under the mainly anaerobic conditions in the water or soil, foul smelling gases may be produced in which hydrogen sulphide and methane may be present. The products of this decomposition change the chemical properties of the marsh. For instance, some marshes are very strongly acidic.

TYPES OF MARSHES

Marshes may be either saltwater or freshwater marshes. In Nigeria, salt water marshes are found along the Atlantic coast, which is influenced by the tides. Usually, freshwater flowing down the river, which empty into the sea, mixes with tidal sea water in the estuaries, creeks and lagoons. However, in the dry season, the volume of river water is relatively small, and large in the rainy season. This large volume of river water mixes together with tidal seawater in estuaries, creeks, and lagoons, filling them up and causing them to overflow their banks.

The water that floods the land near the estuaries, creeks and lagoons is a mix of fresh and salt water; hence the marshes are called saltwater marshes.

Freshwater marshes occur inland, just beyond the limits of the saltwater marshes and beyond the areas influenced by tides. In this zone, only the freshwater of the rivers overflows the river banks to flood the adjoining lowland, forming freshwater marshes.

PLANTS AND ANIMALS IN THE MARSHES

Plants found in saltwater marshes include various grasses and also algae that float on the water surface. Major animals include mangrove crab, lagoon crab, hermit crab, mudskipper fish, bloody calm (*Arcasenioides*), oysters, barnacles and angel-fish.

Freshwater marshes also have floating plants in standing water like algae, water lettuce, Lemna and Salvinia (water arum), various ferns and varieties of sword grass. The animals include frogs and toads, as well as fishes and birds that wade into the water to feed on fish for example, the heron.

ADAPTIVE FEATURES OF PLANTS AND ANIMALS IN MARSHES

The varying condition of the marsh makes the organisms ready to adapt to all kinds of condition:

- a. A soft muddy bottom that provides little support and anchorage;
- b. Low oxygen levels or an anaerobic environment in the soil;
- c. High salinity in salt marshes and
- d. Change in water levels due to the ebb and flow of tides.

Animals

- a. Invertebrates such as clams, shellfishes, shrimps and oysters;
- b. Reptiles like the salt marsh snakes and diamondback turtles;
- c. Amphibians such as frogs and salamanders;
- d. Birds like the great blue herons and clapper rails and
- e. Mammals such as muskrats, racoons, rabbits, and river otters.

SUMMARILY

In saltwater marshes, all the organisms have to be able to tolerate the salinity of the soil or water. They also have to tolerate the low oxygen concentration in the soil and water.

In freshwater marshes, the plants show adaptations similar to those of freshwater plants. Saprophytic organisms such as bacteria, which live on the dead organic matters in marshes, have to adapt to the mainly anaerobic conditions here.

EVALUATION

1. Define Marsh.
2. List types of Marshes.

3.State four characteristics of Marsh.

4.Write three adaptive features of plants and animals in Marshland.

WEEKEND ACTIVITY

Visit a nearby pond or stream and list out all the organisms you find there.

WEEK 8

SUBJECT: BIOLOGY

CLASS: SS1

TOPIC: TERRESTRIAL HABITAT – FOREST, GRASSLAND AND ARID LANDS

CONTENTS:

1.FOREST.

i.Characteristics of forest

ii.Strata in a rain forest

iii.Distribution of organisms in a forest

iv.Adaption of plants and animals in a forest.

2.GRASSLAND

i.Characteristics of grassland

ii.Distribution of plants and animals in grassland

iii.Some adaptation of grassland communities

3.ARID LAND

i.Characteristics of arid lands

ii.Types of arid lands

iii.Distribution of the organisms to arid Lands

iv.Some adaptation of organisms to Arid lands

1. FOREST

A forest is a plant community in which tree species are dominant. There are different kinds of forests, whose distribution is determined mainly by climate (particularly rainfall and temperature), but sometimes by elevation, soil factors and the activities of man, such as farming lumbering, cutting of firewood, bush burning, road construction and building construction. Forest used to cover most of southern Nigeria but the area covered by forest has been reduced by human activity. The rain forest is the major type of forest in Nigeria.

CHARACTERISTICS OF THE TROPICAL RAIN FOREST

i.The forest is rich in epiphytes and climbers.

ii.The interior of the forest has high humidity, low light intensity and damp floor.

iii.Tall trees with canopy strata.

iv.Trees are mesophytes with broad leaves.

v.Leaves of all trees have long drip tips to facilitate dripping off of water.

vi.The vegetation has a pattern of arrangement in storeys or layers.

vii.The forest floor is usually open with little vegetation.

viii.There is usually a large amount of leaf litter on the forest floor

ix.Leaves of all trees have long drip tips to facilitate dripping off of water.

x.Rainfall is usually very high.

STRATA IN A RAIN FOREST

The plants in a forest may be classified into five storeys or layers which are briefly described as follows:

1.The Emergent layer

- 2.The Upper layer
- 3.The Middle layer
- 4.The lower layer
- 5.The Ground layer/forest floor

1.The Emergent Layer: This is the topmost layer or storey made up of the tallest trees, over 40m tall, called emergents. The crowns of the emergents do not normally touch one another.

2.The Upper Layer: this is the second storey or layer and is made up of tall trees, between 20m and 40m tall. Their crowns touch, forming a continuous canopy below the emergents.

3.The Middle Layer: The third layer is made up of small trees, less than 20m tall, which also form a continuous canopy below the second or upper storey.

4.The Lower Layer: Below the third layer of trees is the shrub layer.

5.The Ground Layer/forest floor: the ground layer consists of shade-tolerant plants, including mosses and ferns.

DISTRIBUTION OF PLANTS AND ANIMALS IN THE RAIN FOREST

Plants: Plants such as Mahogany, Mango trees, Coconut trees, Oil palm, Orchids Ferns and herbs.

Animals: There are Birds, Squirrels, Snakes, Toads and Snails.

ADAPTIVE FEATURES OF TROPICAL RAINFOREST ORGANISMS

Plants (Morphological features)

1.Trees have broad leaves to increase rates of transpiration or gaseous exchange of leaves pointed to increases exposure to sunlight.

2.Leaves have pointed draw-out tips, for easy dripping of water or to prevent growth of fungi or algae underneath.

3.Trees have thin bark, to facilitate transpiration or gaseous exchange.

4.Plants with twining stems, for climbing up to source of light.

5.Presence of hydathodes, for guttationsetc.

Temperate Rain Forest

Although scattered pockets of temperate rain forest are found from Mount Rainier northward into coastal British Columbia, nowhere is their development as pronounced as in the Hoh, Queets, and Quinault river drainages along the Pacific coast of the Olympic Peninsula in Washington State. These bowl-shaped river valleys were scoured out during the last ice age, and the river valley shape and climate combine to allow these temperate rain forests to flourish.

Animals: These include animals with gasping pads, e.g. tree frogs, grasping scales, e.g. snakes, the ability to fly, e.g. birds, ability to jump, e.g. monkeys.

Example of food chain existing in the Habitat

Palm fruit Squirrel Snake Bird.

EVALUATION

1.What determines the tropical rain forest?

2.State four characteristics of the rain forest.

3.Outline the strata in the rain forest.

4.Mention five plants and animals in the rain forest.

5.Write two adaptive features each of plants and animals in the rain forest.

GENERAL EVALUATION

1.One of these is a determinant factor of the tropical rain forest (a) Sunshine (b) Climate (c) Temperature (d) Humidity (e) Rainfall.

2. One of these is not a plant of the rain forest (a) Mahogany (b) cocoa tree (c) Kolanut tree (d) Elephant grass (e) Oil palm.

SUB TOPIC 2: GRASS LAND

Grasslands are areas where the vegetation is dominated by grasses and other herbaceous plants. In West Africa, savannah vegetation is about the most important types of vegetation. In Nigeria, over 80% of the vegetation is one type of savannah or another.

CHARACTERISTICS OF GRASSLAND

1. The savanna vegetation is typified by tall grasses and scattered trees and shrubs. The species of grasses in the Sudan and Sahel savannah are annuals which often have cylindrical leaves to reduce transpiration. During the dry season, the leaves of the grass turn yellow and die but the roots remain dormant. The grasses are deciduous.
2. Savannah trees have thick barks which protect them from the effect of fire. Most of the trees are deciduous, they shed their leaves in dry season to reduce loss of water by transpiration and because of annual fire. The trees have long roots (e.g. acacia) to search for ground water.
3. Savannah vegetation is usually not as luxuriant as the forest vegetation. This is because the trees are fewer, smaller in structure and scattered within the savannah habitat.
4. The annual burning and fire in the savanna reduce the quality of the humus in the soil, while the ash retains some minerals salts which are washed into the soil during rains.
5. Rainfall is usually moderate (1000 -1500 mm per year) distributed over 6 to 8 months of the year. The dry season is longer in the savanna than the forest region.
6. Savannah soil is usually sandy, shallow of relative lower fertility than the forest soils.
7. Dry seasons bush fires and livestock grazing are common in the tropical savannah.

Fouta Djallon Savanna

While most of the Fouta Djallon region in Guinea is a rugged mountain plateau cut by deep valleys, the eastern portion is gently sloping land covered in part by savanna. The largest ethnic group of the region is the Fulani, many of whom raise cattle on the grasslands. The Fulani

arrived in the region in about the 10th century, and later established a series of kingdoms throughout the area which stood until defeated by colonial powers in the late 19th and early 20th centuries.

TYPES OF GRASSLANDS

The two main types of grassland are tropical and temperate savanna. Tropical savannas occur in West and East Africa, Southern Africa, north of the tropic of Capricorn, part of Brazil, north and east of Australian Desert and part of Indian deccan Plateau. About 80% of the vegetation of Nigeria is savanna type.

The different types of savanna vegetation in West Africa include – the Guinea savanna, the Sudan savanna and the Sahel savanna.

Temperate grassland includes the Steppe of Asia, Prairies of North America, Pampas of Argentina, Veldt of South Africa and Downs of Murray Darling Basin of grasslands are almost treeless. Among the trees of temperate grassland are poplars, willows and alders.

World map showing the tropical and temperate grassland. Nelson Functional Biology, by KOLA SOYIBO Book 1 page 222

Savanna Elephant

The savanna elephant is the largest of the three species of elephants. Savanna elephants live in grasslands and drier woodlands throughout Kenya, Tanzania, Botswana, Zimbabwe, Namibia, and South Africa.

Stephen Krasemann

DISTRIBUTION OF PLANTS AND ANIMALS IN GRASSLANDS

Grass is the dominant vegetation of the savanna. These shrubs and herbs are scattered in the savanna while grasses cover the soil within them. In the guinea savanna are broad leaved trees, while further north in the sudan and sahel savanna the trees are more scattered and shorter. There are thorny trees with narrow leaves- to reduce transpiration and withstand the prolonged drought.

Palms which cannot withstand the drought are restricted to the wettest area or along the rivers.

Tropical savanna is the home of wild animals. The animals population include herbivores like caterpillars, grasshoppers and birds which feed on grass seeds, grazing animals like cows, goats, sheep and wild herbivores like antelope, deer, elephant, giraffe and okapi.

Carnivores include lion tiger, leopard panter, jacka; and cheetah. Along the rivers and marshy lakes are several species of reptiles such as alligators, crocodiles, giant and monitor lizards; and mammals such as hippopotamus and rhinoceros. There are also numerous species of birds, butterflies, moth and other insects.

SOME ADAPTATION OF GRASSLAND COMMUNITIES

The main adaptations of savanna animals include the following:

- i. Adaptation for drought which include burrowing into the ground by animals such as the rats and building of well ventilated terminals by termites.
- ii. Adaptations such as sharp claw and teeth of the carnivores for catching their prey; and fast movement to catch them.
- iii. Sharp vision, sharp hearing and fast movement of prey to escape from the predators and living together in groups or herd to ensure protection for their members.

The main adaptations of the savanna plants include the following:

1. Adaptation of savanna plants for drought include shedding of leaves, possession of tiny leaves with highly reduced surface area, possession of thick cuticle over the leaf surface and reduction in the number of stomata on the leaves. Many plants possess underground stem through which tides them over the drought period.
2. Adaptation of savanna plants for annual fire include: the thick and cropybarts of the woody plants, possession of fire – restricted twigs; rapid regeneration shortly after fires by suckering

and coppicing, possession of various methods of regeneration vegetative after fires by herbs. This is by the use of organs such as bulbs, tubers, corms and rhizomes, which are buried below. The plants also produce numerous seeds which can remain buried in the soil and sprout quickly during the rains.

EVALUATION

- 1.State four characteristics of tropical grassland.
- 2.Discuss the distribution of plants and animals in the tropical savanna of West Africa
- 3.What are the adaptive features of grassland animals?
- 4.State three ways by which savanna plants adapts themselves to the annual bush burning

SUB-TOPIC 3: ARID LAND

Arid lands are places of water scarcity or where water remains frozen. Tropical hot desert is known for excessive heat and inadequate rainfall resulting in dryness. In the cold deserts the soil is frozen for most of the year. The heat of the sun is so weak that the ice does not melt in many places. As a result water is not available for plant use.

CHARACTERISTICS OF ARID LANDS

- i.They are characterised by very little rainfall which is very irregular in distribution, therefore water is very and shortly supply.
- ii.The temperatures are usually in the extreme, very high in the day time and very low in the night time.
- iii.Atmospheric humidity is very low.
- iv.Sunshine is very intense and penetrating in the hot deserts.
- v.The mean annual evaporation is very high.
- vi.The environment is naturally very windy.
- vii.They have very scanty vegetation
- viii.The ground may in many places have sand dunes.

The tundra is covered with ice in most periods of the year.

TYPES OF ARID LANDS

Arid are terrestrial habitats without water. There are two types of these arid lands.

i. Hot and dry deserts: here the temperature is usually as high as 80°. These include the hot deserts of the world such as Sahara desert of North Africa, Kalahari and Namib desert of Peru in south America.

ii. Cold and frozen desert: they have very low temperature of below 00 during winter. The top soil is frozen all the year round and the long winter lasts about 9 months annually. Cold desert include Gobi desert in china, the Pantagonian desert of south America, and the Tundra in Greenland and USSR.

DISTIBUTION OF ORGANISM IN ARID LANDS.

Very few plants survive in the arid lands and include the cactus family, grasses and thorny shrubs. As soon as rain falls the seeds germinate and make food available for a short time for primary consumers. Grasses grow during the short wet periods.

Fewer animals live under vegetable litters or branches, leaves and trunk of trees and shrubs while many more live in burrows in the soil. Among the primary consumers are beetles, larvae of insects, ants, grasshoppers and small animals like rodents. They feed partly on seeds and partly on dry remains of desert vegetation. Higher – order consumers are centipedes and scorpions. The predators are carnivores such as lizards, geckos, vipers and spiders.

SOME ADAPTATION OF ORGANISMS TO ARID LANDS.

The adaptation of plants and animals in arid lands are similar to those exhibited by the savanna plants and animals to survive drought and high temperatures. Many of the arid land plants also have their modified into scales or thorns. Some such as cactus also store water. The carmel is an example of arid land animal which can go about for a long time without water.

Farming Village, Nigeria

Most of the woodland savanna and forests of the Jos Plateau in central Nigeria have been cleared for agriculture. Farmers usually live in small villages composed of separate compounds, such as this one, where several related families make their homes.

ADAPTIVE FEATURES OF PLANTS IN ARID LAND

Plants that are adapted to dry habitat are called Xerotypes. They possess the following characteristics.

- i. Elongated, slender, branching and roots capable of penetrating great depths.
- ii. Possession of water storage tissue in their stem.
- iii. Possession of adaptive features such as waxy leaves with thick waterproof cuticle, sunken stomata covered with air and thick layer over stems and roots which help to reduce transpiration.

ADAPTIVE FEATURES OF ANIMALS IN ARID LANDS ARE:

- i. Body covering is dry and impermeable to water
- ii. Engaged in burrowing during the day and are active at night to avoid daytime heat.
- iii. Possession of excretory system that reabsorb water efficiently and only excrete concentrated urine and faeces.
- iv. Possession of mechanisms of reducing water lost with exhaled air.
- v. Possession of fringed feet and toes to enhance walking on loose sand.
- vi. Possession sand coloured body to aid camouflage and to remain undetected by predators.
- vii. Examples of animals in arid lands include camels, lizards, snakes, locust, birds, fox, antelopes and jerboa.

Game Preserve in Kenya

A giraffe towers over zebras on the savanna of a Kenyan game preserve. Home to many endangered species of wildlife, the African republic of Kenya shelters its wild animals in game preserves and national parks. Kenya outlawed hunting in 1977, but poachers continue to hunt

many of these commercially valuable animals. Tourists can observe and photograph the animals in safaris through the parks and preserves.

Gregory Dimijian/Photo Researchers, Inc.

EVALUATION

1. List three characteristics of arid lands.
2. Name two hot deserts and one cold desert of the world.
3. State three ways by which organisms adapt to the long drought of arid lands.

GENERAL EVALUATION

OBJECTIVE TEST

1. Which of the following is not an adaptation of animal living in grassland? (a) ability to live in burrows (b) moving about in herds (c) possession of poor sense of sight (d) ability to run at great speed
2. Which of the following is not true of grassland? (a) trees and shrubs have thick fire resistance barks (b) trees and shrubs shed their leaves in the dry season (c) the tree possesses relatively smaller and thicker leaves than trees in the forest (d) plants have shallow leaves
3. Which of the following trees is associated with arid land? (a) mahogany (b) cactus (c) pine (d) cones
4. Arid lands have the following characteristics except (a) they may be extremely hot or cold (b) water is very scarce in arid land (c) the rate of decomposition is very fast in arid land (d) Xerophytes are the dominant plant species.
5. Which of the following is not a temperate grassland (a) pampers of Argentina (b) sahara of North Africa (c) veldt of south Africa (d) Prairies of North America.

ASSIGNMENT

1. Discuss how plants and animals adapt to the long drought and scanty water of the arid land.

WEEKEND ACTIVITY

Go to a nearby forest and identify five plants and animals of the tropical rain forest.

WEEK 9

BIOLOGY

CLASS: SS1

TOPIC: REPRODUCTION IN UNICELLULAR ORGANISMS AND INVERTEBRATES

CONTENT:

1.Reproduction in Amoeba by Asexual Reproduction by

a.Binary fission

b.Multiple fission

2.Reproduction in Paramecium by

a.Asexual reproduction

b.Sexual reproduction

3.Reproduction in spirogyra by

a.Asexual or vegetative reproduction or conjugation

4.Reproduction in the earthworm by

a.Sexual reproduction

SUB – TOPIC1: REPRODUCTION IN AMOEBEA

Amoeba is a unicellular protozoa. Its mode of reproduction is asexual by fission and multiple fission.

Binary Fission

It occurs under normal condition in water when the organism grows to a particular size, the nucleus divides into two equal daughter nucleus divides nuclei and each of the daughter nuclei

become enclosed by half of the protoplast leading to the production of two daughter cells. The cell division is simply mitotic.

Diagram of binary fission in amoeba

Multiple fission

In some unicellular organisms such as Amoeba, the cells rounds up to a cyst-like structure. The protoplasm undergo fission as the nucleus of the parent divides into several daughter nuclei by amitosis (repeated divisions). This is followed by the enclosing one nucleus. Several cells are released from the cyst. The type of asexual reproduction occurs under adverse condition.

A diagram showing binary and multiple fission in amoeba

EVALUATION

1. Define asexual reproduction.
2. Name two forms of asexual reproduction in amoeba;
3. State two difference between binary fission and multiple fission.

SUB-TOPIC 2 : REPRODUCTION IN PARAMECIUM

Paramecium is a protozoa that is more developed than Amoeba. It reproduces both sexually and asexually. Asexual reproduction is by binary fission and sexual reproduction is by conjugation.

(a) Binary fission in paramecium

At maturity the cell stops moving. The two nuclei (macro nucleus and micro nucleus divide mitotically to give four nuclei). This is followed by the movement of the daughter nuclei in opposite direction to the anterior and posterior ends respectively, of a now elongated cell. After

this the cell divides transversely along the region of the oral groove and the daughter cells become separated under normal condition this occurs after 8 to 12 hours.

Sexual reproduction in Paramecium

Sexual reproduction by conjugation takes in Paramecium in the following steps:

1. Two individuals called conjugants come together and lie side by side.
2. The meg nucleus of each conjugants disintegrate.
3. The micronucleus of each conjugants divides into two parts twice, forming four micronuclei. Three of the four micro – nuclei in each conjugant disintegrate. The remaining micronucleus again divides into two.
4. One micronucleus from each conjugal migrates into the other conjugant. In other words, the conjugants exchange nuclear material.
5. The migratory nucleus of one conjugant and the stationary nucleus of the other conjugant fuse in each individual to form a fusion nucleus in each ex-conjugal divides into four new individuals, each with a new
6. The fusion nucleus in each ex-conjugant divides into four individuals each, with a new meganucleus and micronucleus.

Stages in conjugation in paramecium

EVALUATION

1. Explain sexual reproduction in paramecium
2. Describe asexual reproduction in paramecium with the aid of a suitable diagram.

SUB-TOPIC 3: REPRODUCTION IN SPYROGYRA

Spirogyra is a filamentous algae. It reproduces asexually by conjugation.

1. Asexual reproduction in spirogyra: fragmentation under ideal condition of food, sunlight and water a mature filament of spirogyra simply breaks into pieces. Each fragment forms a new filament.

Fragmentation in spirogyra

2. Sexual reproduction in spirogyra: there are two types of sexual reproduction in spirogyra. These are: lateral conjugation and scalariform conjugation.

a. Scalariform conjugation: in this, two filaments lie side by side, particularly or fully along their lengths. One cell from each filament produces tubular protuberances called conjugation tubes. These elongated and fuse to form conjugation canal. The mobile cytoplasm (male cytoplasm) moves through the canal and fuses with the cytoplasm of the other filament. The gametes in both fuses to form a zygospore. The zygospore germinates and forms a new filament.

Scalariform conjugation in spirogyra

b. Lateral conjugation: conjugation occurs between two adjacent cells on the same filament. Two common adjoining cells near their common transverse wall produce protuberances called conjugation tubes, which further form conjugation canal upon contact. The male cytoplasm migrates through the conjugation canal, fuses with the female. This union produces a zygospore. Each zygospores germinates and forms a new filament.

Lateral conjugation in spirogyra

EVALUATION:

Describe a sexual reproduction in spirogyra.

SUB-TOPIC 4: REPRODUCTION IN EARTHWORM

Earthworms are hermaphrodites. Each earthworm has both testes and ovaries. The sexual organs and their ducts are paired on each side of the worms' body.

Sexual reproduction in Earthworm

Copulation usually occurs only at night. Two copulating earthworms lie head to tail and side by side. In this way the clitellia secrete a mucus tube that surrounds the worm from before the reproductive segment to the clitellia segments. Sperms receive from a partner worm is stored in the spermathecal openings and then the two worms separate. Both secrete a new mucus tube that is enriched with album from the clitellum and wrapped in a membrane. the eggs are shed into this tube along with some sperm. The worm then backs out of the tube which now becomes the egg cocoon. Fertilization occurs inside the cocoon. The cocoon is left there, underground to attach to some leaves. It often changes shape. Becoming darker small and harder, the fertilised egg grows into a tiny earthworm.

Copulation in earthworm parent earthworm and cocoon

Parent earthworm and emerging earthworms

Emerged earthworm

EVALUATION

1. Define haemaphrodite.
2. Describe asexual reproduction in earthworm.

OBJECTIVE TEST

1. Which of these statements is incorrect (a) asexual reproduction involves only a single organism (b) amoeba and spirogyra reproduce by binary fission (c) paramecium reproduces by sexual reproduction (d) amoeba reproduces by fragmentation
2. Select the correct statement from this list (a) multiple fission occurs in amoeba (b) budding occurs in spirogyra (c) spirogyra reproduces only by asexual reproduction (d) planaria reproduces by binary fission
3. Which of these statements is false? (a) amoeba and paramecium are protozoa (b) a matured cell of amoeba gives rise to two daughter cells by binary fission (c) spirogyra reproduces only by conjugation (d) copulation in earthworm occurs at night
4. Which of the following structures is not associated with reproduction in earthworm? (a) clitellum (b) ditellia (c) oral groove (d) cocoon
5. In earthworm, cocoon or egg case is secreted by the (a) spermathecae (b) clitellum (c) ootheca (d) ditellia

WEEKEND ASSIGNMENT

1. Read about reproduction in cockroach and housefly.
2. What are the major differences in the lifecycle of a cockroach and housefly?

WEEK 10

SUBJECT: BIOLOGY

CLASS: SS1

TOPIC: REPRODUCTION IN INVERTEBRATES

CONTENT:

- 1.Reproduction in cockroach
- 2.Reproduction in housefly
- 3.Reproduction in snail

INTRODUCTION:

Reproduction is one of the activities that differentiate living organism from Non-living organisms. It is a process through which living organism replicate themselves to ensure continuity of life. Living organisms that fail to reproduce will come to extinct when all living member die.

Thus cockroaches, houseflies, snails and all invertebrates give rise to young ones after their kind. There are two types of reproduction-Asexual and sexual reproduction.

1.REPRODUCTION IN COCKROACH

Reproduction in cockroach is sexual. The process occurs as follows:

- 1.Male and female mate. Sperm cells from the male are stored in a pouch on the 7th abdominal segment of the female cockroach. This pouch is called Spermatheca.
- 2.Fertilisation occurs in pouch.
- 3.Spermatheca (Sperm pouch) forms the egg case called Ootheca. Ootheca contains between 10-16 eggs.
- 4.Ootheca is carried about by the female between its two hind legs for a number of days.
- 5.Female eventually deposit Ootheca containing the fertilised eggs in a suitable place like dark corner of a cupboard for incubation.

6. Incubation period is about 30 days. At the end of incubation, the eggs hatch to give small ones that are similar to the adult except for the absence of wings, small size and pale colour. This small cockroach is called Nymph. Nymph moults a number of times to get to a full grown cockroach.

Cockroaches Mating

Ootheca between the hind legs

Ootheca of a cockroach

Emerging nymph Emerging nymph

Emerged nymph Nymph and Adult cockroaches

EVALUATION

1. Describe sexual reproduction in cockroach.
2. Make a diagrammatic reproduction of the process.

3. Itemise the differences between adult cockroach and a Nymph.

2. REPRODUCTION IN HOUSEFLY

Housefly reproduces sexually, fertilisation is internal and it undergoes Complete Metamorphosis. Mating occurs between adult male and female housefly. Sperm mature before the eggs thus sperm are stored in sperm sacs until eggs are matured for fertilisation.

Mating in housefly

Life cycle of a housefly

STAGES OF DEVELOPMENT AND IN HOUSEFLY

1. Egg stage: after mating and fertilization, eggs are laid in batches of about 100 – 150 eggs.
2. Larva stage: under favourable conditions, eggs hatch after about 24 hours into larva. Another name for larva is maggot. Maggots are cylindrical in shape; they are tapered towards the anterior region and have 12 segments. At this stage, the maggot (Larva) has two spiracles, one on the 2nd segment and the other on the 12th segment for respiring. It has a mouth on the first segment which has a hook. Larvae grow very fast and start moulting two days after hatching from the egg. Ventral pads for movement are located on the 8th, 9th, 10th segments of the larva. The larva moults twice before metamorphosing into a pupa.
3. Pupa: By covering itself with a case known as pupa case after 3 moulting the larva changes into a Pupa. Pupa is barrel-shaped and inactive. The cylindrical shape of the

larva shortens and burrows into the soil. The skin hardens up and turns dark brown. Within 3-5 days under favourable conditions, the pupa hatches to give a young housefly. Cold weather however could delay hatching.

4. Imago or young adult: fully formed adult emerges from the pupa as the pupa case breaks open out of decaying matter. The imago stays for a few hours on a spot for its wings to dry up, harden and expand and flies off in search of food.

Housefly laying its eggs

Eggs laid in batches

Larval form(maggot) of a housefly

Pupal stage of a housefly

3.REPRODUCTION IN SNAILS:

Terrestrial snails are hermaphrodites, a few aquatic species have separate sexes. However, self-fertilization does not occur. Mating occurs and fertilization is internal.

To reproduce, two matured snails pair up to inseminate each other. Each member produces a special structure called spermatophore. The spermatophore is pushed into the partner's body thereby transferring sperm cells into the sperm pouch of each other each partner's egg is then fertilised with the sperm cells from the copulating partner when each is ready to lay eggs. Eggs are laid in shallow top soil while the weather is warm and damp. After about 2-4 weeks, the eggs hatch and the young ones emerge. Snails are prolific breeders. They can lay up to 100 eggs in a single breed and can lay eggs once every month.

Mating in snail

Reproductive structure of a snail

EVALUATION

1. Briefly describe how snails reproduce.
2. What is a spermatophore?
3. What is the duration between fertilisation of eggs and eggs hatching into small snails?
4. Snails are prolific breeders. Explain

OBJECTIVE QUESTIONS

1. Which of the following sequences describe development of an insect with incomplete metamorphosis?

a. Egg ----- Pupa----- larva ----- Adult

b. Egg ----- Larva ----- Pupa -----Adult

c. Egg ----- Nymph ----- Larva ----- adult

d. Egg ----- Imago ----- Pupa -----adult

2. A hermaphrodite is an organism that has

a. Female and male organs.

b. Both male and female reproductive organs.

c. Both male and female reproductive organs are one organism.

(b) Only the male reproductive organ.

3. Which of the following invertebrate exhibits incomplete metamorphosis (a) Mosquito

(b) Housefly (c) Butterfly (d) Cockroach

4. Spermatophore is a reproductive organelle in (a) Housefly (b) butterfly (c) snails (d) grasshopper

5. One of the following statements is incorrect. (a) internal fertilization occurs in snail (b) snails are hermaphrodites (c) as hermaphrodite, self fertilization occur in snails (d) snails are prolific breeders

ASSIGNMENT

1a. Distinguish between complete and incomplete metamorphosis with relevant examples.

1. With the use of annotated diagram, explain the major differences in the life cycle of a cockroach and a housefly.

2. Fill in the gaps accordingly

Organelle Invertebrate where found Notes (use)

Nymph

Spermatophore

Ootheca

Spermatheca

Imago

2b. Snails are prolific breeders, explain

2c. Explain the economic importance of (b) above.

WEEKEND ACTIVITY

Read up all the topics studied this term from week 2 – 9 and write out possible questions.

WEEK 11----- REVISION

WEEK 12 -----EXAMINATION