

SS3 Biology Lesson Note (First Term)

SCHEME OF WORK FIRST TERM SS3

WEEK ONE-REGULATION OF INTERNAL ENVIRONMENT

WEEK TWO-ENDOCRINE GLAND

WEEK THREE-THE SKIN

WEEK FOUR-THE SPINAL CORD

WEEK FIVE-REFLEX AND VOLUNTARY ACTION

WEEK SIX-ECOLGY OF POPULATION

WEEK SEVEN- TERRITORIAL BEHAVIOUR IN ORGANISMS

WEEK EIGHT-FAMILY PLANNINGWEEK

NINE-DEVELOPMENT OF NEW SEED

WEEK TEN-REPRODUCTIVE BEHAVIOUR IN ANIMALS

WEEK ONE

REGULATION OF INTERNAL EVIROMENT (HOME STASIS)

Homeostasis is the regulation of internal environment of the body so as to maintain a steady state by self-regulating adjustment .or homeostasis is the maintenance of a fairly constant internal environment of an organism .This self-regulating adjustment provides optimum conditions for normal and efficient functioning of the body cells thereby preventing the damage of the cells. Homeostasis takes place at all levels of living organism .In one celled organism such as amoeba the adjustment involves the whole body using contractile vacuole to collect and expel excess water while higher animal such as mammals, the adjustment are the tissues, organs and system levels .Structure that carry out these homeostasis in the mammalian body are the kidney , liver , skin, hormones and brain.

Regulating functions of kidney.

1. i) Osmoregulation (water balance in the body) is defined as the process by which living organisms balances the amount of water to mineral salts in its body fluids.

When the body contains small quantity of water and at the same time loosing water through sweating such as during exercise the body start conserving water to prevent damaging the body cell due to loss of water, the osmotic pressure of the blood changes, the osmoreceptor in the hypothalamus in the brain detect the changes in the osmotic pressure in the blood as the water content drops. The pituitary gland is simulated to release more ADH (anti diuretic hormones or vasopressin into the blood thus making the wall of the kidney tubules to be more permeable to water and so water is reabsorbed into the blood by osmosis.

When there is too much water in the blood, the hypothalamus in brain releases less ADH into the blood making the wall of the kidney less permeable to water so that less water is reabsorbed by osmosis

ii)Excretion of urea – the kidney removes urea as waste product of metabolism from the body.

iii)Maintenance of acids-base balance of the body- the acid-base balance of the body fluid is maintained by the kidney. The PH of human blood is between 7.35 and 7.45 (neutral). Anything below or above this range is dangerous to the body. if the acid content of the blood gets higher, the cells of the distal convoluted tubules reabsorb more hydroxyl ions (OH) from the urine and more hydrogen ions (H⁺) or acid are therefore excreted with the urine. On the other hand, if the hydroxyl ions content of the blood gets higher, less hydrogen ions are produced by the cells of distal convoluted tubule while more hydroxyl ions are excreted with the urine. In this way, the acid-base balance of the body is maintained

iv). The kidney eliminates undesirable substances such as drug, alcohol and toxins

v)The kidney helps to maintain the osmotic pressure of the blood by regulating the amount of mineral salt in the blood.

Diseases of the kidney

Kidney stone- This is a condition in which tiny solids e.g calcium phosphate present in urine blocks the nephron or kidney tubules. When the solid becomes too large it forms a kidney stone.

Effects

1. Passing urine is with great difficulty
2. Severe abdominal pain is experienced.
3. High blood pressure may be experienced.

Remedy.

1. Drink sufficient water and other fluid such as fruit juices during hot to prevent the urine from becoming concentrated
2. Avoid food item that are hard to digest
3. Avoid excessive intake of food contain calcium.
4. Drug capable of dissolving kidney stones may be given to the patient (oral acid)
5. Surgery may be used to remove the stones.

Diuresis

Diuresis is the removal of excess watery urine from the body through the kidneys. The situation occurs when the kidney tubules fail to reabsorb water from the glomerular filtrate back to the blood.

Causes

1. Diseases such as diabetes insipidus and pituitary diseases
2. Lack of a hormone called aldosterone causing excess sodium ions to be excreted
3. Drinking of excessive alcohol
4. Heart failure, renal failure and kwashiorkor

Effect

1. Thirst and dehydration occur due to excessive removal of body fluid.
 2. High blood pressure may result
- iii. It can lead of loss of serum electrolytes from the body

1. Loss of appetite, weakness, fatigue and nausea
2. Death may occur if not treated.

Remedy

1. Do not use fans and air condition in cold weather
2. Avoid excessive drinking of alcohol

iii. People lacking ADH and aldosterone should be treated.

1. Kidney transplant may be done on the patient

Nephritis or oedema

This may be caused by streptococcus infection in the throat, ear, nose or elsewhere.

The poison produced by the germs when carried by the blood to the kidneys damage the glomeruli. This will hinder the function of ultra-filtration in the glomerulus. The glomerulus become inflamed and causing them permeable than normal.

Effect

1. Puffiness in the face
2. Watery swellings in the feet and ankles a condition known as oedema.

iii. Kidney becomes swollen

1. Dizziness, fatigue, high blood pressure, convulsion, back pain, headache, fever and vomiting may result.
2. Protein and blood cells pass into the urine

Remedy

1. All food items must be properly washed or well cooked
2. Drinking water must be properly boiled and filtered

iii. Dialysis machine (artificial kidney) for filtering out waste from the patients' blood and body fluid.

In dialysis, the patient's blood is passed through the machine by tubes which convey his blood through the machine and back to his body. As the blood passes through the machines, waste products pass into fluid the machine

1. Kidney transplant – it is a surgical process of replacing a damaged or non-functioning kidney with a healthy kidney

THE LIVER (Structure)

The liver is the largest gland in the body. It is dark -red, spongy and lobed.

The lobes are caudate lobe, left lobe, right lobe and medium lobe. It is located below the diaphragm by a ligament and partly overlaps the stomach. Underside of the right lobe is a gall bladder containing a bile duct which leads from the liver to the duodenum. Blood is supplied to the liver by hepatic artery and hepatic portal vein. Hepatic vein carries blood away from the liver.

FUNCTIONS OF THE LIVER

1. Blood sugar regulation (Blood sugar constant)- Glucose in the blood stream is maintained at a constant level called sugar constant, as low level of glucose would be injurious to tissue of certain organs such as the brain that cannot store glucose. Surplus glucose is converted by the liver cells into glycogen for storage under the control of hormone called insulin. Glycogen is converted to glucose by another hormone called glucagon in order to maintain a constant blood sugar level. The liver also converts fructose and glucose for use by the body.

Glucose in the blood----- insulin--- glycogen in the liver.

2. Regulation of blood protein (Deamination) – is the process by which amino acids are split into its two components – the amino group (RNH_2) and the carboxyl group (COOH). The amino group which is harmful is converted into harmless urea which are excreted while the carboxyl group is processed as carbohydrate and stored in the liver as glycogen

3. Detoxification- is a process taking place in the liver where poisons or harmful substances such as drug, organic compound produced by bacteria are converted into harmless substances which are later excreted from the body. Some enzymes present in the liver cells convert toxic products into non-toxic compounds which are later excreted by the kidney. For example, hydrogen peroxide which is split into water and oxygen by enzyme called catalase in the liver.

4. The liver makes and secretes bile which is used for emulsification of fat in the process of digestion.
5. Formation of red blood cells in foetus but in the adult the bone marrow of long bone form red blood cell.
6. Regulation of lipids by removing the lipid from blood and convert them to glucose and oxidize them to release energy during aerobic respiration.
7. The liver produces heat which is distributed to all part of the body by blood circulation thus regulating the body temperature.
8. The liver manufactures essential blood proteins like fibrinogen, prothrombin, globulin which are needed in blood clotting.
9. The liver break downs worn-out red blood cells in adult
10. The liver manufactures vitamin A from carotene and stores fat soluble vitamin A, B₂ and D
- 11 The liver acts are reservoir of blood.

DISEASE OF THE LIVER

1. Infections Hepatitis (or viral hepatitis)- This disease is caused by virus. Faces of infected person many be carried to source of drinking water or food or palm wine. It may also be transmitted by transfusion of blood of an infected person to an uninfected person. Both forms of disease cause inflammation and destruction of liver cell if not treated.

EFFECT

1. Loss of appetite, nausea, weakness, fever, head ache, diarrhea, abdominal, discomfort, pain, yellow eyes, and skin

Remedies

1. Fruit and vegetable must be properly washed with clean water.
2. Drinking water must be boiled with filter.
3. Faces of an infected person must be buried deeply or burnt.
4. Flies should not be allowed to perch on food.
5. An infected person should have complete bed rest.
6. An infected must around protein foods such as meat, egg fish and groundnut.
7. Constant consumption of sugary foods such as glucose, sugar can pineapple and bread must be avoided.
8. Drink plenty of water.
9. See a medical doctor.

1. Gall stone

This disease is caused by over concentration of bile thus preventing its flow. This leads to crystallization of cholesterol in the bile to form stone. The stone may block the bile duct, this stops the flowing of bile. It also cause high concentration of bilirubin in the blood, tissue and bile which will result in overweight.

Effect

1. Abnormal pains, chills and fever
2. Skin and eyes turn yellow due to the concentration of bilirubin in the blood and tissues.
3. Its may lead to cancer of the liver

Remedies

1. Drink sufficient water or fruit juice
- ii. Reduce consumption of food containing cholesterol
- iii. Avoid overweight
- iv. See a medical doctor
- v. Gall stones can be removed by oral administration of a bile acid or by sugar in case of large stone

1. Sugar in case of large stone

3. Cirrhosis of the liver

This disease is believed to be caused by excessive drinking of alcohol over a prolonged period, as well as by hepatitis. it is a serious liver disease in which the cell of the liver is damaged and became useless fibrous tissue which deprive

the liver of its function.

Effect

1. General weakness of the body.
2. Loss of appetite.

Remedies

1. Avoidance of alcoholic drinking
2. Sugary may be done on the patient

iii. Liver transplant may be done

4. Cancer on the live

It is the abnormal outgrowth or uncontrollable swelling of cell which do not retain the normal function of the tissues in which they arise. This continuous outgrowth eventually will prevent the liver from performing its normal role.

Effect

1. It leads to general weakness
2. The body is exhorted

Remedies

1. The cancers cell may be destroyed using radiotherapy or chemotherapy
2. Sugary boon be done to sure the situation if detected early in life

iii. Liver transplant may be done

1. Amoeba liver abscess

The parasitic amoeba (*Entamoeba histolytica*) which causes amoeba dysentery is also responsible for this infection. The parasite gets into the liver from large intestine via the hepatic portal vein. It produces an enzyme that destroys liver tissue and cause an abscess to form. Abscess is an inflamed swelling containing pus.

1. Diabetes mellitus

The disease is caused as a result of the inability of the liver cell to convert excess glucose in the blood to glycogen due to the failure of the pancreas is produce a hormone insulin, therefore excess sugar left in the blood and lost through

Effect

1. It result is continuous dehydration
2. It may cause exhaustion or muscular weakness

iii. It may lead to blurred vision

1. It leads to lost of weight

Remedies

1. Drug therapy
2. Carbohydrate should be avoided

QUESTIONS

i) Which of the following is not a function of the liver ? (a) protein (b) heat production (c) detoxication (d) emancipation of cell

ii) The largest internal organ of the body is (a) lungs (b) liver (c) kidney (d) skin

iii) Which of the following mammalian organs is not involves in homeostasis? (a) tongue (b) liver (c) kidney (d) skin

iv) Which of the following is not a disease of the kidney? (a) hepatitis (b) nephritis (c) diuress (d) oedema

v) The maintenance of a steady internal environment in human is (a) internal control (b) temperature control (c) coordination (d) homeostasis.

THEORY

1. i) Explain why the kidney is referred to as osmoregulatory organ

ii) Mention any five Liver disease and explain any two of them

iii) Outline the functions of the liver and explain any two of them.

CHECK –ESSENTIAL BIOLOGY FOR MORE INFORMATION

WEEK TWO

ENDOCRINE GLANDS

The endocrine system consists of gland that are locate at various part of the body and which secrete substance called HORMONES. Other glands like salivary glands are called EXOCRINE gland. They release their secretions through ducts to where they

are needed. Endocrine glands have no ducts, they are referred to as ductless glands and their secretions are delivered straight into the blood stream.

Diagram of endocrine system

HORMONES

Hormones are chemical substances produced in small quantity by the cells of one part of the body and carried to all or some part of the body by the blood stream in animals or vascular system in plant where they produce a response.

The activities of the various part of the bodies in higher animals are controlled and coordinated by two coordinating system, these are nervous and endocrine system, the nervous system act swiftly, instantly and electrically while the endocrine system act slowly and chemically.

In animals' hormones are manufactured in ductless (endocrine glands) and poured straight into the blood stream. Hence, hormone can coordinate the body functions in a place far away from where they are produced.

1. **PITUITARY GLAND:** This gland is located below the hypothalamus in the fore brain, it consists of the anterior lobe of pituitary gland produce no less than six hormones . They are made up of four tropic hormones, a growth hormone and prolactin .The pituitary gland is considered as master gland because it controls other glands.

The tropic hormones are

a. Thyroid stimulating hormone (TSH) which stimulates the thyroid gland to produce is hormone .

follicle stimulating hormone (FSH) which causes follicle in the ovary to open mature stage to initiate sperm function.

Luteinizing hormone (LH) which causes the release of mature egg (ovulation into fallopian tube and secretion of testosterone in the testes.

The growth hormone (somatotropin) this hormone stimulates the grow of long bones, it increase the metabolic rate and promotes protein synthesis, over secretion of this hormone in children cause GIGANTISM while under secretion causes DWARFISM

prolactin- this induces milk production in pregnant woman from the mammary gland

Note- over secretion of somatotropin in adult leads to a condition called ACROMEGALY a situation leading increase in size of head, hand ,body, legs thick lips etc The posterior part of pituitary gland produces two hormones

f. Anti- Diuretic Hormone (ADH) It raises blood pressure by constriction of the arterioles and increasing the reabsorption of water in the kidney tubules

oxytocin this hormone induces milk secretion from the nipples and the contraction of the uterine wall.

2. THYROID GLAND –it is located in the neck just in front of the larynx . it provides three hormones but the most important is the thyroxin, .second hormone being calcitonin which lower the level of calcium in the blood by contracting effect of parathyroid hormone . The thyroxin is formed from amino acid and iodine .It regulates the growth and development of all body cells by increasing basal metabolic rate .

Under secretion if thyroxin is secreted at a level less than normal before maturity it causes CRETINISM. A cretin is a dwarf who is physically, mentally and sexually underdeveloped. The under secretion or deficiency of this may lead to GOITRE if under sec is after maturity the person is physically obese and mentally dull with a reduced heart beat and lowered body temperature.

Over secretion of thyroxin may result to HYPERTHYROIDISM i.e. increase in metabolic rate these are four tiny glands attaché to thyroid gland of the neck region. The secretion produces by this gland is called PARATHORMONE which raises the level of calcium in the blood.

OVERSECRETION

-it cause the softening of bones

-it brings about increase los of phosphate .

Under secretion – it lead to tetany (muscle spasm and possible death).

PANCREAS OR PANCREATIC GLAND

The gland is located in the loop of duodenum and pancreas is an organ that produces both enzyme and hormone. A group or cell which are scattered throughout the

pancreas are called islet of Langerhans which secrete hormones called INSULIN from the B- cells and GLUCAGON from the A- cell

Functions

- i) The insulin causes the conversion of excess glucose to glycogen for storage in the liver
- ii). Glucagon is also responsible for reconversion of glycogen to glucose
- iii). It also aids or stimulates the absorption of glucose by tissue cells.

DEFICIENCY OR UNSECRETION

-deficiency of insulin brings about a disorder called diabetes mellitus in which excess blood sugar cannot be converted to glycogen, it may also lead to high blood pressure

oversecretion

- falls in the blood sugar level.
- it may lead to hypoglycemia

ADRENAL GLAND

These glands are located on top of each kidney. They secrete two main hormones; each gland is made up of an outer adrenal cortex and inner adrenal medulla. The outer cortex produces a group of hormones called the corticoids. The inner medulla produces adrenaline and noradrenalin.

Functions: the corticoids regulate the level of potassium and sodium ions in the body fluids

little adrenaline and noradrenalin are hormones produced at emergency that is when terrified

over secretions

- i increases excitement and anxiety
 - ii increases blood pressure and heart beat
 - iii it leads to profuse sweating.
 - iv it leads to heavy breathing on under secretion
- i it brings about slow response to emergency
 - ii it leads to low heartbeat

iii it leads to low blood pressure

SEX HORMONES

The sex hormones which produce male and female reproductive germs cells are the testes and the ovaries. the testis produces the male sex hormones called TESTOSTERONE (ANDROGEN)

Functions:

I- development of secondary male sexual characteristics

ii-it aids the growth of penis and the maturations of the associated structure such as testes and accessory glands

Oversecretion

i -Abnormal urge for sex in males

ii-it leads to excessive development of sexual organ

undersecretions:

i-it leads to under development of sexual organs

ii-it leads to low urge for sex in male.

The OVARY produces female sex hormones which are OESTROGENS and PROGESTERONE

The production of sex hormones begins at puberty both in male and female and continues into old age. The stimulations of sex hormones are brought about by the gonadotropin

Functions:

i-the oestrogen initiates the development of secondary female sexual characteristics.

ii-it regulates the female the female reproductive cycle.

OVERSECRETIONS

-Abnormal urge in sex in female

- Early maturity of secondary sexual characteristics

UNDER SECRETIONS

It leads to poor development of reproductive system.

There is also delayed secondary sexual maturity.

PLANT HORMONES

The growth of plant to a great extent is regulated by hormones. This chemical substance influences the plant internally while a factor such as light temperature water and gravity influences the plant externally. They are produced or manufactures in the apical meristem of shoots and roots, young growing leaves, developing seeds and fruits and diffuse to other part to produce some special effects.

There are about five hormones produced by plant but three of them are very important. They are the auxins, gibberellins and cytokinin.

AUXINS

Among the neutrally occurring auxins that are known is the indole acetic acid (IAA) is the most important. The auxins is produced in the actively growing and developing part such as apexes of shoot and roots , developing leaves ,flowers ,fruits cambial cells from where it is transferred t for short distance by diffusion while for long distance through the phloem tissues .Auxins has been artificially synthesized .an example of synthesized auxins is Dichlorophenocy ethanoic acids (2,4,-D).

Auxins affects the rate of cells division, elongations and differentiation of newly produced cells.

TYPES OF PLANT HORMONES

I Auxins

ii GIBBERELLINS- are produced in young foliage leave and roots, a pieces of roots and system as well as in embryo .

iii CYTOKININS-are produce in the roots, embryo and fruits that are actively undergoing growth. Cytokinins are also growth promoting hormones like auxins and gibberellins.

1. ABSCISSIC ACID: The hormone is produces in matured green learned and fruits. It differs from auxin, gibberellins and cytokinin in being a growth INHIBITOR. It induces dormancy in bud and short such as under unfavorable condition of weather as well as playing a role in leaf and fruit fall.

ethylene (ETHENE): The hormone produces hydrocarbon in young shoots and fruit the hormone stimulates the ripening of fruit and suppress the development of internal buds when activated by auxin

Functions of Auxins

PHOTOTROPISM of shoot: when light shines on one side of the shoot of a plant, the auxin on that side is reduced and consequently the growth of that side slows down. The side receives more auxins resulting in faster growth. This unequal growth produces bending of the shoot towards the side receiving light.

1. Inhibition of lateral buds growth auxins produced in the terminal bud stimulate produced in the terminal bud stimulate the growth or elongation of the main stem while at the same time move downward to the stem to inhibit the growth of lateral bud.

iii. **FRUITS DEVELOPMENT:** After fertilization auxin are produced and sent to the ovary causing rapid development of the ovary as it develops into fruit.

iv. **PREVENT FORMATION OF ABSCISSION LAYER-** the presence of auxin at the base of flower stalk will help to fruit to reach ripening stage.

reduction of auxin at the base of petiole will allow formation of abscission layer will allow shedding of leaves

1. **PARthenocARPY-** Auxins and other plant hormones induce parthenocarp i.e fruiting without fertilization.

vii.-Auxins break dormancy in seeds and ensure their early germination

Function of gibberellins

1. It promotes flowering in some plants
2. It stimulates mitosis in meristematic and in embryo during germination.

iii. It helps to retard the onset of aging in leaves by maintaining protein and nucleic acid synthetic

1. It increases resistance of some plants to harmful effects such as viral infection, radiation and low temperature.

MODERN APPLICATION OF AUXIN IN AGRICULTURE

1. The synthetic auxin commonly known as 2,4-D is used as a selective weed killer (herbicide) to control weeds.

ii. Cytokines which prevent the aging process is used to store and preserve vegetables

iii. Naphthalene acetic acid (NAA) is a synthetic auxin is used to stimulate fruit production in flowering fruit trees. In some species it causes the flower to produce fruit without fertilization, a phenomenon called parthenocarp.

1. Yam and potatoes have preserved for a long time by the application of auxin to tubers.
2. Synthetic auxin is used to seal up cut area of plant after grafting by inducing new tissues formation

3. Auxin are used as rooting powders which are applied to the ends if cutting to induce root formation.

QUESTIONS

- 1a. What is homeostasis?
- 1b. List five applications of plant hormones in agriculture.
- 2a. Describe the process of osmoregulation in man.
- 2b. State two functions of a named animal hormones and two functions of a named plant hormones.
- 2c. Draw a diagram to show the location of the following hormones; adrenal gland, thyroid gland, pituitary and ovary.
- 2d. State the effect of over secretion and deficiency of: (i) thyroxine (ii) adrenaline (iii) insulin (iv) oestrogen.
- 3a The hormone in a mature female that causes the release of mature eggs into the fallowpian tube is (a) follicle stimulating hormone (b)luteinizing hormone (c)thyroxine (d) thyroid stimulating hormone.
- b The hormone that maintains pregnancy is (a)testosterone (b)oestrogen (c) progesterone (d) auxin
- c Which of the following is a negative plant hormone? (a) abscisic acid (b)gibberellin (c) ethylene (d) none of the above.

WEEK THREE

THE SKIN

The entire surface of the body is covered with skin. It is the extensive organs in the body. The mammalian skin consists of two major layers - the epidermis and linear dermis. Epidermis-This is further divided into three layers knows as cornified or horny layer, granular and Malpighian layer. The cornified or horny layer is upper most layer of the flat dead cells. This layer protects the body against loss of water and entering of foreign bodies. It also protects the under lying layers from excessive harmful radiation of the sun.

Granular layer contains living cells. It lies just below the cornified layers. The cells become gradually flattened and longer until they are up to cornified cells.

Malpighian layer is a layer of living cells where active cell division takes place.

The layer contains dark melanin pigment which gives the skin its colour. Black people have more melanin than white people, this pigment is absent in Albinos. Both cornified layer, granular and Malpighian layers have Keratin which is responsible for the toughness and flexibility of the skin.

DERMIS.

The dermis is a thick layer of connective tissues. This layer consists of blood vessels, sweat glands, sebaceous glands, hair follicles, erector muscles, sensory cells and fatty cells.

Blood vessels supply food and oxygen to the tissues of the skin, and the blood in the capillaries determines the amount of heat that is lost from the skin surface by radiation and convection.

Sweat gland - is a coiled tube which arises from the dermis and continues as a sweat duct that opens at the surface of the skin as sweat pores.

The sweat gland is well supplied with blood capillaries from which the sweat gland absorbs waste products such as waste, sodium chloride, small amounts of urea as sweat and sends them to the surface.

Why does the skin through the sweat pore? When the sweat evaporates from the skin, it has a cooling effect on the body. It is also concerned with temperature regulation.

Each hair follicle is supplied with at least two sebaceous glands which secrete

only a substance called SEBUM which lubricates the hair and keeps it flexible. The sebum also contains lysozyme which kills bacteria and viruses.

HAIR FOLLICLES

Each hair has a deep pit called hair follicle. The hair itself projects out by the skin as the hair. Erected hair shaft traps a layer of air between them to prevent heat loss by convection which is a function in temperature regulation.

The cell of the dermis produces the hair and hair itself is made up of protein called Keratin.

HAIR ERECTOR MUSCLES This a slender muscle which runs each from each side of the hair to the base of the Malpighian layers. The contraction of the muscle makes the hair to stand upright and its relaxation.

FATTY CELL (ADIPOSE TISSUE) These cells are formed below the dermis. They are round in shape and act as insulating layers against heat loss. They also act as energy reserve and protect the skin from mechanical danger

FUNCTIONS OF THE SKIN

1. **PROTECTION**-The skin protects the body against entrance of microbes, mechanical injuries, ultra-violet rays of sunlight and desiccation by acting as water-proof. The melanin absorbs the ultra-violet rays which is harmful to the body
2. **SENSITIVITY**. They contain different sense receptors which are to different environmental stimuli such as heat, pressure, cold, touch, and pain.
3. **EXCRETION AND OSMOREGULATION**-The sweat gland excretes surplus water containing salt and some little amount of waste nitrogenous substances mainly urea.

4. **STORAGE OF FAT**-Fats are stored under the dermis where they act as insulating layer.

5. **THE MAMMARY** glands of mammals are modification of the skin which produce milk feeding the young ones.

6. **THE SKIN** manufactures and stores vitamins D.

7. **THE SKIN** regulates the body temperature in two major ways;

(a) when the environment is hot. In hot weather the body temperature goes up, and the following happens to maintain a constant body temperature.

1. **VASODILATION** during which the blood vessels under the skin dilate which causes more blood to flow to surface of the skin. This allows heat to be lost by radiation, conduction and convection.

11. **INCREASING SWEATING**-The flow of blood stimulates the sweat glands to produce more sweat which are sent to surface of skin. The evaporation of the sweat brings about cooling since the latent heat of vaporization is taken from the body. In this manner the body temperature is kept constant.

LOWERING OF THE HAIR-The hairs are lowered and erector muscles relaxes thus lowering the hairs of the body therefore the layer of the air between the hairs and the skin is thin. Thinness of the air allows more heat to be lost from the body.

METABOLIC RATE DECREASES=The body slows down its activities to decrease the metabolic rate. This induces the heat released by metabolic reactions hence minimum heat is produced within the body.

(b) When there is cold, the body temperature falls and the following happens.

1. VASOCONSTRICTION=Less blood flows the surface of the skin in cold weather because the blood vessels udder constricts therefore, less heat is lost through radiation, convection and conduction as little latent heat is taken from the body

DEREASE IN SWEATING=The sweat glands produce little sweat in order to conserve heat within the in body.

HAIRS ARE RAISED-The erector muscles of the hairs contract making hairs to stand erect. A layer of thick air is trapped between them. Air being a poor conductor of heat insulate the body and less is lost conduction, convection and radiation.

SHIVERING=When the body temperature is low some involuntary muscles contract and relax continuously, thus increasing the rate of respiration and more is released as heat which when circulated to all parts of the body by the blood stream helps to raise the body temperature.

INCREASING METABOLIC RATE=The body increases its metabolic rate especially the liver to produce more heat.

CARE OF THE SKIN

1 Bathe regularly with soap to remove dirt, sweats and natural oil from the skin.

11.Expose the skin to fresh air.

111.Eat balanced diet.

1v. Engage in regular excise.

Treat open wounds or cut.

V1. Treat skin diseases such as eczema, chicken pox and small pox.

V11.Always wears clean clothes.

V111.Avoid the use of injurious chemicals such as bleaching cream and soaps in order not to destroy the melanin pigment.

QUESTIONS

i). Briefly explain the term homeostasis

ii). Describe how the mammalian skin can react to regulate the body temperature in a hot room.

iii). In tabular form, state the causes, effects and remedies of the following liver diseases, infectious hepatitis, cancer and gall stones.

iv).Explain the following phenomenon shown by human body.

(a) Violent exercise results in a rise in body temperature accompanied by noticeable sweating.

(b) Shivering when we are cold keeps us cool.

(c) Keeping cool in hot countries by wearing loose fitting light coloured clothing.

(d) The formation of goose pimples on skin when cold.

(e) State six functions of mammalian liver /

1. f) Describe how mammalian body regulates blood sugar.

OBJECTIVES

1. i) The part of the skin where melanin and keratin are stored is (a) Malpighi layer (b) cornified layer (c) dermis (d) granular layer

ii) The structure that is not found in the dermis of the skin is (a) sebaceous gland (b) nerve endings (c) hair shafts (d) sweat gland

iii) The function of the sebaceous gland is the (a) secrete common salt (b) secrete sweat (c) secrete water and salt (d) produces vitamin D for the skin

1. iv) In cold condition, the mammalian body reacts in the following ways except (a) shivering of the body (b) dilation of the capillaries supply blood to the skin (c) constriction of blood capillaries in the skin (d) increases the rate of chemical changes

v) Which organ removes the largest quantity of water from the blood? (a) lungs (b) intestine (c) kidney (d) skin.

CHECK ESSENTIAL BIOLOGY FOR MORE INFORMATION

WEEK FOUR

NERVOUS COORDINATION

Coordination is the process by which all actions of different parts of the body of an organism are harmonized to achieve different objectives.

All metabolic processes in the body of an organism do not function individually but are closely linked and dependent on each other for effective function.

The two-communication systems that bring about coordination are

(1) Endocrine system

(11)Nervous system.

The nervous system of a mammal is made up of two parts

The central nervous system (CNS)

The peripheral nervous system (PNS)

NERVOUS COORDINATION

Coordination is the process by which all actions of different parts of the body of organisms are harmonized to achieve definite objectives.

All metabolic processes in the body of an organism do not function individually but are all closely linked and dependent on each other for effective function.

The two communication systems that bring about coordination are:

1. Endocrine system (hormone)
2. Nervous system.

The nervous system of a mammal is made up of two parts.

1. The central nervous system (CNS)
2. The peripheral nervous system (PNS)

CENTRAL NERVOUS SYSTEM

The central nervous system (CNS) consists of the brain which is enclosed in the cranium or brain box and spinal cord which runs down the centre of vertebral column (backbone).

THE BRAIN

The brain is the most specialized organ of human body. it is composed of millions of nerve cells called neurons. It is protected by the skull, cranium or brain box. The brain is divided into three important portions.

1. Fore brain
2. mid brain
- iii. hind brain.

FORE BRAIN: The fore brain is divided into three parts. The cerebrum, olfactory lobes, thalamus and hypothalamus.

The **CEREBUM** is the largest part of the brain and it is made up of right and left hemispheres which are separated by a deep furrow called median fissure. The two halves are connected by a band of fibre called **CORPUS CALLOSUM**. The outer surface of the cerebrum is called cerebral cortex and is deeply folded in irregular pattern or convolution which increases the surface area of the cerebrum. The cortex consists of grey matter outside as a result of the colour of unsheathed nerve cell, while the inner part of the cerebrum is called white matter because the nerves cells are sheathed. Each cerebral hemisphere is divided into four lobes namely the frontal, temporal, parietal and occipital lobes.

FUNCTIONS OF CEREBRUM.

1. It is the seat of consciousness, intelligence, memory, judgment, learning, interpretation of sensation and imagination.
2. It controls all voluntary actions e.g. movement of legs, arm speech etc.

iii. It collects information from sense organs and store such information (e.g. learning and behaviour)for later use

OLFACTORY LOBES- These are two small structures placed anteriorly on the cerebrum.

THALAMUS- These are two ovoid structures attached to the back of the fore brain. It contains masses of grey matter.

FUNCTIONS

1. It is the center for sensation of pains, touch and anger
2. It is the seat of consciousness or awareness

iii. It receives impulses from mid brain, hind brain and spinal cord

HYPOTHALAMUS

It lies below the thalamus and is connected to the pituitary gland. It contains reflex centre linked to the autonomic system. it plays important role in homeostasis

FUNCTIONS

1. It controls sleep and alertness
2. it controls appetite or feeling

iii. it controls temperature

1. it controls osmoregulation.

2. it controls the secretion of hormones from the pituitary gland
3. it is the seat of aggression and anger

THE MID BRAIN

The mid brain is narrow and short with thick walls portion which connects the hind brain and fore brain together. It consists of optic lobes, pineal body and pituitary gland.

FUNCTION

1. The optic lobes are the seat of sight or vision.
2. It connects the fore brain and hind brain thereby assisting transmission of impulses.

HIND BRAIN

The hind brain consists of three parts namely cerebellum, medulla oblongata and Pons varolli.

CEREBULLUM

It is located below the back of the cerebrum, oval in shape and consists of two hemispheres. It is less convoluted than cerebrum. The surface is covered with grey matter while the inner side is composed of white matter. It is connected to the semi-circular canals of the ears.

FUNCTION

1. It controls posture and balance of the body.
2. it controls most of involuntary action.
3. it receives impulses from auditory organs and skin.

PONS VAROLLI

It connects the two halves of the cerebellum and cerebrum to the medulla oblongata. It is made up of thick bundles of nerve FIBRES.

MEDULLA OBLONGATA

The medulla oblongata connects the cerebellum to the spinal cord. In medulla oblongata the white matter surrounds the grey matter. It is in the medulla oblongata that right and left motor fibers from the brain cross over each other, so that the left hemisphere controls the right side and the right hemisphere controls the left side of the body.

Functions

1. it controls many actions or movement of the body especially those concerned with respiration, heart-beat and digestion.
2. it controls the constriction and dilation of the blood vessels thus regulating blood pressure.

Diagram of rabbit brain

Diagram of human being

human brain

SPINAL CORD: It is an extension of medulla oblongata and passes through the neural canal of the back bone which protects it. The spinal cord is protected by the three layers of meninges namely Dura matter (outer layer), arachnoids matter (middle layer) and pia matter (inner layer). The spaces between these layers are occupied by cerebrospinal fluids which act as protective cushions. The outer portion contains white matter consisting of bundle of axon and dendrite. The inner portion contains grey matter is made up of intermediate neurons and cell bodies of motor neurons.

Functions

1. it coordinates simple reflect actions like knee jerk and automatics reflexes such as sweating.
2. it acts as a pathway between the spinal cord and the brain.

Diagram of spinal cord

PERIPHERAL NERVOUS SYSTEM

The peripheral nervous system (PNS) consists of all nerves outside the brain and spinal cord. These are made up of sensory nerves which arise from all parts of the body to the central nervous system and the motor nerves running from the central to all parts of the body. The peripheral nervous system receives signals changes from the environment registered by the receptors or sense organs and send them to the central nervous system which integrates the information .it receives and send appropriate messages to the effectors accordingly.

The PNS consists of twelve (12) pairs of cranial nerves and thirty one (31) pairs of spinal nerves. The cranial nerves arise from the brain while the spinal nerves arise from the spinal cord. The peripheral nervous system is subdivided into two systems. These are;

(i) Somatic nervous (ii) automatic nervous system.

SOMATIC NERVOUS SYSTEM

The somatic nervous system consists of nerves without synapses lead from the brain through the spinal cord to skeletal muscles. They deal mainly with external stimuli and their responses. The sensory nerves transmit impulses from the external stimuli to the central nervous system and relay responses through the motor neurons or the body causing the body movement. The motor neurons stimulate the effectors i.e. muscle and glands. The somatic nervous system controls activities that are mainly voluntary.

AUTONOMIC NERVOUS SYSTEM (ANS)

The autonomic nervous system is the part of the peripheral nervous system which controls the involuntary actions inside the body such as the rate of heart, sweating, and peristaltic contractions of the intestine. The neuronal of the autonomic nervous system are connected to involuntary muscles of the internal organs.

The autonomic nervous system comprises of sensory and motor neurons. It arises from the central nervous system and is connected to different internal organs.

The autonomic nervous system consists of two parts namely

1. Sympathetic nervous system
2. Parasympathetic nervous system.

These two systems help to regulate the vital internal organs such heart, eye, lungs, kidney etc. maintaining a system of check and balances

SYMPATHETIC NERVOUS SYSTEM consists of nervous which connect internal organs to the thoracic and lumber area of the spinal cord. The sympathetic nervous system stimulates many parts of the body for necessary action in time of danger.

PARA- SYMPATHETIC NERVOUS SYSTEM consists of nervous which connect internal organs to the tenth cranial nervous and the sacral region of the same organ as sympathetic nervous system but its action is opposite or antagonistic to sympathetic nervous system.

Sympathetic. N. System	parasympathetic. N. system
------------------------	----------------------------

- | | |
|---------------------------|----------------------|
| 1. Accelerates heart beat | slow down heart beat |
| 2. Constricts arteries | dilates arteries |

iii. Dilate iris (pupil)	constricts iris
--------------------------	-----------------

- | | |
|-----------------------|-----------------------|
| 1. Slows gut movement | speed up gut movement |
|-----------------------|-----------------------|

- | | |
|---|--|
| 1. contracts bladder and relaxes bladder and sphincters | |
|---|--|

Sphincters	contraction of the bladder muscles
------------	------------------------------------

1. Relaxation of bladder lowers the blood pressure

Muscle

- vii. Raises the blood pressure it stimulates the secretion of salivary glands

Inhibits the secretion of

Salivary gland

THE NEURONES

A neuron or nerve cell is defined as the basic unit of nervous system which is responsible for the transmission of impulses within the body. The neuron is the functional unit of the nervous system. The neurons are found in the brain, spinal cord or nerve fibers of animals which are responsible for receiving and transmitting impulses.

STRUCTURE OF A NEURONE

A neuron consists of three major parts. The cell body, dendron/dendrite and axon, The cell body (soma) consists of the nucleus and cytoplasm. The dendron are projections from the cell body which each dendron branches to form many fine dendrites. The dendrites carry impulses towards the cell body. The axon is made up of single, long fibre which transmits impulses away from the cell body. Each axon is enclosed within a fatty myelin sheath and outer layer of neuralemma- The myelin sheath which is formed by Schwann cells is interrupted at interval by constriction called nodes of Ranvier. The myelin sheath insulates the axon and also facilitates the transmission of impulses. Neurons are joined end to end in a special way to form a nerve. The axon of one neuron forms a junction with the dendrite of the next neuron where two meet is a nerve junction called synapse.

Diagram

Classification of Neurons

There are three types of neurons these are sensory, motor and intermediate neurons .

1. Sensory (afferent) Neurons:- these neuron which transmit impulses from sensory cell or receptor towards the central nervous system and spinal cords. The dendrites are connected to other neurons.
2. Motor (efferent) neurons. These are neurons that transmit impulses away from the central nervous system to the effectors organ e.g muscles and gland. The dendrites are connected is intermediate neuron while the axon is connected to an effectors
3. Intermediate (association) Neurons, are neurons that joins the sensory neuron with motor neuron. In order words, it transmit impulses from one neuron is the other within the central nervous system both their dendrites and axons are connected to other neurons.

Transmission of impulse along a neuron

Transmission of impulse along the nerves transmission of nervous impulse is a wave of electrical activity travelling along the neurons. The transmission of nerve impulse is partially electric and chemical. Though if is electrical but not a flows of electrons like an electric current.

A neurons that is not transmitting an impulse is know as a resting neuron. A resting neuron is actually actively generating electricity. It does this by pumping sodium ions (Na^+) out of the cell through the cell membrane, leaving behind chloride ions (Cl^-). As each sodium ion is pumped out, a potassium (K^+) is pumped into the cell. The potassium ion links out the cell again but the sodium ion cannot move into the cell as the sodium gates in the membrane are closed. This result in an overall net positive charge on the outer surface of the neuron and a negative charge inside the neuron i.e. the neuron is polarized.

When a stimulus reaches the neuron, the sodium channel or gates in the cell membrane opens causing sodium ions to rush into the all. This immediately depolarized, then the interior of the cell momentarily develop a slight net positive charge with respect to membrane outer surface

At the same time, the sodium in the membrane close, the potassium gates in the membrane open, causing K^+ to flow out and reestablished the original resting position.

A nerve impulse passes across synaptic gaps chemically and not electrically. When an electric impulse reaches the end of an axon, it stimulated the synaptic knobs to secrete a neurochemical called Acetylcholine which binds k special receptor sites on the adjacent neuron's membrane , causing the sodium gates to open . This triggers off an impulse in adjacent neuron in the same way . This is known as firing the second neuron . The neurochemical is quickly destroyed by enzyme called

Chlorine terase which render the acetylcholine inactive thereby preventing it from accumulating at the synaptic gap Neurochemical can only move from the axon's synaptic knob to the target cell membrane, so impulses are always transmitted in one direction only

+++++_____

+++++

Differences.

Nervous coordination Hormonal coordination

1. Messages are passed mainly as electrical impulses along nerves. Messages are passed as chemical substances.
2. Responses is fast Response is slow

iii. Effect is for a short time Effect is for a long time.

1. Response is not depending on quantity of stimulus. Too much or too little can cause metabolic disorder.
2. It is controlled by the brain and spinal cord It is controlled by the pituitary gland.
3. Effectors (muscles) and gland receive the messages. The target organs receive the messages.

QUESTIONS

i) The point where two nerve cells are joined together is (a) dendrite (b) axon (c) synapse (d) myelin sheath

1. ii) The central nervous system is made up of (a) brain and liver (b) liver and kidney (c) kidney and skin (d) brain and spinal cord

iii) The ions that are responsible for transmission of impulse are (a) sodium and potassium ions (b) iron and calcium ion (c) sodium and iron ions (d) potassium and calcium ions

iv The chemical that fills the synapse to convert electrical chemical to transmission (a) choline (b)acetyl ion (c)acetylcholine (d) acetyl cholinesterase

1. v) The part of the brain that controls the hormonal system is (a) hypothalamus (b) optic lobe (c) auditory lobe (d) pituitary gland
2. vi) Muscle contraction is controlled by (a)cerebrum (b)pons varolli (c)medulla oblongata (d) cerebellum

vii) Voluntary movement of a mammal are coordination by the (a) medulla (b) forebrain (c) cerebellum (d)cerebrum

viii) The structure that detects mechanical stimuli such as sound, gravity, pressure, pain and vibration is (a)mechanoreceptor (b)chemoreceptor (c) thermos-receptor (d)photoreceptor

1. ix) The structure that help the eye to nourish the eye cell is (a) choroid (b)sclera (c) retina (d) eye lashes
2. x) The most refractive part of the eye ball is (a) cornea (b)lens (c) aqueous humour (d)vitreous humour
3. xi) The bones of ossicle at the center is (a) anvil (b)stirrup (c)malleus (d)stape

xii) When the lens and the ciliary muscles lose their elasticity, a disease called----- result (a) astigmatism (b) squinting (c)presbyopia (d)short sightedness

xiii) Which of the following parts of the eye is not involve in the image formation? (a) retina (b)lens (c)yellow spot (d)blind spot

xiv) Which parts of the ear affect balance and posture? (a)semi-circular canal (b) cochlea (c) oval window (d) ossicle

1. xv) The main organ in the inner ear that is responsible for hearing is (a) sacculus (b)otholith (c)utricle (d)cochlea

xvi) Which of the following structures occupies the neural canal of the vertebral column? (a) cerebellum (b)hypothalamus (c) medulla oblongata (d) spinal cord

xvii) Which parts of the tongue is sensitive to bitter taste? (a)tip (b)side (c)middle (d) back

xviii) An example of a conditional reflex action is (a) cycling (b)typing (c) riding (d)all of the above

xix) The grey matter of spinal cord consists of (a)bundles of fibre (b)axons (c)cell bodies and synapses (d) dendrites

1. xx)

WEEK FIVE

REFLEX AND VOLUNTARY ACTIONS

A reflex action or involuntary action is a fast automatic response to a stimulus of an organ or system organ, the action which is not initiated by the brain. Actions such as sneezing, yawning, knee jerk, breathing action are actions are not initiated by the brain but by muscle receptor cell

The reflex arc represents the series of neurons which impulses have to pass in order to bring about a reflex response. The events that occur during a reflex action when a person suddenly touches a hot object can be outlined as follows:

On touching the hot object, the nerves ending of a sense organ e.g skin are stimulated. The impulses are transmitted through the sensory neuron passing through the dorsal root ganglion into the spinal cord. A ganglion is a complex set of synapses. From here; the impulses are relayed via synapses into intermediate neurons through another synapses to the motor afferent nerve. This passes through the ventral root to the motor (effectors) organ which brings about a response. The impulse causes the muscle of the hand to contract thereby removing the hand from the painful stimulus and prevent injury to the ti

Voluntary Action is an action initiated and controlled by the conscious part of the brain. Voluntary actions are various activities we usually think about before we do them. For examples writing, walking, running, reading, talking, driving, swimming, typing, dancing and climbing.

Reflex Actions

voluntary Actions

1. Action is initiated by Action is initiated by the brain

Muscle receptor cell

by the brain

1. It occurs unconsciously It occurs consciously

iii. It is automatic and fast It neither automatic nor fast

1. It is inborn It can be learnt
2. Nerve impulse do not Nerve impulse

reach brain always reach the brain.

Reflex Action Source of stimulus Response

Sneezing Irritation of nasal mucous membrane Quick and violent contraction of the abdominal muscle.

Contraction of iris muscle Variation in height intensity Increase or decrease in the pupil of the eye.

Salvation withdrawal reflex Small of food hot or sharp object Flow of saliva contraction of muscle resulting in immediate withdrawal form of the object.

Knee jerk Tap on the tendon which causes the muscle to stretch Muscle flexes and the lower leg is raised.

Coughing Irritation or the throat by foreign body Contraction of the abdominal muscle

Resulting in the closure of the epiglottis.

Conditioned Reflex

Condition reflexes are those behaviors' which are acquired through learning. Such actions can be repeated without thinking about it. Most of our behaviors are conditioned reflexes. Examples are walking, driving, reading, writing, typing, cycling and swimming.

Roles or Function of conditioned Reflex on behavior

1. It helps individual to acquire new skills through the learning of such habit.
2. It helps to develop certain behaviors which are not originally shown in the individual.

iii. The principles was used by a Russian biologist Ivan Pavlov in 1902 in the training of dogs for their role in crime detection and for security.

1. Unhealthy behavior like smoking, drinking, and drug taking may become bad habit when acquired through conditioned reflex be difficult to stop.

Differences between

Reflex Action Conditioned Reflexes

1. It is an inborn behaviors It is a learned behavior
2. It takes a short time It takes a longer time
3. It involves spinal cord and it is controlled by the brain

relay It is controlled by the

brained to brain after action is

complete.

1. Action starts by muscle receptor Action starts in the brain cells

SENSE ORGANS

Sense organs are special organs that receive information inform of impulse from outside and send them through neurons in never fibres to the spinal cord and brain. They include organs of eye, ear, skin, nose and tongue

The skin as a sense organs.

The mammalian skin has a very rich supply of sensory receptors. These detect stimuli that enable us to feel, touch, pressure, pain, cold and heat. The skin can therefore be consider to be a sense organ, though, it is not specialized in detecting only one type of stimuli like the other sense organs .

Sensory receptors in the skin are mainly dendritic endings of sensory neurons, that is they are primary sense cell .Some of these dendrites are finely branched with free ends .Other are enclosed within capsules. Sensory receptors are not evenly distributed throughout the skin . Each type is more concentrated in certain regions which are thus highly sensitive to that particular stimulus than the other region of the skin. The following are receptors present on the skin.

(a)MECHANO RECEPTOR: These are receptors that detect mechanical stimuli e .g sound, touch, gravity, pressure, pain, muscle, contraction and vibration .

(b)CHEMO RECEPTOR: They are the receptors in the skin that detect response to

Chemical stimuli e . g smell, taste, change in concentration of substance nutrient , waste product, hormones , gases, iron, etc. in the b & n.

(c)THEROMRECEPTOR: These are receptor that receive internal stimuli e .g cold heat

(d)PHOTORECEEPTOR- these are receptors that receive electromagnetic stimuli such as light intensities of and colour.

THE HUMAN OR MAMMALIAN EYE

The eye in man and other animals is the organ for sight. The mammalian eye is roughly spherical in shape. It is located in a protective cavity in the skull called eye socket .The eye lashes protect the eye balls from tiny particles .The secretion of the tear glands washes away dust particles .The eye ball is made up of three layers. The outer is the sclera or sclerotic coat. It is the white portion of the eye which is extensively tough and protects all the inner parts. It also protects and maintains the shape of the eye ball. The sclerotic layer bulges out in front to form a transparent and convex tissues called cornea.

i)The cornea protects the eye in front

ii)It allows light rays to enter the eye ball.

iii)It helps the lens to bend light rays to form an image on the retina.

The middle layer of the eye is the choroid layer which is dark in colour due to the presence of its black pigment. It also contains melanin (a black pigment which enables it to prevent the reflection of light rays within the eye.

Functions.

i)The choroid supplies food and oxygen to other parts of the eye especially the retina.

ii)The black pigment (melanin) helps to absorb light rays thus prevents internal reflection within the eye.

Iris; The choroid forms the iris in front of the eye lens .It covers the lens except the pupil which restricts amount of light entering the eye so that a clear image is formed on the retina.

The innermost layer is the retina which is very sensitive because it contains receptive cells or light sensitive cells called rod and cones.

The rods are sensitive to dim light and colourless vision since they are unable to detect colour.The rod cells contains a sensitive pigment called visual purple or

rhodopsin which contains vitamin –A and protein. Deficiency of vitamin-A in the body can affect the rods hence causing night blindness.

The cones are sensitive bright light and able to detect colour. They contain a photochemical substance called iodopsin which is not easily bleached by light .The yellow spot or fovea is the most sensitive point on the retina where the sharpest and clearest image can form and also it receives detail information for transmission to the brain. The blind spot is a point on the retina where the nerve fibers leave the eye ball to form the optic nerves ,the point is not sensitive to light since there are no rods or cones there .The optic nerves carry impulse from the retina to the brain.

The eye lens focuses light unto the retina .It is crystalline and bi-convex in shape .It is attached to the ciliary muscle by the suspensory ligaments .The suspensory ligament divides the eye chamber into two parts ;an aqueous humour and vitreous humour, each chamber is filled with a clear liquid of different density. The space between the cornea and the lens is filled with thin watery fluid called aqueous humuor which help to hold cornea together and bend light rays. The vitreous humuor is a jelly-like transparent substance that filled the interior part of the eye ball .It helps to keep the shape of the eye ball and also allow for bending of the light rays. The pupil is a small hole in the iris which help to regulate the amount of light rays entering the eye..

Mechanism of Seeing

Light rays from an object enters the eye through the cornea which causes the light rays to be refracted and pass through the aqueous humour which further

Bends the light rays before entering the lens through the pupil. The lens further bends the light rays and focuses them on the retina especially on the yellow spot. The light rays passes through the vitreous humuor .Further bending of the light rays occurs again. The light rays on reaching the retina stimulates the rods and cones forms an inverted image on the retina .The inverted image is smaller in size than the object. Impulses are sent through the optic nerves the optic lobes of the brain, then to visual cent cerebral hemisphere where the actual size and colour of the image are interpreted correctly.

ACCOMMDATION OF THE LENS

Accommodation is the ability of the human eye to focus far and nearby object on the retina .It is brought about by the contraction and relaxation of the ciliary muscle. Accommodation decreases with age.

EYE DEFECTS AND THEIR CORRECTIONS

1) Myopia or Short sightedness-This is a condition in which parallel rays of light from a distant object are brought to a focus in front of the retina. Therefore the image of a distant object is formed in front of the retina, not on the retina. Myopia occurs when the eye ball is too long or the lens is too thick. The defect can be corrected by wearing spectacles fitted with concave or diverging lenses which diverge the light rays from a distant object before they enter the eye, so the eye brings the rays to a focus on the retina.

2) Hypermetropia or Long sightedness-In this case, light rays from a near object are brought to a focus behind the retina. The eye can see distant objects. This occurs when the eye ball is too short or the eye lens is too flat. This type of eye defect can be corrected by using spectacles fitted with suitable convex or converging lenses. The convex lenses help to converge rays of light before they enter the eye, so that they come to a focus on the retina.

3)Astigmatism-It arises from unevenness in the curvature of the cornea which parallel rays of light from a distant object not be refracted to the degree by different areas of the cornea which result to a clear image not being formed on the retina .Astigmatism can be corrected by wearing spectacles made with cylindrical lenses.

4)Presbyopia-This occurs at old age when the lens and the ciliary muscle of the eye gradually loses their elasticity.The lens can no longer adjust its shape to focus the image of clearly on the retina.This is described as a loss in accommodation.The correction is by wearing spectacle fitted with bi-focal lenses.A bi-focal lens is combination of a concave and convex lens.

5)Cataract-This is an eye disease in which the sufferer develop a cloudy area either in one or the both eyes lenses.It causes partial or complete blindness if not attended to .The is by surgical operation.

6)Colour Blindness- When one type of colour receptive cone is missing on the retina, the person concerned will not able to distinguish this colour from others.For example , if the red sensitive cone is lacking, the person will not be able to identify a red colour.The person will perceive red colour as green.Colour blindness is an inherited sex-linked character showing up in male child.

6)Conjunctivitis-The is the inflammation of the conjunctiva. It may be caused by irritants such as wind or bacterial infection.It is a very contagious infection.Remedy is by the use right antibiotics prescribed by medical doctor.

7)Xerophthalmia-This is an eye disease caused by vitamin - A deficiency.It can lead to blindness.

8)Glaucoma-This is a bacterial disease that may end up destroying the eyes completely.

THE STRUCTURE OF MAMMALIAN EAR

The ear of a mammal such as human ear consists of three main parts ,the outer ear ,the middle ear and the inner ear.The outer ear consists of the pinnae,the auditory canal or meatus and the tympanum or eardrum .The major function of the pinnae is to direct sound waves and the tympanum is the first call of vibration.The middle ear is an air-filled cavity containing three small bones called the ossicles whose function is to transmit and magnify the vibration already started by the tympanic membrane.The outer ossicle is malleus or hammer which is connected to one end of the eardrum and

the second ossicle is the called incus or anvil and the third ossicle is called stape or stirrup which touches a flexible membrane between the middle inner ear membrane called oval window. The three tiny bones magnify transmit sound vibration from eardrum to the oval window. The middle ear also contain eustachian tube which is an air-filled cavity whose function is to equalise the air pressure on either side of the eardrum with atmospheric pressure. The inner ear is made up of complicated and interconnected canal and sac. The membranous labyrinth is made up of three semi-circular canals; utriculus, sacculus and cochlea. Inside the membranous is a fluid called endolymph which filled the utriculus, sacculus, sem-circulus and cochlea. The semi-circular canals are attached to the utriculus. They are loop- shape and lie at right angles to one another. They contain sensory cell and sensory hair cell called otoliths which are concerned with balancing and maintainance of posture of the body. The cochlea is a coiled tube in the inner ear and it contains nerve cells sensitive to sound vibration and the function is for hearing. The cochlea changes sound vibration to nerve impules which will be sent the brain through auditory nerve.

FUNCTIONS OF THE EAR

i)Hearing of sound

ii)Awareness of the position of the body thereby maintaining rhe balance of the body

Mechanism of Hearing

Souns waves entering the pinnae are directed into the auditory canal which make the eardrum to vibrate. The vibration sets the ossicles into a greater vibration. This vibration greatly amplified in the middle ear, which the oval window to vibrate far more than the eardrum because of its smaller size. The in the oval window are passed on to the endolymph in the cochlea and cause the membrane carrying hair cells to vibrate. The vibration the hair cell to set up a nerve impulse. The is carried through the auditory nerve to auditory region of the brain where is interpreted as sound.

Diagram of mammalian ear.

Care of the ear

- i) The ear should be cleaned regularly with cotton to remove the wax.
- ii) The use of sharp object or pointed object while cleaning or scratching the ear should be avoided.
- iii) Avoid loud noise
- iv) Consult a doctor for any ear problem.

Organ of Smell(nose)

The organ of smell in human is the olfactory organ. Several sensory nerve endings are found in the roof of the nasal cavity. The olfactory organ functions well when the nose is wet. Smell receptors are stimulated by chemicals when particles of volatile substances dissolve in mucus layer over the smell receptor in the nostril. The stimulation of the receptor cells give rise to nerve impulses which travel through the olfactory lobe of the brain. The brain interpretes the kind of smell.

Organ of Taste(tongue)

The tongue is the organ responsible for the sense of taste. Sensory cells for taste are grouped into buds located on the tiny swellings on the exposed surface of the tongue. They are receptors for chemicals in solution from the food, drinks, medicine or whatever that is being tasted on the tongue. The taste buds connected by fine sensory nerves to the brain which give information about what is tasted. The tongue is sensitive to four primary tastes namely; sweet, sour, salty and bitter. The back of the tongue is sensitive to bitter stimulus, the side of the tongue is to salty and sour stimulus while the tip of the tongue is sensitive to sweet sensation. The tongue can also detect alkaline taste, texture of food as well as its temperature. Certain factors which affect taste by tongue include;

- i) The state of health of the taster.
- ii) The temperature of the food being tasted.
- iii) The number of food being chewed at the same time.

Diagram of a tongue

QUESTIONS

- i) Which part of the tongue is sensitive to bitter taste? A) tip B) side C) middle D) back.
- ii) The eye balls are attached to the eye socket by muscle. A) two B) t
- iii) The most refractive part of the eye ball is A) cornea B) lens C) aqueous humour D) vitreous humour.
- iv) The ear ossicles receive sound vibrations directly from the A) pinna B) eardrum C) cochlea D) oval window
- v) The pressure in the middle ear and external ear is equalized by the A) eardrum B) malleus and incus C) eustachian tube D) malleus, incus and stape.
- vi) Describe the structure of mammalian eye with the aid of diagram
- vii) Describe three defects of eyes and their corrections
- viii) Make a well labelled diagram of mammalian ear
1. ix) Explain the process of balancing
- x) For more information ,check your Essential Biology.

WEEK SIX

ECOLOGY OF POPULATION

SUCCESSION-The ecological succession is the orderly changes that occurs in plant and animal community of a given area over a period of time until a climax (stable) community is established.

Characteristics of Ecological succession.

- i) Ecological succession takes place in a newly formed habitat .e. g .seashore, sand dunes ,lakes and bare rock surface.
- ii) Successional changes are orderly and develop in a certain sequence.
- iii) The pioneers colonizers are mainly plants with short life span which get replaced by small herbaceous plants with low nutrients requirement. e.g. algae, fungi, lichens.

iv)The rate of successional changes is rapid initially and gradually it slows down until climax community is reached.

v)Climax community are formed after a long period of time and once formed, they maintain their structure and composition.

Types of succession

i)Primary succession-it is a succession that occurs by plant in an area not previously covered by vegetation. For example, it can occur on bare rocks, lava flow and sand dunes. The stages of primary succession include

The first stage is the formation of soil, followed by habitation by pioneer organisms such as bacteria ,fungi, algae and lichen .The death of pioneer plants add some organic matter to the soil which will support the growing of algae and mosses. This is followed by the shrubs and eventually the trees.

ii)secondary succession-is a succession that occurs in a place where the disruption of all the original vegetation of an area has taken place. It is a succession that occurs in a site previously occupied by vegetation.

Causes Of Secondary Succession

Burning of farmland-This results in exposing the land to sun which destroy the grasses and the herbs .Examples are

a)growing of vegetation after road construction

b)colonization of burnt farmland with new sets of plants .

c)growing of vegetation in an abandoned farmland.

Pioneers in secondary succession are seeds, weeds e .t. c.

Primary Succession In An Aquatic Habitat(Lake)

The newly formed lake will be harboring of alluvial soil, producers like phytoplankton's e. g. spirogyra and blue green algae will be the occupant followed by the zooplankton as well as protozoans like amoeba, paramecium before submerged rooted plant and finally other floating rooted aquatic plants like water lettuces followed by animals such as scorpion and fish.

Primary Succession In Terrestrial Habitat

Primary succession in terrestrial habitat can take place in an abandoned farmland and it has stages;

Stage one- In abandoned farmland, the pioneer organisms are weeds, underground stems, seed of plants, eggs and larvae of insects and worms. These pioneers derive their food from the leftover nutrients of the old farm. Animals such as rats, mice, can now visit the vegetation to feed on the grasses.

Stage two-The seeds start to germinate, underground stem such as cocoyam grow up, grasses and weeds increase in population. Eggs and larvae of insect start to hatch and grow into adult insect and worms population also increase. The vegetation can now provide a suitable habitat for rodents such as mice, rabbit and rat

Example of primary succession in terrestrial habitat; Bare soil-----weeds and grasses-----shrub----- small tree-----large trees -----climax community.

Secondary Succession-It is a succession that takes place in an area previously occupied by plants and animals

(a community).It occurs when a community develop in a habitat where another community had been removed. secondary succession starts an existing community as a result of interference by one or more conditions.

Secondary succession grows faster than a primary one because reproductive parts (seeds, spores, and storage organs) may remain in the soil. These parts grow faster when condition is favourable i.e. climate and soil condition.

Characteristics of a stable community.

- i)The community develops into forest, savannah or Sahel vegetation.
- ii)In stable community, the vegetation has reached its highest development, same species reoccur from year to year.
- iii)The appearance and composition is stable due to sequence of species.
- iv)It takes many years to attain a stable community.
- v)Stable community is not easy to attain and it does not undergo further or easy transformation unless deformation occurs.

OVER-CROWDING-is a condition whereby the space available for an individual organism is too small for normal survival, existence and well-being.

Factor That Cause Over-crowding

- i)Increased in natality (birth rate) of organisms in an habitat.
 1. ii) Migration of the organisms of the same kind to an area causes over- crowding.
- iii)Absence of predators that feed on smaller organisms.

iv) Social habit of some organisms such as bees, termites and ants can cause over-crowding.

v) Dispersal problems .i. e. lack of disposal of fruits and seeds of certain plants make them fall under the same trees and grow to cause over-crowding.

Adaptation To Avoid Over- Crowding.

Some measures are in place by nature to avoid over-crowding such as ;

i) Movement of some member of the population outside of the habitat

ii) Claiming of an area (territorial behavior) among some organisms reduce overcrowding.

iii) Spreading of seeds and fruits (dispersal) by animals

iv) Bees and termites in insect' population can swarm to reduce overpopulation.

Effects of over-crowding.

i) It leads completion of the available food which can not go round.

ii) It can lead to spread of infectious diseases.

iii) Mortality rate increases due to short supply of basic things like food.

iv) Over-crowding may lead to fighting, cannibalism and reduction

POPULATION-is defined as a group of organisms of the same kind living in a given habitat at a particular time.

Population Density-This is defined as the of number organisms in a unit area or volume of the habitat. Space that is available for organisms to occupy in habitat.

Important Of Factors Affecting Population

i) Factors that affect a population include living and non-living factors (biotic and abiotic).

iii) Organisms cannot grow well at high temperature while moderate temperature favours organisms and its population .If space available is small, there will be choking, hence completion and stampeding.

iv) Living factors affecting population include birth, ,death, food, dispersals, parasites, pathogens, predators, emigration and immigration.

v) Excess or scarcity of these factors affects population size .If food is plenty ,organisms are well fed and reproduce well

RELATIONSHIP BETWEEN COMPETITION AND SUCCESSION

Competition-is the ability of an organism to struggle or compete for the limited available resources such as food, water, space ,light .e. t. c. in order survive in their environment. Competition results from adverse condition that organisms are exposed to .For instance, if the space available cannot sustain organism present there will be unhealthy rivalry or struggle for space which is termed competition.

Whereas succession is progressive change that takes place in habitat that always increase the number of organism, varieties and diversities

Competition is harmful to population as succession is productive and progressive..

QUESTIONS

- i)A chain events in which one community is gradually replaced by another in an orderly series is (a) population (b)ecosystem (c)succession (d)estuary
- ii)Which of the following will not affect population size (a)predation (b)competition (c)immigration (d)none of the above
- iii)The succession that involves formation of new soil is (a)primary (b)secondary (c)tertiary (d)all of the above
- iv)Which of this is not an example of a primary succession? (a)at the pond (b)on a rock surface (c)in estuary (d)in a forest
- v)Which of the following biotic factors does not affect a population (a) mortality (b)natality (c)predation (d)food

THEORY

i)Explain the following terms

-primary succession

-climax community

-population density

-territoriality

ii)List the birth controls methods that are very effective in preventing conception

iii) What is ecological succession?

iv)Outline the effects of overcrowding

v)What is a climax community?

For more information; check Essential Biology

WEEK SEVEN

TERRITORIAL BEHAVIOUR IN ORGANISMS (LIZARD)

The male Agama lizard exhibits territoriality by being aggressive as soon as intruding male lizard enters its territory. It exhibits its brightly coloured head and body, nods its head, expands its gular fold and scares off the other male lizards.

SHORTAGE FOOD –occurs when population increase s beyond normal more than the available food supply. Food is an important factor that affects population size .Food shortage arises when country or population cannot produce enough food for human consumption.

Causes Of Food Shortage

1. i) Lack of rainfall
- ii) Infestation of crops by pests such as locusts, grasshoppers and aphids.
- iii) Lack of adequate method of food storage and preservation.
- iv) Attack of plants and animals by diseases that not controllable
- v) Outbreak of war can affect farming activities
- vi) Natural disaster such as flood, fire outbreak and volcanic eruption occurrence can cause food shortage.

EFFECTS OF FOOD SHORTAGE

- i) Short supply of food will lead competition for the available food in which the most fitted organisms will survive while the other ones will die. Competition is of two types;
 - a) **INTRASPECIFIC OR INTRA SPECIES** competition---is a type of competition that exist between organisms of the same kind or species .Example is pepper seedlings in nursery.
 - B) **INTERSPECIFIC OR INTERSPECIES** competition- is a type of competition that occurs organisms of different kind or species .Example is seen between species of Daphnia’.

1. ii) Short supply of food causes decline in reproduction and increase in death rate which directly lead to decrease in the population of the organisms in the habitat.

BALANCE IN NATURE

POPULATION-is an a small part of the community and is determined by some factor referred as limiting factors. If the limiting factor is more than one , the sum of the limiting factors resists the population

FACTORS AFFECTING POPULATION.

i)BIOTIC FACTORS-These are factors of the living things. Examples are ;birth, food ,death ,competition ,dispersal ,parasites , pathogens, predators ,emigration , and immigration.

1. ii) ABIOTIC FACTORS-They are the factors of non-living things which includes; water, space light ,temperature and rainfall.

DYNAMIC EQUILIBRIUM- is a point at which the effect of biotic and abiotic factors on population size approaches equality or equilibrium. This equilibrium is referred to as balance in nature.

For Examples cats regulate the population of rats by feeding on the rats .At the same time rats regulate the population of cat through the quantity to be eaten by cat. Cat and rat are in dynamic equilibrium.

WEEK EIGHT

FAMILY PLANNING

Family planning is a device by which couples determine the number of children they want and how they want them

Benefits of Family Planning.

- 1) It prevents unwanted pregnancy thereby avoiding the danger of illegal abortion.
- 2) It ensures good health care and qualitative education for the children.
- 3) It reduces maternal death rate usually caused by frequency of pregnancy.
- 4) It brings about adequate nutritional care to the child
- 5) It eliminates child dumping which is the main cause of motherless babies.
- 6) It prevents population explosion.

7) It allows the government to provide social amenities, education and health care facility for the citizen.

Method of Birth Control or Family Planning Devices.

1. A) NATURAL METHOD
2. i) Abstinence from sex.
3. ii) Breast feeding prevents pregnancy as the woman does not menstruate.

iii) Withdrawal method which is the removal of the penis from the vagina when ejaculation is about to take place prevents pregnancy.

1. iv) Prediction of the ovulation period based on duration of the previous menstrual cycle.

vii) Basal body temperature-During ovulation period the body temperature of a woman rises above normal.

viii) Cervical mucus billing ovulation –When ovulation is about to occur the cervical gland stimulates to produce a thick and cloudy mucus.

1. B) ARTIFICIAL OR MODERN METHOD

i) Use of hormonal family pills such as contraceptive pills by a woman.

ii) Use of injectable hormonal drugs such as progesterone into the woman's body.

iii) The use of a drug called Norplant which is implanted intradermal into the arm of the woman to prevent pregnancy

iv) Use of a sheath or barrier such as condom by the man.

v) The use of diaphragm which is a thin rubber sheath inserted into the vagina of the woman before sexual intercourse to prevent sperm from reaching the oviduct and uterus.

1. vi) The use of female condom which is a thin rubber sheath fitted into the vagina and cervix.

vii) The use of spermicidal cream or tablet which a woman applies inside the vagina 5-10 minutes before sexual intercourse, the spermicidal kills the sperm cell.

viii) Use of intrauterine Device(IUD)-This is a metal or plastic coil or loop that is inserted into the uterus of the woman to prevent fertilization or implantation of the zygote in the uterus. It is usually done by a medical expert.

1. ix) Sterilization Method is normally used by couples who not want more children. It is an irreversible birth control method and is the surest method .It can be done in two ways;
2. a) Vasectomy-This is the cutting of sperm duct or spermatid duct in men.
3. b) Tubal-ligation-This is the cutting of oviduct/fallopian tube. The two methods require an operations to be done by a qualified medical doctor.

REPRODUCTIVE SYSTEM IN MAMMAL

Male Reproductive System

The male reproductive system in man consists of testes, vasa efferentia, vas deferens (sperm duct penis and glands)

Testes

There are two testes in male animal. Each testes is oval in shape and is housed in a wrinkled sac called scrotum which hangs out of the body behind the penis. The scrotum functions as a thermo-regulator that protects the sperm from high temperature. The body temperature is too high for the formation of sperm hence the testes are positioned out of body that is slightly water (2 or 3°C lower) than the normal body temperature.

Each testis is made of a large number highly coiled tubes called seminiferous tubules and interstitial cells which lie with the seminiferous tubules. The seminiferous tubules produce the sperm while the interstitial cells produce testosterone.

Vasa efferentia: are small number of tubes which are connected with seminiferous tubules and unite to form epididymis, vasa deferentia collect sperms from the seminiferous tubules to the epididymis

Epididymis: This is highly coiled tube about 6 meter long which receives sperm from vasa efferentia. Sperm are temporarily stored to mature and develop in the epididymis.

Urethra: it serves as a passage for both urine and sperm

Seminal vesicle: the seminal vesicle is a small sac where sperms are stored. It is located close to the posterior end of vas deferens. It secretes seminal fluid. Seminal fluid contains fructose which provides energy for the sperm.

Glands: Three glands open into the male reproductive system. These are seminal vesicle, prostate gland and Cowper's gland.

The prostate gland is located a little below the bladder while a pair of Cowper's gland is situated below the prostate gland. These three glands secrete seminal fluid in which

sperm swim. The fluid activities sperm and into swimming. It provides food for the sperm and lubricates the passage. The sperm swim freely in the seminal fluid. The acidity of the urine is neutralized by the seminal fluid.

The seminal fluid plus the sperm make up the semen.

Functions of male Reproductive system

1. Formation of sperm to fertilize the eggs of the female
2. It produces male hormones (testosterone)

FEMALE REPRODUCTIVE SYSTEM

The female reproductive system consists of ovaries, fallopian tube or oviduct, uterus, cervix and vagina and vulva.

Ovaries: These are two oval-shaped structure located in the abdominal cavity on the side of the uterus.

Each ovary is held in position by ligaments. Ovaries are small and short, each contain thousands of undeveloped egg (ova). It is only when a girl has reached the age of puberty (9-15years) that a ripe egg is released alternatively each months by the ovaries. The ovaries stop producing eggs at about the age of 45-55years, a condition referred to as menopause.

Functions

1. Ovaries produce and release mature egg
2. They produce female sex hormones (oestrogen and progesterone)

Fallopian Tube: this arise from the uterus as narrow tube of about (9-13cm) long. The free ends are funnel-shaped free ends are lined with cell having cilia. When an egg is related to the cilia beat to direct the egg into the fallopian tube. Fertilization takes place in this tube

Functions of Fallopian Tube

1. Directs the release egg from the ovary to itself
2. Fertilization takes place inside the oviduct
3. The fertilized egg (zygote) is pushed to the uterus by the cell of the fallopian tub

Ovulation is the release of t matured egg into the Fallopian Tube by the ovaries.

Uterus (womb)

The uterus is a wide and thick-walled muscular chamber of about 8cm long and 5cm wide. Two fallopian tubes enter into it at the top while the lower narrow part terminates as a neck or cervix. The inner side of the uterus is lined with endometrium (layer well supplied with blood and food to receive fertilized egg)

Function of Uterus

1. Implantation of fertilized egg (zygote): Implantation is the attachment of the fertilized egg to the wall of the uterus.
2. The uterus provides a place for the attachment of foetal placenta. Before the development of placenta, the uterus provides nutrients for the embryo.
3. Before the development of placenta, the uterus provides nutrients for the embryo

CERVIX

The cervix is a ring of muscle with tiny aperture that closes the lower end of the uterus where it joins the vagina. It controls the opening and closing of the vagina during birth.

VAGINA

The vagina leads from the cervix of the uterus to the outside of the body. It is an elastic and muscular tube of about 10-14cm long. The opening of the vagina is partially covered by a thin membrane called hymen. If the hymen is intact, it means that the girl is still a virgin. However the hymen can be torn during vigorous physical exercise such as athletics or during sexual intercourse.

Function of the Vagina

1. It receives the male penis which deposits sperm into it
2. It serves as birth canal during the expulsion of the foetus from the uterus
3. The woman menstruate through the vagina

VULVA

The external female organ are collectively called vulva. These include the two thick fold of skin covered the public hair called labia major and labia minora.

Function of Vulva

1. It protects the opening of the vagina

CLITORIS: is a small erectile organ. It is a sensitive organ well supplied with blood vessels and nerves. It causes excitement during sexual intercourse and accelerates organism in female. Like penis it become erective in sexual excitement

HYMEN-This covers the entrance of the vagina and is often referred to as virginity

THE STRUCTURE OF SPERM AND OVUM(gametes)

Gametes are defined as a reproductive cell which can take part in reproduction and the process by which they are formed is called gametogenesis.

Male Gametes- The male gamete is called sperm which are produced in the testis by the process of spermatogenesis. The gamete is unicellular in nature that is it has haploid number of chromosomes. The sperm cell consists of three parts namely;

A head which contains the nucleus, a middle piece and a whip-like tail called flagellum. The head, also called acrosome is located at the anterior end of the head which contain lytic enzyme or agent being used to dissolve egg membrane to enhance penetration of egg cell during fertilization. The nucleus which is present in the head of the sperm cell contains the genetic materials which fuses with the nucleus of the egg or ovum to produce a zygote.

The middle piece contain numerous mitochondria which generate the energy used by the sperm cell to swim towards the egg. The long whip-like tail helps to move or propel.

Diagram of a sperm

Female Gamete

The female sex cell or gamete is called egg or ovum which is produced in the ovary by process called oogenesis.

The ovum is the female sex cell which is round in shape and large than the sperm. It consists of a nucleus and cytoplasm. The nucleus has haploid number of chromosome and is surrounded by nuclear membrane. The cytoplasm has yolk and is surrounded by two thin membranes ;plasma and vitelline membranes' jelly layer surround the vitelline membrane. The yolk provides a source of nourishment for the embryo especially at the early stage of development. The nucleus contains chromosomes which carry the genes which are responsible for the transmission of character from the parent to the offs

Diagram of an ovum

FERTILIZATION is defined as the fusion of the nucleus of the a sperm and the nucleus of an ovum to form a zygote. The route of the released sperm is from the vagina—cervix----uterus---fallopian tube----where fusion of sperm and ovum will take place .

IMPLANTATION is the attachment of the zygote to the wall of the uterus. The placenta is a disc of vascular tissues formed partly by embryonic tissues and partly by uterine lining. A placenta has villi which grows into the uterine lining to anchor it firmly.

Development of Embryo in man.

The developing embryo in man consists of three distinct layers.

1. a) Amnion-It is a thin innermost membrane that covers the embryo. The space between the amnion and the embryo is called amniotic cavity which is filled with amniotic fluid.

FUNCTIONS.

1. i) The amniotic fluid protects the embryo from shock and mechanical injury.
2. ii) The amniotic fluid provides an even temperature for the embryo and allows the embryo to move freely.

iii) The amniotic fluid keeps the embryo moist.

1. iv) The amniotic fluid is slippery and therefore help for easy passage of the foetus during child birth.

1. b) Chorion

The chorion is the outermost membrane that surrounds the amnion.

FUNCTIONS

1. i) It protects the embryo outside.
2. ii) It helps in the formation of placenta.

c) Allantois

The allantois grows out from the embryonic gut and fuses with the choroid villi in the uterine wall.

FUNCTIONS

i) It is the part of the umbilical cord that carries foetal blood vessels to and from the chorionic villi, thus serving for respiration, nutrition and excretion of foetus.

Gestation- This is the period between fertilization to parturition. i.e. period of pregnancy to delivery.

Parturition- It is the process of giving birth.

Types of Twins

1. i) Identical twin- develops from the same egg.
2. ii) Non-identical twin- develops from two different eggs.

iii) Siamese twin- Twins are attached together due to incomplete cleavage of the zygote,

.The placenta (also known as afterbirth) is an organ that connects the developing fetus to the uterine wall to allow nutrient uptake, provide thermo-regulation to the fetus, waste elimination, and gas exchange via the mother's blood supply, fight against internal infection and produce hormones to support pregnancy. The placenta provides oxygen and nutrients to growing babies and removes waste products from the baby's blood. The placenta attaches to the wall of the uterus, and the baby's umbilical cord develops from the placenta. The umbilical cord is what connects the mother and the baby. Placentas are a defining characteristic of placental mammals, but are also found in some non-mammals with varying levels of development

FUNCTIONS OF PLACENTA

i) It transfers mineral such as iron to the embryonic circulatory system.

ii) The placenta filters urea out of the baby's blood and transfer it to the mother's kidney.

iii)It exchanges carbon (iv)oxide from embryo's blood for oxygen from the mother's blood.

iv)It carries digested food from the mother's blood and pass them to embryonic circulation by diffusion.

v)The placenta prepares certain hormones for both the embryo and the mother.

vi)It prepares antibodies that protects the embryo against infection.

vii)The placenta selects the substances to be passed into the embryo's blood.

Diagram of placenta

QUESTIONS

i)An example of a permanent family planning method is (a) vasectomy (b)intra uterine device (c)diaphragm (d)condom

ii)Which of these is a natural method of birth control? (a)diaphragm (b)spermicidal (c)rhythm method (d)sterilization

iii)The structure of the embryo which develops and make contact with the uterine wall is known as the (a)umbilical cord (b)placenta (c)allantois (d)amnion

iv)The monthly release of an egg by the ovary is called (a)gestation (b)implantation (c)menstruation (d)ovulation

v)Fertilization in mammal occurs in (a)cervix (b)oviduct (c)uterus (d)vagina

vi)The following are parts of the male reproductive system EXCEPT (a)scrotum (b)seminal vesicle (d)vulva

vii)Identical twins inherit their genes from (a)different sperms and many ova (b)different sperms different ova (c)the same ovum and different sperm (d)the same ovum and sperm

THEORY

1)Make a well-labelled diagram (10-12cm long of mammalian sperm

ii)State five functions of placenta

For more information ,check Essential Biology

WEEK NINE

DEVELOPMENT OF NEW SEEDS

FERTILIZATION-in flowering plants to form a zygote takes place through the following processes.

After pollination the pollen grain absorbs a sugary liquid on the stigma, swell and germinates. The outer coat of the pollen grain which is exine split so that the pollen tube nucleus grows out into the style. At the initial stage, the pollen grain has only one nucleus. Later this nucleus divides into .i.e. a larger tube nucleus a smaller generative nucleus. The generative nucleus also divides into two male nuclei or two male gametes. The pollen tube nucleus grows into the ovule and enter through the micropyle and at the end, the pollen tube degenerates or burst. The two male nuclei or gametes are released into the embryo sac. One of the male nuclei fuses with the ovule to form a diploid ($2n$). This zygote develops into the embryo. This is the first fertilization. The second male nucleus or gamete fuses with the secondary nucleus to form a triploid cell ($3n$) i.e. endosperm nucleus which produces the endosperm. This is referred to as second fertilization which takes place in plant.

After fertilization, the sepals petals stamens, stigma and style wither and fall off. The zygote divides by mitosis to form many cell which are differentiated and become organized into an embryo. The embryo consists of the following parts;

- the plumule or embryonic shoot
- the radicle or embryonic root
- one or two cotyledons
- the endosperm.

After fertilization, the ovary become the fruit while ovule become the seed.

A seed is defined as a ripened fertilized ovule. The plumule and the radicle occupy opposite poles of the embryo. The cotyledons arise in the middle of the axis between the plumule and the radicle. The part of the axis above the cotyledon is called epicotyl while the part just below the cotyledon is known as hypocotyl. The endosperm and the cotyledon stored food for the growth of the embryo. They store food such as carbohydrate, lipid, and protein. A seed which has only one cotyledon is called monocotyledon while those that have two cotyledons are called cotyledon

GERMINATION OF SEED

Germination-is defined as the process which involves the gradual development of the embryo of a seed into a seedling or a young plant

TYPES OF GERMINATION.

1. i) Epigeal germination-is defined as type of germination in which the cotyledon or seed leaves are carried above the soil surface .It can be seen in dicotyledonous plant such as cowpea, groundnut ,melon , mango .e .t. c. The cotyledons are flat ,green and leaf-like in appearance as it pushes upward by elongation of hypocotyl.

2) Hypogeal germination-is defined as a type of germination in which the cotyledon or seed leaf and endosperm remain below the soil surface. Examples of plants with hypogeal germination are maize plant, oil palm,guinea corn, millet, wheat .e. t. c. The cotyledon does not turn green but gradually dry up and fall off.

CONDITIONS NECESSARY FOR GERMINATION

1. i) Water or moisture
 2. ii) air or oxygen
- iii) warmth or suitable temperature
1. iv) Enzymes

v) viability of the seed.

1. vi) Some seeds require light for germination to be effected.

Epigeal germination

FRUIT

A fruit is a complete structure that is formed from a ripened and fertilized ovary. Fruits that develop without fertilization are called parthenocarpic fruits or seedless fruits.

A true fruit is a fruit that develops from only one ovary while a false fruit is fruit that develops from the receptacle or calyx or other whorl.

Structure of a Fruit

A typical fruit consists of fruit wall called Pericarp. The pericarp is divided into three layers; Epicarp which is the outer layer, Mesocarp which is the middle layer and an inner layer called Endocarp.

Diagram.

Types of fruits

i) Simple fruit-This is a fruit that develops from a flower with one ovary. The ovary may be monocarpous.e.g .maize, cowpea ,and it may be syncarpous e.g. pawpaw

ii) Aggregate fruit-This is a fruit that develops from a single flower with many ovaries (apocarpous pistil).Carpels are separate, free and have many ovaries. Cluster of fruits arise on the main fruit stalk .e.g. cola, strawberry and custard-apple.

iii) Multiple/ Composite fruit-is a fruit that develops from several flowers(inflorescence) e.g. pineapple ,bread fruit.

CLASSIFICATION OF FRUITS

Fruits are classified based on whether they are fleshy or dried when they are matured.

i) FLESHY/SUCCULENT FRUITS

1. a) DRUPE—is simple fruit from a single carpel. It consists of outer exicarp and mesocarp and inner stony endocarp containing the seed. It usually contains a seed (mango, coconut) or two or three seeds at most (palm tree fruit). The mesocarp may be edible (mango) or not edible but fibrous (coconut)
2. b) BERRY—is a fleshy fruit with many seeds or without seeds. It also contains epicarp, mesocarp and endocarp. The three layers may be edible in some fruit. Examples of berry are tomatoes, orange, Guava, Water melon, pepper .e.t.c .
3. c) POME is a fleshy fruit formed from one or more carpels with a fleshy part derived from the receptacle. e.g apple, pear
4. d) SOROSIS/ HESPERIDIUM—is fruit formed from several carpels. The outer of the ovary is modified into a tough leathery ring while the inner part is modified into compartmentalized succulent part with many tiny seeds. e.g .pineapple and bread fruit.
5. ii) DRY fruits are divided into
6. a) Dried Dehiscent Fruits which are fruits that split when they are dried. Examples are
7. i) Legume/pod is a simple dry fruit that develops from a simple carpel e.g crotalaria, locust bean fruit, cowpeas .It splits open when dried along one side.

ii)Follicle is a dry fruit developed from a carpel and contains two or more seeds. It splits along both sides when dried.

iii) Capsule is a simple fruit that developed from two or more carpels. It splits along many sides of fusion when dried.

1. b) Dried Indehiscent -Fruits-they are fruit that do not split even when they are dried. Examples are
2. a) Nut is compound fruit consisting of the seed and a hard shell. It usually contains one seed. e. g cashew nut.
3. b) Caryopsis is simple dry fruit , formed from a carpel. The pericarp is fused with the thin seed coat.eg maize and other cereals.
4. c) Achene is a simple dry fruit developed from one carpel. It contains one seed but the seed does not fuse with the pericarp.eg fruit of sun flower.
5. d) Cypsela is simple dry fruit developed from an inferior ovary. It contains one seed and is surrounded by calyx sheath.eg tridax fruit.
6. e) Samara is dry fruit in which the ovary is extended to form flat wings which aids dispersal by wind.eg fruit of conbretum plant.

DISPERSAL OF FRUITS AND SEEDS

DISPERSAL—is the process of scattering or spreading out of seeds and fruit from their parent plants and site. Agents of dispersal are means through which the fruit seeds are being dispersed.

1. a) WIND-fruits and seeds dispersed by wind possess the following features

-have parachute, pappus eg tridax

-Wing .e.g combretum

- light.eg cotton have floss around the seed.

b)WATER-Any fruit dispersed by water must possess the following features

-light

-flat on water

-able stay for a long time water without spoil

-the mesocarp possesses air space in order float

-the epicarp must be water-proof.eg coconut.

c)ANIMAL- Fruits dispersed by animals must possess the following features;

-hooks and barbs that can stick to the body of the animals for a long distance.

-sticky hairs

-edible to be attracted to animals .eg coconut, mango, tomato

The animals disperse the fruit after eating.

d)EXPLOSIVE MECHANISM/BIOLOGICAL DISPERSAL-The seeds are dispersed when the fruit wall is dried, it splits along the lines of fission and the seeds are scattered. Examples are castor oil, oil bean, crotalaria, cowpea

WEEK TEN

REPRODUCTIVE BEHAVIOURS IN ANIMALS

COURTSHIP BEHAVIOUR-is a collection of ritualized behaviours unique to each species that lead up to and enable animals to have successful sexual union. It is a pattern of instinctive behavior in response to certain external stimulus in animal .Courtship may be simple ,involving a small number of chemical, visual, or auditory stimuli or it may be a highly complex series of acts by two or more individuals, using several modes of communication. Courtship behaviour is displayed by partners dealing with competing emotion like fear, aggression, and sexual interest spurred by physical closeness.

IMPORTANCE OF COURTSHIP

i)It brings the male and female animals together .

ii)It prepares the male and female animals for mating

iii) Courtship stimulates egg laying and sperm release in the animals

iv) The process enhances fertilization and reproduction.

TYPES OF COURTSHIP BEHAVIOURS

1. i) PAIRING - is a type of courtship behavior in which two animals usually a male and a female separate themselves from other groups to form a mating partners. The pairing may be very brief or just for mating act or last for a life time. Pairing may be seen in such as fishes, toad, termites and human being.

Pairing in winged termites- During breeding season, the winged termites usually a male and female pair up. They fly out to form new colony.

Pairing in fish- During the breeding season, the male fish pick a female as partner. The male stimulates the female to lay egg and the male releases sperm on the egg for external fertilization to take place.

Pairing in Toad- During the breeding season, the male toad goes to the ponds, it croaks which invites and excites the female. When the female comes, the male mounts on its back of the female for two or three days. During this period, the female lays egg while the male fertilizes them externally.

Pairing in Human Being- Male and female after they attain sexual maturity come together as husband and wife. They form sexual partners which live together, mate and reproduce.

1. ii) DISPLAY- is an elaborate process which involves a series of fixed pattern of movement or attractive exhibition between mating partners. This movement is a response to some action of the partner and trigger a re-programmed movement pattern by the partner.

TYPES OF DISPLAYS

-dancing

-singing

-croaking

-nest making in birds

-production of odour of by female to the male

--symbolic feeding of the female to attract the male.

DISPLAY IN Agama lizard- The lizard displays its bright colour and approaches the female. The female lizard curves her back and lifts her tail vertically. The male wags

his tail ,nods his head and grip the female by the neck and pushes his tail under her body so their cloacae come into contact for copulation to take place

DISPLAY IN BIRDS—In domestic fowl, display involves dancing of male cock towards the female(hen).The cock lowers the wing on the side away from the hen and dances in staggering manner sideways towards the hen, beating the lower wing against its body and its leg as it moves. If the hen is ready for courtship, the cock chases the hen and overtakes her, mount on her back and pecks on hen her head while it stoops down and raises her tail feather to expose the cloaca to allow mating to take place.

DISPLAY IN HUMAN BEING—Display behaviour in human being involves physical appearance and make-up of both sexes.

Display in matured girl includes the followings;

- applying of lipsticks to their lips and powdering of the faces
- Wearing, plaiting, curling of hair, wearing of wigs of different colour
- Wearing of attractive hat and head gear
- Wearing of large brightly coloured bangles and dangling earring
- Wearing of tight fitting dresses to display the body curve
- Displaying of thigh by wearing short dresses
- Well-built feminine stature
- Wearing perforated or transparent dresses to show the attractive parts of the body
- Wearing of artificial eye lashes, finger nails, breasts and buttock
- Use of perfumes to conceal the body odour
- Walking with shaking of buttocks
- Attractive dancing and singing of melodious songs in public gathering especially in social gathering.
- Showing kindness, generosity and favour with good manner
- Attractive smile, dazzling of eye and genuflecting to senior male

Display in matured male child includes the followings;

- Attractive hair cut

- Wearing of colourful and neat reigning style dresses, shoes and cap to match
- Use of perfumes to conceal body odour
- Exposure of hairy body
- Well-built muscular stature
- Display of money and other valuable jewels
- Singing melodious songs
- Walking gracefully and majestically
- Attractive smile
- Showing kindness, favour and generosity with good manner.

iii) TERRITORIALITY—This is claiming exclusive control or ownership over a particular territory. Or territoriality is a phenomenon in which an animal acquires a specific area, advertise it and defend it against intruders particularly of its own species. Usually, it is the male animals that establishes the territory only the female animals are allowed to share the territory with them.

FUNCTIONS OF TERRITORY

- i)Territoriality ensures an adequate supply of food, nesting materials for the young therefore resulting in better growth.
- ii)The young and the female are protected from the attack of the other male.
- iii)The population is reduced to a density that the territory can support
- iv)It reduces attack of diseases and parasites
- v)It makes the male animals to be familiar with its site

WAYS IN WHICH ANIMALS DEFEND THEIR TERRITORY

- i)By displaying of visual signs-are signs that quickly attract the sense of sight
- ii)By auditory signs or signals-signals in form of sound
- iii)By producing smell signal that drive away other animals

IV)SEASONAL MIGRATION- This is the movement of animals in response to unfavourable climatic conditions ,food availability and to ensure reproduction .Animals migrate in order to bear their young in places relatively safe from predator and rich in resources.

Seasonal Migration can be seen in certain birds such as swallows, storks, cattle egrets .Fishes such as barbells, maid fishes, eels, salmons.