BIOLOGY 1 2013 - NECTA FORM FOUR

Solutions from: Maktaba by TETEA

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i	ii	iii	iv	v	vi	vii	viii	ix	x
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i	ii	iii	iv	v	vi	vii	viii	ix	x
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3. (a) Botany: A branch of Biology which deals with the study of plants. It is also called plant science or plant biology. A person who specializes in Botany is called a botanist.

(b) Characteristics of living organisms

Growth and development: During growth the size of an organism increases permanently. Growth is caused by an increase in the number of cells that make up an organism.

Development occurs when cells become specialized to perform specific functions. This causes an organism to change in shape and form; also it becomes more complex.

Sensitivity or Irritability: Living things detect and respond to changes in their environment. For example, human beings can feel and react to heat, cold and pain. Plants also respond to stimuli; however the responses may not be very fast or visible. Mimosa is an example of a plant that clearly shows sensitivity. The leaves of mimosa plant close when they are touched.

Movement: All organisms can move on their own accord in response to things in the environment. Non-living things only move when pushed or pulled by something or someone. Some living things move from place to place in search of food, water, shelter, light or suitable temperature. Movement involving the whole body of an organism is called locomotion. For example, animals can walk, crawl or

run. Other organisms especially plants only move some of their parts for instance movement of plant roots towards water this is called movement by curvature.

Reproduction: Living things reproduce new individuals of their own kind for example human beings give birth to human beings. Chicks are hatched from eggs, maize seeds grow into maize plant. Reproduction ensures continuity of living organisms.

Nutrition: A process whereby living things take in food substance from the environment to nourish their bodies. Green plants and some other organisms such as euglena make their own food from simple inorganic substances such as carbon dioxide and water whereas fungi and animals feed on ready-made food in the form of plants, plan materials, other animals or micro organisms. Food enables living thing: to grow, develop and produce energy to carry out other life processes.

Respiration: The food taken in by organisms contains energy, however this energy is not in a directly usable form. The food has to be broken down into simpler molecules in order for it to release energy Respiration is a process by which digested food substances are broken down to simpler molecules thereby releasing energy.

Excretion: Metabolic processes such as respiration produce byproducts, some of which can be harmful if left to accumulate in the body of an organism. Excretion is the process by which the end products of metabolism are removed from the body of an organism. Examples of excretion processes in human beings include sweating and urination.

4. (a) The development of a seed into a seedling is called germination. The environmental conditions necessary for germination are:

(i) Moisture/water

(ii) Oxygen and

(iii) Suitable temperature

(i) Roles played by water in germination

Water softens the seed coat and makes it possible to be ruptured and allow embryo to emerge during germination. Water activates enzymes responsible for digestion of food stored in the endosperm and cotyledons.

Water absorbed by the seed creates pressure that ruptures the seed coat.

(ii) The roles played by air during germination

All living things need energy to activate their protoplasm for cell division and growth. In seeds this energy is obtained through respiration of food stored in the seed. Thus, air is used in respiration of stored food to give the seedling energy and nutrients for growth.

Chemical equation of aerobic respiration:

$C_6H_{12}O_6 + 6O_2$, Enzyme > Energy + $6CO_2 + 6H_2O$

(iii) The roles played by temperature during seed germination.

Before germinating a seed requires a certain minimum temperature. Optimum temperature is necessary for activating enzymes required to digest stored food in a seed.

(b.

Epigeal germination

- Germination in which cotyledons are forced above the ground
- The hypocotyl elongates
- The cotyledons become photo- synthetic

- Seed coat emerges from the soil.

Hypogeal germination.

- Germination in which the cotyledons remain in the seed below the ground.

- Epicotyl elongates

- Cotyledons do not become

photosynthetic

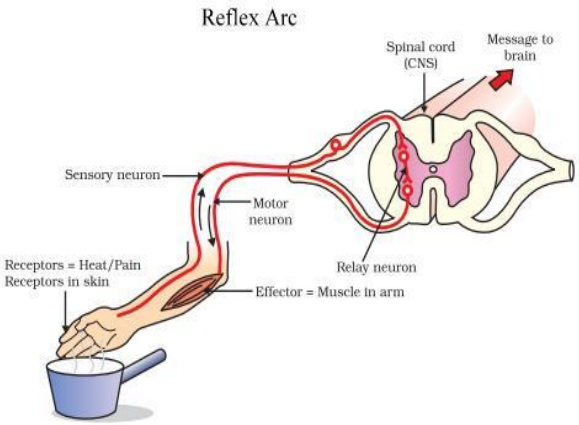
- Seed coat remains in the soil

Example: maize and wheat)

5 (a) Irritability is a characteristic feature of all living organisms and refers to their ability to respond to stimuli..

(b) Reflex action involves the nervous system. A stimulus initiates nervii impulses in the sensory neurone. These impulses pass via the relay neurone in the spinal cord and a motor neurone to the effector organ la. muscle or gland which brings.about the response. The neural pathway linking the receptor and effector organ is called a reflex arc.

Consider a reflex action involving hand withdrawal when one touches a hot object. On touching a hot object, the pain and temperature receptors in the skin where the stimulus has been applied are stimulated. Nerve impulses are initiated in the nerve endings in the receptors. The impulses are relayed to the spinal cord through the sensory neurone. Within the spinal cord the nerve impulses are passed to the relay neurone across the synapse then the nerve impulses are passed to the motor neurone. Once the nerve impulses are in the motor neurone they are transmitted to the biceps muscle. On reaching the biceps the nerve impulse initiates the contraction of the biceps muscles thus pulling the hand away from the hot object.



6. (a) (i) Osmosis is as a process by which water molecules move from a weak solution to a strong solution through a semi permeable membrane.

Osmosis is a form of passive transport, it is a special form of diffusion which involves movement of water molecules through a semi permeable membrane, form a region of high concentration to a region of their low concentration.

(b) (i) When a cell is immersed in a hypertonic solution (concentrated solution) it loses water through osmosis and so the cell shrinks. This process is known as plasmolysis when it occurs in plant cells and crenation when in animal cells.

(ii) When red blood cells are put in a hypotonic solution (dilute solution) they absorb water causing the cell volume to increase. Excessive amounts of water cause haemolysis (bursting) of the cell membrane.

taken by reflex actions in human being.

7. (a) Steady state theory: This theory states that "The planet earth and all organisms in it have always been there and therefore, there has been no beginning of life.

The theory of creation: This suggests that the earth and all organisms in it were created in a single event by a super being or God. This theory is stated in holy books such as the Bible and the Quran.

Spontaneous generation theory: This theory suggests that living

things arose from non-living materials on a number of distinct occasions.

Cosmozian (Panspermian) theory: This is based on the idea that life arose somewhere else in the universe and arrived here from outer space by some means.

Organic evolution theory (Naturalistic): This theory suggests that life arose from the evolution of simple organic molecules into more complex ones and their ultimate evolution into cells. The theory of organic evolution is the one that is most widely accepted today. Over millions of years, life on this planet has evolved from its simple beginnings into the vast range of organisms present today by biochemical processes.

(b) Darwin contributed to the theory of evolution by postulating the following ideas:-

Individuals within a population produce on average more offspring than are needed to replace themselves. The numbers of individuals in a population remain nearly constant.

Many individuals fail to survive or reproduce.

There is a struggle for existence between organisms for the limited resources that they all need.

All living things vary from one another considerably.

The offspring of the naturally selected organisms will inherit many of their parents favourable characteristics and become, better adapted.

8. (a) Digestion: is the process whereby food is chemically broken down in a simpler form which can be used by the body.

Malnutrition: This is a physical condition of a body that results from eating a diet in which there are either too little or too much nutrients.

Balanced diet: It refers to a diet containing all types of food nutrient i correct proportions.

Nutritional disorder: Any of the nutrient-related conditions of tly body that results from either taking in a poor diet or over feeding.

(b) There are different types of nutritional disorder in humans whict include obesity, marasmus, rickets, kwashiorkor, Anorexia Nervosa and Bulimia nervosa.

Obesity: is a condition whereby excess body fats accumulate in the body resulting to overweight and other health complications. It often results from eating too much and not exercising enough.

Marasmus: This is a form of malnutrition in children caused by lack of adequate amount of food. It is characterized by weight loss, stunted growth, dry skin, extreme hunger, irritability, decreased activity and lack of energy.

Kwashiorkor: A nutritional disorder caused by deficiency of proteins in the body. Its signs and symptoms include swollen abdomen due to accumulation of fluids, dry skin which cracks easily, extremely thin arms and legs, weakened immunity and enlarged liver.

Rickets: A condition whereby bones of a child soften leading to deformity and fractures. Rickets results from lack of vitamin D, phosphorus and calcium. Signs and symptoms include bow legs, nockknees, odd-shaped skull, bone pain, weak muscles, easily fractured bones, and slow growth.

9.(1) Continuous variations are variations in which there are intermediate forms between extremes. For example, in a group of 100 people you get different heights ranging from intermediate to tall.

Discontinuous variations are those variations which show clear cut difference between the characters with no intermediate forms. These variations separate members of a population into two or more distinct groups. For instance normal human beings are either males or females; human blood groups are either A or AB or B or 0.

(ii) Difference in a characteristic as a result of genetic inheritance from the parents is called inherited variation.

Difference in a characteristic as a result of adaptation to the environment which can be easily recognized during individual development is called acquired variation.

Unlike in inherited variation, acquired variations do not include changes in the genetic material.

b) How nutrition and nutritional factors cause variation among organisms

Mutation: Mutations produce random changes in an organisms genetic code. Mutations that occur in reproductive cells are passed onto the next generations and contribute to genetic variation in a population.

Nutritional factors: Nutrition is an environmental source of variation. Poor nutrition or bad feeding habits lead to abnormal growth. A person whose diet is poor shows a stunted growth and he/she becomes more susceptible to diseases which in turn cause further poor growth. This is contrary to those who eat well as they will grow well.

10. (a) Factors affecting gaseous exchange in animals

(I) Concentration of carbon dioxide: If there is a high concentration of carbon dioxide in the blood the rate of gaseous exchange increases. This is in order to provide the tissues with adequate amounts of oxygen and eliminate large amounts of carbon dioxide.

(ii) Concentration of haemoglobin: Haemoglobin is responsible for the transportation of gases from the lungs to the tissue and back. Therefore efficient transportation of gases only takes place when the body has adequate amounts of haemoglobin.

When a person is anemic the body has a low concentration of haemoglobin. Therefore, only small amounts of oxygen can be transported at a time. As a result, the rate of gaseous exchange has to increase so that the tissue gets adequate oxygen.

Physical activity: A more active body requires more oxygen than a less active body. As a result, gaseous exchange takes place faster when there is increased body activity.

Health state of the body: Generally, the rate of gaseous exchange increases when somebody is sick. This is as a result of increased metabolism by the liver in order to either remove the toxins released by disease causing micro-organisms or break down the drugs taken. Certain diseases also make the body weak and cause slowing down of the breathing process.

Age: Young people are generally more active than old people. Also, a lot of growth processes take place in the bodies of young people. This increases the demand for oxygen and therefore increases breathing rate.

Altitude: At high altitudes concentration of oxygen in the atmosphere is lower compared to low altitudes. At high altitude,there is also decreased atmospheric pressure. This makes breathing difficult. Mammals therefore have to breathe in faster in order to get enough air.

(b) (I) A fish uses gills for gaseous exchange. Gills operate by taking oxygen dissolved in water and so when a fish is taken out of water its gills stick together and cannot absorb oxygen from air.

A frog on the other hand has lungs and skin as organs for gaseous exchange. So when in water a frog can get dissolved oxygen from water using its skin and when out of water it can get oxygen through its lungs and water through the skin

11. Common accidents at home and school, causes and how to prevent them

(i) Fires, burns and scalds

Causes:

Running in the laboratory

Allowing children to play in the kitchen

Storing oxidants, flammable and explosive substances near sources of heat.

Prevention:

Do not run in the laboratory

Do not allow children to play in the kitchen

Store oxidants, flammable and explosive substances far from sources of heat.

(ii) Drowning

Causes:

Going near water bodies when it is dark

Allowing children to play near water bodies.

Leaving pools of water at home or school uncovered.

Prevention:

Avoid going near water bodies when it is dark.

Do not allow children to play near water bodies.

Cover or fence all pools of water at home or school.

(iii) Falls

Causes:

Climbing trees and walls

Running unnecessarily

Leaving the floor wet and slippery with spilled liquids.

Leaving fruit and vegetable peels on the floor

Prevention:

Avoid climbing trees and walls.

Put signs to indicate where there are stairs or steps

Do not run unnecessarily.

Wipe spilled liquids on the floor immediately.

Do not leave fruit and vegetable peels on the floor.

(iv) Poisoning

Causes: -

Bad storage of poisonous substances e.g. kerosene

Testing or eating in the laboratory

Testing unlabelled containers

Prevention:

Label all containers clearly.

Store all poisonous substances in a safe lockabled space when not in use.

Do not taste or eat things in the laboratory.

(v) Choking

Causes:

Talking while eating or drinking

Eating or drinking while laying down

Giving children small objects to play with.

Prevention:

Do not talk while eating

Sit upright when eating or drinking

Eat slowly and do not take part in eating competitions

Do not give children small objects to play with as they could put them in the mouth.

(vi) Bites and stings

Causes:

Playing near beehives and wasp nests

Irritating bees or wasps.

Keeping tall grass and bushes that could harbour dangerous animals and insects near the house.

Prevention:

Do not irritate animals.

Stay away from beehives and wasp nests.

Cut bushes and tall grass that can harbor dangerous animals and insects near the house.

Electric shocks

Causes:

Touching electrical equipments with wet hands

Poor installation of electrical appliances

Leaving electrical appliances that are not being used on.

Pushing metal objects into electric sockets.

Spilling water near electric sockets.

Prevention:

Switch off electrical appliances that are not being used.

Do not touch electrical appliances with wet hands.

Ensure that all electrical appliances are properly installed.

Do not push metal objects into electric sockets.

When water is spilt near electric sockets put off the main switch until it has dried.

Inherited and acquired variations.

12. HIV/AIDS

AIDS is an acronym for Acquired Immune Deficiency Syndrome. HIV on the other hand is an acronym for Human Immunodeficiency Virus. HIV is the causative virus for AIDS.

HIV is deadly because it attacks the types of white blood cells (helper Tcells) which are essential for immunity. After infection with HIV, a person can remain asymptomatic for many years during which the virus multiplies. The multiplication of HIV in the blood leads to massive destruction of helper T cells. This weakens the body immunity and the person may develop full- blown AIDS. Due to low immunity the person gets diseases which would normally be fought off by the immune system. These diseases are called opportunistic infection. Death may result from these infections.

Transmission of HIV

HIV virus lives in body fluids of an infected person mostly blood, semen, vaginal secretion and breast milk. Sweat, saliva and tears have very low concentration of the virus. HIV can be transmitted through any of the following routes:

Sexual intercourse with an infected person.

Blood transfusion from an infected donor.

Using unsterilized surgical or skin piercing instruments such as scapel infected with HIV.

needles and circumcision blades that have been used on a person with HIV.

Sharing toothbrushes, shaving blades or nail cutters with infected people.

Symptoms of HIV and AIDS

There are four stages of HIV and AIDS

The primary stage or window stage - accompanied by a flue-like illnes The HIV test is negative at this stage.

The asymptomatic stage has no symptoms but the HIV test is positive, The symptomatic stage is characterized by severe damage to the immune system.

The fourth stage is full-blown AIDS whereby one gets various opportunistic infections and diseases.

The following are symptoms during symptomatic stage

Loss of body weight by over five kilograms in two months.

Persistent fever that lasts for longer than a month.

Painless flat hard lumps growing on the skin or in the mouth.

Diarrhoea for longer than a month.

Coughing for more than a month.

Itchy rashes on the skin.

White layers in the mouth and throat (oral thrush).

Swollen glands, especially in the neck and armpits.

Shortness of breath gradually getting worse.

Genital rashes.

Treatment

Currently there is no treatment for HIV and AIDS. Antiretroviral drugs (ARVS) can slow the progress of AIDS but cannot cure it.

13. Similarities between wind and insect pollinated flowers

-In both ovules are enclosed in ovaries, hence seeds are enclosed in fruits.

-In both, for pollination to occur, pollen grains are deposited on the stigma.

-They are both reproductive structures

-Both are advanced flowers

Characteristic	Insect-pollinated flower	Wind-pollinated flower
1) **Flowers**	Usually large, brightly coloured and scented to attract insects.If flower small → form an influorescence	Usually small, dull-coloured and scentless (unattractive to insects)
2) **Nectar**	Often present to attract insects	Usually absent
3) **Scent**	Flowers are fragrant or sweet-smelling	Flowers do not have scent
4) **Pollen**	Fairly abundant; large, sticky and heavy, rough surfaces to cling onto insects' bodies	Abundant; small, smooth, dry, light → buoyant & easily blown about by wind
5) **Stamens**	May not be pendulous	Usually have long, slender filaments that sway in the slightest wind → pollen grains easily shaken out from anthers
6) **Stigmas**	Usually small and compact, not feathery and do not protrude; sticky so that pollen grains setting on them are not easily displaced	Protrude + large & feathery → large s.a. to catch pollen floating in air
7) **Nectar guides (marking that guide insects to nectar)**	May be present	absent