

BIOLOGY- is the study of living organisms.

- Characteristics of living organisms (MRS GREN)
- ✓ **movement** as an action by an organism or part of an organism causing a change of position or place;
- ✓ **respiration** as the chemical reactions in cells that break down nutrient molecules and release energy for metabolism
- ✓ **sensitivity** as the ability to detect or sense stimuli in the internal or external environment and to make appropriate responses
- ✓ **growth** as a permanent increase in size and dry mass; by an increase in cell number or cell size or both
- ✓ **reproduction** as the processes that make more of the same kind of organism
- ✓ **excretion** as removal from organisms of the waste products of metabolism (chemical reactions in cells), toxic materials, and substances in excess of requirements
- ✓ **nutrition** as taking in of materials for energy, growth and development; plants require light, carbon dioxide, water and ions; animals need organic compounds and ions and usually need water

1.0 SAFETY IN THE LABORATORY

- when working in the laboratory, you need to know safe procedures and investigations so as to avoid accidents.

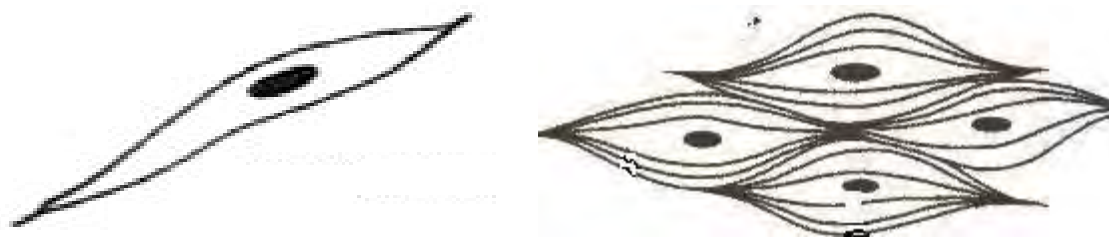
1.1 Causes of accidents in the laboratory

- fire-there should never be open flames in the lab;
- electricity-all electrical cables should be insulated/do not pull cords when disconnecting/do not overload circuits/keep electrical cords away from water, heat or oils to avoid damaging them;
- improper handling of microorganisms-schools must not keep snakes in the lab;
- fumes/ inhalation of chemicals-keep your nose away from gaseous substances;
- strong acids/bases-many mineral acids and alkalis are corrosive to the skin and eyes;
- improper handling of apparatus-handle apparatus with care;

1.2 Accidents that can happen in the laboratory

- explosions/fire;
- fire burns/chemical burns/corrosion/spills;
- slipping/tripping/falling;
- fumes inhalation;
- electrocution/electric shock;
- damaging of apparatus/building;
- body burns/injury/infection;

2.45 Muscle cells

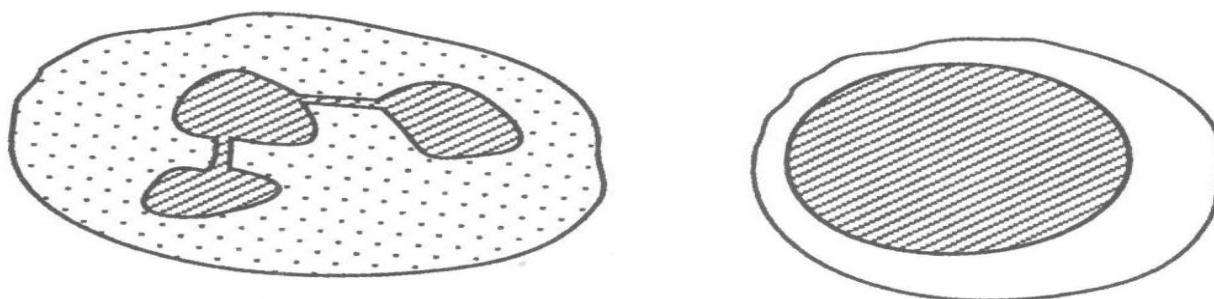


- for contraction resulting in movement

Adaptations

- have many/numerous mitochondria-for energy
- they are elastic-so as to change shape
- they are long-so as to change size
- have nerve cells connected to the muscle fiber-they are effectors in a response
- are attached to the bone-for movement

2.46 White blood cells-for immunity



Phagocyte	Lymphocyte
• engulfs and digests bacteria	- produces antibodies to agglutinate antigens/neutralize toxins
• has a lobed nucleus	- has an oval/round nucleus
• granular cytoplasm	- aggranular cytoplasm
• more cytoplasm	- less cytoplasm
• larger	- smaller

2.47 Ciliary hairs

- move mucus up the trachea
- have cilia (tiny hairlike projections)-sweeps the contaminated mucus upwards.

4.0 VARIATION

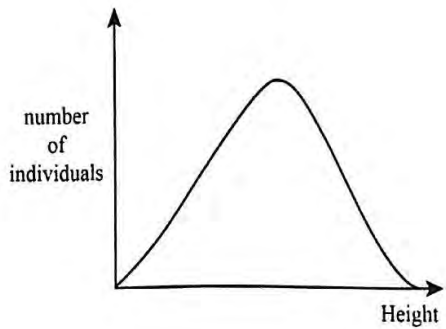
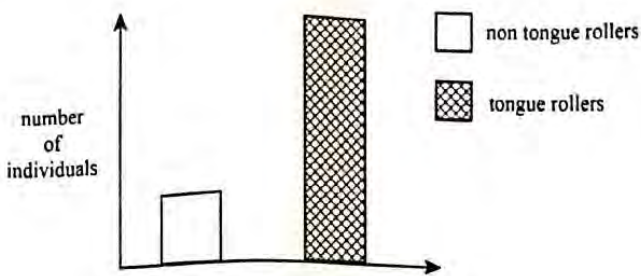
- is the differences in characteristics/ features among organisms of the same species/type/kind.
- can be phenotypic/ genotypic
- Phenotype of an organism is the observable characteristics
- Genotype is the genetic makeup of an organism

Causes of variation

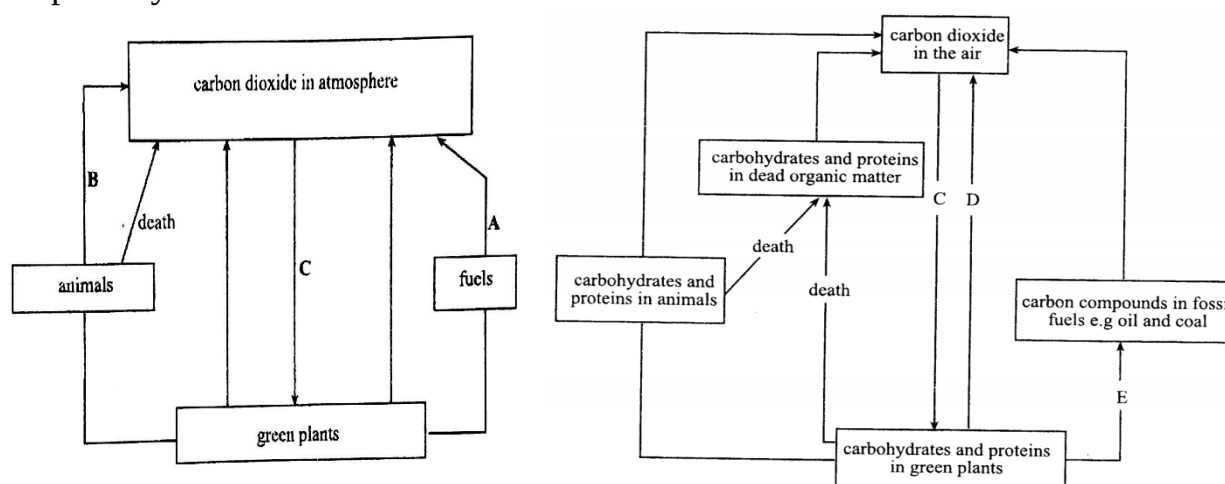
- Environmental factors
 - Genetic factors
 - Mutations
- there are two types of variation
1. continuous variation – produces no clear/ no distinct groups
 2. discontinuous variation- produces clear/ distinct groups;

Factors affecting continuous variation

- diet/ nutrition
- genetic predisposition/ mutation
- health/ diseases

Continuous variation	Discontinuous variation
1. -is Quantitative/measurable	-is Qualitative/descriptive
2. -no clear cut/no distinct differences	-clear cut/distinct differences
3. -intermediate characteristics	-no intermediate
4. -influenced by the environment and genes e.g. • diet/ nutrition • genetic predisposition/ mutation • health/ diseases	-influenced by genes only
5. -when plotted gives a normal distribution curve	-when plotted gives a random distribution curve
6. -e.g. height, mass, shoe size, intelligence, leaf size, size of pods, number of pods	-e.g. blood groups in humans; skin/coat color; sex; tongue rolling; left/right handedness; eye color; ear lobes;
	

- atmospheric air is made up of only 0.03% carbon dioxide
- plants and animals need carbon to produce carbohydrates, proteins and fats
- biological components of an ecosystem utilize carbon only through green plants during photosynthesis



Burning/ combustion – carbon from fossil fuels and plant matter is released into the atmosphere as carbon dioxide gas

Respiration – carbon is released back into the atmosphere in the form of carbon dioxide when plants, animals and decomposers break down food

Photosynthesis – carbon in the form of carbon dioxide is combined with water to form carbohydrates

Feeding – animals obtain carbon by eating plants and are turned into animal carbohydrates, fats and proteins

Death and decay – carbon passes from plants and animals to decomposers as they break down the nutrients in these organisms

Fossilization/ compaction – compacted dead animal and plant materials are turned into fossil fuels

Role of bacteria in the Carbon cycle

- dead animals/ plants/ organisms
- breakdown of carbohydrates to release Carbon dioxide
- to be used up by plants
- during photosynthesis

The Nitrogen Cycle

- the atmosphere is 78% nitrogen
- plants and animals can't absorb nitrogen gas from the air
- nitrogen can only be absorbed in another form e.g. nitrate (NO_3)
- plants use the nitrates to make proteins
- animals obtain nitrogen compounds from feeding on plants

MALNUTRITION

- is overfeeding/ nourishment
- excess of a specific nutrient in diet
- underfeeding/ nourishment
- lack of a specific nutrient in diet

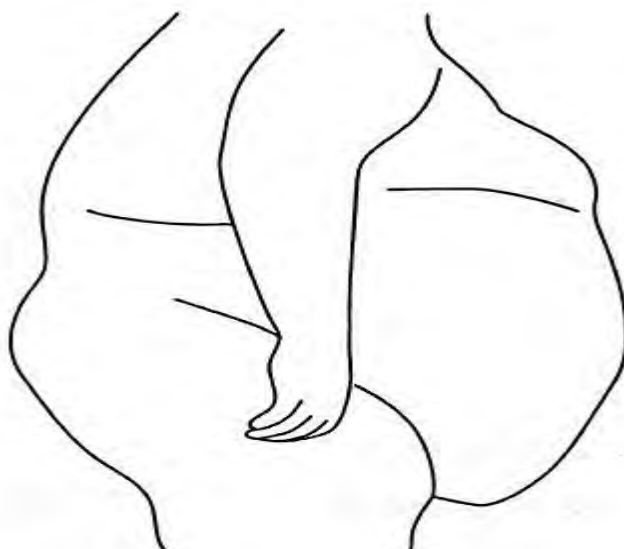
Effects of malnutrition

- ✓ obesity
- ✓ anorexia nervosa/ excessive weight loss
- ✓ deficiency diseases e.g. scurvy/ rickets/ night blindness/ goiter/ kwashiorkor
- ✓ stunted growth in children

Effects of malnutritional disorders

❖ **Obesity**

- caused by high intake of carbohydrates
- which results in excess being stored as fat under the skin
- the person may gain weight and become obese
- caused by a lowered metabolism
- occur due to glandular disturbances/ may be an inherited condition



How a person with obesity is likely to suffer from Coronary Heart diseases

- high blood cholesterol
- results in narrowing of coronary artery/ atherosclerosis
- thrombus plaque formation/ thrombosis
- leading to coronary artery blockages
- high blood pressure/ hypertension

- for lipase action
- **pancreatic juices contain enzymes**
- pancreatic amylase; catalyzes breakdown of starch to maltose
- pancreatic trypsin; catalyzes breakdown of proteins to peptides
- pancreatic lipase; catalyzes breakdown of fats to fatty acids and glycerol
- contains sodium hydrogen carbonate
- neutralizes stomach acids

The Ileum

- for final digestion of food
- for absorption of soluble food nutrients e.g. glucose, amino acids, fatty acids and glycerol
- secretes intestinal juice with enzymes
- maltase
- converts maltose to **glucose**
- sucrase/ invertase
- converts sucrose to **glucose and fructose**
- lactase
- converts lactose to **glucose and galactose**
- lipase
- converts fats/ oils/ lipids to **fatty acids and glycerol**
- trypsin
- converts proteins/ polypeptides to **amino acids**

Adaptations of the Ileum to its function

- long coiled length – ensures enough time for digestion and absorption.
- Villi – increase the surface area for absorption of food.
- thin epithelial wall – promotes faster diffusion of digested food.
- dense network of blood capillaries – to carry away dissolved food to storage organs/ metabolic sites.

Experiment to investigate the action of amylase on starch

- Collect a 15cm length of Visking tubing which has been softened in water
- Tie one end tightly. Use a syringe to introduce 2% starch solution into the Visking tubing to about two thirds full
- Add 2 cm³ of 5% amylase solution
- Rinse the outside of the Visking tubing thoroughly with tap water then place it in a boiling tube, trapping the top of the tubing with an elastic band.
- Add enough distilled water to cover the Visking tubing
- Test a small sample of the distilled water and the contents of the Visking tubing for starch and reducing sugar.
- Place the boiling tube in a beaker of water or a water bath at 37 C.

Differences between Aerobic respiration and Anaerobic respiration

Aerobic respiration	Anaerobic respiration
➤ more energy release/ slower	➤ less energy release/ faster
➤ Carbon dioxide and water produced	➤ lactic acid/ ethanol and Carbon dioxide
➤ Oxygen is involved/ presence of Oxygen	➤ no Oxygen involved/ absence of Oxygen
➤ complete breakdown/ oxidation of carbohydrates/ glucose	➤ incomplete breakdown/ oxidation of carbohydrates/ glucose
➤ occurs in mitochondria	➤ occurs in cytoplasm

Importance of respiration

In Animals

- energy released
- for protein synthesis
- for growth/ cell division
- for muscle contraction/ movement/ locomotion
- active uptake
- maintenance of body temperature/ homeostasis
- used during digestion
- used during excretion

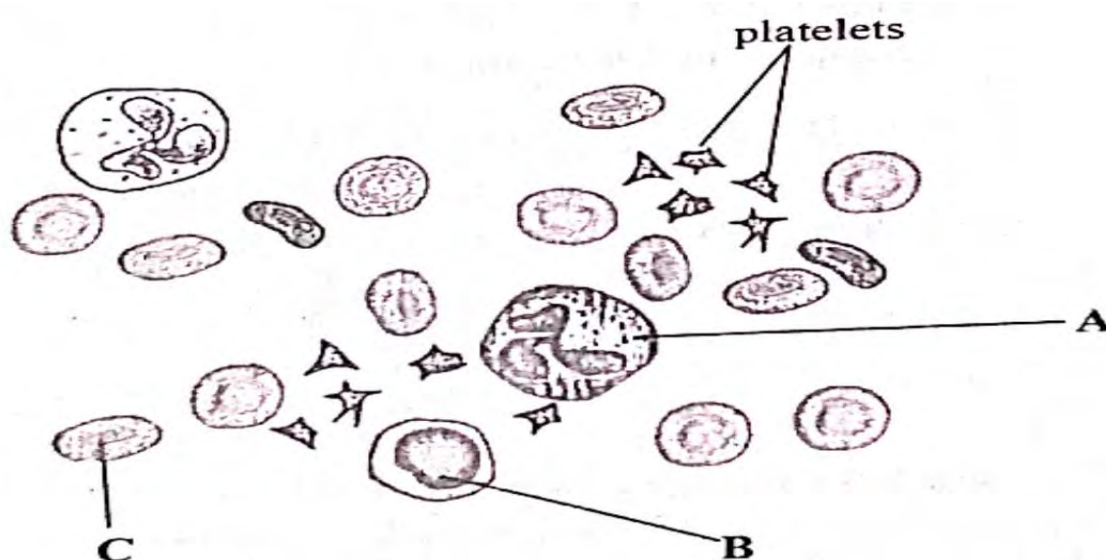
In Plants

- energy released
- for translocation of Amino acids/ glucose
- for active transport
- for synthesis of proteins from Amino acids
- for hydrolysis of starch/ proteins/ fats.
- for growth/ cell division

Differences between Respiration and Photosynthesis

Respiration	Photosynthesis
uses Oxygen	uses Carbon dioxide;
releases Carbon dioxide	releases Oxygen;
breaks down glucose/ carbohydrates	produces glucose/ carbohydrates
occurs in all living cells/ plants and animals	occurs in plants only;
releases energy	uses up energy;

Components of blood



➤ Blood plasma

- transport of substances O_2 , CO_2 , glucose, amino acids, hormones etc.
- dissolved in solution
- distribute heat

➤ Platelets

- stop further bleeding from the wound
- block entry of pathogens through the wound

How platelets stop excessive bleeding

- ✓ platelets secrete an enzyme
- ✓ when blood vessel is damaged
- ✓ enzyme converts prothrombin to thrombin
- ✓ soluble fibrinogen forms insoluble fibrin
- ✓ forms a dense network of threads over a wound
- ✓ traps red blood cells
- ✓ forming clots

➤ Red blood cells

- carry Oxygen

➤ White blood cells

- fight infection

❖ Phagocytes; engulfs bacteria

❖ Lymphocytes; produces antibodies

Signs of puberty

In Boys

- begins at the age of around 12 – 14 years
- changes mainly caused by the hormone testosterone
- body hairs grow e.g. in armpits, on chest, face and pubic regions
- lengthening and widening of the penis
- increased mass and height
- voice deepens due to enlarged voice box
- broadening of shoulders
- wet dreams occur – involuntary ejaculation of semen during sleep

In Girls

- begin at the age of about 10 – 13 years
- changes mainly caused by hormones oestrogen and progesterone
- onset of menstruation
- widening of the pelvic girdle to prepare the body for carrying and delivering a baby
- enlarged breasts
- body hairs grow in armpits/ pubic region
- Premenstrual symptoms include
 - ❖ mood swings/ irritability/ anger
 - ❖ poor concentration
 - ❖ social withdrawn
 - ❖ change in libido
 - ❖ tension and anxiety
 - ❖ breast tender
 - ❖ nausea and constipation/ diarrhea
 - ❖ period pain when the uterus contract
 - ❖ stomach cramps
 - ❖ acne

Fertilization

- is the fusion of male and female sex cell nuclei to form a zygote
- sperms are deposited into the vagina
- they swim through the cervix, uterus to the oviduct where the egg will be
- only one sperm enters the ovum and fuses with its nucleus.
- zona pellucid thickens to prevent other sperm to enter the ovum

- damage to organs e.g. brain damage
- skin rash
- hair loss

Effects if not treated

- may cause
- brain damage
- obstruction of arteries
- heart failure
- paralysis
- insanity
- death

Effects on an unborn child

- still birth/ death;
- blindness;
- paralysis;
- low baby birth weight
- premature birth

Treatment

- use antibiotics during early stages

Chancroid

- caused by bacteria (*Haemophilus ducreyi*)

Signs and symptoms

In males

- painful ulcers on genitals
- pus discharge
- pain during sex
- pain when urination
- ulcer that easily bleed if touched
- swollen lymph nodes

In females

- painful ulcers on genitals
- painful burning sensation when urinating/ bowel movements
- abnormal vaginal discharge

- spray with insecticide/ pesticide/ larvicide
- cutting grass short around homes
- ❖ Egg – remove breeding places
- ❖ Larva – apply oil on stagnant water/ introduce fish in ponds
- ❖ Pupa – drain stagnant water
- ❖ Adult – use of insecticides

Ways of preventing a person from contracting malaria

- avoid being bitten by mosquito
- through use of mosquito nets/ wearing long sleeved shirts/ blouses/ long trousers/ dresses
- repellents sprayed/ smeared on skin/ clothes/ coils
- taking prophylactic drugs/ drugs that prevent malaria/ antimalarial drugs/ kill pathogen
- e.g. Deltaprim/ Malasone/ Malaquine/ Coartemether/ Chloroquine/ Paludrin
- use of insecticides/ destroy the vector
- being vaccinated

Bilharzia

- Causative agent – parasitic flatworm/ blood fluke/ *Schistosoma*
- Transmission – contact with contaminated water/ water borne
 - drinking contaminated water;

Signs/ symptoms

- a fever/ high temperature
- vomiting
- abdominal pain
- tiredness/ weakness
- blood in urine/ faeces
- liver/ spleen enlargement

Life cycle of a bilharzia parasite (schistosoma)

- adult worms mate and lay eggs
- eggs pass out through faeces/ urine
- eggs hatch into larvae and enter water snails
- larva multiplies into free living larva and enters into water
- larva penetrates through human skin to start new cycle