A SOFTCOPY ON
THE EDUCAN APP
AVAILABLE ON GOOGLE PLAYSTORE

A NEW COMPETENCE BASED

Biology

STUDENTS' BOOK 2




A comprehensive guide to excelling in

Ordinary Level Biology

Educan

BAGOOLE DANIEL

A NEW COMPETENCE BASED Biology
BAGOOLE DANIEL

A NEW COMPETENCE BASED

BIOLOGY

A comprehensive guide to excelling in ordinary level biology

STUDENTS' BOOK 2

A PERSPECTIVE OF THE COMPETENCE BASED CURRICULUM

(A must-read handbook for young visionary Biologists)

BAGOOLE DANIEL

BSc. Educ. (Hons) Makerere University

Contacts: +256-701706589 / +256-784652712

Email: danielbagoole@gmail.com

Courtesy of;

Educan
Values Beyond School

Bagoole Daniel.

TABLE OF CONTENTS

Unit 1

SOIL COMPOSITION

Chapter Learning Outcomes

By the end of this chapter, you should be able to;

- Know different types of soil.
- Outline importance of soil in plant growth and nutrition
- Outline soil constituents and identify their properties.

Competency: *You should be able to appreciate that different soil types are made of different components and that the balance of these components affects the properties of the soil*

What is soil?

When you look around you, everything around you rest on a ground surface; which is made up of a substance called soil. It is the most top layer of the earth's surface and certainly we have interacted with it before.

Soil can also be defined as a non-living finely divided material covering the earth crust

Soil is a natural material that covers the earth's crust. It is composed of very tiny fragments of rock mixed with organic matter. Soil is always treated as **"Dirt",** but as we shall see in this chapter, it is one of the most essential natural resources on earth. Without soil, there would be no home, no food for any of the living things you see around, and everything would simply be an imagination.

Importance of soil.

As discussed earlier, soil is such a magnificent and valuable resource that we can never do away with. Below are some of the different areas in which soil is important to us.

1. Agriculture.

This mainly involves growing crops and rearing of animals. Soil contains nutrients like water and mineral salts that are greatly required by crops / plants for proper growth and productivity. It also provides support / anchorage for plants as they grow, this prevents them from being carried away by natural forces like wind and running water. Soil also contains organic matter (Humus), which is absorbed by plants for proper growth and productivity. Soil is also home for many micro-organisms (very small organisms), and macro-organisms (relatively large), that are important in crop growth for example the free-living bacteria that fix nitrogen into the soil, making it available for plants.

Task: ***Discuss and come up with the best type of soil that is best suited for plant growth. Give reasons why you choose that particular type of soil.***

(a) Determining percentage of soil air in a soil sample

Requirements: plastic beaker (250ml), 2 measuring cylinders (250ml and 500ml), dry soil sample, water, stirring rod.

Procedure:

1. Measure exactly 250cm^3 of dry soil into a measuring cylinder. Ensure that the level of the soil is just to the mark.
2. Measure 250cm^3 of water in a measuring cylinder, and put all of it in a 500cm^3 measuring cylinder.
3. Carefully pour the dry soil into the water in the measuring cylinder
4. Stir the mixture until no more bubbles come out from the mixture.
5. Read the final volume of water and soil mixture in the measuring cylinder.
6. Repeat the procedure using other soil samples such as sand, and clay.
7. Record your results in the table below;

Soil sample	*Volume of soil in cm^3*	*Volume of water in cm^3*	*Volume of soil + water in cm^3*		*Volume of air in cm^3*
			Before stirring	*After stirring*	
Loam					
Clay					
Sand					

8. Calculate the percentage of air in the soil using the following formula.

Volume of air = (Volume of soil + volume of water added) – (final volume of mixture in the measuring cylinder).

$$\textit{Percentage of air} = \frac{\textit{Volume of air}}{\textit{Volume of soil}} \times 100$$

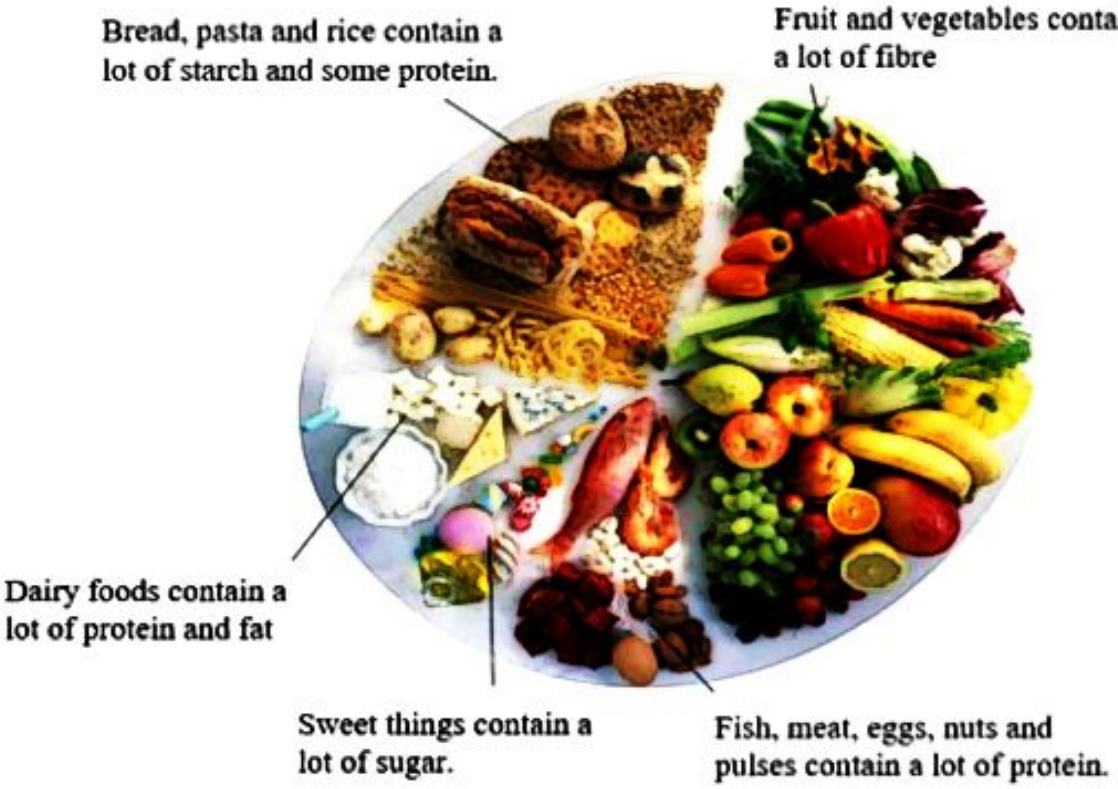
9. Make a conclusion on the soil with the sample with the highest percentage of air, and suggest reasons why.

Conclusion

The final volume of the mixture after stirring is lower than the sum of both the volume of water and volume of soil, before adding the two; i.e., there is a ***contraction***. This is because the water displaces air from the spaces between the soil particles; which reduces the final volume; the observed volume is less than the expected volume of the mixture.

You will also note that different soil types have different air percentages; sand soil has greater percentage of air than clay soil. This is because it has larger air spaces between particles, that can accommodate more air than loam and clay soil.

A BALANCED DIET



A perfect diet contains all of the nutrients in reasonable proportions, not too much and not too little. The perfect diet should also contain energy as much as the total energy used by the individual.

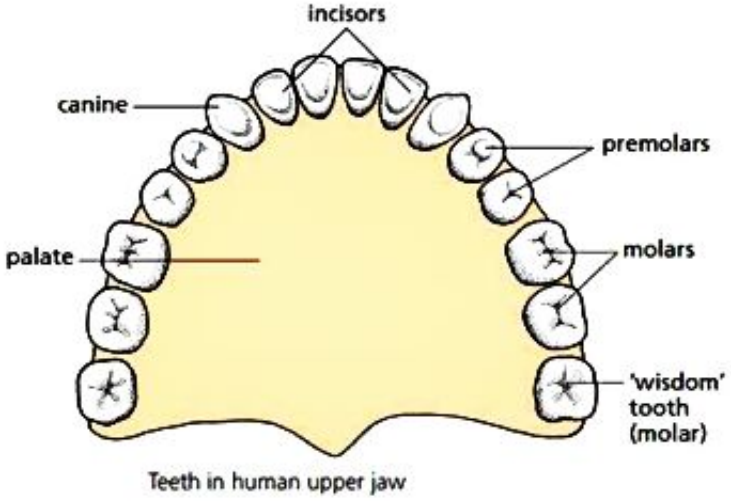
A balanced diet is one which provides all the nutrient compounds required by the body in their right amounts and proportions. It should therefore contain carbohydrates, proteins, lipids, vitamins and mineral salts. It should also contain water and roughages.

Not too much

There are some nutrients that you should avoid eating too much of. Too much sugar can make your teeth decay. Too much fat in the diet can increase the risk of developing heart disease when you are older.

Eating too much fat and carbohydrate may mean that you take in more energy each day than you use.
The body stores these extra nutrients as fat. Everyone needs some fat stores, but it is not good to have too much. Being seriously overweight can cause damage to joints, and increase the risk of developing heart disease and diabetes.

The students on the left are giving some good guidelines for eating a ***balanced diet.***



Teeth in human upper jaw

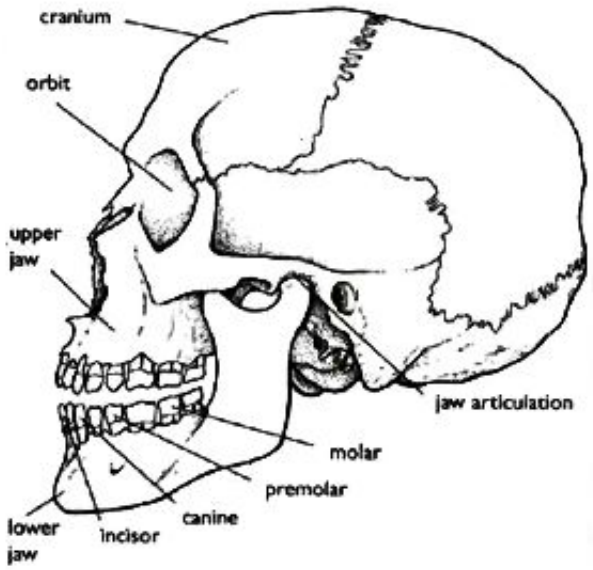
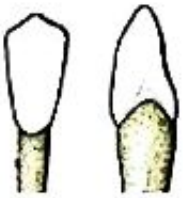


Table below shows the different types of teeth in the mammalian jaws and their roles;

Type of tooth	*Incisor*	*Canine*	*Premolar*	*Molar*
Diagram				
Position in mouth	Front	Either side of incisors	Behind canines	Back
Description	Chisel-shaped, with a sharp edge.	slightly more pointed than incisors	Broad surfaces with ridges on them. have two points (cusps); have one or two roots.	have four or five cusps; have two or three roots
Function	biting off small pieces of food	Cutting and tearing food	Grinding and chewing food	Grinding and chewing food

Internal tooth structure

The part of a tooth that is visible above the gum line is called the **crown**. The **gum** is tissue that overlays the jaws. The rest, embedded in the jaw bone, is called the **root**. The surface of the crown is covered by a very hard layer of **enamel**. This layer is replaced by **cement** in the root, which enables the tooth to grip to its bony socket in the jaw. Below the enamel is a layer of **dentine**. Dentine is softer than enamel. Inside the dentine is a **pulp cavity**, containing nerves and blood vessels. These enter the tooth through a small hole at the base of the root.

Figure below shows a cross section through a tooth;

Relationship between the structure and position of teeth in the jaw of animals to the diet they eat

Carnivore dentition

Carnivorous animals such as dogs, cats and lions are adapted for feeding on other animals. Their teeth are adapted for *capturing and killing other animals and tearing their flesh*. Their incisors are chisel shaped and enable them to grip and strip off pieces of flesh from bones.

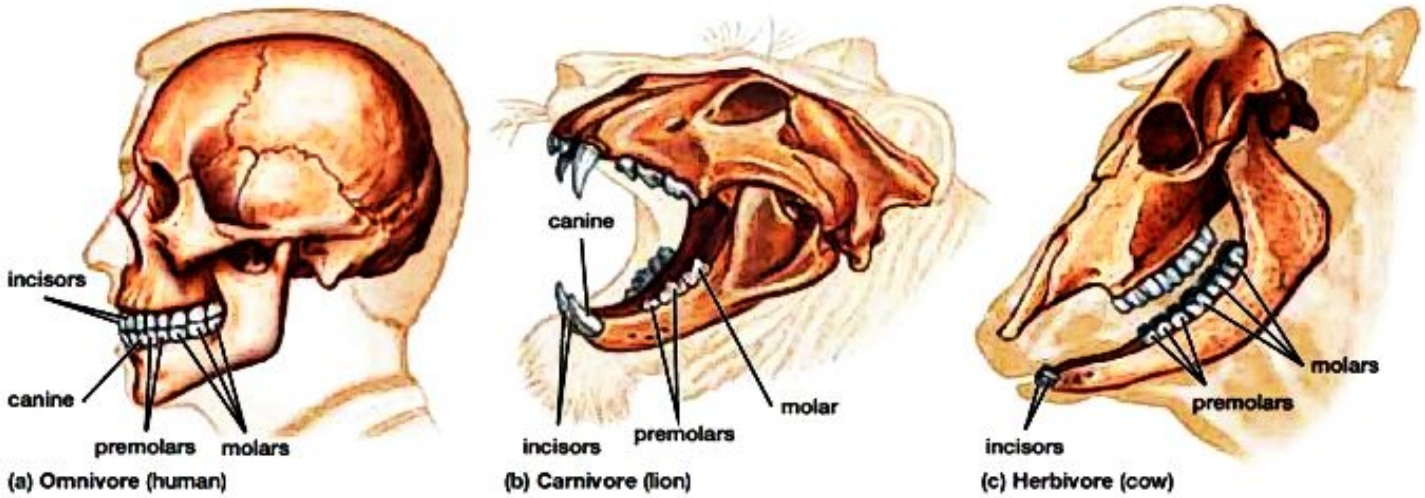
Their canines are long, curved and pointed used for piercing the prey and preventing it from escaping.

The upper fourth premolar and the first lower molar are large and powerful. They are called ***carnassial teeth***. They overlap like blades of scissors and are used for tearing and slicing flesh.

The other premolars and molars have jagged edges that fit perfectly together making them ideal for cracking bones.

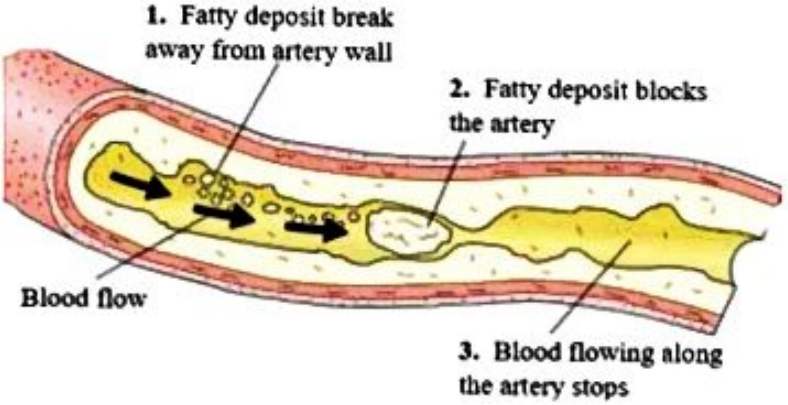
Herbivore dentition

Herbivorous animals e.g., cows, goats and elephants eat plant foods such as grass, leaves and small stems. Their teeth are adapted for crushing and grinding vegetables. Their incisors and canines are chisel shaped and only found in the lower jaw. ***In the upper jaw, the incisors and canines are replaced by a thick horny pad***. Grass and other vegetables are gripped between the incisors and canines on the lower jaw and the horny pad. Between the front teeth and the cheek teeth is a large gap called ***diastema***. It provides space for the tongue to manipulate vegetation in such a way that the material being chewed is kept away from that which is freshly gathered.



(a) ***As omnivores***, humans are adapted to eating both plants and meat. Adults have 32 teeth. From front to back along either side of the mouth are four bladelike incisors for biting, a pair of pointed canines for tearing, four premolars for grinding, and six molars for crushing

The artery walls can become rough, which can cause the blood to clot and block the vessels. The blockage is called a **thrombosis**.



Narrowing of the coronary artery causes serious problems. If the coronary artery gets partly blocked, it can cause chest pains, especially if activity or emotion makes the heart work harder.

This is called **angina**. It is caused by nor enough oxygen getting to the heart muscle. Angina should act as a warning to the sufferer because it may lead to a heart attack.

A total blockage or thrombosis can cause a heart attack. When this happens, the supply of oxygen is cut off. It causes a severe pain in the chest and the affected part of the heart is damaged. The heart may stop beating altogether – this is called **cardiac arrest**. Death will follow unless the heart restarts beating again within minutes.

Major causes of heart diseases

- ***Eating a diet with too much animal fat***, which can increase concentration of cholesterol in blood.
- ***Being overweight.***
- ***Taking little or no exercise.***
- ***Smoking.***
- ***Stress.***

People can do something about these risk factors by changing their way of life, but other risk factors cannot be avoided such as;

- ***Genes*** inherited from parents. These control metabolism of fat and cholesterol.
- ***Age*** – the chances of getting heart diseases increases with age.
- ***Sex*** – men are more likely to get heart disease than

About Educan

Educan Uganda is an organization that has opened up a new page of teaching and learning. We offer free online educational services via the Educan App at both primary and secondary levels. These include free lessons, textbooks, topical books, revision notes, tests, exams and their marking guides, UNEB past papers and their solutions, scholarships, consultancy, motivational videos, news and many other services. Please download the **Educan App** from Google Play and enjoy free learning. We also sell educational materials and services at very low prices. You can as well shop these from the Educan App. We deliver to all destinations around Uganda.

Download the Educan App

from the following link:

https://play.google.com/store/apps/details?id=com.educan.educanapp

We organize special classes for schools and for science students with special challenges in science subjects; Biology, Chemistry, Physics, and Mathematics at all levels.

We write books both academic and non-academic.

We also do Motivational speaking, inspiring fresh teacher graduates and teacher trainees. We offer Career Guidance & Counseling, particularly to youths and students at all levels.

Educan
Values Beyond School