UNIVERSITY OF SWAZILAND
FACULTY OF EDUCATION
DEPARTMENT OF CURRICULUM AND TEACHING
MAIN EXAMINATION QUESTION PAPER, MAY 2020

TITLE OF PAPER	:	CURRICULUM STUDIES IN BIOLOGY II
COURSE CODE	:	CTE328/528
STUDENTS	:	B.Ed. III, PGCE
TIME ALLOWED	:	THREE (3) HOURS

INSTRUCTIONS:
1. This examination paper has five (5) questions. Answer four (4) questions only.
2. There are 3 attachments for one question.
3. Write complete sentences. No bullets allowed.
4. Each question has a total of 25 points.

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1. a) Professors Ajeyalemi (1990) and Yoloye (1999) recommended that African countries, Eswatini included, engage more on low science than high science. Examine the significance of this recommendation in general and in light of how Eswatini is responding to the COVID-19 pandemic. **[12]**

   b) In Africa there has been a major effort to reform the science curriculum by infusing the STS approach. Explain how individual African countries have embarked on this reform as indicated in the following projects:
   i) Bunumbu project in Sierra Leone **[2]**
   ii) Namutamba project in Uganda **[2]**
   iii) LISSIT project in Eswatini **[5]**
   iv) STAG project in Ghana **[4]**

2. a) The NCC (National Curriculum Centre) curriculum development model guides curriculum development in Eswatini at the primary and secondary school levels. Explain to what extent the model was followed in developing the following curriculum materials:
   i)Swaziland Integrated Programme, SWISP **[5]**
   ii) Science in Everyday Life, SIEL **[5]**
   iii) Science Around Us, SAU **[5]**

   b) Compare how Eswatini and Botswana developed their science curricula at the Junior Secondary level in terms of the following:
   i) Goals of the new curricula **[4]**
   ii) How both countries set out to meet these goals **[6]**

3. The attachments labelled A, B, and C, show different approaches in teaching the topic on **cell structure** at the Form 1 level. Study these and answer the questions that follow.

   a) How are these approaches similar to and different from one another? **[13]**

   b) Rank these approaches according to how effective you think they are in arousing learner interest and engaging them with the activity. Justify your ranking. **[3x4]**

4. a) In Eswatini, for the most part, there is no significant difference in participation and performance of girls and boys in SMT subjects at the high school level. The table below shows the percentage of males and females engaged in Research and Development in different sectors in 2017.

i) Discuss what the data indicates regarding the participation of females in Science, Technology and Innovation (STI) in Eswatini, given that there are no disparities at the high school level. **[5]**

ii) Provide or suggest possible reasons for this scenario, especially in higher education. **[10]**

b) Discuss the steps FAWESWA has taken to increase continued access to, participation and retention of girls in SMT subjects. **[10]**

5. a) Explain how the following factors affect learner performance in assessment: terms of quantity, large numbers of words and negative forms of language. **[9]**

b) Concept mapping is a personal active process. Discuss what this entails. **[6]**

c) What do constructivists say about the following? **[2x5]**

i)Zone of proximal development, ZPD
ii) More knowledgeable others, MKO's
iii) Prior concepts
iv) Collaborative learning
v) Advance organizers

- Take care not to smash the slide as you turn the coarse focusing knob.
- Never use the coarse focusing knob when viewing the object under the high power objective (40×).

Activity 9.2: Using a microscope

Individual or pair activity

In this activity you will use a microscope to magnify and observe various objects.

You will need a microscope and a piece of newspaper with newsprint on it.

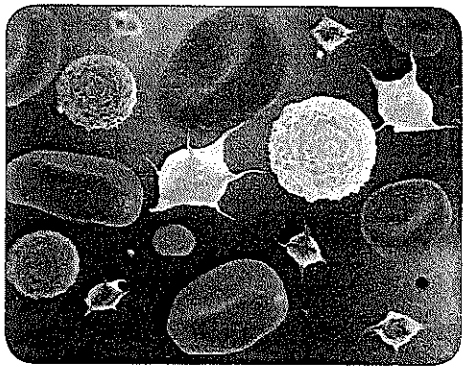
1. From the piece of paper given to you, pick a word with the letter 'p'. Cut out the letter 'p' from the word.
2. If your microscope has a mirror, set it so that you get light reflecting off the mirror. If it has a light source, switch it on.
3. Turn the low power objective so that it is in place over the stage.
4. Put the letter on a microscope slide and put the slide on the stage.
5. Gently raise the stage using the coarse focusing knob, while looking at the stage directly until it almost touches the objective.
6. Now look through the eye piece and focus properly by lowering the stage using the fine focusing knob. This will give you a clear image, which we will call Image 1.
7. How does Image 1 differ from the original letter?
8. Shift the high power objective into place.
9. Focus properly using the fine focusing knob. This will give you a clear image, which we will call Image 2.
   Caution: Never use the coarse adjustment knob when using a high power objective to avoid breaking the slide.
10. Compare Image 2 with Image 1. How do they differ?
11. Return to the low power objective.
12. Put a pencil eraser, pen or a pencil on the stage and observe it.
13. a) Describe what you see.
    b) Explain your observation.

The microscope is a powerful tool for examining things that you cannot see with your own eyes.

Cells and cell structure

A cell can be defined as the **basic and smallest unit of life.** Some people also describe cells as 'the building blocks of life' because all living things are built by putting together cells of different types. Some living things, such as bacteria, are made up of only one cell. Other living things such as plants and animals are made up of millions and millions of cells.

Our bodies are made up of about 37 trillion cells and it is estimated that there are about 200 different cell types in our bodies. Different types of cells are there to do a certain type of job or function in the body. Each cell type is structured in such a way that it can carry out its function. Different cell types may therefore differ from each other in both appearance and size.



Some of the different types of cells found in blood; different cell types have different shapes.

Cells are very small. The smallest human cell is the sperm cell produced by the male, with a diameter of about $\frac{1}{10}$ the diameter of a human hair. The largest cell in the human body is the egg cell produced by the female. It has a diameter that is about the same size as the thickness of a human hair. As cells are so small they can only be viewed using a microscope. In the activities that follow you will get the opportunity to view different cells for yourself.

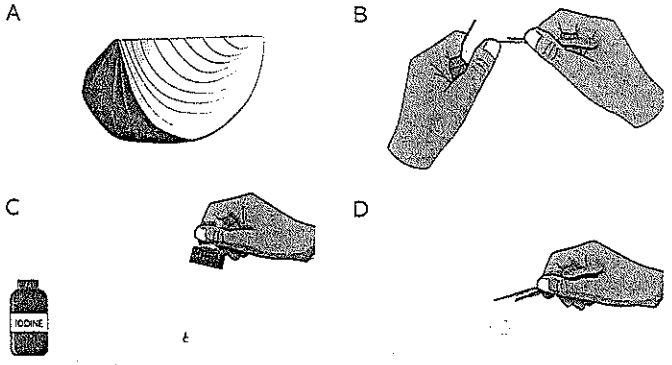
Activity 9.3: Viewing plant cells using a microscope

Individual or pair activity

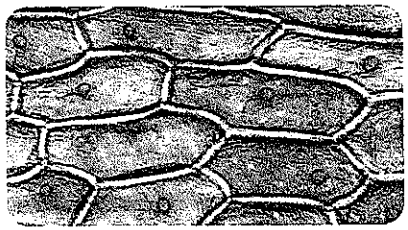
In this activity you will use a microscope to view onion cells.

You will need a microscope, an onion, a microscope slide and cover slip, and some iodine solution.

Before you begin this activity, remind yourself about the instructions for using a microscope given earlier in this chapter.



1. Break up an onion and peel away layers. Pull off the very thin lining of one of the layers (you may find this easier to do using a needle). This layer is one cell thick and is known as the epidermis.
2. Spread the thin layer of onion epidermis out on a microscope slide.
3. Add a drop of iodine solution. This will stain the cells so that you can see them clearly.
4. Cover the piece of onion with a cover slip.
5. Place the slide on the stage of the microscope and view it under a low and a high magnification. What you see are plant cells.
6. Draw a few of the plant cells in detail and label the parts that you can identify.



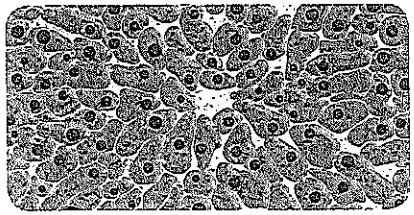
Activity 9.4: Viewing animal cells using a microscope

Demonstration

Your teacher will let you observe some animal cells under a microscope.

In this activity you will use a microscope to view chicken liver cells.

Draw a few of the liver cells you see in detail.

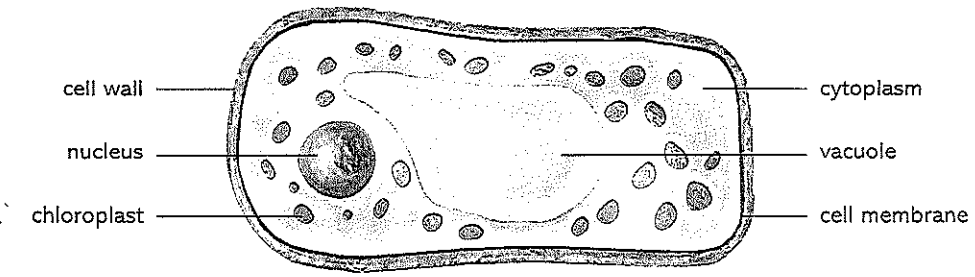


In Activities 9.3 and 9.4 you prepared and examined specimens of plant and animal cells. You may also be able to look at prepared slides of other examples of plant and animal cells, such as blood cells, animal tissues, plant roots and leaves. What do you notice about the different types of cells? What is the same and what is different between them?

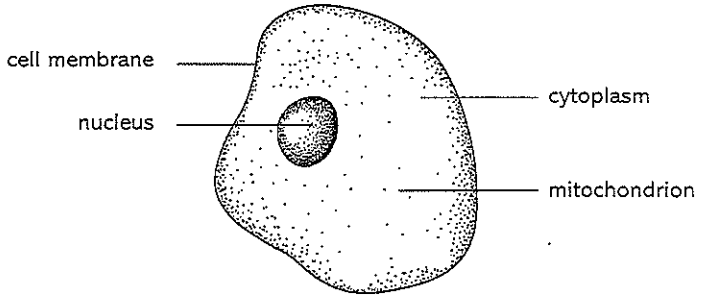
The structures of plant and animal cells

When you look at a cell under a microscope as you did in Activities 9.3 and 9.4, you can see that the cells have different shapes and structures and that these shapes and structures are kept together by a wall that surrounds them. All of these parts of the cell are important for the function of the cell. Some organelles (components of a cell) are found in nearly every type of cell and others are only found in certain specialised cells. Plant cells and animal cells share many of the same organelles but there are some differences between them, as you will see.

The following pictures show the basic structure of a typical plant cell and a typical animal cell.



A diagram of a typical plant cell



A diagram of a typical animal cell

If you compare the pictures of the plant and animal cell, you will see that plant and animal cells both have a nucleus, cell membrane and cytoplasm. Plant cells also have chloroplasts, vacuole and a cell wall.

The functions of cell organelles

Just like the organs in your body have different functions, the organelles within cells have different functions too.

The nucleus

The nucleus is the central control area of the cell. It contains the chromosomes that carry all the information that produces the substances (i.e. **proteins**) and chemicals that make the cell work properly and function in the way it is supposed to. The chromosomes carry this information in the form of genes. Genes determine what the plant or animal will look like.

Other than at a school laboratory, find out about two other places where microscopes are used in this country, and what they are used for.

FIND OUT

Unit 7 Microscopic organisms

Think about it: What is the smallest part of a living thing?

Living cells

Act out the play below and answer the two questions that follow.

OVER TO YOU

Busi and Themba usually helped their mother weed the fields every morning before going to the nearby secondary school. Themba was in Form 5 and Busi was in Form 1.

Mother: You had better go and take a bath now my children, or you will be late for school.
Busi: Let me pull out this last cluster of weeds and then I'll be off.

She pulled out a cluster of weeds with thick, fleshy leaves that was growing next to a weak-looking maize plant.

Busi: Ah ha! When I tear this leaf, it leaves a plastic-like part. I wonder what it is?

Themba came to see the "plastic-like" part Busi was referring to.

What do you think Themba saw?

Themba: Come on, you pumpkin! This is not plastic. It is a layer of cells that cover the inner parts of the leaf.

She looked at Themba with questioning eyes.

Busi: What does this mean? What are cells? Can I see them here?

1. Discuss Busi's questions.
2. Themba promised to show Busi what he meant. Describe a complete plan of what Themba would do to show Busi the cells.

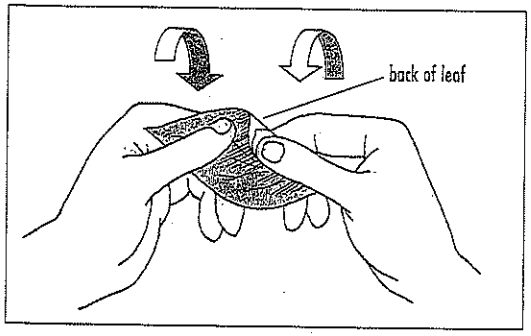
In the next activity you will find out how Busi could have prepared the "plastic" layer in order to see the cells.

ACTIVITY

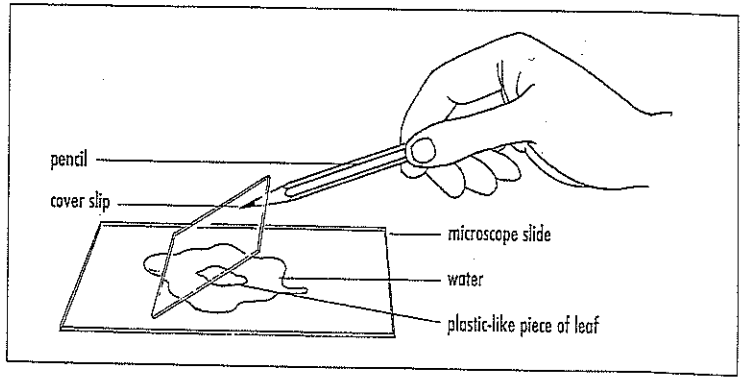
Activity 5.14

You will need a scalpel (or a sharp pen, knife or razor), leaf, microscope slide, microscope, cover slip, water, dissecting needle or sharp pencil.

You are provided with a leaf similar to the ones Busi discovered. Look at the picture below. Tear the leaf in two (breaking the top surface first) to get a thin layer.



1. Put two drops of water onto a clean microscope slide.
2. Use a scalpel to cut off a small piece of the layer of leaf epidermis and spread it flat on the water.
3. Cover with a cover slip, putting one end on the edge of the water and lowering the opposite end slowly, using a sharp, dissecting needle (or sharp pencil). This will prevent air bubbles from being trapped under the cover slip.



4. Put the slide on the microscope stage and observe the layer under the low power objective. Describe what you see.
5. Move the high power objective into place, and focus using the fine focusing knob.

Organisms and cells

The small compartments you see under the microscope are called **cells**. All living things, plants and animals, are made up of cells. A cell has all the characteristics of living things discussed in chapter 4. Some organisms are made up of one cell, yet others are made up of many cells. Those that are made up of one cell are called unicellular organisms e.g. bacteria. Most organisms however, are made up of many cells and are called multicellular organisms e.g. a cat. Human beings are also multicellular organisms.

ACTIVITY

Activity 5.15

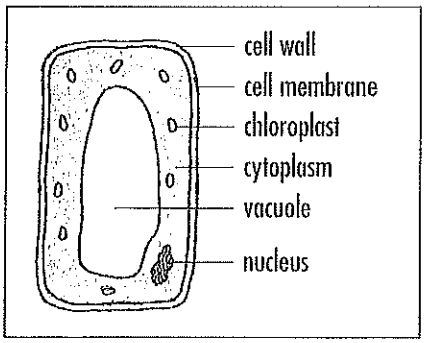
Your teacher has prepared several slides of kidney cells and has put them under microscopes for you to look at. The microscopes are already focused, therefore **do not** touch the focusing knobs.

1. Observe the cells and draw them in your notebook.
2. Compare these cells with those you drew in question 1 above.
3. The cells you are looking at come from a piece of kidney that is 200 times smaller than your thumb. Estimate the number of cells that cover your thumb.

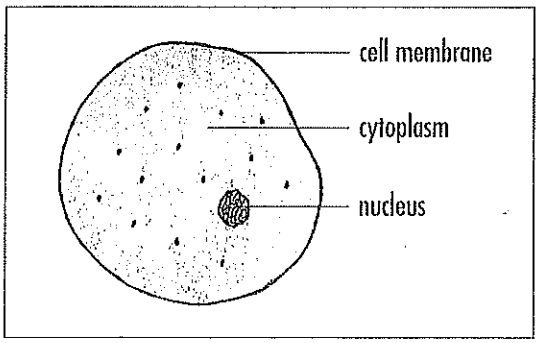
ACTIVITY

Activity 5.16

The diagrams below show a plant cell and an animal cell. Study them and answer the questions that follow.



A plant cell



An animal cell

1. Mention ways in which the two diagrams differ from each other.
2. In what ways are the two diagrams the same?
3. Try to draw a diagram of a plant cell and one of an animal cell.

All cells are made up of a nucleus, cytoplasm and a cell membrane. Plant cells have extra parts that make them different from animal cells. These parts are the cell wall, the vacuole and chloroplasts. A vacuole has a solution in it. A chloroplast contains a green substance called chlorophyll. You learned about chlorophyll, in Chapter 4.

ACTIVITY 3.2 CELLS

Although there are many different kinds of cells, they are all built to a basic pattern and all have certain common features.

The following exercises will help you to get a simple understading of cell structure.

LOOKING AT ONION CELLS

a) Cut an onion bulb into quarters. The fleshy "scale leaves" will easily separate from each other.

b) Hold one of the leaves so that the curving inside faces you and snap it backwards. The transparent thin epidermis (outer skin) is seen as a ragged (torn) edge on the broken leaf.

c) Using a forceps remove a small piece of the epidermis and place it on a drop of water on a microscope slide. Cover the piece of epidermis with a cover slip as shown in drawing E.

d) Examine the slide with the low power objective. What is the shape of the cells?

Next examine the cells under high power.

The "lines" you see making a network between the cells are the walls of the cells.

The walls are made up mainly of a non-living substance called cellulose.

Inside the cell wall is the cell membrane. This is a kind of "skin" which surrounds the living material of the cell. This living material is called the cytoplasm. The middle part of many plant cells has a fluid filled space called a vacuole. The fluid consists mainly of water and salt.

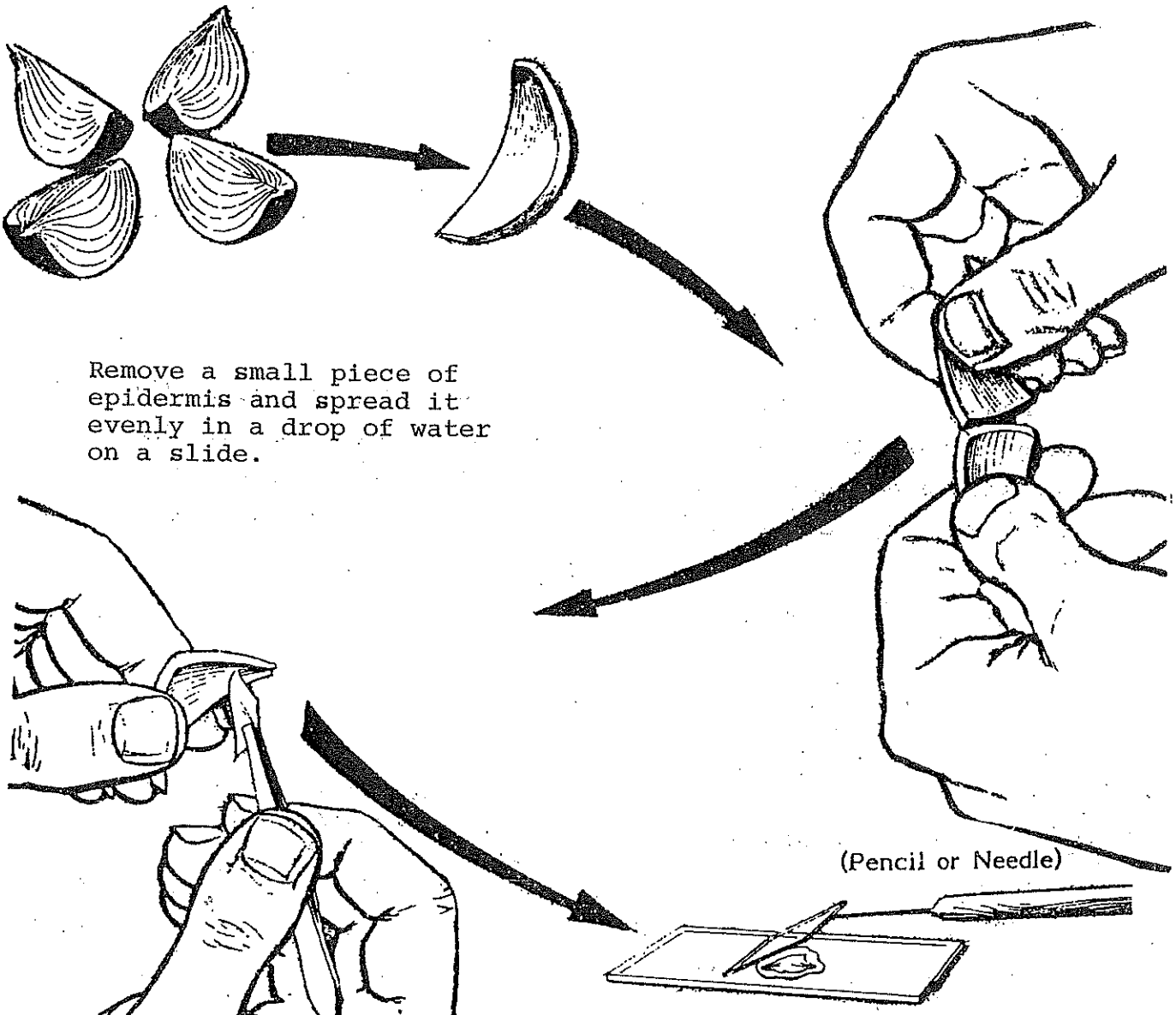
You will see a small dark body in the cytoplasm. It is the nucleus. This little body regulates all the activities of cell. It is separated from the cytoplasm by a "skin" (membrane). The membranes of the cell are very difficult to see in this kind of preparation.

Make a drawing of what you see and label the parts of one cell that you were able to see with the microscope.

A Cut an onion bulb into quarters.

B Remove one of the fleshy "scale" leaves.

C. Snapping the "leaf" backwards usually provides a ragged piece of epidermis.



Remove a small piece of epidermis and spread it evenly in a drop of water on a slide.

E Gently lover a cover slip to prevent trapping air bubbles. Examine with your microscope. Add more water to the edge of the cover slip with an eye dropper if the slide begins to dry.