



SUBJECT and GRADE	Life Sciences Grade 11
TERM 2	Term 2 (Week 7 and 8)
TOPIC	Cellular respiration
AIMS OF LESSON	<p>At the end of this lesson you should be able to:</p> <ul style="list-style-type: none">• Define basic terminology such as glycolysis, oxidative phosphorylation, aerobic and anaerobic respiration etc.• Know the process of respiration• Understand the processes of aerobic respiration and anaerobic respiration• Compare the processes of aerobic and anaerobic processes
RESOURCES	<p><i>Paper based resources</i></p> <p>Refer to the following sections on 'Cellular Respiration' section in your textbook:</p> <ul style="list-style-type: none">• Overview of cellular respiration• Description of the process of cellular respiration• The role of anaerobic respiration in industry• Experiments on cellular respiration
INTRODUCTION	<ul style="list-style-type: none">• Revise the sections on the cell structure in Grade 10.
CONCEPTS AND SKILLS	<p>Below are definitions of some of the terms that you will study under this section. Use your textbook and underline all the new terms/words that you encounter while studying through the section on cellular respiration. Use the glossary in your textbook to define these new terms/words (Note: At least 2 marks are awarded if you can define a term correctly in a test or examination)</p> <p>Mitochondrion – cell organelle associated with cellular respiration Aerobic respiration– type of cellular respiration that requires oxygen Anaerobic respiration – type of cellular respiration that occurs in the absence of oxygen Glycolysis – phase during cellular respiration when glucose is broken down to pyruvic acid Oxidative phosphorylation – series of cyclic reactions during cellular respiration when energy rich hydrogen atoms and carbon dioxide are released Lactic acid fermentation– anaerobic respiration that occurs in muscle cells Alcoholic fermentation – anaerobic respiration that occurs in yeast cells</p>



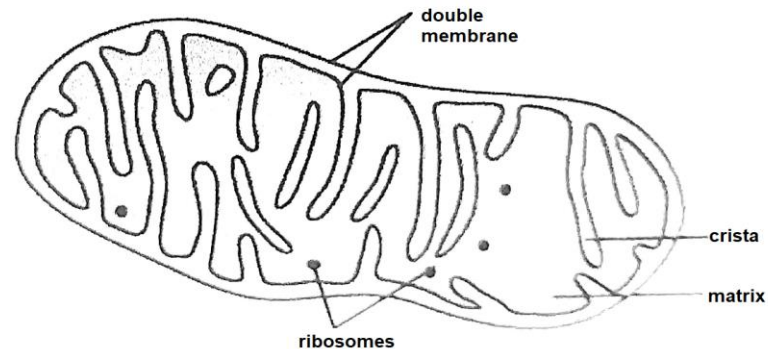
AEROBIC RESPIRATION

- All living organisms are composed of cells and cells perform work therefore they require energy
- Cellular respiration occurs in cells of plants and animals
- Aerobic respiration occurs in the presence of **oxygen**
- The process of aerobic respiration can be represented by the following equation:



- Cellular respiration takes place in the **mitochondria** of cells. (*Remember you have studied the structure of the mitochondrion in Grade 10*)

STRUCTURE OF A MITOCHONDRION



Stages of aerobic respiration:

Glycolysis:

- Glycolysis occurs in the cytoplasm of the cell outside the mitochondrion
- Glucose is broken down into pyruvic acid
- Energy-rich hydrogen atoms are given off and move into the mitochondrion
- ATP is formed during glycolysis



Krebs cycle:

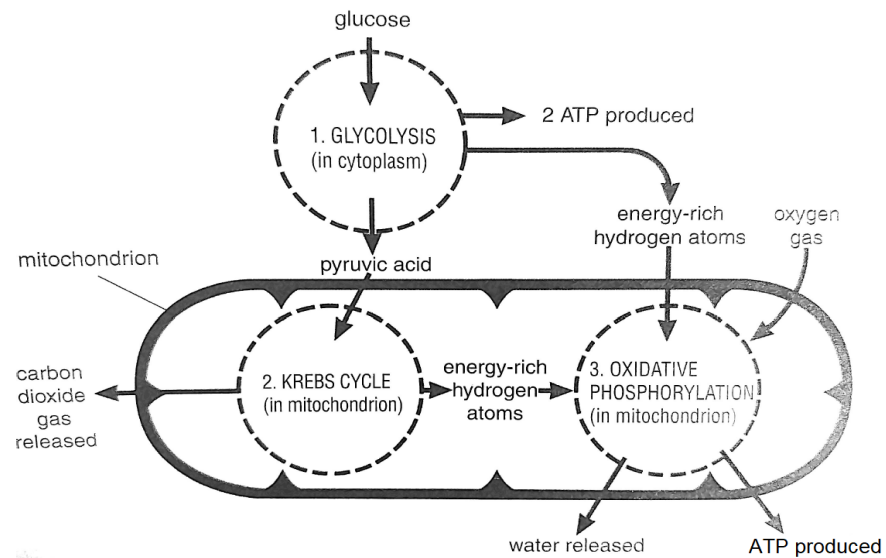
- The Krebs cycle is a series of cyclic reactions that takes place inside the mitochondrion
- Pyruvic acid that entered the mitochondrion is broken down into energy-rich hydrogen atoms and carbon dioxide
- The carbon dioxide is released and given off as a gas

Oxidative phosphorylation

- Oxidative phosphorylation takes place in the mitochondrion
- The energy from the hydrogen atoms is used to form energy-rich ATP
- The hydrogen atoms combine with oxygen to form water

Activity 1:

Use the flow diagram below to describe the different stages of cellular respiration i.e. glycolysis, Krebs cycle and oxidative phosphorylation.





ANAEROBIC RESPIRATION

- Takes place in the absence of oxygen
- Glucose is only partially broken down and less energy is released.
- **Lactic acid fermentation**– anaerobic respiration that occurs in muscle cells. Pyruvic acid is converted into lactic acid
- **Alcoholic fermentation** – anaerobic respiration that occurs in yeast cells. Carbon dioxide and alcohol(ethanol) is formed.

Activity 2:

Use your textbook to describe how anaerobic respiration occurs in muscle cells and in plants.

Activity 3

Use your textbook to discuss the role of anaerobic respiration in the industry e.g. beer brewing and bread making.

COMPARISON BETWEEN AEROBIC AND ANAEROBIC RESPIRATION

Aerobic respiration	Anaerobic respiration
Occurs in the presence of oxygen	Occurs in the absence of oxygen
Products are carbon dioxide and water	Products are lactic acid (animals) or carbon dioxide and ethanol (plants/yeast cells)
A large amount of energy is released	A small amount of energy is released

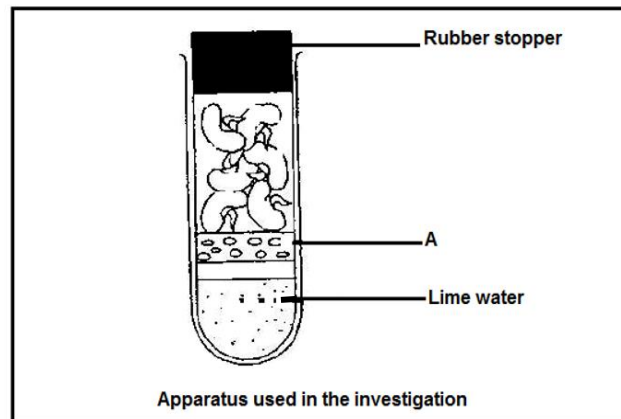


Activity 4:

Study the experiments on cellular respiration in your textbook.

Question 1:

1.1 A group of grade 11 learners set up an investigation as shown in the diagram.



1.1 *State* the aim for this investigation.

1.2 Identify

(a) the part labelled A

(b) TWO functions of part labelled A

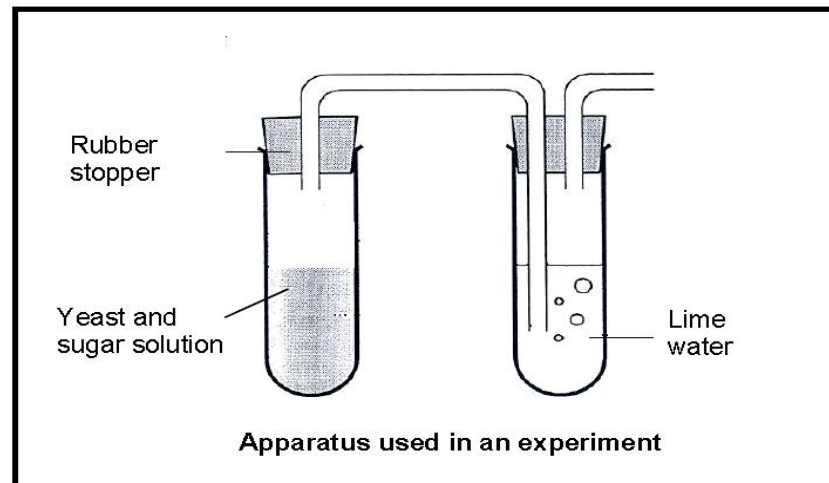
1.3 *State* a suitable conclusion for the investigation above.

1.4 How could the learners ensure that the investigation is valid?



Question 2

The diagram below represents an experiment in which the apparatus was placed in a warm place in the laboratory for some time. The sugar solution was first boiled and then cooled down before yeast was added. Study the diagram and answer the questions that follow.



2.1 *State* the aim of this experiment?

2.2 *Name* ONE function of EACH of the following in this investigation:

- (a) Lime water
- (b) Rubber stopper
- (c) Sugar solution

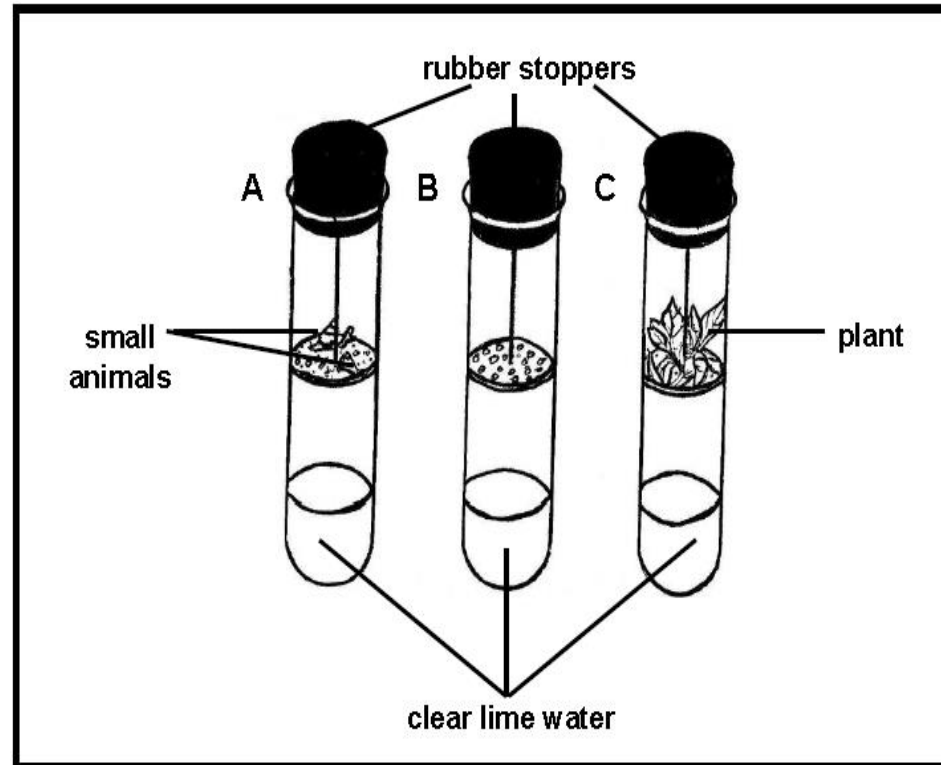
2.3 Why should the sugar solution be boiled before yeast is added?

2.4 *Name* TWO new substances that may form in the sugar solution during the experiment.



Question 3

The diagram below represents the apparatus used in an investigation. The apparatus was kept in the dark.



3.1 *State* the **aim** of this investigation.

3.2 What is the purpose of the following

- (a) test tube B
- (b) Lime water

3.3 *Tabulate* the expected **results** in each of the test tubes.

3.4 *Name* ONE factor that needs to be the same in all test tubes in this investigation.



	<p>Common errors made by learners in examinations:</p> <ul style="list-style-type: none">• Learners not familiar with basic terminology• Learners do not understand instructional verb/s in a question e.g. the difference between describe and explain• Learners not able to provide correct labels to drawings/illustrations• Learners not able to answer questions on experiments of cellular respiration• Learners not able to answer questions based on scientific investigations e.g. identification of variables, writing conclusions etc.
ACTIVITIES/ASSESSMENT	<ul style="list-style-type: none">• Complete the activities/questions on the section on cellular respiration in your textbook.
CONSOLIDATION	<ul style="list-style-type: none">• Define all the terminology relevant to the topic covered in this lesson• Work through the activities/questions in your textbook on the section of cellular respiration <p>Note: The knowledge and skills gained in this section will help you to have a better understanding of the following section that you still need to deal with i.e.</p> <ul style="list-style-type: none">• Gaseous exchange
VALUES	<ul style="list-style-type: none">• By studying and learning about cellular respiration, you will develop a deep appreciation of the value and application of knowledge of this topic in the industry e.g. beer-brewing and bread making.