

UTTERMOST

Harroan Uttermost

2024
SERIES

Competency based

Biology

Revised
and
Updated

Learner's book

Unlock your full competency potential

Book

3



2024
Series

A sample teaching guide
Appears at the end



HARROAN-UTTERMOST



Biology S3

New curriculum learner's book
for s.3

Student's information.

This book belongs to:

Name

School

Class

Stream.....



i of 210 pages

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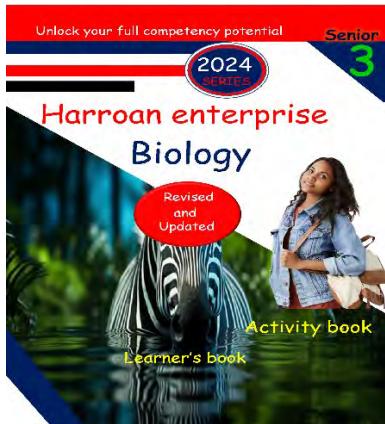
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Changes in 2024 versions

1. Two versions have been released for each book. That's **Harroan uttermost** and the **Harroan enterprise**.



Harroan enterprise versions are first editions of our new book full of scenario & practical based questions which will unlock the learners competence potential.

Harroan uttermost versions are our third editions improved from our 2023 versions with new features like **use your brain power**, **answer sheet template**, **improved guide notes** & others



2. Full **teaching guide** books for all the versions have been made though each book has a different structure. A sample of the uttermost teaching guide appears in this sample. The ones for enterprise also appear in the enterprise sample versions. **For uttermost versions:** learning objectives, learning outcomes & sample activities of integration have been pushed to teaching guides



3. **key question** has been introduced in uttermost versions. The key question in learner's books provide a focus for the lesson period.

4. **Use your brain power** has been introduced in uttermost books with **critical thinking and problem-based questions** meant to unlock the learner's competency potential. The answers to these questions appear in the teaching guides.

5. an answer sheet template has been introduced to provide enough space for learners to answer the questions & write other important notes



5. **Guide notes** in the uttermost series have been improved. The guide notes introduce learners to a lesson period but they don't answer the lesson key question. This makes learner's to research and brainstorm on the question to get the desired solutions. The answers for all the activities appear in the teaching guide.

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Chapter 1

Gaseous exchange



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

- Appreciate the need for gaseous exchange in organisms
- Identify gas exchange surfaces and their adaptations
- Understand the human respiratory system and gaseous exchange in humans
- Understand the dangers of smoking and air pollution
- Identify the diseases of the respiratory system; their causes, symptoms and treatment.
- Understand the concept of gaseous exchange and its importance in maintaining the respiratory systems of organisms.
- Identify and describe the different respiratory structures and mechanisms found in various organisms, including humans, plants, and aquatic organisms.

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1.1 Need for gaseous exchange

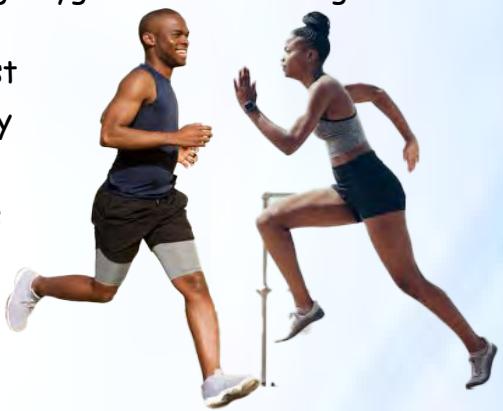


Introduction



Have you ever wondered how your body gets the oxygen it needs to function properly? Or why you feel out of breath after running or playing sports for a while? It's all because of a fascinating process called gaseous exchange that happens inside our bodies. Every time you take a breath, you are inhaling oxygen from the air around you. This oxygen travels deep into your lungs, where it is exchanged with carbon dioxide, a waste product produced by your body's cells. This exchange is vital for your body's overall health and functioning.

Imagine you are participating in a race, running as fast as you can to reach the finish line. As your muscles work harder and demand more energy, your body needs extra oxygen to produce that energy. Your heart rate and breathing rate increase to supply oxygen-rich blood to your muscles, ensuring they have the fuel they need. Gaseous exchange plays a crucial role in this process, delivering oxygen to the working muscles and removing the carbon dioxide they produce. These scenarios show how gaseous exchange is not just something that happens inside our bodies; it is directly linked to our daily activities and the ways our bodies respond to different situations. By understanding this process, we can appreciate how crucial it is for our overall health and the benefits it brings to our everyday lives.



Key question: why is gaseous exchange necessary in organisms?

Guide notes

Gaseous exchange and breathing

Breathing is a fundamental process that allows our bodies take in and bring out gases. **Gaseous exchange** is the process by which gases move passively by diffusion across a surface, for example, the exchange of oxygen gas and carbon dioxide gas across the respiratory surface. In humans, gaseous exchange involves the exchange of oxygen and carbon dioxide between the lungs and the blood, as well as between the blood and body's cells.

When we breathe in, we inhale air containing oxygen through our nose or mouth. This air travels through the trachea and into the lungs, where it reaches millions of tiny air sacs called alveoli. The alveoli are surrounded by a network of tiny blood vessels called capillaries. **Here's the connection:** The primary function of breathing is to ensure that fresh oxygen enters our lungs, while at the same time, removing waste carbon dioxide from the body. This continuous inhalation and exhalation process is essential for maintaining the right balance of oxygen and carbon dioxide in our bloodstream. Therefore, breathing ensures that gaseous exchange occurs efficiently.





Differences between gaseous exchange and ventilation.

Gaseous exchange	Breathing/ventilation
It occurs along a gas exchange surface	It occurs along the body and a respiratory organ
It doesn't involve action of muscles	It involves action of muscles
It occurs by simple diffusion and doesn't involve the use of energy	It involves the use of energy

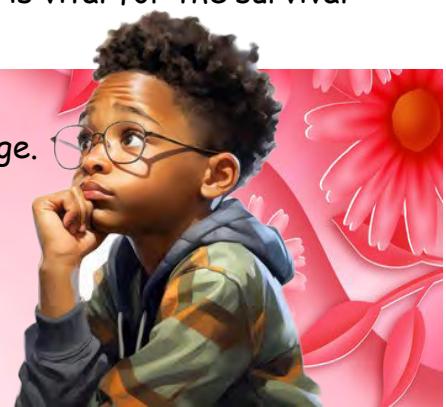
Gaseous exchange between plants and animals

Plants and animals exhibit interdependence in their gaseous exchange, with each relying on the byproducts of the other for survival. During photosynthesis, plants utilize carbon dioxide released by humans and other animals for their own growth and in turn release oxygen as a byproduct. This oxygen is crucial for our respiration. Humans need oxygen for their metabolism and release carbon dioxide as a waste product. This carbon dioxide is absorbed by plants, completing the cycle. In summary, plants and animals are interdependent when it comes to gaseous exchange. While plants produce oxygen and remove carbon dioxide through photosynthesis, animals utilize this oxygen and release carbon dioxide during respiration. This mutual exchange of gases is vital for the survival and well-being of both plants and animals.

Group activity:

Group activity:

1. Explain why organisms need gaseous exchange.
2. Why do people carry oxygen in tanks when swimming beneath a water body.
3. Imagine you are in a crowded room with poor ventilation. Explain how inadequate gaseous exchange can affect your overall health and well-being.



Use your brain power!

You and your team are embarking on a challenging mountain expedition, reaching high altitudes where oxygen levels are significantly lower.

TASK

Write a short essay explaining how the low oxygen level at high altitudes affects the human body during a mountain expedition. Support your answer with relevant scientific concepts and describe the adaptations that occur in the body to cope with the lack of oxygen.



1.2 Gaseous exchange surfaces.



Key question: what are the characteristics of a good gas exchange surface & how does each ensure efficient gaseous exchange?

Guide notes

Unicellular organisms carry out gaseous exchange by diffusion across the cell membrane. Large organisms cannot carry out diffusion efficiently, instead they have well developed and specialised structures for gaseous exchange called respiratory surfaces or gaseous exchange surfaces. Gaseous exchange surfaces play a vital role in the respiratory systems of both plants and animals. These surfaces allow for the exchange of gases, such as oxygen and carbon dioxide, which are essential for the survival and functioning of living organisms. A **gaseous exchange surface** is a site within a respiratory organ of an organism where gaseous exchange occurs.

Why unicellular organisms don't need gaseous exchange surfaces?



Unicellular organisms, such as bacteria and amoeba, are single-celled organisms that lack specialized gas exchange surfaces. Due to their small size and simple structure, they have a large surface area to volume ratio which allows gases to pass in and out of their cell membranes through the process of simple diffusion. Oxygen can diffuse into the cell, while carbon dioxide, a waste product of cellular respiration, diffuses out. A daily life connection to the simplicity of gas exchange in unicellular organisms can be observed through the example of bacteria. Bacteria are ubiquitous and can be found in various environments, including the soil, water, and even on our skin.

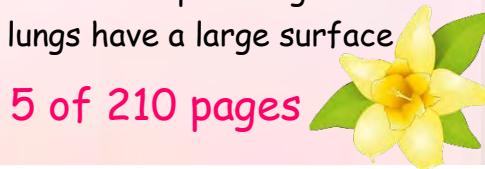
Despite lacking complex respiratory systems, bacteria can survive and thrive by relying on their direct gas exchange with the surrounding environment. This is why bacteria can live in diverse habitats ranging from deep-sea hydrothermal vents to acidic hot springs

Multicellular organisms and gaseous exchange

Multicellular organisms, such as insects, animals, and plants, have larger bodies with complex structures and organs. Their increased size and greater metabolic demands make simple diffusion inadequate for efficient gas exchange. Therefore, they have evolved specialized respiratory structures, such as lungs, gills, tracheal systems, or stomata, to facilitate the exchange of gases throughout their bodies.

Multicellular organisms have specific respiratory structures that enhance their ability to obtain and distribute oxygen efficiently. These structures provide a larger surface area for gas exchange, ensuring that oxygen can be transported to all cells while carbon dioxide is effectively removed. For example, animals have lungs or gills that contain numerous small air sacs or filaments, respectively, to maximize gas exchange. Insects rely on tracheal systems

A daily life connection to the necessity of specialized gas exchange surfaces in multicellular organisms can be observed through the example of humans. Humans have complex lungs in their respiratory system that enable efficient gas exchange. Our lungs have a large surface area provided by numerous tiny air sacs called alveoli.



Examples of gaseous exchange surfaces in animals.

Animal	Gaseous exchange surface
Birds	Alveoli
Reptiles	Alveoli
Mammals	Alveoli
Fish	Gill filaments
Insects	Tracheae
Amphibians	Skin, buccal cavity lining and lungs

Group activity:

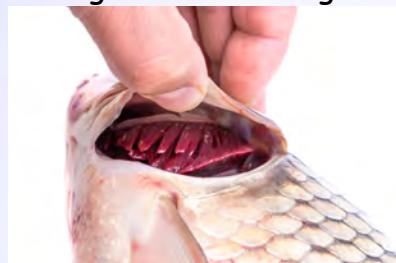
Group activity:

Examining sites of gaseous exchange in various organisms

What you need: insects, fish, a variety of leaves, hand lens, and pencil

Procedure

- Collect various organisms from the environment.
- Observe the organs for gaseous exchange in the collected organisms using a hand lens.



Observing organs and structures for gaseous exchange

Questions

1. Compare organs of gaseous exchange in different organisms. Give similarities and differences in a tabular form.
- 2 a) Outline the characteristics of a good gaseous exchange surface.
b) Explain how the gaseous exchange surfaces are adapted to perform their functions
- 3 a) Draw a well labelled drawing of a respiratory organ of a fish. Your drawing should include a title, magnification & should be neat
b) Explain how the gills of a fish are adapted to perform their function
4. a fisherman catches a fish and keeps it out of water for an extended period. What impact does it have on the fish's ability to extract oxygen.
5. Describe how the process of gaseous exchange occurs in a bony fish. (research from internet & textbooks)



Use your brain power!

1. A group of fishermen catches a large fish and places it on the deck of their boat.



Task: Write a scientific explanation summarizing the potential consequences of removing the fish from its aquatic environment for an extended period and discuss the impact on its gas exchange processes, the fish's overall physiology and survival.

2. A group of tourists catches fish from a river and keeps them alive in a bucket for a few hours before releasing them

Task: Evaluate how prolonged confinement in a bucket affects the fish's gas exchange surfaces and overall health. Suggest best practices for tourists engaging in catch-and-release activities to ensure minimal harm to the fish.



My notes

Answer template



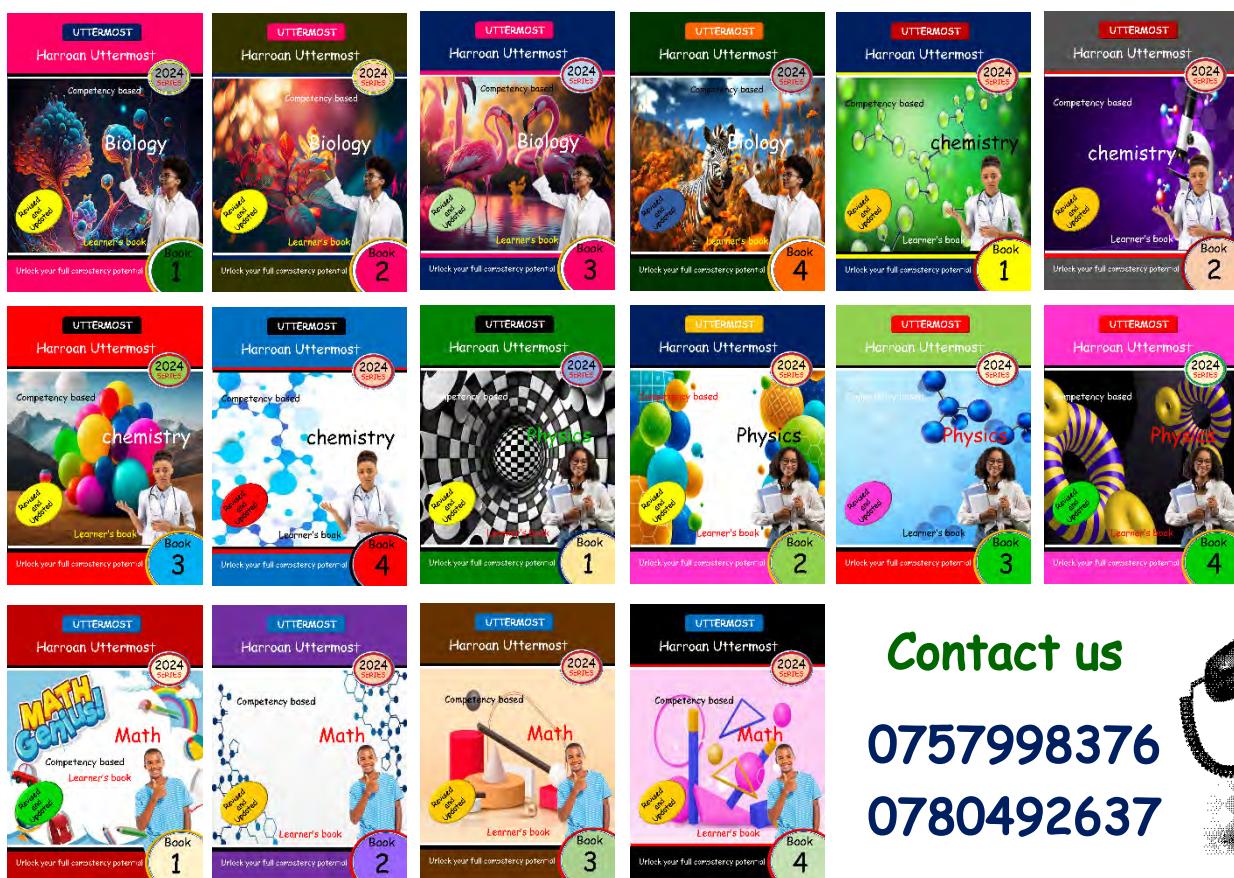
Why a new version each year?

Harroan releases new versions of learner's books each year in order to align the content with evolving education needs and standards. Producing new versions ensures that the content remains current & up to date. This allows learners to learn most relevant and accurate information. Education methodologies & pedagogical approaches evolve over time, incorporating new insights & strategies to enhance student learning.

2024 books on market

1. Uttermost series - 2024 series

Harroan uttermost versions are our third editions improved from our 2023 versions with new features like use your brain power, answer sheet template, improved guide notes & others. This sample contains a few pages of the Harroan Uttermost books. All other Harroan Uttermost books have the same structure.



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Selling structure

The 2024 versions have two printing formats:

1. The standard clear format print- the one used in 2023 versions
2. The best quality hd print- the newly introduced one



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Book pages 210

Color printing

Book(s) price	Price	Additional benefits (Tp costs, free teaching guide, free other versions)
1 learner's book	25,000	None
1 teaching guide	30,000	None
Learner's book + teaching guide	50,000	None
5 to 9 learners' Books	20,000 each	None. The books can be of different classes or subjects
10 to 19 learners' Books	18,000 each	None. Still the books can be of different subjects or classes
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2. Enterprise series - 2024 series

Harroan enterprise versions are first editions of our new books full of scenario & practical based questions which will unlock the learners' competence potential. The books are not practical books though they contain a practical view section with competence based practical questions. They are different from Harroan Enterprise plus that they concentrate on a particular class. They contain a full separate teaching guide.

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Book(s) price	Price	Additional benefits (Tp costs, free teaching guide, free other versions)
10 to 19 learners' Books	18,000 each	None. Still the books can be of different subjects or classes
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2. Enterprise plus series - 2024 series It's of 2 classes



These are Harroan enterprise but of combined classes. Each book is on 300 pages with the same structure as Harroan enterprise. They contain scenario questions from combined classes though on comparing with single class Harroan Enterprise, they have less questions but all topics covered.

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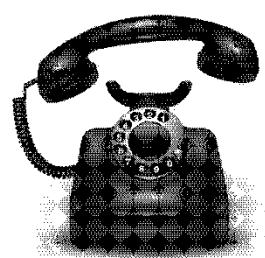
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40 to 49 learners' Books	23,000 each	Free transportation, books can be of different subjects or classes
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3. 2023 & 2022 series

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1.5. Making a lung model.

Key question: Explain breathing in humans using your made model

Demonstrating the mechanism of breathing in man using a model.

Materials: plastic (bottle with a cap), 2straws, scissors, 3balloons, push pins, tape.

Procedure:

1. Gather your materials



2. Cut the necks of two of the balloons



3. Cut one straw in half



4. Then attach one balloon to each straw half.
Use tape to seal it off. These will be your lungs.



5. Take the other straw and make a 5cm cut on one end so that it is split in half.

Flip the straw around and make two 5cm cuts on the other end so that it is split into four.



6. Tape one "lung" on the either side of the two way split straw.



Chapter 2

Aerobic and anaerobic respiration.



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

- Appreciate the importance of respiration
- State the sites of aerobic and anaerobic respiration
- Describe the relationship between aerobic respiration and photosynthesis.
- Carry out experiments in relation to aerobic and anaerobic respiration
- Describe applications of anaerobic respiration
- Compare aerobic and anaerobic respiration

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2.1 The process of respiration

Introduction

Take a deep breath. Did you know that every breath you take is part of a remarkable process that keeps you alive? Welcome to the fascinating world of respiration. Respiration is not just a concept confined to textbooks; it is a fundamental process that impacts our daily lives and is connected to our very survival. From the moment we wake up in the morning to the time we go to bed at night, respiration is constantly at work, enabling us to carry out even the most basic of activities.



Respiration is a complex biological process that occurs at the cellular level. It involves the breakdown of organic molecules, such as glucose, to release energy in the form of ATP (adenosine triphosphate). But how does respiration relate to our daily lives? Let's explore a few examples that illustrate the significance of this biological process in our everyday routines.



1. Imagine yourself engaging in physical exercise, such as playing a sport or cycling. As you exert yourself, your muscles require more energy. In response, your body increases its breathing rate to provide the necessary oxygen for the production of ATP. This increased respiration assists you in meeting the energy demands of exercise.

2. Another scenario to consider is when you're enjoying a meal. While you eat, your digestive system breaks down the food into smaller molecules, which are then absorbed into the bloodstream. But how does this food get converted into the energy needed to power your body? It is through the process of respiration that the glucose molecules derived from food undergo a series of intricate chemical reactions, releasing energy in the form of ATP. This energy is vital for carrying out essential bodily functions, such as the beating of your heart or the synthesis of new molecules.

 **Key question: how is energy got from respiration used in daily life?**

Importance of energy produced during respiration in the body.

- ❖ Energy is required for the contraction of muscle cells to create movement.
- ❖ Movement of food along the alimentary canal by peristalsis.
- ❖ Building up of amino acids and proteins.
- ❖ Growth of an organism through formation of new cells.
- ❖ Conduction of electrical impulses by nerve cells.
- ❖ Active transport of molecules along the cell membrane.
- ❖ Digestion of food.
- ❖ The process of cell division to create new cells.



Group activity:

1. Describe how the energy got from respiration is used in daily life. Describe as many ways as you can.



2. During a biology class, a student asks for examples of everyday activities where the importance of energy obtained from respiration can be observed. However, multiple students are having trouble relating this concept to their daily lives. How would you address the challenge of connecting the importance of energy produced by respiration to everyday activities for students who are struggling to make the connection? Provide suitable examples that will resonate with their daily lives, and discuss the relevance of respiration and energy production in each example.

Use your brain power!

3. A person is experiencing constant fatigue and lack of energy throughout the day. They have a sedentary lifestyle and consume a diet high in processed foods. Explain how the energy obtained from respiration plays a crucial role in their overall well-being and suggest lifestyle changes to improve their energy levels.



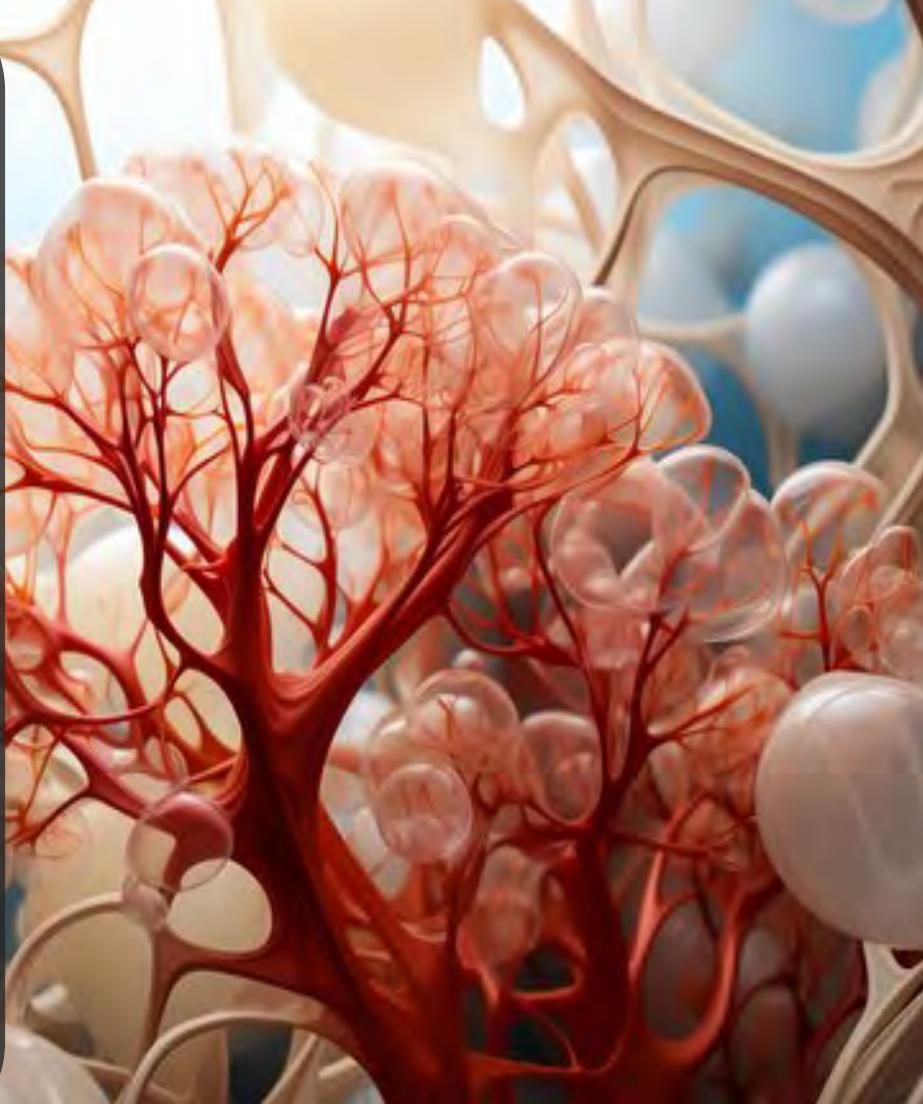
4. A professional athlete is training for an upcoming competition. She has been following a strict diet and exercise regimen but is still struggling to improve her performance. Discuss the significance of energy obtained from respiration in athletic performance and provide recommendations to optimize her energy production during training.

My notes

Answer template

Chapter 5

CHEMICAL COORDINATION IN HUMANS



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

- Differentiate between an enzyme and hormone
- Describe the effects of hormones to the body
- Describe causes of hormonal disorders
- Appreciate the role of diet in managing hormonal disorders
- Describe the interrelation between enzymes and hormones using examples.

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5.1. Hormones and enzymes.

Introduction

Have you ever wondered why you feel hungry or thirsty? Or why your heart rate increases during exercise? These are just a few examples of how chemical coordination plays a role in our everyday lives. Hormones help regulate our appetite and thirst levels, and they also control our heart rate and other bodily functions necessary for survival.



Chemical coordination is the coordination which occurs with the help of hormones.

Hormones are organic chemicals produced by the body and released into the blood.

Hormonal coordination, governed by the endocrine system, is a network of glands and hormones that work in harmony to regulate our body's functions and maintain internal balance. Throughout your day, hormones play a fundamental role in maintaining equilibrium in various bodily processes. When you enjoy a satisfying meal, hormones released by the pancreas, such as insulin, allow your body to effectively process and convert the food into energy. In moments of stress or danger, your body's stress response kicks into gear through the release of hormones like adrenaline from the adrenal glands. This immediate hormonal coordination prepares your body for a quick response, sharpening your focus, increasing your heart rate, and boosting your energy levels.



Key question: compare enzymes and hormones in terms of structure and function

Hormones

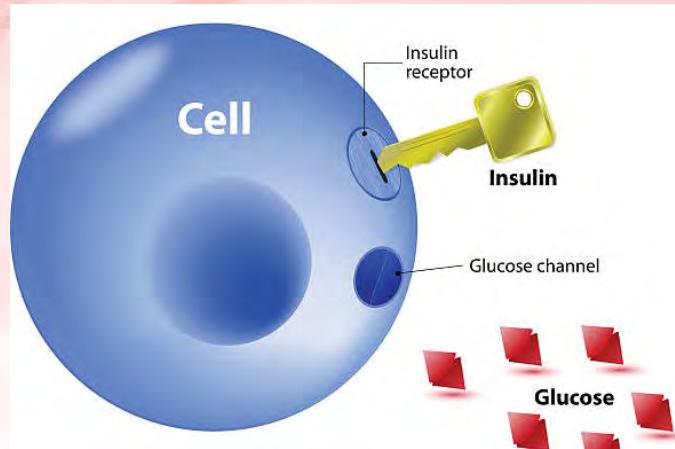


A hormone is a chemical messenger that controls the activities of a target organ to ensure the normal functioning of a system. They are released into the bloodstream and travel to target cells or organs where they bind to specific receptors. Hormones play a crucial role in regulating and coordinating numerous bodily functions.

Some examples of hormones.

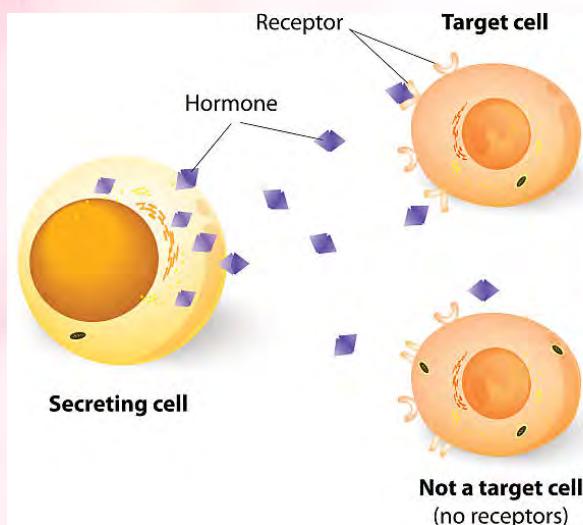
- **Insulin:** Produced by the pancreas, insulin regulates blood sugar levels by promoting the uptake of glucose from the bloodstream into cells.
- **Thyroid Hormones (T3 and T4):** Secreted by the thyroid gland, these hormones regulate metabolism, growth, and development.
- **Estrogen and Testosterone:** These sex hormones are responsible for the development of secondary sexual characteristics and reproductive functions.
- **Adrenaline:** Released by the adrenal glands during stress or emergencies, adrenaline prepares the body for a fight-or-flight response.

Hormones are used in; sleep, metabolism, stress indicators, respiration, excretion, reproductive growth and development.



Insulin stimulates uptake of glucose by cells.

How do hormones function?



Hormones act as messengers which are released into blood. Blood transmits them to various organs and tissues of the human body. After reaching a target organ, hormones bind to receptors. Once this is complete, hormones then transmit the message which causes an organ or tissue to perform a specific action.

Enzymes

An enzyme is a chemical substance protein in nature produced by living cells that speeds up the rate of a chemical reaction. Examples of enzymes include; Salivary amylase, pepsin, renin, trypsin peptidase. Etc.

Group activity:

1. Outline the characteristics of:
 - i) hormones
 - ii) enzymes
2. Compare enzymes and hormones give differences and similarities



Use your brain power!

Michael, a diabetic patient, experiences high blood sugar levels even after adhering to his medication regimen. He wonders how hormones and enzymes might be involved in glucose regulation. How do hormones and enzymes interact to regulate glucose levels in the body? Which hormones are responsible for stimulating the enzymes involved in glucose regulation and what could be causing Michael's persistent high blood sugar levels?

My notes

Answer template

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Advert break

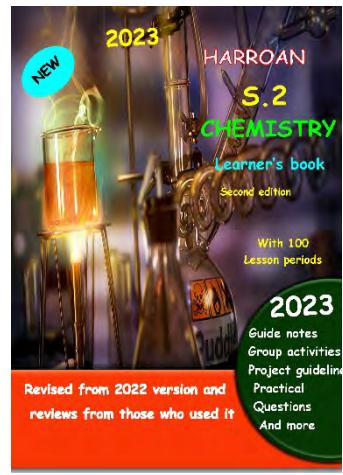
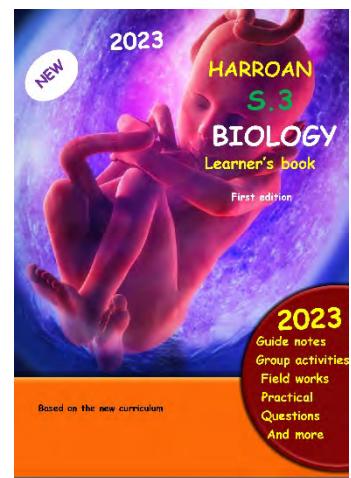
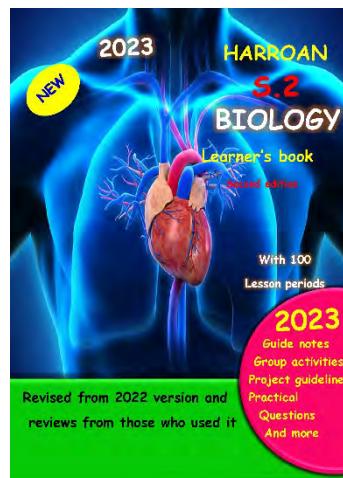
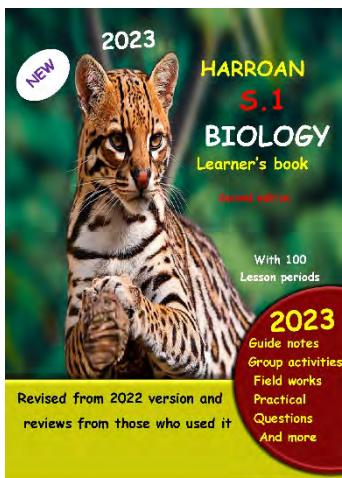


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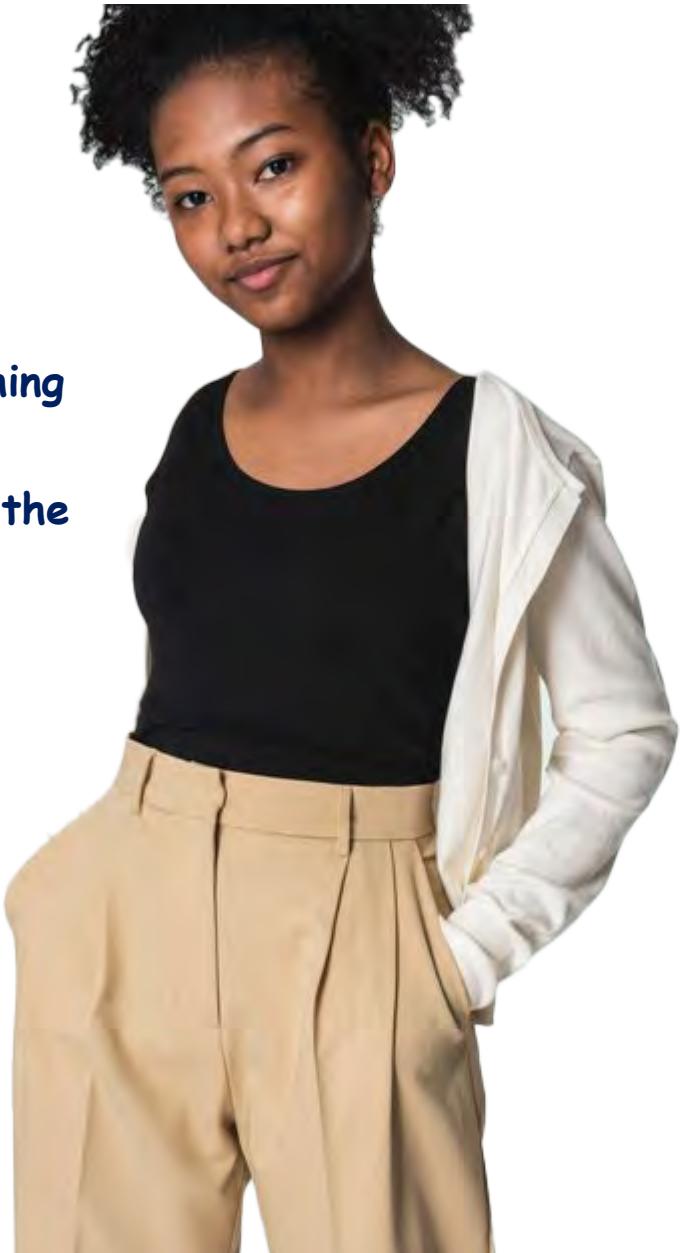
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A sample of the teaching
guide for Harroan
uttermost appears on the
next page



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Teaching guide

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3

How to use the Teaching guide



Harroan Uttermost teaching guide has been developed for teachers to teach learning contents to their students more effectively with using the harroan **uttermost series**. As for the features of this Teaching guide, its contents correspond to that in the textbook according to the Senior 3 Syllabus. The **NCDC syllabus** sets the national standards that are taught by teachers in the classroom that all students should acquire throughout the country, regardless of the context. **These standards outlined in the syllabus are reflected in this teaching guide.** Therefore, information in this teacher's manual will help teachers to prepare lesson plans and to conduct lessons in line with the syllabus. Firstly, the composition of the textbook is introduced, then, the components in this teacher's manual are introduced in the following section.

Main contents of the Teaching guide

Introduction: In the introduction, teacher makes students review the previous lesson to connect the new lesson through the key question. An example of the introduction is shown in the lesson flow.

Showing a key question: The key question is closely related to the core or main points of the lesson including the new knowledge, new concepts and new skills. The teacher delivers the key question by using the review of the previous lesson or a new phenomenon at the beginning of a new lesson. In this particular lesson, students try to answer the key question by guessing or predicting based on their experiences.

Activity The activity is delivered to examine their guess and prediction to the key question. In some lessons, the teacher may deliver the activity without students' prediction or hypothesis. These two different ways are dependent on the lesson content. Activities are carried out by a group, individually or done by teacher's demonstration, which is dependent on the availability of the materials and contexts of the lesson topics. Teacher allows students to have enough time to do the activity..

Preparation

Materials and apparatuses recommended for use in the lesson are shown.

Theme: **Respiration in plants and animals**

Topic: **Gaseous exchange**

Lesson Title: **Need for gaseous exchange**

Lesson flow

Introduction

- Review primary knowledge about breathing. Ask learners what they know about breathing & listen to their response. Go through the introduction with the rest of the class as they develop curiosity on how gaseous exchange impacts daily life

Introduce the key question to learners.

Listen to what they have to say about it. They don't have to be perfect at the start of the period but they should have a right answer for the same question at the end.

- Let learners go through the given guide notes in form of discussion about gaseous exchange. They can also get more from other relevant biology text books

Activity

- Organise the students to work in groups.
- Students will share ideas with each other on why organisms need gaseous exchange, effects of inadequate gaseous exchange & how low oxygen levels affect gaseous exchange.
- Give enough time to the students to find new ideas through the activity by themselves.

Lesson No: 1

Learner's book pgs: **1 to 4**

Preparations: **nil**

1.1 Need for gaseous exchange

Introduction

Have you ever wondered how your body gets the oxygen it needs to function properly? Or why you feel out of breath after running or playing sports for a while? It's all because of a fascinating process called gaseous exchange that happens inside our bodies. Every time you take a breath, you are inhaling oxygen from the air around you. This oxygen travels deep into your lungs, where it is exchanged with carbon dioxide, a waste product produced by your body's cells. This exchange is vital for your body's overall health and functioning.

Key question: why is gaseous exchange necessary in organisms?

Guide notes

Gaseous exchange and breathing

Breathing is a fundamental process that allows our bodies take in and bring out gases. Gaseous exchange is the process by which gases move passively by diffusion across a surface, for example, the exchange of oxygen gas and carbon dioxide gas across the respiratory surface. In humans, gaseous exchange involves the exchange of oxygen and carbon dioxide between the lungs and the blood, as well as between the blood and body's cells.

Group activity:

- Explain why organisms need gaseous exchange.
- Why do people carry oxygen tanks when swimming beneath a water body.

- Imagine you are in a crowded room with poor ventilation. Explain how inadequate gaseous exchange can affect your overall health and well-being.

Use your brain power!

You and your team are embarking on a challenging mountain expedition, reaching high altitudes where oxygen levels are significantly lower.

TASK

Write a short essay explaining how the low oxygen level at high altitudes affects the human body during a mountain expedition. Support your answer with relevant scientific concepts and describe the adaptations that occur in the body to cope with the lack of oxygen.

Discussion In the discussion part, the teacher allows students to present their results or findings from the activity and to share with all other students. The teacher allows time to students to think and seek the answers for the key question by using the results or findings in the activity. The teacher must verify the results to the students to avoid misconceptions

- themselves.
3. **Discussion for findings**
 - Ask students to present their findings from the activity.
 - Write their findings on the blackboard.
 - Facilitate active students' discussions.
 - Confirm the findings with the students.
 - Let other groups ask the discussing group questions on what they are discussing
 - Settle arguments arising within learners



Learners should research about the questions before the lesson period such that more time is given to discussion. Researching during the lesson periods wastes a lot of time actually it may take the entire lesson period

Summary The summary confirms the core points of the lesson. The teacher asks questions shown in the teacher's manuals as summative assessment to students in order to confirm if they have acquired the main knowledge and skills in the lesson. The summary points may be the students' findings or results in the discussion part of the textbook which the teacher would facilitate and direct students

4. Summary & conclusion

- Ask students to open their learners' books And write answers for the key question & use your brain power in the answer sheet space provided.
- Learners can add any other relevant information & summaries in the answer sheet template provided.
- Ask the key question once again & listen to Learner's responses. As a form of assessment, ask learners the questions appearing in the assessment table



It's better for learners to write notes after discussions such that the answer template is not wasted.

Lesson Flow

A lesson flow includes several teaching points. The main components are:

- ①. Introduction, ②. Key question, ③. Activity, ④. Discussion and ⑤. Summary.

Lesson flow in some lessons contains additional information like "Result" or "Challenge", according to the content of the lesson in the textbook.

Lesson Objectives

Objectives capturing the main knowledge and skills in the lesson are provided in the textbook.

Learning objectives

Students will be able to:

- Explain the difference between gaseous exchange and Breathing
- Explain why organisms need gaseous exchange.
- Explain how low oxygen levels affect gaseous exchange in humans

Assessment

Students are able to:

- State the differences between exchange and Breathing
- Explain why organisms need gaseous exchange.
- Explain how low oxygen levels affect gaseous exchange in humans

Assessment

Teacher should reflect own lesson along this criteria through the lesson. The three components of knowledge, thinking skills, attitude & values are also indicated in the teacher's manual.

'Knowledge' means new concepts, new findings and their relationships.

'Thinking skills' means scientific process skills, which contain observing, measuring, inferring, classifying, predicting and communicating.

'Attitude and Value' means the interests, curiosities and respect for nature and recognition on the importance and usefulness of the content.

Teacher's Notes contains answers to questions in learner's book & supplementary information useful for teaching, such as background knowledge and more detailed explanations, are introduced. In case of materials or equipment not accessible nationwide, the alternatives are mentioned and instructions on how to improvise are provided.

Teacher's notes

Below are some of the expected answers on the group activity & use your brain power questions

1. Explain why organisms need gaseous exchange.

Organisms need gaseous exchange to ensure the proper functioning of their cells and organs. Gaseous exchange allows the exchange of oxygen and carbon dioxide between an organism and its environment. Here are some reasons why organisms require gaseous exchange:



Theme: Respiration in plants and animals

Topic: Gaseous exchange

Lesson No: 1

Learner's book pgs: 1 to 4

Lesson Title: Need for gaseous exchange

Preparations: nil

Lesson flow

1. Introduction

- Review primary knowledge about breathing. Ask learners what they know about breathing & listen to their response. Go through the introduction with the rest of the class as they develop curiosity on how gaseous exchange impacts daily life
- Introduce the key question to learners. Listen to what they have to say about it. They don't have to be perfect at the start of the period but they should have a right answer for the same question at the end.
- Let learners go through the given guide notes in form of discussion about gaseous exchange. They can also get more from other relevant biology text books

2. Activity

- Organise the students to work in groups.
- Students will share ideas with each other on why organisms need gaseous exchange, effects of inadequate gaseous exchange & how low oxygen levels affect gaseous exchange.
- Give enough time to the students to find new ideas through the activity by themselves.

3. Discussion for findings

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1.1 Need for gaseous exchange

Introduction



Have you ever wondered how your body gets the oxygen it needs to function properly? Or why you feel out of breath after running or playing sports for a while? It's all because of a fascinating process called gaseous exchange that happens inside our bodies. Every time you take a breath, you are inhaling oxygen from the air around you. This oxygen travels deep into your lungs, where it is exchanged with carbon dioxide, a waste product produced by your body's cells. This exchange is vital for your body's overall health and functioning.

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Group activity:

Group activity:

1. Explain why organisms need gaseous exchange.
2. Why do people carry oxygen in tanks when swimming beneath a water body.

3. Imagine you are in a crowded room with poor ventilation. Explain how inadequate gaseous exchange can affect your overall health and well-being.

Use your brain power!

You and your team are embarking on a challenging mountain expedition, reaching high altitudes where oxygen levels are significantly lower.

TASK

Write a short essay explaining how the low oxygen level at high altitudes affects the human body during a mountain expedition. Support your answer with relevant scientific concepts and describe the adaptations that occur in the body to cope with the lack of oxygen.



Learners should research about the questions before the lesson period such that more time is given to discussion. Researching during the lesson periods wastes a lot of time actually it may take the entire lesson period



Teacher's notes

Below are some of the expected answers on the group activity & use your brain power questions

1. Explain why organisms need gaseous exchange.

Organisms need gaseous exchange to ensure the proper functioning of their cells and organs. Gaseous exchange allows the exchange of oxygen and carbon dioxide between an organism and its environment. Here are some reasons why organisms require gaseous exchange:

- **Oxygen for Cellular Respiration:** Oxygen is essential for cellular respiration, the process by which cells convert glucose and oxygen into energy, carbon dioxide, and water. Through gaseous exchange, organisms acquire oxygen from the environment to support this vital metabolic process.
- **Removal of Carbon Dioxide:** As a byproduct of cellular respiration, carbon dioxide must be removed from the body. Gaseous exchange allows organisms to expel carbon dioxide, preventing its buildup, which can be toxic and disrupt normal cellular function.
- **Energy Production:** Oxygen is a crucial component in the production of ATP (adenosine triphosphate), the energy currency of cells. Efficient gaseous exchange ensures an adequate supply of oxygen to support ATP production and provide energy for essential cellular processes.
- **Maintenance of pH Levels:** Gaseous exchange helps regulate the acid-base balance (pH) in organisms. Carbon dioxide, when dissolved in water, forms carbonic acid, which can lower the pH. By removing excess carbon dioxide, gaseous exchange helps maintain stable pH levels, which are important for proper cellular function.
- **Homeostasis:** Gaseous exchange contributes to maintaining homeostasis, the balance and stability of internal conditions in an organism. Oxygen is needed to support the optimal functioning of organs and systems, while the removal of carbon dioxide helps maintain a healthy internal environment.

2. Why do people carry oxygen in tanks when swimming beneath a water body

. Lack of Oxygen: Underwater, the air we breathe is not readily available, and the oxygen concentration decreases as we dive deeper. When we swim beneath the water's surface, our lungs cannot extract sufficient oxygen from the surrounding water to sustain normal bodily functions. Therefore, carrying an oxygen tank allows divers to supplement their oxygen

3. Imagine you are in a crowded room with poor ventilation. Explain how inadequate gaseous exchange can affect your overall health and well-being.

Poor ventilation means there is limited fresh air entering the room, resulting in lower oxygen levels. Inadequate oxygen supply can lead to symptoms like dizziness, shortness of breath, and fatigue. Oxygen is essential for cellular respiration, which provides energy for various bodily functions. Without enough oxygen, your body may struggle to perform optimally, leading to decreased cognitive abilities, decreased physical endurance, and an overall feeling of lethargy

TASK: Write a short essay explaining how the low oxygen level at high altitudes affects the human body during a mountain expedition. Support your answer with relevant scientific concepts and describe the adaptations that occur in the body to cope with the lack of oxygen.

Title: The Impact of Low Oxygen Levels at High Altitudes on the Human Body during a Mountain Expedition.

Introduction: Embarking on a mountain expedition is an exhilarating experience, but it also presents unique challenges, particularly the decrease in oxygen levels at high altitudes. This essay aims to explain how low oxygen levels affect the human body during a mountain expedition, supported by scientific concepts, and describe the adaptations that occur to cope with the lack of oxygen.

Effects of Low Oxygen Levels: At higher altitudes, the partial pressure of oxygen decreases, resulting in a reduced availability of oxygen for the body. This decrease in oxygen levels can have several significant effects on the human body:

- **Hypoxia:** Hypoxia refers to a condition where there is an inadequate supply of oxygen to body tissues. As oxygen is vital for cellular respiration, the lack of oxygen can impair the functioning of various organs and systems, leading to symptoms such as fatigue, dizziness, and shortness of breath.
- **Increased Breathing and Heart Rate:** To compensate for the reduced oxygen levels, the body responds by increasing the breathing and heart rate. This helps to deliver more oxygen to the tissues, ensuring a continuous supply to meet the body's demands.
- **Altitude Sickness:** As individuals ascend to higher altitudes, they may experience altitude sickness, also known as acute mountain sickness (AMS). AMS is characterized by symptoms such as headache, nausea, vomiting, and insomnia. It occurs due to the body's struggle to acclimatize to the reduced oxygen levels.

Adaptations to Cope with Low Oxygen Levels:

- **Increased Red Blood Cell Production:** In response to low oxygen levels, the body increases the production of red blood cells (RBCs). RBCs contain hemoglobin, a protein that carries oxygen from the lungs to the body's tissues. The increased number of RBCs enhances oxygen-carrying capacity, ensuring a more efficient delivery of oxygen.
- **Enhanced Lung Function:** The body adapts by increasing the depth and rate of breathing, allowing for a greater intake of oxygen. Additionally, the lungs undergo structural changes, such as increased capillarization, to improve oxygen exchange between the air and blood.

Conclusion:

Low oxygen levels at high altitudes pose significant challenges to the human body during a mountain expedition. The effects of hypoxia, increased breathing and heart rate, and altitude sickness can impact the overall well-being and performance of individuals. However, the body's remarkable adaptations, including increased red blood cell production, enhanced lung function, and improved oxygen extraction, help to mitigate the effects of low oxygen levels and enable individuals to acclimatize to high altitudes. Understanding these scientific concepts and adaptations is crucial for mountaineers to ensure their safety and success during mountain expeditions.

Learning objectives

Students will be able to:

- Explain the difference between gaseous exchange and Breathing
- Explain why organisms need gaseous exchange.
- Explain how low oxygen levels affect gaseous exchange in humans

Assessment

Students are able to:

- State the differences between exchange and Breathing
- Explain why organisms need gaseous exchange.
- Explain how low oxygen levels affect gaseous exchange in humans

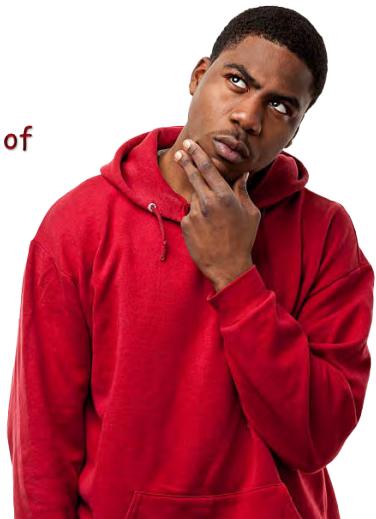
More on discussion for findings

ask these questions as discussion points to the learners discussing or even to the entire class to unlock learners' competency potential on impacts of gaseous exchange in daily life

1. Why do astronauts carry oxygen tank when going to the moon.
2. Why does a fish die when placed out of water
3. Why do we feel dizzy on holding our breath for so long.
4. Why is it advisable not to sleep under a tree at night
5. Describe how a cow and a bean plant can depend on each other in terms of gaseous exchange.

4. Summary & conclusion

- Ask students to open their learners' books And write answers for the key question & use your brain power in the answer sheet space provided.
 - Learners can add any other relevant information & summaries in the answer sheet template provided.
-
- Ask the key question once again & listen to Learner's responses. As a form of assessment, ask learners the questions appearing in the assessment table



It's better for learners to write notes after discussions such that the answer template is not wasted. Learners should research abt the qns of the nxt period be4 the lesson period

Remind learners to research about questions of the next lesson period

Suggested lesson time allocation

Duration: 80 minutes (two 40 mins double lesson)

Introduction: 10 minutes

Activity: 35 minutes

Discussion for findings: 25 minutes

Summaries & conclusion: 10 minutes





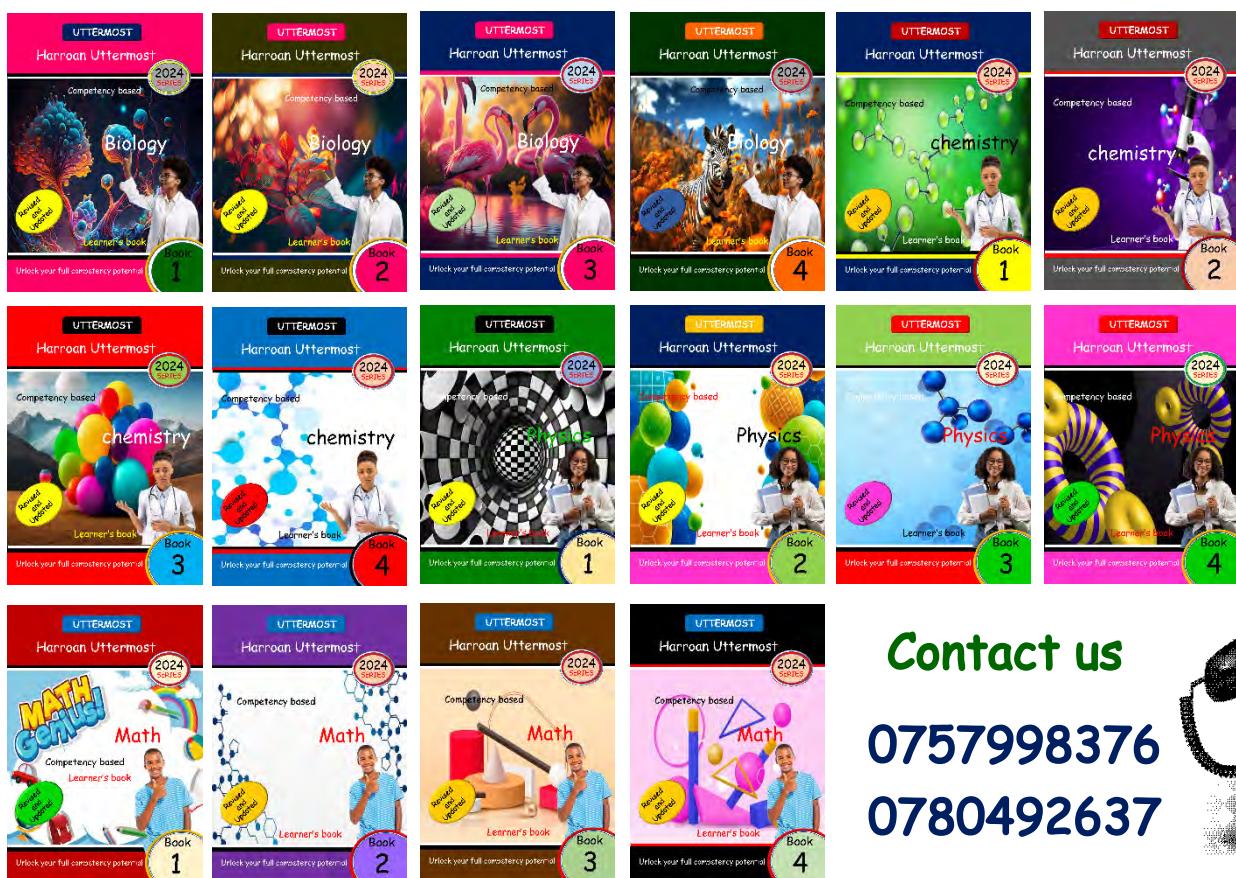
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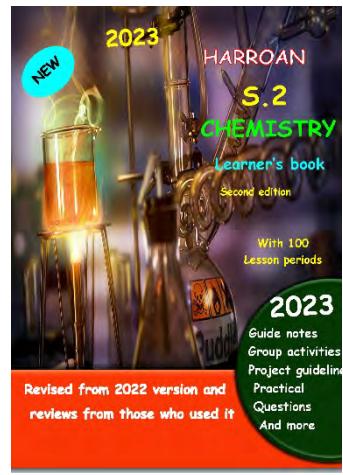
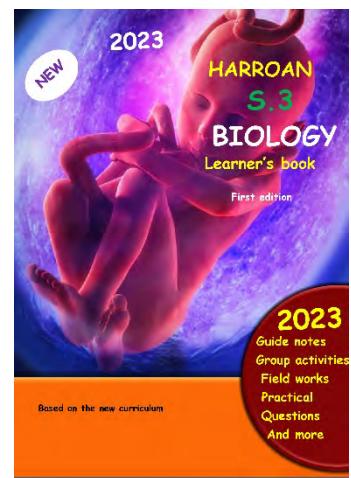
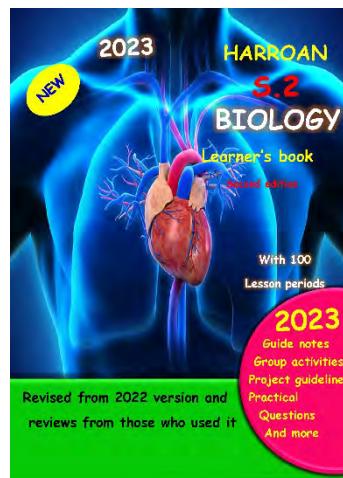
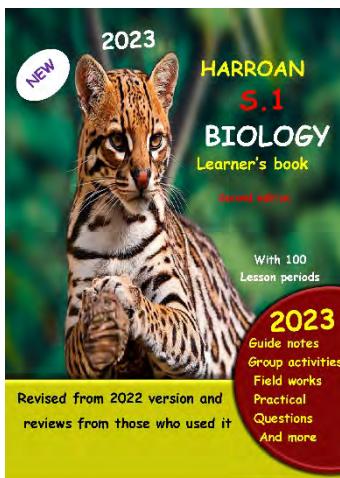


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