

**VISION GROUP**

NATIONAL PRIDE • GLOBAL EXCELLENCE

# **HOME SCHOOLING MATERIAL**

**SECONDARY**

**S3 & S4**





**Ministry of Education and Sports**

# O' LEVEL

## SELF STUDY MATERIALS

### SENIOR THREE

## HUMANITIES PACKAGE



# Geography

## LESSON 1: Major Fishing Grounds and Factors Favouring Fishing in East Africa

### Learning Outcomes

- By the end of this lesson, you should be able to:
- identify the major fishing grounds and types of fish caught.
  - explain the factors favouring fishing in East Africa.

### Materials you need:

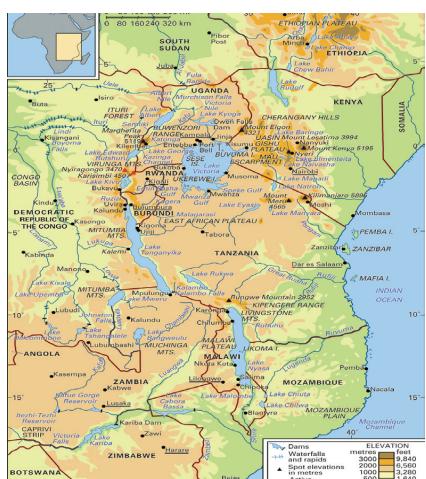
- geography textbook
- photographs
- diagrams
- notebook
- pen
- pencil
- rubber
- ICT tools (where possible)

### Introduction

In Senior One you learnt about the utilization of natural resources in British Columbia, and among the resources was fish. In this lesson you are going to learn about fishing as an economic activity in East Africa. Furthermore, you will learn about major fishing grounds, the fish species caught, and the factors favouring fishing activities. In your note book, first find out the meaning of the fishing.

### Fishing Grounds

You have probably eaten fish before or seen fish being sold in a local market. Have you ever bothered to find out where it is got from? Fish is not caught in all water bodies. It is caught in specific water bodies, collectively called fishing grounds. **Figure 1** shows some of the fishing grounds of East Africa.



### Figure 1: Map showing major fishing places and ports of East Africa

The places where fishing is carried out are called **fishing grounds**. Fresh water lakes, rivers and swamps are called inland or fresh water fishing grounds whereas oceans and seas are marine fishing grounds.

### Activity 1: Identifying fishing grounds and types of fish in East Africa

Study **Figure 1** and do the following:

- Copy the map into your notebook and on it mark and name:
  - Fresh water fishing grounds.
  - Marine fishing grounds.
  - Major fishing ports/landing sites.
- Identify the countries with marine fishing grounds.
- Using the knowledge of fishing in British Columbia and any other background knowledge, describe how the following factors could have led to the development of fishing activities in East Africa:
  - Nature of the fishing ground
  - Abundant fish species
  - Warm temperatures
  - Market
  - Government policy
  - Transport system
  - Capital
  - Technology

### Activity 2: Types of fish caught in East Africa

- In your notebook, make a list of the types of fish caught or sold in your home market. Which type is the commonest?
- Using textbooks, magazines, newspapers or ICT, find out the types (species) of fish caught in each of the major fishing grounds of East Africa.
- Construct a table with two columns to classify the fish types (species) in relation to fresh water and marine.
- Determine the commonest type of fish caught in East Africa.

### Follow-up Activity: Locating fresh water and marine fishing grounds in East Africa

- Draw a table similar to the one below in your notebook.
- Using your knowledge of the fishing

grounds of East Africa, fill in the second column of the table.

- Put a tick in either the third or fourth column to indicate whether the fishing ground you have listed is a fresh water or marine ground. The first row has been filled to guide you.

Country	Fishing ground	Type of fishing ground	
		Fresh water	Marine
Uganda	Lake Victoria		
	River Nile		
Kenya			
Tanzania			
	Total number for East Africa		

Using the information, you have created, estimate the percentage of:

- fresh water.
- marine fishing grounds in East Africa.
- Using the percentages you have got in (4) above, draw a pie chart to illustrate the proportion of fishing grounds in East Africa by type.

### Summary

In this lesson, you have learnt that:

- fishing is the extraction of animals living in water.
- fishing is carried out in both fresh water and marine water bodies.
- two of the three East African countries have marine fishing grounds.
- Tanzania has a larger marine fishing ground than Kenya.
- the development of fishing in East Africa has been favoured by both physical and human factors.

## LESSON 2: Fishing Methods and Fish Preservation in East Africa

### Learning Outcomes

By the end this lesson, you will be able to

describe the:

- (i) fishing methods used in East Africa.
- (ii) methods used to preserve fish in East Africa.

#### Materials you need:

- textbook
- photographs
- diagrams
- notebook
- pen
- pencil
- graph paper
- rubber

#### Introduction

In the previous lesson you learnt about the major fishing grounds of East Africa and the types of fish caught in each country. In this lesson you are going to learn about the fishing methods and how fish is preserved so that it can be sold to far away markets.

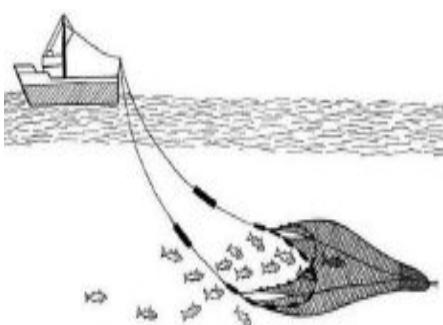
#### Methods Used to Catch Fish

There are many methods of catching fish. Some of the methods are traditional while others are modern. Each method uses different tools or equipment (technology) depending on the type and size of fish to be caught. To understand this better, do the following activity.

#### Activity 1: Methods of catching fish in East Africa

Study **Figure 2** and do the following:

1. Copy each picture into your notebook.
2. Write at least two paragraphs to describe each of the fishing methods you have drawn in your notebook.
3. Suggest other methods of catching fish used in East Africa which are not shown in **Figure 1**.
4. For each method you have suggested in (3) above, describe how it is used.
5. Suggest which of the methods shown in Figure 1 and those you have described in (4) above might lead to exhaustion of fish in the fishing grounds. Give reasons to support your suggestions.



(c) Sun drying

(d) Smoking

**Figure 3: Methods used to preserve fish**

#### Activity 2: Methods of preserving fish in East Africa

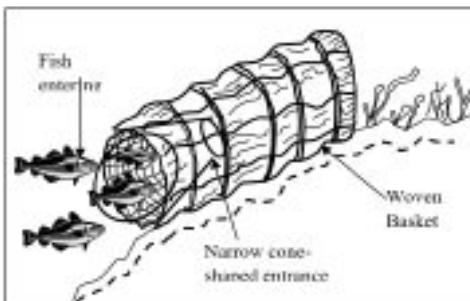
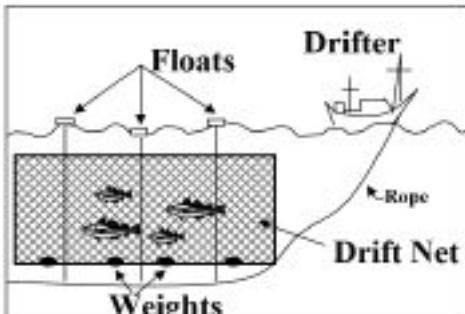
Study **Figure 3** and do the following tasks:

1. Write at least four sentences describing each method of preserving fish shown in **Figure 3**.
2. Outline the likely advantages and disadvantages of each method.
3. Suggest other methods of preserving fish used in East Africa which are not shown in **Figure 3**.
4. For each method you have suggested, explain how it is used to preserve fish.
5. Determine which of the methods shown in **Figure 3** and those you have described in (4) above should be promoted in Uganda. Give reasons to support your opinion.

#### Summary

In this lesson you have learnt that:

- the modern methods of fishing include purse seine net, drifting, trawling. These methods ensure a large catch.
- the traditional methods include: gill netting, use of bows and arrows, spears, cast nets, fish basket and traps, beach seine netting.
- most fresh water fishing grounds use traditional methods of preserving fish like salting, sun drying and smoking.



**Figure 2: Some of the methods (a-d) used to catch fish**



(a) Salting

(b) Icing

#### Follow-up Activity

Study the table below showing fishing methods used in East Africa and do the tasks that follow.

Fishing methods	Estimated catch in tonnes
Gill net motorized	25359
Gillnet/sail	30746
Gill net/ paddle	28942
Long line sails	23646
Beach seines	15747
<b>Total</b>	<b>124440</b>

1. Draw a bar graph to represent the

- information shown in the table.
2. Which method is used to catch the:
    - (i) largest amount of fish?
    - (ii) least amount of fish?
  3. Explain what would happen to the East African fish stocks if the amount of fish caught by beach seines doubled.

### **LESSON 3: Contribution of Fishing to the Economy of East Africa**

#### **Learning Outcome**

By the end of this lesson, you should be able to explain the contribution of fishing to the economy of East Africa.

#### **Instructions**

- Read the instructions carefully before you begin doing each activity.
- In case you find an activity difficult, ask a resourceful person around you for assistance.

#### **Materials you need:**

- Textbook
- Photographs
- Diagrams
- Notebook
- Pen

#### **Introduction**

Fish and fishing have grown into a big economic sector in East Africa. Did you know that fish has become a major non-traditional export for Uganda? For instance, in 2006 Uganda earned US dollars 145.8 million from fish, while fish by-products accounted for 15.2% of the country's total exports. The fishing sector provides employment to over 700,000 people in the country. In this lesson you are going to learn more about the contribution of the fishing industry to the development of Uganda and the rest of East Africa.

#### **Activity 1: Contribution of fish to economic development**



#### **Figure 4: Packaged fish products for sale**

Silver fish (mukene/omena) is sold at commercial scale to make fishmeal and animal feed, but it is also an important part of the local diet. Recent advances in drying technology—raising the nets off the ground—have improved product quality. Packaging silver fish to sell in the market is a relatively new innovation that adds value to the product.

#### **Summary**

In this lesson you have learnt that fishing has greatly contributed to the economy of East Africa through creating jobs for fishers, fish traders, and transporters.

### **LESSON 4: Problems Facing the Fishing Industry of Fishing in East Africa**

#### **Learning Outcome**

By the end of this lesson, you should be able to explain the problems facing the fishing industry of fishing in East Africa.

#### **Instructions**

- Try to do all activities in this lesson.
- Read the instructions carefully before you begin doing each activity.
- In case you find an activity difficult, ask a knowledgeable person around you for assistance.

#### **Materials you need:**

- textbook
- photographs
- diagrams
- notebook
- pen

#### **Introduction**

You have learnt about the methods used for catching and preserving fish. You have noted that fishermen go through a lot of hardship to extract fish from the water bodies. In this lesson you are going to learn more about the problems fishermen face when carrying out fishing.

#### **Activity 1: Reading about the problems of fishing**

Extracted from *Daily Monitor* newspaper of Monday July 3, 2017 page 11.

#### **Hundreds flee Kalangala Islands as Army Pursues Illegal Fishermen**

In January, President Museveni instituted

a special fisheries protection unit (FPU) to fight illegal fishing on all major lakes in the country to end the vice that was reaching crisis proportions. The President's action was promoted by a petition from a team of fishermen from Kalangala islands, who had accused operatives charged with fighting illegal fishing of selling immature fish to Allied Democratic Forces (ADF) rebels in eastern Democratic Republic of Congo.

Indeed the indiscriminate fishing had generally placed immense pressure on the fish varieties and threatening their extinction on some lakes.

1. From the extract above, why do you think fishermen use forbidden fishing nets to catch fish?
2. Suggest measures that can be taken to improve the fishing sector in Uganda.

#### **Summary**

In this lesson you have learnt that the problems facing the fishing industry are both physical and human in nature.

### **LESSON 5: Major Areas of Wild Life Conservation and Tourism in East Africa**

#### **Learning Outcomes**

By the end of this lesson, you should be able to:

- i) identify and locate the major areas of wildlife conservation and tourism in East Africa.
- ii) explain the factors leading to the development of the tourism industry in East Africa

#### **Instructions**

- You will be studying one lesson each day. Try to do all activities programmed for each day.
- Remember that some activities may take more than one hour to complete.
- Read the instructions carefully before you begin doing each activity.
- In case you find an activity difficult, ask a knowledgeable person around you for assistance.

#### **Materials you need:**

- textbook
- photographs
- diagrams

- notebook
- pen
- pencil
- eraser

## Introduction

Many people come to East Africa especially during the summer holiday from Europe, North America and Asia. Who are they? Why do they come to East Africa? In this lesson you are going to learn that not all people that come to East Africa are tourists. Some are visitors and have a particular reason for coming. You will also learn the location of major areas of wildlife conservation and tourist attractions, and explain the factors leading to the development of tourism industry.

### Activity1: Finding about tourism



2001	993.6
2002	1001.3
2003	1146.1
2004	1358.1
2005	14790
2006	1556

**Source: Central Bureau of Statistics**

1. Draw a line graph to show the trend of tourist arrival.
2. Describe the trend of tourism arrivals in Kenya.

## Summary

In this lesson, you have learnt that:

- East Africa is blessed with a number of tourist attractions ranging from wildlife, physical features, landscape to artificial (human-made) tourist attractions.
- the major tourist attraction of East Africa is wildlife, that is, wildlife forms the basis for the tourism industry.
- the factors leading to the development of the tourism industry are physical and human in nature



**Figure 5: Scenes of tourism**

1. Who are tourists?
2. Using **Figure 5**, write short notes on tourism.
3. Are all people who visit East Africa tourists?
4. What places do tourists go to?

Did you know that tourism is an activity that involves moving from one place to another either within or outside one's country for purposes of pleasure, curiosity and discovery or research study?

A tourist is a person who travels to a place purely for pleasure. The major tourist attraction in East Africa is wildlife. Wildlife refers to all undomesticated plants and animals.



## LESSON 6: Contribution and Challenges of the Tourism Industry in East Africa

### Learning Outcomes

By the end of this lesson, you should be able to:

- i) describe the challenges facing the tourism industry in East Africa.
- ii) explain the contribution of the tourism industry in East Africa.

### Instructions

- Try to do all activities programmed in this lesson.
- Remember that some activities may take more than one hour to complete.
- Read the instructions carefully before you begin doing each activity.
- In case you find an activity difficult, ask a knowledgeable person around you for assistance.

### Materials you need:

- Textbook
- Photographs
- Diagrams
- Notebook
- Pen
- Pencil
- Rubber



### Follow-up Activity

Study the table below showing tourist arrivals in Kenya

year	Tourist arrivals(000)
2000	1036.7

## **Introduction**

In the previous lesson you have learnt about the tourist potentials of East Africa. Is tourism of any economic importance to the economy of your country? In this lesson, you are going to learn about the contribution of the tourism sector to the economy and problems facing the industry.

### **Activity 1: Finding the economic importance of tourism**

Read the extract below (*Sunday Monitor* 13th/2011 p.8) and do the tasks that follow.

If Uganda does not take the necessary steps to improve its tourism sector, according to Mr Sebunya, the country will cede even more ground to some of her neighbours who had already been using their comparative advantage to market some of Uganda's tourist sites.

He cited the example of Rwanda which he said had made it easier for tourists to their country to visit even sites within Uganda.

"People don't want us to talk about Rwanda so much here but Rwanda has made a lot of things easier and we need to challenge that," he explained. "They are selling Queen Elizabeth National Park in Kasese district in Uganda by saying that you can land in Kigali and go to see Queen Elizabeth. Why are they selling it? It takes ten hours for someone who lands in Entebbe to go and see Queen Elizabeth National Park."

From Kigali it takes four or five hours so it's half the time. The government has laid out its plans for the tourism sector in the national development plan (NDP) 2010/11–2014/15. The five-year NDP identifies the constraints to the performance of the tourism sector as inadequate public and institutional capacity to initiate meaningful tourism development, inadequate policy framework to conserve Uganda's cultural heritage which is presently threatened to extinction, and limited funding, lack of adequate skilled human resources particularly in tourism promotion of leisure and hospitality.

Other constraints include inadequate physical infrastructure support, narrow product diversity, and inadequate research on emerging trends, market and consumer surveys as well as regular statistical information required to inform decision makers, investors and tourists and negative perception about Uganda's image due to past insecurity.

1. Explain the problems facing the tourism sector in Uganda.
2. Sebunya's report points out some tourist attractions. Identify and note them in your notebook.
3. What advice would you give the Government of Uganda to attract more tourists.
4. Why do you think the government should develop the tourism industry?

## **Summary**

In this lesson, you have learnt that the:

- tourism sector in East Africa has a number of constraints.
- contribution of the tourism sector is both positive and negative

## **LESSON 7: Site and Location of Major Ports and Towns in East Africa**

### **Learning Outcomes**

By the end of this lesson, you should be able to:

- i) describe the site and location of ports and towns in East Africa.
- ii) explain the factors that led to the growth of ports and towns in East Africa.

## **Introduction**

The number of people living in towns is growing every day. About 80% of the population of East Africa lives in rural areas where most of them are employed in agriculture. But there is a growing attendance of rural-urban migration in search of gainful employment and better standards of living in towns and cities. Most people believe that better employment opportunities and services are in towns. In this lesson you are going to

learn about the major towns and ports of East Africa. You will be able to describe the urban sites and their location, explain the factors that led to the growth of ports and towns of East Africa.



(a) Mombasa port



(b) Kampala City

### **Figure 1: Some urban areas of East Africa**

#### **Activity 1. Locating major towns and ports of East Africa**

Study **Figure 1** above and do the following tasks:

1. Write two paragraphs explaining the distinction between a town and a port.
2. Urban centres have features that differentiate them from villages. Write those features in your notebook.
3. With the aid of a map from the Internet, or an atlas, draw the sketch map of East Africa and locate major ports and towns.

# History

## HISTORY FOR SENIOR 3

Term 1 2020

### LESSON 1: Events of World War 1 in East Africa

#### Topic: World War 1 in East Africa

#### Learning Outcomes

By the end of this lesson you should be able to:

- i) know the meaning of World War 1
- ii) explain the causes of World War 1
- iii) mention the impact of World War 1 in East Africa

#### Materials you will need:

- a pen
- a pencil
- a world atlas
- a notebook

#### Instructions

1. Make sure you have nothing distracting you. Switch off the TV and create a quiet environment for yourself that is suitable for study.
2. Take time to study and understand the information given for each step.
3. In case you find difficulty, it is all right to seek help from any adult that is near you.

#### Step 1: Introduction

There are different wars that world history has kept on record; and the First World War is one of them. By the end of this topic, you should be able to know what it was that sparked off World War 1, which countries were involved, and what impact the war had on East Africa.

- Think of any conflict that you have heard about before.
- Did that conflict ever get bloody with intense fighting and people losing lives?
- Think of what could have caused that conflict.
- It is possible that the cause was even trivial, yet it sparked such a terrible conflict.
- How did the conflict get resolved in the end?

The First World War was a global war that broke out on 28 July 1914 and ended on 11 November 1918. The countries involved in

the war included Britain, France, Russia, Italy and the United States. These countries fought against the Central Powers, which included Germany, Austria-Hungary, the Ottoman Empire and Bulgaria.

#### Is there any other country not mentioned that was involved in World War 1?

#### Task 1

1. Find out the one incident that sparked off World War 1.
2. Use the diagram below to explain the different stages of World War 1.



Figure 3.1: Timelines of World War 1

#### Step 2: Causes of the First World War

The First World War was primarily sparked off by the assassination of Archduke Franz Ferdinand of Austria, but there were several other factors that led to the war. They include the following:

Mutual defence alliances were agreements between countries that would bind them to support each other. If any of the countries was attacked, the other country in alliance with it would defend it. The countries which were already in alliance before the war began include the following: Russia and Serbia; Germany and Austria-Hungary; France and Russia; and Britain, France and Belgium. See the figure below.

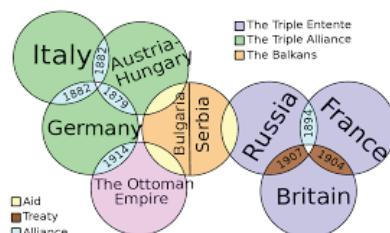


Figure 3.2: Alliances of World War 1

Another cause of the war was militarism. By the 20<sup>th</sup> century most countries in Europe had experienced an increase in militarism.

Armies grew in size and number of guns and underwent frequent training. The armies, therefore, felt they had the power and might to engage in war. **See Figure 3.3 below.** Nationalism also caused the First World War. Each country wanted to prove their dominion and power, hence prolonging the war.



Figure 3.3: World War 1 Troops

Imperialism was one of the issues that caused the outbreak of the war. Imperialism is when a country increases its power and wealth by bringing additional territories under its control. European powers had an interest in most African and Asian countries because of the abundance of raw materials found in them. Therefore, the struggle to gain control over other countries partly contributed to the outbreak of the war.



Figure 3.4: Cecil Rhodes

#### Task

1. Why was East Africa involved in World War 1?
2. Was it proper for these colonial powers to involve East Africans in World War 1?

#### Step 3: Impact of World War 1 in East Africa

#### Instructions

- Think of what happens whenever there is conflict, and especially when it involves

weapons of mass destruction.

- Think of circumstances in your area such as a fight between the police and protesters. Were some people shot dead in the scuffle?
- What about the areas surrounding the location where the incidents take place?
- A case in point is a scuffle between the Uganda Police and rioting Makerere University students. The police disperse the protesting students with gunshots and teargas.
- This does not only affect the students in Makerere but their parents, the surrounding businesses, and the local residents as well.

**See the pictures below showing the police using teargas and force to disperse rioters.**



**Figure 3.5: Riots in Kampala**

Whenever there is a conflict, it does not affect only the parties to the conflict but also the people around them. The First World War similarly had a great impact on people in the following respects:

The war brought every economic activity worldwide to a standstill; so there was no economic development during the war. Trade and commerce also suffered greatly; trade could not go on. Agriculture also greatly declined. European plantations were abandoned in order to concentrate on fighting.

Very many lives were lost and a lot of property destroyed. In the midst of such intense global fighting, very many people were killed in a brutal way and their property demolished.

Africans' attitude towards Europeans changed; the Africans became very critical and started questioning Europeans regarding everything. That is why the Africans rose up and started demanding power and representation in

government. Some of the Africans who participated in the war gained exposure and were now able to stand up and fight for their rights.

There was increased exploitation of the Africans by the colonialists. Those who supported their imperial masters in the war did not get the rewards that had been promised them, and this intensified their bitterness towards the white man.

**Study the above pictures and note down your observations on the impact of the war.**

**Task**

1. Classify the above effects into social political and economic effects.
2. Study the puzzle below and identify any words related to World War 1.

G	F	N	A	Z	I	H	C	V	O	N	S
U	E	H	A	L	L	I	A	N	C	E	O
A	D	O	L	F	A	R	M	S	I	T	P
F	E	R	D	N	A	N	D	E	N	T	I
P	I	I	L	M	L	O	P	D	T	V	H
E	N	T	E	T	E	S	O	M	A	L	I
A	A	R	I	E	A	H	I	T	L	E	R
C	R	E	D	R	G	I	C	N	Y	A	A
E	D	A	R	M	U	M	W	A	R	D	C
V	S	T	C	S	E	A	X	I	S	E	F
W	A	R	P	O	L	A	N	D	J	R	K
V	E	R	S	A	I	L	L	E	S	S	F
A	R	C	H	D	U	K	E	O	T	T	O

**Lesson Summary**

World War 1 did not have an impact only on the countries that were involved in it but also on their colonial territories across the world, East Africa inclusive. The European colonial powers did not have enough manpower to participate in the First World War and thus recruited manpower from East Africa to boost their troop numbers. The impacts of the war were economic, political and social. As a result, there was mass destruction of human lives and property, leading to widespread trauma. The war also had a long-lasting effect on East Africa's economy and politics, among others.

**Follow-up Activity**

1. Make reference to any other conflicts in Uganda and discuss their effects on the people.
2. Look for any old newspapers that reported an incident that occurred during one such conflict and summarise it in your notebook, taking note of how people were affected by the conflict.

**LESSON 2: The Development of Nationalism in Uganda**

**Topic: Rise of Nationalism in Uganda**

**Learning Outcomes**

By the end of this lesson you should be able to:

- i) know the meaning of nationalism.
- ii) identify the factors responsible for the rise of nationalism in Uganda.
- iii) define the role played by political parties in Uganda.

**Materials you will need:**

- a pen
- a pencil
- coloured pencils
- a notebook where you will write down your findings
- any newspaper, magazine or book that talks about nationalism in Uganda

**Instructions**

1. Make sure you have nothing distracting you. Switch off the TV and create a quiet environment for yourself that is suitable for study.
2. Take time to study and understand the information given for each step.
3. Read the instructions carefully before attempting each activity.
4. In case you find difficulty, it is all right to seek help from any adult who is near you.

**Step 1: Introduction**

Nationalism can be defined as loyalty and devotion to a nation. It is a feeling that people have of being loyal to and proud of their country, often with the belief that it is better and more important than other countries. Or it can be a sense of national consciousness that exalts one nation above all others and places primary emphasis on the promotion of its culture and interests as opposed to those of other nations.

- Is there anything like an item or activity that you love so much and put before any other thing?
- This can be your sibling, your friend, or an activity that you enjoy doing.
- Think of moments when the love for any of the above has influenced the decisions and actions that you have taken.

**Look at the photograph below and describe what you see with regard to nationalism.**



**Figure 3.6: A show of nationalism**

After many years of being ruled and controlled by Britain, Uganda, like her neighbouring African countries, felt a deep desire to end all forms of foreign control and influence; they felt a need to take charge of their own political, social and economic affairs. This need stirred a love for their country and set off a wave of efforts to attain independence.

#### **Task 1**

1. Suggest possible reasons as to why Ugandans developed the spirit of nationalism.
2. Ask your parents or any of the elders near you to share with you what happened to Uganda just before independence.

#### **Step 2: Factors responsible for the rise of nationalism in Uganda**

➤ Think of a scenario at your school or a neighbouring school. The school administration has introduced rules that seem harsh and unfriendly to the students. The students therefore decide to resist. This is similar to resistance in the form of nationalism that Ugandans took up after feeling the impact of the oppression inflicted by the colonialists.

The growing grievances by Ugandans towards the colonial state and the economic structures it created paved the way for the rise of men who would lead the agenda for reform and political change. Political parties were organised to force self-rule or independence from a reluctant colonial government.

In Uganda there had been some demands for greater self-rule, but these were mostly expressed by local nationalists surrounding the five constituent kingdoms of the colony. The political parties included the following: The Democratic Party (DP) modelled on Germany's Christian Democrats, which

represented the Catholic population; the Uganda People's Congress (UPC), which was supported mainly by groups from the northern and western parts of the country; and the KabakaYekka (KY) (meaning 'king only'), which was a Buganda nationalist party.

The foreign systems of government that neglected African interests aroused feelings of resistance, resulting in nationalism. There were unfair colonial policies of taxation, forced labour and compulsory growing of cash crops, which caused discontent among the Africans, who thus developing a desire to fight for self-rule.

Colonialists had come with developments such as construction of roads and railways. These led to improved means of transport that eased the movement of nationalists. Whenever they wanted to move to sensitise the masses and carry out some of their activities, they would do it with ease.

Formal education also introduced Ugandans to new ideas. They were now enlightened and developed the desire to fight for their rights. The nationalists in the Diaspora also gave support to their countrymen back home.

Christianity also led to the rise of nationalism. Christian missionaries came with the aim of preaching against the ills in society like slave trade, forced and unpaid labour, corruption and all inhuman acts. The nationalists, therefore, based themselves on this to rise up and fight against these inhumanities that were majorly inflicted on them by colonialists.

Uganda was characterised by ethnic and tribal divisions. These divisions, however, were a unifying factor that brought Ugandans together and they were able to fight for self-rule.

#### **Task 2**

List some of the grievances that Ugandans had against the colonialists.

Reflect on the colonial administrative systems you studied previously, and state the system that was used by the British in Uganda.

What were some of the shortcomings of that system?

#### **Step 3: Role played by political parties**

Parties trained leaders who helped to mobilise the masses to demand independence. They sensitised and educated Ugandans on the politics in the country. This aroused political awareness in Ugandans and everyone developed the spirit to fight for self-rule.



**Figure 3.7: A political rally**

Political parties organised peaceful demonstrations to oppose colonial policies like taxation, cash crop growing (forced) etc. They also called for the independence of Uganda and won massive support for the independence movement. They sent representatives to the pre-independence negotiations and last-minute constitutional preparations. Through constant participation, they took up common positions on the issues under discussion and requested self-rule.



**Figure 3.8: A peaceful demonstration**

They also mobilised funds to finance political activities, including campaigns for the pre-independence elections.

Party slogans and songs became key attractions for large gatherings. This made the flow of information about the struggle very easy. The parties recruited the youths into active party service, thus training a generation that was to lead Uganda to independence. In this generation were people like Jejoash Mayanja Nkangi, Ignatius Musaazi etc.

Violent action organised by the various parties pressured the colonialists to grant independence. Boycotts, attacks on foreigners and torching (burning) of houses all sped up the process to decolonise Uganda.

#### **Task**

Carry out research about the following parties and discuss their activities in the struggle for the independence of Uganda: UNC, UPC, DP, and KY.

Write short notes about the following personalities highlighting their role in Uganda's struggle for independence:

- Ignatius Musaazi
- Apollo Milton Obote
- Benedicto Kiwanuka

#### **Chapter Summary**

Deep feelings of anger and resentment developed owing to the conditions that

Ugandans were subjected to by the colonial administrators. The people who had attained western education took on the role of mobilising their fellow Africans to fight for self-rule. This led to the formation of political parties that saw Uganda getting her independence in 1962.

### Follow-up Activity

Mention the difficulties faced in the struggle for independence in Uganda and hand in this work to your teacher when schools re-open.

## LESSON: The Devonshire White Paper

### Topic 3: The Devonshire white Paper (1923)

#### Learning Outcome

By the end of this lesson you should be able to:

- i) know the meaning of the Devonshire White Paper.
- ii) identify the reasons why the Devonshire White Paper was issued.
- iii) state the terms of the Devonshire White Paper.
- iv) outline the effects of the Devonshire White Paper.

#### Materials you will need

a textbook  
a pen  
a notebook

#### Instructions

1. Make sure you have nothing distracting you. Switch off the TV and create a quiet environment for yourself that is suitable for study.
2. Take time to study and understand the information given for each step.
3. Understand each activity before you attempt it; it is then that you will easily approach the tasks given.
4. Read the instructions carefully before attempting each activity.
5. In case you find difficulty, it is all right to seek help from any adult that is near you.

#### Step 1: Introduction

- What comes to your mind when you hear the term "White Paper"?
- Anyone would straightaway think of a paper with information written on it.
- Think of any written official document, such as an agreement over something.

- The Devonshire White Paper was, therefore, an agreement of some sort. A "White Paper" is an authoritative document or guide that informs readers briefly of a difficult issue and presents the issuing body's viewpoint on the matter. Its purpose is to help readers understand an issue, solve a problem or make a decision.

### Step 2: Reasons for the issuance of the Devonshire White Paper in 1923

The Devonshire White Paper was a document written in March 1923 during a conference in London by the colonial secretary Victor Cavendish, the ninth Duke of Devonshire, regarding the status of settlers and natives in Kenya Colony (see Figure 3.9 below). The paper stated that whenever the interests of the native Africans clashed with those of Asian, European or Arab settlers, those of the Africans should prevail. Although the paper had little effect on the welfare of native Africans, it still set a standard for future conflict resolution between the various groups living in the colony.



Figure 3.9: Devonshire White Paper meeting

#### Task 1

1. Why do you think it was called the Devonshire White Paper?
2. Identify the key parties that took part in the Conference of March 1923.
3. Carry out research and find out the key events that led to the signing of the Devonshire White Paper.

### Step 3: Terms of the Devonshire White Paper of 1923

1. The Kenyan Highlands were exclusively reserved for the white settlers.
2. The Asians were allowed to elect five members to the Legislative Council (Legco) but were not put on the same voters roll as the whites (on a communal basis).

3. The Legislative Council was to have eleven Europeans, five Asians, one Arab and one missionary to represent African interests. See Figure 3.10 below.



Figure 3.10: The Legco of Devonshire

4. There were to be no more restrictions on Asian immigration into Kenya since they were also subjects of the British Empire.
5. There was to be no more racial segregation or discrimination in all residential areas. Settling in these areas was now to be open to all people – Africans Asians and Europeans alike.
6. A missionary (Dr Arthur) was to be nominated to the Legislative Council to represent the interests of the Africans.
7. Africans were allowed to be members of the local councils.
8. The Colonial Office in London was to watch over the Kenyan affairs in order to ensure that the interests of the Africans were protected and given first priority.
9. The document recognised the contribution made by the European community to the development of Kenya.
10. However, the document also warned the settlers against making further advances towards self-rule. It made it clear that all racial groups must gradually work towards this goal.
11. The paper clearly stated that Kenya was primarily an African territory and that the interests of the Africans were paramount.
12. It also stated clearly that the settlers would no longer have a controlling influence on the government (so that it would always serve the settlers' interests).
13. The paper ruled out any constitutional changes in favour of the settlers.

#### Task 2

1. Which party benefited a lot? Support

your answer.

- Outline the terms that were applied to Africans, Asians and British respectively.

### Step 3: Effects of the Devonshire White Paper

The Asians failed to win equality with the whites; they were denied the right to occupy the Kenyan Highlands. They were given a few representatives on the Legislative Council and had to play a different role since inequality persisted. The paper was a great disappointment to the Asian community.

The white settlers lost their dream of controlling Kenya as a racist colony; they had been warned against further advances towards self-rule since Kenya was still under the colonial government in London. They had to shelve the idea for at least some time.

The paper confirmed Kenya as a settler colony and this led to an increase in the number of Europeans coming in. It also recognised the contribution made by the settler community towards the economic development of Kenya. It served as a warning to the settlers and the Indians that their effort to colonise Kenya would not be acceptable. Kenya was for Kenyans and their interests were to be given priority.

After being frustrated politically, the settlers resorted to controlling the finance, agriculture and industrial sectors. The Africans and the Asians were denied settlement in the Kenyan Highlands since the paper had reserved them exclusively for the whites. **See Figure 3.11 below.**



**Figure 3.11: The Kenya Highlands**

The giving of the highlands to the whites stimulated plantation farming and, subsequently, the growth of a cash crop economy. The paper clarified that neither the settlers nor the Asians would gain a monopoly in the administration of Kenya whatsoever.

The free immigration policy resulted in many Indians coming into Kenya and these became a major force in Kenya's economy. The paper failed to address the land and labour problems. Africans were to continue providing labour on settlers' farms, something that the Africans strongly hated and had hoped the paper would address. **See a photo of African labourers below.**



**Figure 3.12: African labourers**

Owing to increased pressure and the influx of immigrants, the East African High Commission was established to promote cooperation between the Africans, Asians and settlers. The Asians continued to voice their dissatisfaction with the white settlers, and were not happy with the inequality that the paper had failed to address. They, for example, refused to pay a different tax from what the settlers were paying.

The paper laid the foundation for the future independence struggle in Kenya. Armed groups like the Mau-Mau were formed by the Africans to fight to regain their lost lands and for independence. Finally, independence was achieved in 1963.

**In what other ways do you think the paper laid the foundation for Kenya's independence struggle?**

The paper fostered unity among Africans and Asians as it affected them equally since the paper favoured the white settlers against them.

The colonial government started training and educating Africans, a measure that was intended to prepare them for the future responsibilities they would hold and for independence. **See Figure 3.13 below.**



**Figure 3.13: A colonial school**

Africans started sharing in the running of their country through the native councils and in 1931 they were allowed to send representatives to the Legislative Council (Legco).

### Task 3

- How did the terms of the White Paper aid the rise of African nationalism in Kenya?
- Find out the memories of the Devonshire White Paper of 1923 in today's government of Kenya and present to class.

### Lesson Summary

The Devonshire White Paper was written to solve a conflict that existed between Africans, Arabs and whites in Kenya Colony. Much as the terms stated in the paper seemed to advocate equality among the different racial groups, it left some gaps which later led to the rise of African nationalism in Kenya.

### Follow-up Activity

How did the terms of the 1923 Devonshire White Paper aid the rise of African nationalism in Kenya?

# Entrepreneurship Education

## PROJECT: Making charcoal briquettes, designing a poster for advertising them and making a package for the briquettes

By the end of this project, you should be able to:

- Identify the right materials needed for making charcoal briquettes.
- Make charcoal briquettes.
- Explain three benefits of using charcoal briquettes in relation to ordinary charcoal.
- Write a brief report on making charcoal briquettes explaining some of the challenges faced while making the briquettes, how these were overcome and any lessons learnt from the project work.
- Design a poster for advertising your charcoal briquettes.
- Identify the right materials for making packages, design a package for your charcoal briquettes and Label it.

**NOTE:** You can use any material you think will make your package attractive.

### Read the scenario below and respond to the instructions given.

#### SCENARIO

#### HOME MADE SOLUTIONS TO EFFECTS OF THE CORONAVIRUS PANDEMIC

The world registered the first case of Coronavirus (COVID 19) in December 2019, in Wuhan City in China. The disease was declared a global pandemic by the World Health Organisation on 11<sup>th</sup> March 2020. By 14<sup>th</sup> April 2020, the pandemic had spread to 210 countries infecting over 2,000,000 people with close to 120,000 deaths registered.

To mitigate the spread of the virus and to avoid creating a fertile ground for its spread, His Excellency the President of the Republic of Uganda, Mr. Yoweri Kaguta Museveni ordered the closure of public gatherings like Schools, Churches and Bars, and suspended public transport on 20<sup>th</sup> March 2020. He further put in place a Task Force to steer the fight against the **spread** of the disease. Among the measures taken, was to declare a national lock down and curfew from 7:00pm to 6:30am for 14 days.

The effects of the coronavirus are enormous, ranging from health, social and economic among others. Indeed, following the lockdown, a number of people have complained about

failure to feed their families. Consequently, government provided food for such families. However, due to the lock down, fuel specifically charcoal, became expensive and scarce yet majority of families especially in the urban areas use it as a source of energy. As a learner of entrepreneurship, you are expected to provide solutions to business challenges.

#### Activity one

At your home, you have several resources like domestic waste, peelings and soil which you can use to make charcoal briquettes, to solve the problem at hand.

#### Task

- Identify the right materials needed for making the charcoal briquettes.
- Make charcoal briquettes using the materials you have identified following the step by step procedure provided below.
- Write a report, explaining some of the challenges you faced while doing the project work. How did you overcome the challenges? Mention any lessons you have learnt from the project work.
- Explain three benefits of using charcoal briquettes.
- Assuming you want to make briquettes for sale, design a poster to advertise your charcoal briquettes, using either your exercise book or a plain sheet of paper whichever is available. Make your poster as attractive as possible.
- Design a labelled package for your charcoal briquettes. You will present your report, the poster and the package to your class teacher when schools reopen after the lockdown.

**Note:** The project may not be finished in one day, you may choose to take a few days doing it. You can keep some of the briquettes for home use but keep some for presenting to your teacher as part of your project work when schools reopen.

#### MATERIALS REQUIRED

SN	ITEM	ALTERNATIVE	QUANTITY
1	charcoal dust	Fresh cow dung	4 (tumpeco) cups
2	Soil	Anti-hill soil/brown soil/Clay	2 (tumpeco) cups
3	Water		4 (tumpeco) cups
4	Basins	Container	3
5	Gloves	Polythene bag/ open hand	1pair

6	Plastic cup (tumpeco) = $\frac{1}{2}$ litre	Mug	1
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#### Instructions

- Make charcoal briquettes using some of the readily available materials at your home.
- Use the cup (tumpeco) or mug to measure the materials.
- Place the materials in different containers.
- In case you do not have charcoal dust you can use cow dung in the same quantities.
- Make sure you do not miss out on any step.
- Record every step followed in the making of briquettes in your note book, because you will have to write the report for submission to your teacher.
- Using your note book or a sheet of paper, design an advert for your charcoal briquettes.
- Design a package for your charcoal briquettes. You will submit the report, the advert and the package to your teacher on the day of reporting to school.

#### Step by Step Procedure of Making Charcoal Briquettes

Please pay attention to every detail outlined in the step by step process provided below.

#### Step one: Preparing the waste materials

Using a pair of gloves, polythene bags or your free hands collect the waste materials to use as guided below. Be very careful with the safety of your hands.



**Fig. 1. Putting on Gloves**

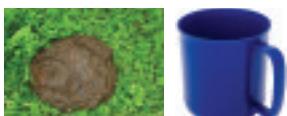
Collect four cups of charcoal dust and put it in a container. If you do not have charcoal dust, you can use carbonized charcoal dust or fresh cow dung in the same quantities and follow the same procedure.



**Fig. 2. Charcoal dust**



**Fig.3. Carbonized charcoal dust**



**Fig. 4. Fresh Cow dung Fig. 5. Plastic cup**

#### **Step two: preparing the charcoal dust**

Sieve/filter the charcoal dust and remove the big particles, plastics and any other unwanted materials using your hands to remain with fine charcoal dust. (You can also crash the bigger particles into powder form and use it).



**Fig. 6. A boy sieving charcoal dust.**

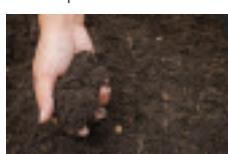
#### **Step three: preparing the soil**

Collect two cups of soil preferably brown or anthill soil or Clay soil if its available but normal soil can also be used. Put it in a second container.

Sort the soil removing the bigger particles, sticks, broken glass, stones and plastics.



**Fig. 7. Brown Soil**



**Fig. 8. Any other soil**



**Fig. 9. Clay Soil**

#### **Step four: Measuring the quantity of water**

Get a small Jerrycan/Jug or any other container and pour in four cups of water.

#### **Step five: Making the mixture**

Measure off two cups of charcoal dust and one cup of soil. Put them in a third container and

mix them well using your hands until they are thoroughly mixed.



#### **Fig.10 Mixing Charcoal dust, soil & water**

**Add water.** Start with a small amount of water and mix it into the mixture using your hands. Keep adding water until the mixture becomes easily moldable. When squeezed, your mixture should hold together easily. When the mixture is too soft add more charcoal or soil, and if it is too hard add more water.

#### **Step six: Molding the briquettes**

Take a hand full of your mixture and mold using your two hands until it is hard enough. The mold or briquette can be in a round shape or any other shape you want. You can make briquettes of any reasonable size.



#### **Fig. 12. Picking a handful of mixture**



#### **Fig. 13. Molding the mixture into briquettes**

#### **Step seven: Drying the briquettes**

Place the molded briquettes on a flat surface ready for drying. Set your briquettes in a dry place. Briquettes need 2-3 days to dry properly before you can use them. If placed in an open place do not leave them outside because in case it rains they can get spoilt. Alternatively, you can dry them under a shade.



#### **Fig.14. Laying molded briquettes on a flat surface for drying.**

#### **Step eight: Using your briquettes**

Light your charcoal stove using a few usual

charcoal pieces. When it is hot enough add the briquettes and cook.



#### **Fig. 15. Lighting the charcoal briquettes and cooking.**

#### **Summary**

After going through the step by step process, it is assumed that you now know what briquettes are. Below is an explanation of what briquettes are.

These are small, compact blocks made from organic waste which you can use for cooking in the charcoal stove or fire. While some briquettes require expensive machinery to make, others can easily be made at home from the locally available waste materials with no machinery required.



#### **Fig. 16. Sample of Charcoal briquette**



#### **Fig. 17. Briquettes burning in a charcoal stove**

#### **Follow up activity**

- Continue practising the making of charcoal briquettes until you perfect the process.
- You can sell the excess briquettes to your neighbours at the end of the lockdown. This will help you to save your earnings.
- In case you have access to the internet, you can make further research using Google on the other ways and materials you can use to make charcoal briquettes.
- Practice designing several adverts for the briquettes to have a variety from which to choose the best.
- Practice designing several packages for the briquettes to have a variety from which to choose the best.

**NOTE:** This project will enable you to answer Paper one at senior four during examinations.

# English Language

## ENGLISH LANGUAGE LESSONS

**Before we start our lesson, do not forget that COVID19 is a disease affecting every country in the world:**

We are advised:

- not touch our **soft parts (eyes, nose, mouth)** because the virus can pass through them and enter the body
- to wash our hands thoroughly with soap and water
- not to spit anywhere
- to cover our mouth with a tissue when we are **coughing**
- to use a tissue for our nose when **sneezing**.

### LESSON 1

#### LESSON OUTCOMES:

By the end of this lesson, you should be able to:

1. use demonstratives as pronouns and as determiners
2. identify demonstratives from the given passage.

#### TOPIC: USE OF DEMONSTRATIVES

##### INTRODUCTION

Demonstratives are words that identify someone or something. A demonstrative word separates one thing from others or describes a noun. They tell who or what you may be referring to. There are four demonstratives: **this, that, these and those**. Demonstratives can be used as pronouns or determiners.

Examples of demonstratives as determiners.

Here the demonstratives identify nouns.

- a. Who brought this marker here?
- b. Take that book to the library.
- c. We were advised not to watch those programmes.
- d. Take these clothes to the tailor.

Examples of demonstratives as pronouns. Here the demonstratives take the position of nouns.

- a. Do you want to eat this?
- b. Can you clean that!
- c. Hang these up.
- d. Give those to the electrician.

##### Activity 1

Read and enjoy the passage below.

#### Battle Against Televisions

Recently, I visited my sister who lives in Jinja. I arrived at about 3.00 **o'clock** in the afternoon. After asking around I was directed to her house. I knocked on the door for quite some time but no one answered. However, I could hear some music **playing** inside the house. I got frustrated, and being very tired, I decided to sit on the beautiful lawn that made up the large compound. I must have dosed off because the next thing I heard was my sister's voice waking me up.

'Mukisa, how can you travel all the way from Kagulu to come and sleep on the lawn? Let's go inside,' she said as she led me into the house.

I was surprised when we got inside the house only to find four children glued to the TV. My greetings were answered with sullen grunts. Only one or two looked up briefly to see who the stranger was.

My sister excitedly introduced me to the children as their uncle. They shouted and screamed, but I was scandalised to realise that I was not the cause of their excitement. Their pop star had just taken the stage in the music program they were watching, causing all the excitement. This infuriated me.

For the next three days I witnessed the children wake up early in the morning and watch TV till late into the night. I observed that during prayers for meals, all the children did was to mute the sound on the TV and then pretend to be praying while they continued to watch the TV. I heard very little conversation either among themselves or their mother. These children had become 'TV zombies.'

On the last evening of my visit I decided to intervene. After supper I demanded that they switch off the TV. This was met with disbelief and open hostility. Nobody made any effort to switch off the TV, but I was not going to relent. So I took the remote control unit and switched off the TV.

'What is wrong with watching TV?' the eldest girl protested, looking at me with murderous eyes.

'The TV itself is not the problem,' I said firmly, 'but the way you use it.'

At least I now had their attention. The house was **deadly** silent. This was the first time in three days that the children were talking with me, albeit in a hostile environment.

I explained to them that television was a positive tool only to a certain extent. First, it is certainly a good source of education. There are many well researched documentary programmes which viewers can benefit from. Second, TV is a good source of entertainment. There are numerous sports and drama programmes which are quite entertaining.

On the other hand, TV can be a negative force. When you sit for hours on end watching every programme without discrimination, thus this is very dangerous. Some of the programmes may not be appropriate and may corrupt your morals. You also run the risk of becoming a zombie.

'Since I came here three days ago none

of you has had time to talk with me, yet I am your only maternal uncle' I reasoned with now attentive children. 'I am leaving tomorrow morning but none of you even knows my name!' I continued.

'I am sorry, uncle,' the youngest child pleaded.

'I am not against your watching TV, but you need to plan your time properly so that you don't end up watching TV the whole day. You must select the programmes you are going to watch carefully; otherwise you'll end up watching all the programmes, including those meant for adults only!' I concluded.

As I went to sleep that evening, all the children followed suit. The next morning, as my sister and her four children escorted me to the bus station, I told her that she needed to create time to discuss with the children what they watched on TV.

##### Activity 2

Reread the passage and write down the demonstrative pronouns used.

##### Activity 3

Write two sentences using each of the demonstratives as determinants and as pronouns.

##### Activity 4

In a paragraph of about 50 words, summarise the effect that unlimited watching of TV has had on the children and the entire family.

### LESSON 2

#### LESSON OUTCOMES:

By the end of this lesson, you should be able to:

1. identify derived nouns used in the passage.
2. derive nouns from nouns
3. derive nouns from verbs
4. derive nouns from adjectives

#### TOPIC: USE OF DERIVED NOUNS

##### INTRODUCTION

What are derived nouns? They are nouns formed from other words. To derive is to form/obtain/get/create something from another. Therefore, these are nouns obtained from other words that could be other nouns, verbs or adjectives. For example:

- **Motherhood** is a noun derived from another noun, **mother**
- **Information** is a noun derived from the verb, **inform**
- **Popularity** is a noun derived from the adjective, **popular**

##### Activity 1

Read and enjoy the passage below.

## The Man with Loud Hiccups

When little children know terror, it usually comes in forms that, as they learn later in life, are harmless. As a little boy, Pamba's terror came in the form of an old man who had a terrifying condition of loud hiccups.

It was said that since he was a boy, the old man had hiccups that progressively grew louder and became more frightening as he grew older. As a grandfather, the hiccups were loud and pronounced. They popped out in loud bursts so that he seemed to purr like a motorcycle, as he walked.

The hiccups came in phases. At one time the man would have the calmness of a swimming pool. At other times he would break out in loud, sporadic hiccups that would bring contortions to the old man's face that one would have thought was pain. When he was in that state, he could not talk. His face, already furrowed with old age, would become rough and unpleasant to look at.

The old man never minded his hiccups. In fact, he seemed to enjoy them, and he was never bothered when people wondered why he would occasionally explode into loud sounds. Sometimes he used the hiccup to tease and scare children. For good measure, parents used him to terrorize wayward children. The man's hiccups were easily the worst form of terror that many little children had ever encountered in their lives.

Pamba first encountered the terror of the man's hiccups one fine morning. The old man was headed for the garden. From a distance, the hiccups started rolling out like muted gunshots: 'hic, hic, hic, hic, hic,' the man went. As he hiccupped, he grimaced in a way that made him look subhuman. The hiccups gathered speed as they rolled out so that the time lapse between one and the next became almost non-existent.

Pamba had heard stories of people who ate others. He was convinced that this old man was one of the man-eaters that he had heard about. As the man drew closer, the hiccups grew louder and more rapid in their frequency. The man sounded like a machine that was stirring to life. Pamba looked back hoping there would be some people to rescue him from the man whom he was convinced would now devour him. He looked behind. There was no one there. He looked sideways, there was no one either, though there was a small path he could sneak into.

### **Pamba could not understand the old man's excitement at his fear.**

The man rejoiced at seeing terror in small boys. He approached Pamba theatrically. This, as Pamba learnt later, was what used to give the man the energy to go on with his life. The terror that formed on children's brows rekindled his energy and rejuvenated him. Since he knew that he was essentially harmless, he used terror as the only

connection between him and the children. The children feared him. In their minds, he was the representation of all that was terrible.

The old man knew this and he used it to his own advantage. First was as if he had entered into a secret pact with parents whereby he would be used as a whip to beat back to line wayward children. So when Pamba saw the man coming at him he started to run away. The man went after him, hiccupping louder and louder as he ran. Pamba had never known that kind of terror. He ran as fast as he could, but he could still hear the man behind him. When he realised that the man would catch up with him anyway, he started wailing, but he did not stop running.

When he reached home, he realised that the man was not behind him. Unbeknown to him, the man had branched off into another path and gone on with his business. Pamba's brother later told him that it was not only his eyes that were wet, but his pants too. They say that if you see a child wetting his pants, he must have been in an acute state of fear. Shortly afterwards, Pamba went to bed, wondering how he was expected to live with the man with loud hiccups always appearing on his way.

Today, Pamba looks at the whole episode as a moment of stupidity in his growing up. But he also realises that little children can be knocked into shape by something as harmless as an old man with hiccups.

### **Activity 2**

Go through the passage above and write down all the derived nouns that have been used.

### **Activity 3**

Write two sentences using each of the derived nouns you have written down in your note book.

### **Activity 4**

Re-read the passage above, identify the words and expressions that are new to you. Study how they have been used and explain their meaning.

### **Follow up Activity**

Create sentences using the new words and expressions identified above.

### **LESSON 3**

#### **LESSON OUTCOMES:**

By the end of this lesson, you should be able to:

1. differentiate between the subjective and objective cases.
2. identify the subjective and objective cases from the given passage.
3. compose sentences using the two cases.

### **TOPIC: USE OF PRONOUNS AND CASE INTRODUCTION**

A case is the function that a pronoun performs in a sentence. Therefore, the pronouns used to refer to the same person or people differ because of the function the pronouns have

in those sentences. A pronoun can be either a subjective case or objective case. In the subjective case the pronoun acts as the subject of the sentence while in the objective case the pronoun takes the place of objects. For example:

- a. She likes Mathematics. **She** is the subject. It is in the subjective case.
- b. The policeman arrested **them**. **Them** is the object. It is in the objective case.

### **Activity 1**

Read and enjoy the following passage.

### **A Careless Cook**

It was the satisfied ducklings of chickens finishing the remains of a great feast that reminded me of the groundnuts. Yes, every nut was gone. How stupid I had been to leave them uncovered with the kitchen door wide open. But such self-reproach did not occur to me at the time, for I was filled with a terrible anger and an overwhelming desire to punish the greedy offenders.

I seized a pestle and raised it high above my head. By this time, they had seen me and were flying in disorder all over the kitchen. They tumbled over each other through the doorway. I let down my powerful weapon just in time to hit the last one right on the head. I did hit! It was the most active hen of the lot and therefore my bitterest enemy. 'Got you this time!' I gasped in triumph as it croaked painfully. But my victory song did not last, for in a minute the poor thing was staggering about the kitchen, and after a while it fell lifeless just near the fire. I leapt to rescue it from the eager flames. I shook it, examined it, shook it again and then tried to open its closed eyes with my finger. It would not move.

I raced with it to the house, got hold of the baby's Vaseline and rubbed a lump on the wound. No response. I put it down to try and make it walk but it gave a feeble 'coo' and fell over. I applied another lump of Vaseline, and carried it to the quiet part of the garden, rocking it like a baby. Seeing this had no effect I put it down and fanned it with a banana leaf.

All this time I was dreading what my father would do to me. Of course the hen had offended and deserved a punishment, I told myself. Mother would be angry with me because of the groundnuts which were to make up the sauce for supper. But then punishing or killing the hen would not make her less angry with me. In short I was going to bring both my mother's and, worse still, my father's anger against me by my foolish action. After five minutes' vigorous fanning without any change, a thought struck me. Back to the kitchen I raced and returned with a basin of water in which I dipped the poor thing. At long last, I was rewarded. Having drunk some water, the hen became normal again although it showed great disgust at my conduct especially at being wetted ruthlessly.

'I could have sworn there were no groundnuts in that source last night,' said my mother the next morning. 'One could detect the tomatoes and eggplant all right, but no groundnuts.' I kept quiet.

## Activity 2

Go through the passage again and write down all the subjective and objective cases which have been used.

### Activity 3

Write three sentences using each of the cases that you have listed in your notebook.

## Follow Up Activity

Imagine your classmate has lost his father and you are the leader of a group of five representing your class for burial. Write a condolence message that you will read out at the funeral.

# Art and Design

## Theme: Graphic Design

### Topic: Poster Designing

#### Introduction

Poster designing is part of Graphic design which is a broad area of art. Poster art combines the use of lettering and illustrations to communicate a message to the public. Today, Poster design is a main part of late 20<sup>th</sup>-21<sup>st</sup>-century visual communication. Posters are found all around us. Poster design is closely associated with modern information and communication technologies (ICT), and uses the computer and internet to communicate its messages. Good visual communication is measured by the ability of the message to be readily understood.

You will develop the skill of creating Poster designs by practicing the process skill of transforming the verbal and text information into artistic graphic works of posters to communicate information.

#### Resources

You will need:

- Note book, pencils, coloured pencils
- Paper, mathematical set
- Paints, markers and brushes if possible
- Computer with internet if possible

#### Why Poster designing?

It is one of the modern means employed in the media and industries where advertising is often used. It is always specific, eye catching and includes commercial and non-commercial activities.

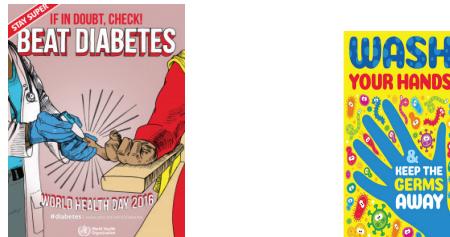
#### Practice

**If you can access any ICT gadget for example the cellphone or computer with internet check for the graphic images and consider how the ideas connect to the elements of art, the words and the imagery. You can also look at the magazines or newspapers for the same.**

#### Project description: Poster Designing

A Poster is a graphical art work which provides specific information for a special event, usual-

ly for commercial purposes. It is eye catching, contains clear and precise content with varying ratio of image to text and rich in colour. See the two examples of posters example given in figure 3.1.



**Fig. 3.1 Examples of Posters**

#### Making a Poster

Poster making being part of graphic design follows the same process as given in this booklet. You must follow them while creating your graphic designs.

#### Stages in Poster making process

1. Identification of a topic and research process: This is the formulation stage of an idea or message you may want to communicate. Where the topic, theme or design brief is given it involves determining your poster format. Your topic, theme or brief will help you to determine the colour scheme, the type of lettering or fonts suited for the design and the image or illustration that will best complement the lettering. best suit
2. Plan your Content: Select your written message. Write all the key information that relate to what you intend to tell the audience. Consider the type of lettering suitable for your design. A short catchy slogan is great for drawing peoples' attention. Be clear and concise but having all the relevant information that your readers need.
3. Select your image: The image or illustrations must relate to the main idea or theme of your graphic design. Make rough sketches of your ideas, then de-

velop the drawings.

4. Combine written message and image: Combining text and image is done artistically with variations. Varying ideas come when you add or remove lettering or image. They also change when the paper orientation, size, font style, colours are manipulated.
5. Refine the final design: Refining the design adds to its effectiveness. You need to consider the following principles of art and design (balance, contrast, emphasis, gradation, harmony, proportion, variation, unity). Clean up any clutter as you keep asking yourself these questions; is the message clear? Are any of the colours overpowering? Do the graphics look clean and well placed?
6. Present your design: Do not forget to autograph your work. Do not forget to refer to your sketches which must be part of your presentation to check authenticity of your creativity. This helps the viewers to assess the amount of thought you put into your work, the techniques used and your ability to make intelligent design choices.

#### Create

**Task:** The invasion of Corona virus to the world population claimed thousands of lives. The population live with a mixture of facts and myths. Basing on the information you have gathered from reliable government source, design and create an illustrated poster informing your local residents on the dangers of covid-19 illustrating the three strategies of combating the pandemic.

#### Practice

Make another Poster design to improve your graphic design ability through practice. Where possible try using a computer aided design approach to create new designs.



THE REPUBLIC OF UGANDA  
Ministry of Education  
and Sports

# SENIOR THREE SELF STUDY MATERIALS SCIENCE PACKAGE



## CHEMISTRY

### ATOMIC AND MOLECULAR STRUCTURES

#### Learning outcome

By the end of these lessons, you should be able to:

- Define the term chemical bonding.
- Explain how ionic, covalent and metallic bondings occur.
- Demonstrate the role of valence electrons in bonding.

#### Lesson 1: Chemical bonding

##### Introduction:

Of your brother or sister and a friend at school, to whom would you tell your secret? Just like you have a stronger connection with one person than another, an atom, ion or molecule either is strongly or weakly attracted to another atom, ion or molecule. This lasting force of attraction between atoms, ions or molecules which results into the formation of chemical compounds is termed as **chemical bond**. When the force of attraction is strong, the type of bond is called **ionic bond**. When the force of attraction is weak, such a bond is called a **covalent bond**. Chemical bonds are formed by sharing or loss and gain of electrons.

##### a) Ionic bonding:

You earlier learnt that atoms use valence shell electrons to participate in chemical bonding. Metals have valence shells with 1, 2 or 3 electrons. Non-metals have valence shells with 5, 6 or 7 electrons. When atoms of metals combine with atoms of non-metals, metals completely lose electrons while non-metals completely gain electrons. The type of bonding is called **ionic bonding**.

#### Activity 1.1: Demonstrating bonding with beans

##### Materials needed:

- Six tins labelled A, B, C, X, Y and Z
- Six different types of beans
- Pen and paper

##### Procedure:

- Put beans in tins as below:

A	B	C	X	Y	Z
1	2	3	5	6	7

- Combine beans from two tins such that the total number is 8. Ensure that when combining beans, one tin remains empty when all the beans are transferred to another tin.
- Write down the tin combinations that make eight, holding on to the rules in step

Combination	Combinations	
	beans picked from tin	beans picked from tin
Tin	A	X
Number of beans	1	5
Number of tins	3	1
Total beans	3	5
Combination formed	$A_3Y$	

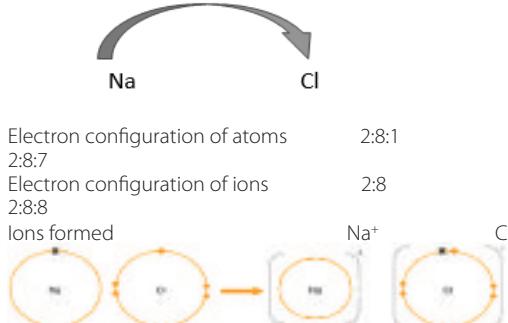
- Redraw this table to form more 5 combinations.

##### Results and conclusion:

- Why should beans add up to 8 in each case?
- What do the beans in each tin represent?
- Which type of bonding has been demonstrated?

##### Summary:

We can now relate beans to atoms, the outermost electrons or valence electrons in atoms participate in bonding. During ionic bonding, atoms completely gain or lose electrons. An atom that loses electrons becomes positively charged while those that gain attain a negative charge. For example, the electron configuration of sodium is 2:8:1 and that of chlorine is 2:8:7, using the valence shell this can be demonstrated as:



The valence shell electron in sodium is lost, leaving the shell empty while the lost electron is gained by the valence shell of chlorine to attain a maximum number of electrons on a shell.

##### Follow-up exercise:

Aluminium has atomic number 13 while Chlorine has atomic number 17.

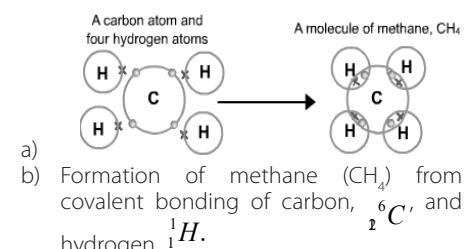
- Write the electron configuration of the elements.
- Using valence shell electrons show the formation of the compound formed.
- Write the formula of the compound formed.
- Which type of bond is this?

#### Lesson 2

##### b) Covalent bonding:

Sometimes atoms cannot donate or gain electrons but instead share them to attain stability. A chemical bond that involves the sharing of electron pairs between atoms is called a covalent bond, or molecular bond. The electron pairs shared between atoms are known as shared pairs or bonding pairs, and the stable balance of attractive and repulsive forces between atoms, when they share electrons, is known as **covalent bonding**. Carbon has 4 electrons in its valence shell, it neither loses nor gains electrons to maximally fill their shell but instead share their bonding electrons with other atoms.

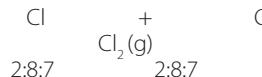
Consider:



- Formation of methane (CH<sub>4</sub>) from covalent bonding of carbon, <sup>6</sup>C, and hydrogen, <sup>1</sup>H.

Carbon has 4 electrons in its outermost or valence shell while hydrogen has only 1. These two atoms share the valence shell electrons.

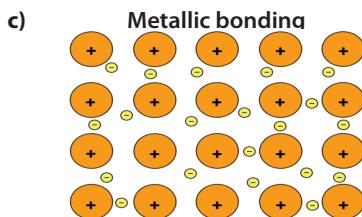
- Formation of a chlorine molecule as two atoms of chlorine, <sup>17</sup>Cl, bond with each other.



#### Covalent Compounds of ELEMENTS

##### Chlorine, Cl<sub>2</sub> (single covalent bond)



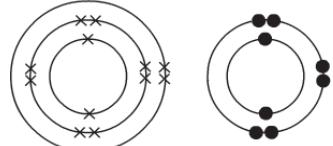


Metallic bonding is a type of chemical bonding that arises from the sharing of *free electrons* among a structure of positively charged ions (cations). For example, since sodium has one free electron on its outer most shell, eight sodium atoms share their free electrons creating a lump of sodium. Electrons in this structure are said to be delocalized. Metallic bonding accounts for many physical properties of metals, such as strength, ductility, heat and electrical conductivity, denseness, and shiny nature. Metal alloys are created through metallic bonding, for example, brass (zinc and copper) and steel (carbon and iron).

#### Follow-up activity

1. The diagram below shows the electron arrangements of magnesium and oxygen:

a) Draw a diagram showing how a bond is made between magnesium and oxygen.

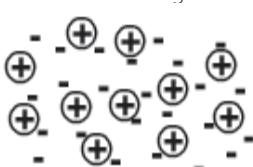


b) What name is given to this type of chemical bond?

2. a) What type of chemical bond would you expect in hydrogen fluoride, HF?

b) Draw a diagram to show how this bond is formed.

3. Look at the diagram below:



a) Which type of structure is shown in the diagram?

b) Will a material with this structure be able to conduct electricity? Explain your answer.

#### Topic: Organic Chemistry

##### Lesson One:

###### Introduction

**Organic Chemistry** is a branch of chemistry dealing with compounds of carbons except oxides, carbonates, hydrogen carbonates and carbides.

Carbon has the ability to form bonds to itself. These bonds are very strong and can be single, double or triple bonds. Carbon forms four covalent bonds making it possible making it possible to have different groups attached to the chains of

carbon atoms hence leading to a wide diversity of compounds being formed.

###### Important Terms:

###### 1. Hydrocarbons

These are organic compounds containing hydrogen and carbon atoms only. They have a general molecular formula  $C_xH_y$  where x and y are the whole numbers. The main classes of hydrocarbons are alkanes, alkenes, and alkynes.

###### 2. Homologous series

This is a group of organic compounds of similar structure which possess the same functional group and each member differs from the next by  $-CH_2$  group.

Characteristics of a homologous series:

- (i) members conform to the same general mol formula
- (ii) each member differs in molecular formula from the next by a  $CH_2$  group
- (iii) members show similar chemical reactions but vary in vigour
- (iv) The physical properties of members change gradually in the same direction along the series.

###### ALKANES

Alkanes are hydrocarbons with the general molecular formula,  $C_nH_{2n+2}$  where  $n \geq 1$ . Their names end with the suffix -ane.

Examples, Methane in which  $n=1$ , so its formula is  $C_1H_{(2 \times 1)+2}$  hence  $CH_4$ .

Ethane in which  $n=2$ , so its formula is  $C_2H_{(2 \times 2)+2}$  hence  $C_2H_6$

**Activity** This table gives the first six members of alkanes. Fill in the gaps

Number of carbon atoms	Name of alkane	Molecular formula
1	Methane	
2	Ethane	
3	Propane	
4	Butane	
5	Pentane	
6	Hexane	

###### Structural formula

This shows the sequence and arrangement of atoms in a molecule.

For example, the molecular formula of propane is  $C_3H_8$ . The structural formula of Propane is;  $-C-C-C-$  OR  $CH_3CH_2CH_3$

###### Activity

Write the molecular and structural formula for each of the following alkanes;

- a. Hexane
- b. Butane

###### c. Pentane

Alkanes are saturated hydrocarbons i.e. all the atoms exert their usual combining power with other atoms and have only single covalent bonds.

#### Lesson two: General properties of Alkanes

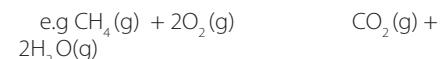
##### Introduction

Physical properties

1. The first four members are gases, the next twelve members are liquids and the rest are waxy solids at room temperature.
2. They are insoluble in water but soluble in organic solvents.
3. They are less dense than water.

##### Chemical properties

###### 1. Alkanes burn in oxygen forming carbon dioxide



In a limited supply of oxygen, carbon monoxide is formed.



During combustion, a lot of heat is liberated hence alkanes are used as fuels for industrial and domestic purposes, for example:

- Butane is used in gas cigarette lighters
- Methane is found in natural gas and bio gas and is used in gas appliances.
- Butane found in petrol is used to run petrol engines.

##### ISOMERISM

This is the occurrence of two or more compounds with the same molecular formula but different structural formulae.

All alkanes with more than four carbon atoms have more than one structural for a given molecular formula i.e exhibit isomerism.

The easiest way of finding isomers is to draw the longest chain of carbon atoms first and then reduce it by one carbon atom at a time.

##### Activity 3

Write the structural formulae and names of possible isomers of compounds with the given molecular formulae

- i)  $C_4H_{10}$
- ii)  $C_5H_{12}$

#### Lesson four: Preparation of alkanes

There are mainly three ways of preparing alkanes i.e

- a. *Fractional distillation of crude oil or petroleum*
- Petroleum is a mixture of hydrocarbons with differing chain lengths. It was formed from the

remains of plants and animals which lived millions of years ago and decomposed.

Fractional distillation of petroleum gives various fractions or products.

### Activity

1. Use the internet or chemistry text books to research and write the uses of the various fractions obtained after fractional distillation of petroleum. Present your work in a table.

Fraction	Uses
1.Gas (propane and butane)	
2.Petrol	
3.Paraffin	
4.Gas oil	
5.Diesel oil	
6.Lubricating oil	
7.Waxes and bitumen	

#### 1. Cracking

Due to the increasing demand for petrol worldwide, it has become necessary to devise a new process of obtaining it i.e by cracking of gas oil.

Cracking is the process of breaking down the long chain hydrocarbons into shorter chain molecules by using heat or a catalyst.

#### 2. Bio-gas

Under anaerobic conditions, bacteria feed on waste organic products for example animal wastes, human wastes and make them decompose. One of the products formed from this decay is methane gas which is a component of bio-gas.

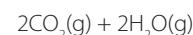
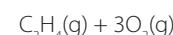
Methane is an alkane and is used as a fuel for cooking and lighting purposes.

### Activity

With reference to the internet and chemistry text books,

- a. Describe how bio-gas can be obtained from cow dung
- b. Mention any three advantages of bio-gas production
- c. Give the disadvantages of bio-gas production

- IV. Ethene burns in plenty of oxygen to give carbon dioxide and steam.



Because alkenes burn with a sooty flame, they are not suitable as fuels.

### Activity 6

Linda carried out some tests on ethane gas and below are her results;

Test	Observation
-appearance	Colourless gas
-smell	No smell
-a lighted splint is applied to the neck of the gas jar of ethene	Gas burns with a sooty flame and condensation forms at the top of the gas jar.
-chlorine water is added to a gas jar of ethene gas	Chlorine water instantly changes from pale yellow to colourless.
-acidified potassium manganate (vii) is added to the gas jar of ethene.	The potassium manganate (vii) solution changes from purple to colourless.

- i. What is the colour and smell of ethene gas?
- ii. What kind of flame does ethene burn with?
- iii. What forms at the neck of the gas jar?
- iv. What is observed when chlorine water is shaken with ethene gas?
- v. What is observed when ethene is shaken with acidified potassium manganate (vii) solution?

### Lesson Five: ALKENES

These are members of a homologous series of a general molecular formula

$\text{C}_n\text{H}_{2n}$  where  $n \geq 2$ . They have a carbon-carbon double bond as their functional group. They are unsaturated compounds-some atoms do not exert all their combining powers with other atoms.

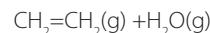
Examples: Ethene, Propene, Butene

Task 5.1.....Using the general molecular formula for alkenes, write the molecular formulae for the first three alkenes.

Alkenes are named by dropping the suffix -ane of the corresponding alkanes and replacing it with the suffix -ene.

### Lesson six: Preparation of alkenes

Ethene gas can be prepared by the dehydration of ethanol by concentrated sulphuric acid at  $180^\circ\text{C}$



### Properties of Ethene

- I. It is a colourless, sweet smelling and non-poisonous gas.
- II. It is slightly less dense than air.
- III. It is insoluble in water but soluble in organic solvents.

# PHYSICS

### Chapter: Motion

#### Lesson 1

##### Competence:

By the end of this lesson, you should be able to apply the relationship between speed, distance, and time

##### Introduction

Motion occurs in many aspects of life. When an object changes its position, it is said to have moved. When this happens, distance and time change. There are some natural phenomena which cause destruction as a result of motion, for example earthquakes and erupting volcanoes. These experiences help us understand motion. In this chapter, you will study the relationship between distance and time, and use it to calculate speed and acceleration and explain their implications.

### Speed, distance and time.

Jane is to walk 500m in five minutes as shown in the illustration below. How many metres does she cover in one minute? Explain how you arrived at the answer. The answer you obtain is how fast Jane moves. Suggest also the units of your answer.



500m

How fast should she walk if she is to cover this distance in 10 minutes?

Suggest a term for your answer and state its SI unit.

Convert your answer to:

i. km/h

ii. m/s

#### Activity 1.0

Question: At what speed will you walk round the

house?

##### What you need:

- Tape measure or meter rule or calibrated stick
- Watch/Stop watch/clock

In case you cannot get a tape measure or meter rule, ask an adult at home to count the number of paces round the house.



**Did you know that the stride/pace of a normal adult is about 1 m**

### Procedure:

1. Measure the distance round the house.
2. Walk round the house and using a clock/watch to note the time it will take you to go round the house.
3. Determine your speed.
4. Repeat this activity while walking faster, and then running.
5. Compare the three results. What do you conclude?

### Application

1. Cars and motorcycles are fitted with speedometers so that the driver/cyclist is able to know at what speed they are moving. Why is it necessary for the driver/cyclist to know their speed?
2. Have you seen such a road sign? What is its importance?



### Summary:

- Jane's speed was the distance she moved every unit time
- The smaller the value of speed, the slower Jane was and vice versa.

## Lesson 2

### Competence:

By the end of this lesson, you should be able to explain the terms displacement, velocity and acceleration.

### Demonstrating displacement, velocity and acceleration

What is the difference between the following statements?

- α. Jane moved 500m
- β. Jane moved 500m in the southern direction

### Activity 2.0



1. If Hope drives a car along the road from town

A to B through C, which is 300 km away, the journey will take 5 hours.

At what rate does she cover this distance?

Suggest the term that represents the rate at which this journey is covered.

2. If she drives due east from town A to B it will be a distance of 100 km in half an hour. At what rate does she cover this distance?

Suggest the term that represents the rate at which this journey is covered.

### Summary:

- **Displacement** is distance moved in a specified direction.
- The magnitudes of other paths, ACB and ADB, are known as the **distances** travelled from A to B because the direction is not specific.
- Rate of change of displacement is called **velocity**.
- Rate of change of distance is called **speed**.

### Demonstrating acceleration



You are among a group of friends that are planning a competition in a relays game at the village football pitch. During the game, you realize that some are gaining distance ahead of the others.

- Explain why some are gaining distance ahead of the others.
- How did you arrive at the answer?

### Exercise:



1. When traffic lights turn green, cars begin to move. What is happening to the velocity of the cars? Explain your answer.
2. When the light turns red, the cars gradually stop. What happens to the velocity of the cars? Explain your answer.

### Summary:

When a driver steps on the accelerator, the car moves faster. In other words, its velocity increases with time. This is called **Acceleration**.

- When a driver steps on the brake, the car slows down. In other words, its velocity reduces over time. This is called **Deceleration**.

- Acceleration is defined as the change of velocity per unit time. Its unit is the meter per second per second ( $\text{m/s}^2$ ).

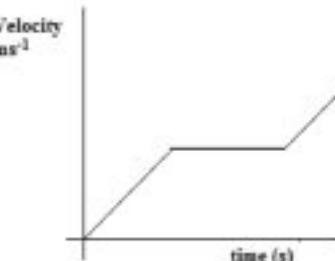
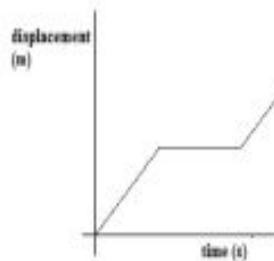
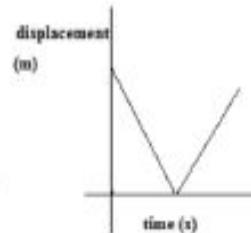
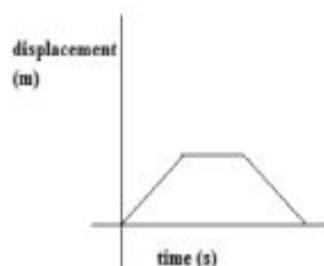
Acceleration = Change of velocity

Time taken

### Interpreting motion graphs:

#### Activity

Apply your understanding of displacement and velocity to explain and demonstrate the motion indicated.





If he threw two balls with the same strength, which of them would you prefer to catch and why?

### Summary:

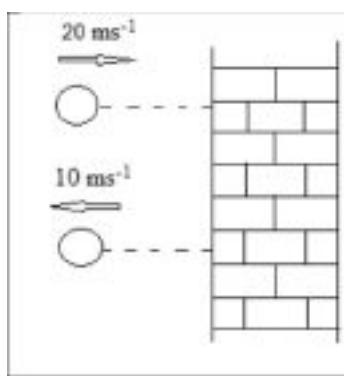
The moving balls produce an effect on your hands which are there to stop the motion of the ball. This effect is due to the **momentum** of the moving ball. Momentum depends on mass and velocity of an object.

$$\text{Momentum} = \text{mass} \times \text{velocity}$$

Derive the unit of momentum.

### Exercise:

1.

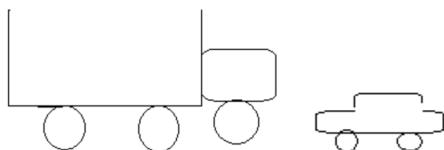


A ball of mass 1.0 kg strikes a wall at a velocity of  $20 \text{ m s}^{-1}$  and rebounds at  $10 \text{ m s}^{-1}$ .

What is its momentum:

1. before it strikes the wall, and
2. after the rebound?

3. A lorry loaded with matooke and a saloon car are moving at the same speed. The two have to stop at a police check point. Which of the two will be easier to stop? Explain your answer.



### Conservation of linear momentum

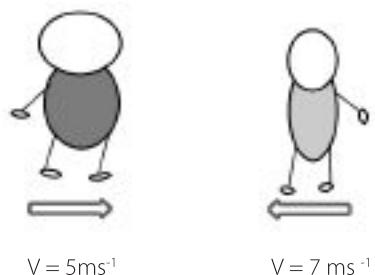
#### Activity

1. What does it mean to 'conserve'?
2. What is conservation of linear momentum?

#### Example

You see a friend you have not seen in a long time. The two of you run towards each other with open arms. When you meet, you hug each other for two minutes as you exchange greetings and slowly fall on the side of your friend because he is lighter than

you are. If your mass is 60kg and your friend's mass is 45kg, find the velocity with which the two of you will gradually fall to the ground.



Conservation of linear momentum occurs when the total momentum of the objects **before a collision equals** that **after the collision**.

$$\text{Your momentum before collision} = 60 \times 5 \\ = 300 \text{ ms}^{-1}$$

$$\text{Your friend's momentum before collision} = 45 \times -7 \\ = -315 \text{ kgms}^{-1} \dots\dots\dots (1)$$

$$\text{What does the negative sign mean?} \\ \text{Total momentum before collision} = 300 - 315 \\ = -15 \text{ kgms}^{-1}$$

$$\text{Total momentum after collision} = (60 + 45)v \\ = 105v \dots\dots\dots (2)$$

$$\text{If momentum is conserved, (1) = (2)} \\ -15 = 105v \\ v = -0.14 \text{ ms}^{-1}; \text{ where } v \text{ is your common velocity.}$$

**Question:** Why is your common velocity negative?

#### Exercise

1. A trolley of mass 3kg moving at a velocity of  $2 \text{ m s}^{-1}$  collides with another trolley of mass 0.5kg which is moving at a velocity of  $1 \text{ m s}^{-1}$  in the same direction. If the 0.5kg trolley moves at a velocity of  $2.5 \text{ m s}^{-1}$  in the same direction after the collision, what is the velocity of the 3kg trolley?
2. A butterfly rests on a leaf floating on the surface of a pond. The butterfly then starts moving to the tip of the leaf at a speed of  $5 \text{ cm s}^{-1}$  while the leaf moves at  $3 \text{ cm s}^{-1}$  in the opposite direction. If the mass of the leaf is 8g, determine the mass of the butterfly.
3. In the Bible, 1Kings 17: 49, David, a small man, was able to kill Goliath, a giant using a small stone! Discuss with a friend, how possible this could have been.

### Lesson 5

#### Competence:

By the end of the lesson, you should be able to demonstrate and apply Newton's laws of motion.

#### Newton's 1<sup>st</sup> law of motion

#### Activity :Demonstrating Newton's 1<sup>st</sup> law of motion

What you need:

- A coin
- A beaker

- A smooth cardboard (you can also fold a piece of paper)

#### Procedure:

1. Place a coin on a smooth cardboard and place it over a cup.



2. Push the card slowly and observe what happens to the coin.
3. Repeat the activity, but this time push the card away suddenly. Observe what happens to the coin.

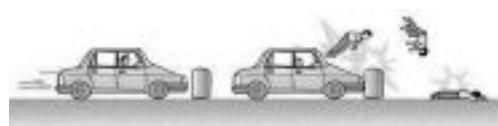


4. Why does the coin behave differently in these steps?

#### Exercise:

Explain each of the following:

1. A passenger sways backwards when a car initially at rest suddenly starts moving forward.
2. When a bus is moving very fast and suddenly negotiates a corner in one direction, the passengers sway to the opposite direction.
3. If the brakes of the fast moving car are applied suddenly, the passengers jerk forward. This can result into a fatal accident as shown below.
4. Suggest how a passenger's safety in the above cases can be ensured.



#### Summary:

Newton's first law of motion-the law of inertia: A body continues in its state of rest or uniform motion in a straight line unless compelled by some external force to act otherwise.

### Lesson 6

#### Newton's 2<sup>nd</sup> law of motion

#### Activity1

Two cars, A and B are labeled at their rear as follow:

A: 1500 cc

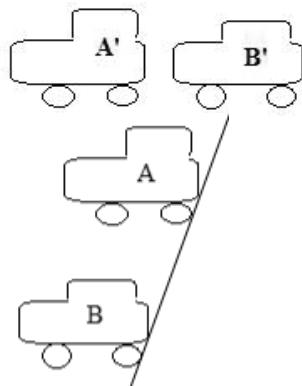
B: 3000 cc

What do these labels mean? You can ask someone who is knowledgeable about cars at home or in the neighborhood.

### Activity 2

The figure below shows two cars: A and B of the same mass at the same starting line. The engine capacity of sports car A is much bigger than car B.

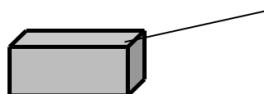
A' and B' shows their new positions after 3 seconds. Explain why this is possible.



You can also try out this activity by using an empty box, a few masses (e.g. books) and a string.

### Procedure:

Tie the string to the box and put some masses in the box.



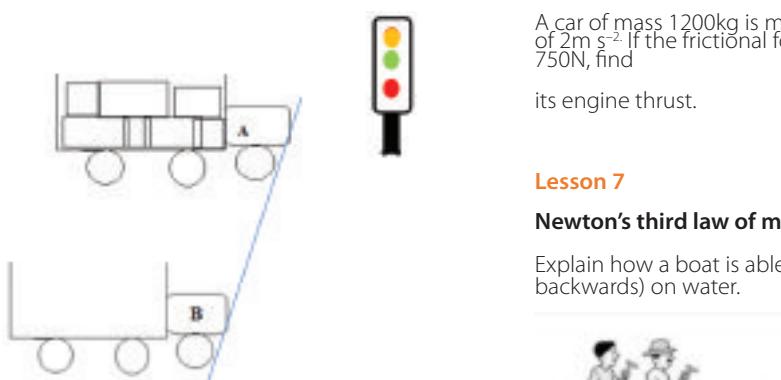
- i. Hold the string and drag the box with a big effort in 1 minute. Note the distance the box covered.
- ii. Using a less effort, drag the box in 1 minute and note the distance the box covered. Try to move in a straight line in both cases.

Using activity 1 and 2, draw a conclusion on the relationship between the force applied to the mass and its acceleration.

### Activity 3

The figure below shows two similar lorries, A (loaded) and B(not loaded) in front of a traffic light. When the light turns green, both drivers step on the accelerator at the same time with the same effort.

Three seconds later, Lorry B is ahead of A.



Explain why this is possible.

Using activity 3, draw a conclusion on the relationship between the mass and the acceleration on the mass.

### Summary

The acceleration of an object is **directly proportional** to the force applied if the mass is constant ( $a \propto F$ ).

The acceleration of an object is **inversely proportional** to its mass when the force acting on it is constant ( $a \propto 1/F$ ).

**Task:** Using the two relationships above, establish a relationship between force, mass and acceleration.

### Summary

The net force  $F_{net} = ma$  is the mathematical expression of Newton's second law of motion.

### Activity

Recall: The first equation of motion is:  $v = u + at$

Using the 1<sup>st</sup> equation of motion, substitute for a in  $F = ma$

### Exercise



Okello pushes a 15kg box with a force of 60N. If the floor is frictionless, find the acceleration with which the box moves.



A car of mass 1200kg is moving at an acceleration of  $2\text{ m s}^{-2}$ . If the frictional force acting on the car is 750N, find its engine thrust.

### Lesson 7

#### Newton's third law of motion

Explain how a boat is able to move forward (or backwards) on water.



The picture shows a squid. Do some research and find out how it is able to propel itself in water.



Explain how your chair in your classroom, or at home is able to sustain your weight without collapsing.



Explain what happens when the air in an inflated balloon is released.

### Summary:

When a body exerts a force on another body, the other body exerts an equal but opposite force on the first body.

This is sometimes stated as: to every action there is an equal and opposite reaction.

### Exercise:

Discuss and make short notes on other real life situations where action and reaction apply.

### Lesson 8

#### Competence:

By the end of this lesson, you should be able to differentiate between vector and scalar quantities.

### Activity 1

Consider the following statements:

- i. Our home is 35km from the trading center.
- ii. Our home is 35km east of the trading center.

What is the difference between these two statements?

### Activity 2

Will Jose be able to reach the health center using Ali's help? Explain your answer.



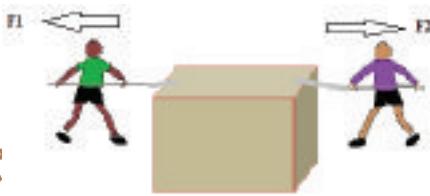
Help Jose reach the health center!

Using the above two activities, define:

- i. A scalar quantity
- ii. A vector quantity

Give three examples of each.

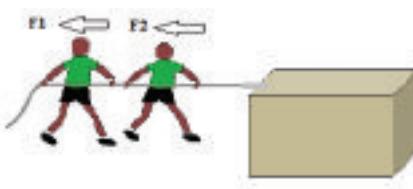
### Addition of scalar quantities



Town B is 50km away from town A while town C is 52km from town B. How far is town C from town A?

### Addition of vector quantities:

1. What is the total force  $F$ , with which the load is being pulled? In which direction does the load move?



3. If Quinci pulls the concrete slab with a force of 85N at an angle of  $45^\circ$  to the horizontal, find the vertical and horizontal components of this force.



2. Find the resultant force  $F$ , with which the box is being moved. Suggest the direction of its motion.

# BIOLOGY

## BIOLOGY SELF-STUDY MATERIALS

### Senior Three

#### Topic: Gaseous Exchange

By the end of this topic, you should be able to demonstrate the mechanism of breathing.

#### Introduction

Breathing involves two actions; breathing in (inhala-tion) and breathing out (exhalation) of air.

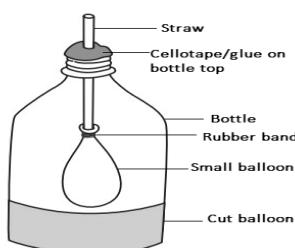
#### Activity: Demonstrating breathing

In the following activity, you are going to make a model and use it to demonstrate breathing in the human respiratory system.

**Things you will need:** 2 balloons (one small and one large), straw, empty plastic bottle, rubber band/string.

#### Set up of the experiment

- i) Measure 7 cm from the bottom of the water bottle and cut it off.
  - ii) Insert a straw of length 5 cm into the open end of the small balloon.
  - iii) Tie the balloon onto the straw using a rubber band. Make sure not to squeeze/block the straw.
  - iv) Pierce a hole - the size of the straw - on
- v) the bottle top (cover of the bottle). Insert the remaining open end of the straw through the hole at the bottle cap. Glue / cellotape the straw to make it firm on the cap.
  - vi) Cut the larger balloon in half. Keep the bottom half.
  - vii) Attach the bottom half of the larger balloon firmly around the cut end of the bottle.



#### Procedure

##### Part A

1. What do the following represent?
  - i) Balloon in the bottle
  - ii) Straw
  - iii) Bottle
  - iv) Piece of balloon at the bottom of the bottle
2. Pull the larger balloon at the bottom downwards.

- i) What does this action represent in the human respiratory system?

- ii) Why should the bottom of the balloon be pulled?

- iii) State what you have observed.

- iv) Explain your observation.

- v) What is the equivalent of this action in breathing process?

3. Now release the balloon to return to original position.

- i) What is this action equivalent to?

- ii) What do you notice?

- iii) Give reasons for your observation.

4. What is the scientific principle behind the breathing action?

##### Part B

1. Fill your mouth with water.
2. Push the water from your mouth into the small balloon through the straw.
3. Pull the larger balloon at the bottom downwards and then release it back to its position.
4. What do you observe?
5. Give reasons for your observation.

#### Follow-up activity

Corona virus causes accumulation of fluid in the human lungs. Patients suffering from Corona virus disease – 19 (COVID-19) have difficulty in breathing. How do you explain this?

# MATHEMATICS

**Class: SENIOR THREE**

**Mathematics**

**Topic:** Position Vectors

**Lesson 1**

**Learning outcome**

By the end of this lesson, you should be able to describe two things:

- A position vector as a column vector.
- To represent the position vector on a graph.

**Materials needed:**

Graph papers, a ruler and a pencil.

**Introduction**

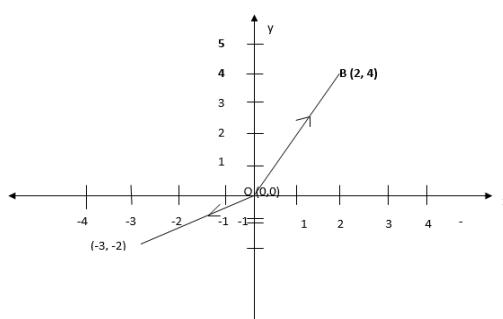
In S2, you looked at vectors and how they are represented as column vectors, with letters and also on a graph (geometrically). You also handled operations on vectors such as addition, subtraction and multiplying a vector with a scalar. The length or magnitude of vectors was also shown you.

Position vectors are also represented as column vectors, with letters and geometrically. A vector has both magnitude and direction. A position vector shows the position of a point from the origin. The position vectors are represented with letters such as **OP, OA, OD, p, a, d** or as column vectors such as

$$\begin{pmatrix} 4 \\ 3 \end{pmatrix}, \begin{pmatrix} 7 \\ -2 \end{pmatrix}, \begin{pmatrix} 7 \\ -2 \end{pmatrix}, \begin{pmatrix} -8 \\ 5 \end{pmatrix}, \begin{pmatrix} -8 \\ 5 \end{pmatrix}$$

**Instructions**

We are going to plot points on the x and y axes and write down their position vectors.



The coordinates of the origin O are (0, 0).

The position vector of point B (2, 4) is the column vector **OB**.

X -coordinates: 2 strides to the right = +2

Y-coordinates: 4 strides upwards = +4

$$\mathbf{OB} = \begin{pmatrix} 2 \\ 4 \end{pmatrix} \quad \mathbf{OB} = \begin{pmatrix} 2 \\ 4 \end{pmatrix}$$

The position vector of point C (-3, 1) is the column vector of **OC**.

X-coordinate is 3 strides to the left = -3  
Y-coordinate is 1 stride upwards = 1

$$\mathbf{OC} = \begin{pmatrix} -3 \\ 1 \end{pmatrix} \quad \mathbf{OC} = \begin{pmatrix} -3 \\ 1 \end{pmatrix}$$

The position vector of any point P(x, y), is written

$$\mathbf{OP} = \begin{pmatrix} x \\ y \end{pmatrix}$$

## ACTIVITY

- Using the x- and y-axes on a squared paper,
  - Show the position vectors of the following points D (4, 6), E (-2, 5), F (1, 3).
  - Write down the position vectors **OD, OE, OF** as column vectors, where O is the origin.
- Write down the coordinates of the points whose position vectors are:

$$\mathbf{OM} = \begin{pmatrix} 4 \\ -3 \end{pmatrix} \quad \mathbf{OM} = \begin{pmatrix} 4 \\ -3 \end{pmatrix}, \quad \mathbf{ON} = \begin{pmatrix} -7 \\ -8 \end{pmatrix}$$

$$\mathbf{ON} = \begin{pmatrix} -7 \\ -8 \end{pmatrix}, \quad \mathbf{OT} = \begin{pmatrix} -6 \\ 11 \end{pmatrix} \quad \mathbf{OT} = \begin{pmatrix} -6 \\ 11 \end{pmatrix}$$

**Lesson 2**

**Learning outcome**

By the end of this lesson you, should be able to write a column vector of a vector when the position vectors of the end points of the vector are provided to you.

## Materials you will need

- Graph paper or squared paper
- Ruler
- pencil

## Introduction:

In the last lesson, we wrote position vectors of points as **OP, OA** and in vector form

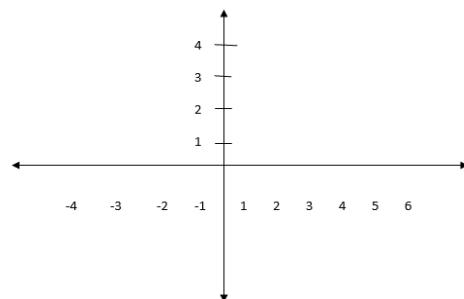
$$\begin{pmatrix} 2 \\ -5 \end{pmatrix}, \begin{pmatrix} 2 \\ -5 \end{pmatrix}, \begin{pmatrix} 7 \\ 8 \end{pmatrix}, \begin{pmatrix} 7 \\ 8 \end{pmatrix}$$

We also represented them on graphs.

We are now going to obtain column vectors of any given vectors using the position vectors of the end points of the vector. In senior two, you handled combination of vectors such as **AB + BC = AC**. This idea will also enable us to find the column vector.

## Instructions

The graph below shows us the vector **ST** and the position vectors **OS** and **OT** of points **S** and **T** respectively.



Using addition (combination) of vectors

$$\mathbf{OT} = \mathbf{OS} + \mathbf{ST}$$

$$\mathbf{ST} = \mathbf{OT} - \mathbf{OS}$$

From the graph:

$$\mathbf{OT} = \begin{pmatrix} -4 \\ 5 \end{pmatrix} \quad \mathbf{OT} = \begin{pmatrix} -4 \\ 5 \end{pmatrix}$$

And

$$\mathbf{OS} = \begin{pmatrix} 4 \\ 1 \end{pmatrix} \quad \mathbf{OS} = \begin{pmatrix} 4 \\ 1 \end{pmatrix}$$

$$\mathbf{ST} = \begin{pmatrix} -4 \\ 5 \end{pmatrix} - \begin{pmatrix} 4 \\ 1 \end{pmatrix} \quad \mathbf{ST} = \begin{pmatrix} -4 \\ 5 \end{pmatrix} - \begin{pmatrix} 4 \\ 1 \end{pmatrix}$$

$$\mathbf{ST} = \begin{pmatrix} -4 - 4 \\ 5 - 1 \end{pmatrix} = \begin{pmatrix} -8 \\ 4 \end{pmatrix}$$

$$\mathbf{ST} = \begin{pmatrix} -4 - 4 \\ 5 - 1 \end{pmatrix} = \begin{pmatrix} -8 \\ 4 \end{pmatrix}$$

Writing the vector **ST** directly from the graph

X-Coordinates- 8 strides to left = -8  
Y – coordinates- 4 strides upward = 4

$$\mathbf{ST} = \begin{pmatrix} -8 \\ 4 \end{pmatrix} \quad \mathbf{ST} = \begin{pmatrix} -8 \\ 4 \end{pmatrix}$$

This agrees with the method of using position vectors.

**Therefore, the column vector of any vector is obtained by subtracting the position vector of the starting point from the position vector of the end point.**

Also without using the axes, we obtain the column vector of a vector given the coordinates of the end points. Given two points A (-3, -2) and B (4, 2) to obtain the column vector **AB**.

We first write the position vectors of the end points

$$A \text{ and } B \text{ as } \mathbf{OA} = \begin{pmatrix} -3 \\ -2 \end{pmatrix}, \quad \mathbf{OA} = \begin{pmatrix} -3 \\ -2 \end{pmatrix}, \quad \mathbf{OB} = \begin{pmatrix} 4 \\ 2 \end{pmatrix}$$

$$\mathbf{OB} = \begin{pmatrix} 4 \\ 2 \end{pmatrix}$$

Also  $\mathbf{AB} = \mathbf{OB} - \mathbf{OA}$

$$\mathbf{AB} = \begin{pmatrix} 4 \\ 2 \end{pmatrix} - \begin{pmatrix} -3 \\ -2 \end{pmatrix}$$

$$\mathbf{AB} = \begin{pmatrix} 4 \\ 2 \end{pmatrix} - \begin{pmatrix} -3 \\ -2 \end{pmatrix}$$

$$\mathbf{AB} = \begin{pmatrix} 4-(-3) \\ 2-(-2) \end{pmatrix} = \begin{pmatrix} 7 \\ 4 \end{pmatrix}$$

$$\mathbf{AB} = \begin{pmatrix} 4-(-3) \\ 2-(-2) \end{pmatrix} = \begin{pmatrix} 7 \\ 4 \end{pmatrix}$$

### ACTIVITY

- 1) On a graph with x and y axes
  - a) Plot the points V (3, -2) and W (-1, 4).
  - b) Show the column vector of  $\mathbf{DE}$
  - c) Draw the combination of position vectors that make up the vector  $\mathbf{DE}$ .
  - d) Write the column vector for  $\mathbf{DE}$ .

2. Point R has position vector  $\begin{pmatrix} 5 \\ 3 \end{pmatrix}$ , vector  $\mathbf{RQ} = \begin{pmatrix} 7 \\ 4 \end{pmatrix}$

Write the position vector of Q.

### Lesson 3

#### Learning outcome

By the end of this lesson, you should be able to write the position vector of the mid-point of a line segment.

#### Materials you will need:

- 1) Graph paper or squared paper
- 2) Ruler
- 3) Pencil
- 4) Introduction**

A line segment has a mid-point. This is a point found halfway the line segment. A line segment AB, has two end points A and B.



M is the mid-point of the line segment AB.

The position vector of the mid-point M, is found by using the position vectors of end points A and B.

#### Instructions

On a graph with x and y axes, have a **drawn line segment** CD and you are going to find the position vector of M the mid-point of CD.

$$\mathbf{OM} = \mathbf{OC} + \mathbf{CM}$$

$$\text{But } \mathbf{CM} = \frac{1}{2} \mathbf{CD}$$

$$\mathbf{CD} = \mathbf{OD} - \mathbf{OC} \quad (\text{In the last lesson, we looked at this with end points})$$

$$\mathbf{OM} = \mathbf{OC} + \frac{1}{2}(\mathbf{OD} - \mathbf{OC})$$

$$= \mathbf{OC} + \frac{1}{2}\mathbf{OD} - \frac{1}{2}\mathbf{OC}$$

$$\mathbf{OM} = \mathbf{OC} - \frac{1}{2}\mathbf{OC} + \frac{1}{2}\mathbf{OD}$$

$$\mathbf{OM} = \frac{1}{2}\mathbf{OC} + \frac{1}{2}\mathbf{OD}$$

The position vector of a mid-point of a line segment is got by adding  $\frac{1}{2}$  of the position vectors of the end points of the line segment.

$$\mathbf{OC} = \begin{pmatrix} -2 \\ 3 \end{pmatrix}, \mathbf{OD} = \begin{pmatrix} 4 \\ -1 \end{pmatrix}$$

$$\mathbf{OM} = \frac{1}{2} \begin{pmatrix} -2 \\ 3 \end{pmatrix} + \frac{1}{2} \begin{pmatrix} 4 \\ -1 \end{pmatrix}$$

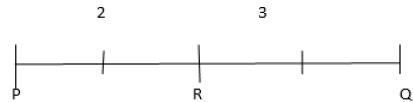
#### Multiplying a scalar by a vector

$$= \left( \begin{pmatrix} \frac{1}{2} \times -2 \\ \frac{1}{2} \times 3 \end{pmatrix} \right) + \left( \begin{pmatrix} \frac{1}{2} \times 4 \\ \frac{1}{2} \times -1 \end{pmatrix} \right)$$

$$= \begin{pmatrix} -1 \\ \frac{3}{2} \end{pmatrix} + \begin{pmatrix} 2 \\ -\frac{1}{2} \end{pmatrix}$$

$$= \begin{pmatrix} -1+2 \\ \frac{3}{2}-\frac{1}{2} \end{pmatrix} = \begin{pmatrix} 1 \\ 1 \end{pmatrix}$$

Draw a line segment PQ. Divide the line segment in a ratio 2:3.

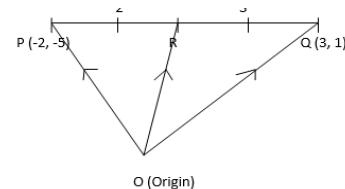


In the ratio 2:3, there is 2+3 portion, so 4 divide the line PQ into 5 equal proportions

Length  $\mathbf{PR} = 2/5 \mathbf{PQ}$  also  $\mathbf{RQ} = 3/5 \mathbf{PQ}$

$$\mathbf{PQ} = \mathbf{PR} + \mathbf{RQ}$$

Using position vectors



$$\mathbf{PR} = \frac{2}{5} \mathbf{PQ}$$

Also

$$\mathbf{RQ} = \frac{3}{5} \mathbf{PQ}$$

$$\mathbf{OR} = \mathbf{OP} + \mathbf{PR}$$

$$\text{But } \mathbf{PR} = \frac{2}{5} \mathbf{PQ}$$

$$\text{And } \mathbf{PQ} = \mathbf{OR} - \mathbf{OP}$$

$$\mathbf{PR} = \frac{2}{5} (\mathbf{OQ} - \mathbf{OP}) = \frac{2}{5} \mathbf{OQ} - \frac{2}{5} \mathbf{OP}$$

$$\mathbf{OR} = \mathbf{OP} + \frac{2}{5} \mathbf{OQ} - \frac{2}{5} \mathbf{OP}$$

$$\mathbf{OR} = \frac{3}{5} \mathbf{OP} + \frac{2}{5} \mathbf{OQ}$$

$$\text{But } \mathbf{OP} = \begin{pmatrix} -2 \\ 1 \end{pmatrix} \text{ and } \mathbf{OQ} = \begin{pmatrix} 3 \\ 1 \end{pmatrix}$$

$$\mathbf{OR} = \frac{3}{5} \begin{pmatrix} -2 \\ 1 \end{pmatrix} + \frac{2}{5} \begin{pmatrix} 3 \\ 1 \end{pmatrix}$$

$$\mathbf{OR} = \left( \begin{pmatrix} \frac{3}{5} \times -2 \\ \frac{3}{5} \times 1 \end{pmatrix} \right) \left( \begin{pmatrix} \frac{3}{5} \times -2 \\ \frac{3}{5} \times 1 \end{pmatrix} \right) + \left( \begin{pmatrix} \frac{2}{5} \times 3 \\ \frac{2}{5} \times 1 \end{pmatrix} \right) \left( \begin{pmatrix} \frac{2}{5} \times 3 \\ \frac{2}{5} \times 1 \end{pmatrix} \right)$$

$$\mathbf{OR} = \left( \begin{pmatrix} -\frac{6}{5} + \frac{6}{5} \\ \frac{3}{5} + \frac{2}{5} \end{pmatrix} \right) \left( \begin{pmatrix} -\frac{6}{5} + \frac{6}{5} \\ \frac{3}{5} + \frac{2}{5} \end{pmatrix} \right) = \left( \begin{pmatrix} 0 \\ 1 \end{pmatrix} \right) \left( \begin{pmatrix} 0 \\ 1 \end{pmatrix} \right) = \begin{pmatrix} 0 \\ 1 \end{pmatrix}$$

Coordinates of R which divide point PQ in the ratio of 2:3 are (0, 1)

#### ACTIVITY

Point E divides the line segment KL in the ratio 1:3.

The coordinates of K are (4, 1) and L are (-5, 2). Use vectors to get the coordinates of E

### LESSON 4:

#### Learning outcome

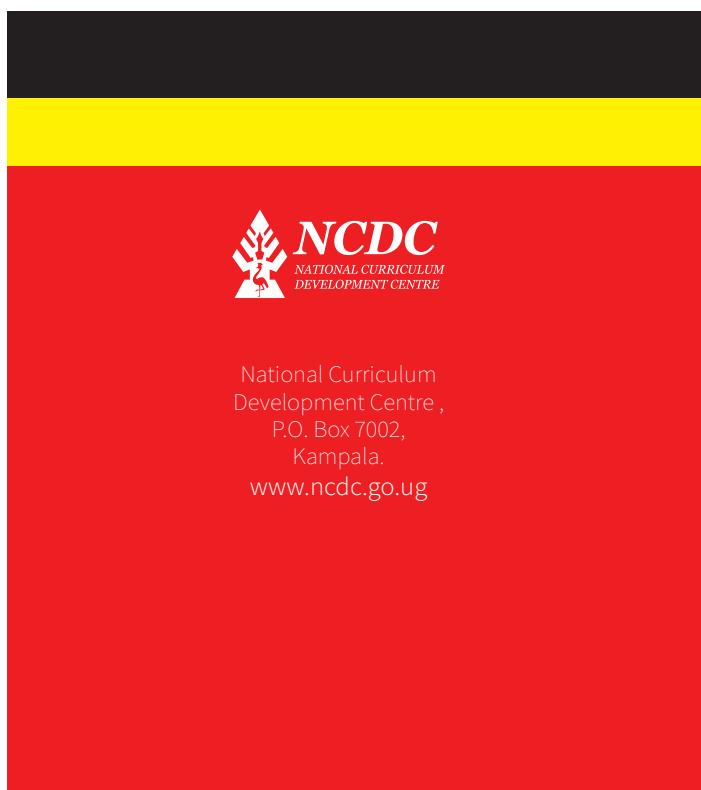
By the end of this lesson, you should be able to use the vectors to widen a line in a given ratio.

#### INTRODUCTION

A line segment is divided into a given proportion or ratio. Vectors are used to help in dividing any line in a given proportion or ratio.

#### INSTRUCTIONS







**THE REPUBLIC OF UGANDA**

**Ministry of Education and Sports**

# **SENIOR FOUR SELF STUDY MATERIALS**

## **HUMANITIES PACKAGE**



# Geography

## Topic 1: The Climate of Africa

### Instructions:

- You will be studying one lesson each day. Try to do all activities programmed for each day.
- Remember that some activities may take you more than one hour to complete.
- Read the instructions carefully before you begin doing each activity.
- In case you find an activity difficult, ask an older person around you to assist you.

### Lesson 1: Types of climate in Africa

#### Equatorial Climate

##### Materials you need:

Notebook, map of Africa showing climate regions, graph paper, pen, pencil, foot ruler and a rubber

##### Introduction

In Senior One you learnt about the major climatic regions of the world while in Senior Three you learnt about the climate of East Africa. Do you still remember these climates? Which of those climate types do you think are found in Africa? In this lesson you are going to explore Equatorial climate in Africa and how it affects people's ways of life.

### Activity 1

Study the information in Figure 1 and Figure 2, and do the tasks that follow.

Month	J	F	M	A	M
Temp(°C)	30	31	31	31	30
Rainfall(mm)	250	250	325	300	213

J	J	A	S	O	N	D
29	28	28	29	29	29	30
25	25	25	100	275	380	200

Figure 1: Mean monthly Temperature and Rainfall for Libreville, Gabon

Temperature	
Temperature(°C)	Term used
Below -10	Very cold
-10 – 0	Cold
1 – 10	Cool
11 – 21	Warm
22 – 30	Hot
More than 30	Very hot

Annual Temperature range (°C)	Term used
Less than 5	Small

5 – 19	Moderate
More than 20	Large

### Rainfall

Annual Rainfall (mm)	Term used
More than 1500	Very wet
1001 - 1500	Wet
501 - 1000	Moderate
250 – 500	Dry
Less than 250	Very dry

Monthly Rainfall (mm)	Term used
Less than 0 - 50	Dry
More than 50	Wet

Figure 2: Temperature and Rainfall conditions and Terms used to describe them

- Using the information in Figures 1 and 2, describe the climate of Station **L** in your notebook.  
To assist you with this, consider the following things:
  - The total amount of rainfall received
  - Rainfall distribution pattern; including peak seasons, hottest and coolest months of the year
  - Expected levels of relative humidity
  - Temperature conditions and their pattern over the year; including the annual temperature range.
  - The hottest and coolest months of the year
- Using the characteristics of climate you have described for station **L** as a guide, suggest the likely economic activities carried out in the area where the station is located. Give reasons to support each activity you have suggested.
- Explain the likely problems facing the people living in the area where Station **L** is located.
- Carry out textbook or internet research about Equatorial climate and crosscheck your responses to this Activity. Have you got it right?

The climate you have described for Station **L** is a typical Equatorial climate. The economic activities and the problems you have suggested are also similar to those found in the areas of Africa experiencing an Equatorial climate.

### Summary

In this lesson you have learnt that:

- areas with an Equatorial type of climate receive rainfall throughout the year, have two seasons with maximum rainfall called rainfall peaks.
- equatorial regions experience hot temperatures throughout the year.
- the activities carried out by people living in

the equatorial region are mainly influenced by the hot temperatures and heavy rainfall.

- there are certain problems associated with equatorial climate. These problems are brought about by heavy rainfall, hot temperatures, and high humidity.

### Follow-up Activity

Study Figure 3 and do the tasks that follow.

Month	J	A	M	J	J
Temp (°C)	27	27	26	25	25
Rainfall (mm)	85	150	250	225	125

A	S	O	N	D	
25	26	27	27	26	26
75	75	75	112	125	125

Figure 3: Mean monthly Temperature and Rainfall for Station E

- Draw a suitable graph to represent the information in the table.
- Using the graph you have drawn, describe the climate of Station E.
- In your opinion, does Station **E** experience an Equatorial climate or not? Give reasons to support your view.

Lesson 2: Savannah (Tropical Continental) Climate

##### Materials you need:

Textbooks, map of Africa showing climate regions, notebook, graph paper, pen, pencil, foot ruler and a rubber

##### Introduction

In the Geography of East Africa, you learnt about Savanna lands; including their location, climate, economic activities, and how the climate affects people's life styles. Do you remember the areas found in the Savannah region of East Africa? Is your home found in one of the Savanna lands of East Africa? In this lesson, you are going to learn more about Savannah climate with special focus on Africa.

### Activity 1

Study Figure 3 and do the tasks that follow.

Month	J	F	M	A	M	J
Temp (°C)	22	24	27	32	31	26
Rainfall (mm)	0	0	0	25	75	125

J	A	S	O	N	D
26	25	26	26	25	23
200	325	150	25	0	0

Figure 1: Mean monthly Temperature and Rainfall for Station K

- Draw a suitable graph to represent the

- climate of Station K.
- Using the graph you have drawn and Figure 2 in the previous lesson (the table showing Temperature and Rainfall conditions and Terms used to describe them), describe the climate of Station K.
  - Using the characteristics of climate you have described for station **K** as a guide, suggest the likely economics activities carried out in the area where the station is located. Give reasons to support each activity you have suggested.
  - Explain the likely problems facing the people living in the area where Station **K** is located.
  - Carry out textbook or internet research about Savannah climate and crosscheck your responses to this Activity. Have you got it right?

The characteristics of climate you have described for Station **K** are typical of Savannah climate. The economic activities and the problems you have suggested are also similar to those found in the Savanna lands of Africa.

### Summary

In this lesson you have learnt that:

- areas with a Savannah type of climate receive moderate rainfall, one rainy season stretching for about seven month followed by a dry season lasting about four months. This is called unimodal climate.
- Savannah regions experience hot temperatures for most of the year.
- the activities carried out by people living in the savannah lands are mainly influenced by the hot temperatures and moderate rainfall.
- there are unique problems which are brought about by the climate.

### Follow-up Activity

Study Figure 2 and do the tasks that follow.

Month	J	F	M	A	M	J
Temp (°C)	24	23	22	21	20	18
Rainfall (mm)	200	175	100	25	20	0

J	A	S	O	N	D
17	18	20	23	24	24
0	0	0	50	100	175

**Figure 2: Mean monthly Temperature and Rainfall for Station H**

- Draw a suitable graph to represent the information in the table.
- Determine the:
  - wettest month, and
  - driest months at Station **H**.
- How many rain seasons does Station **H** experience?
- Why is it correct to say that Station **H** experiences a Savannah climate?

Lesson 3: Mediterranean Climate in Africa

### Materials you need:

Textbooks, notebook, map of Africa showing climate regions, graph paper, pen, pencil, foot ruler and a rubber

### Introduction

Africa, you learnt about Savanna lands; including their location, climate, economic In the Geography of East activities, and how the climate affects people's life styles. Do you

remember the areas found in the Savannah region of East Africa? Is your home found in one of the Savanna lands of East Africa? In this lesson, you are going to learn more about Savannah climate with special focus on Africa.

### Activity 1

Study Figure 3 and do the tasks that follow.

Month	J	F	M	A	M	J
Temp (°C)	22	24	27	32	31	26
Rainfall (mm)	0	0	0	25	75	125

J	A	S	O	N	D
26	25	26	26	25	23
200	325	150	25	0	0

**Figure 1: Mean monthly temperature and Rainfall for Station K**

- Draw a suitable graph to represent the climate of Station K.
- Using the graph you have drawn and Figure 2 in the previous lesson (the table showing Temperature and Rainfall conditions and Terms used to describe them), describe the climate of Station K.
- Using the characteristics of climate you have described for station **K** as a guide, suggest the likely economics activities carried out in the area where the station is located. Give reasons to support each activity you have suggested.
- Explain the likely problems facing the people living in the area where Station **K** is located.
- Carry out textbook or internet research about Savannah climate and crosscheck your responses to this Activity. Have you got it right?

The characteristics of climate you have described for Station **K** are typical of Mediterranean climate. The economic activities and the problems you have suggested are also similar to those found in the Savanna lands of Africa.

### Summary

In this lesson, you have learnt that:

- areas with a Savannah type of climate receive moderate rainfall, one rainy season stretching for about seven month followed by a dry season lasting about four months. This is called unimodal climate.
- Savannah regions experience hot temperatures for most of the year.
- the activities carried out by people living in the savannah lands are mainly influenced by the hot temperatures and moderate rainfall.
- there are unique problems which are brought about by the climate.

### Follow-up Activity

Study Figure 2 and do the tasks that follow.

Month	J	F	M	A	M	J
Temp (°C)	24	23	22	21	20	18
Rainfall (mm)	200	175	100	25	20	0

J	A	S	O	N	D
17	18	20	23	24	24
0	0	0	50	100	175

**Figure 2: Mean monthly Temperature and Rainfall for Station H**

- Draw a suitable graph to represent the information in the table.
- Determine the:
  - wettest month, and
  - driest months at Station **H**.
- How many rain seasons does Station **H** experience?
- Why is it correct to say that Station **H** experiences a Savannah climate?

Topic: The Natural Vegetation of Africa

Lesson 4: Equatorial or Tropical rain forest Vegetation

### Materials you need:

Textbooks, atlas, map of Africa showing natural vegetation, notebook, pen, pencil, foot ruler and a rubber

### Introduction

In the Geography of East Africa, you learnt about Savanna lands; including their location, climate, economic activities, and how the climate affects people's life styles. Do you remember the areas found in the Savannah region of East Africa? Is your home found in one of the Savanna lands of East Africa? In this lesson, you are going to learn more about Savannah climate with special focus on Africa.

### Activity 1

Study Figure 3 and do the tasks that follow.

Temp (°C)	22	24	27	32	31	26
Rainfall (mm)	J	F	M	A	M	J

26	25	26	26	25	23
J	A	S	O	N	D

for station **K** as a guide, suggest the likely economics activities carried out in the area where the station is located. Give **Figure 1: Mean monthly Temperature and Rainfall for Station K**

- Draw a suitable graph to represent the climate of Station K.
- Using the graph you have drawn and Figure 2 in the previous lesson (the table showing Temperature and Rainfall conditions and Terms used to describe them), describe the climate of Station K.
- Using the characteristics of climate you have described reasons to support each activity you have suggested.
- Explain the likely problems facing the people living in the area where Station **K** is located.
- Carry out textbook or internet research about Savannah climate and crosscheck your responses to this Activity. Have you got it right?

The characteristics of climate you have described for Station **K** are typical of Savannah climate. The economic activities and the problems you have suggested are also similar to those found in the Savanna lands of Africa.

In this lesson, you have learnt that:

- areas with a Savannah type of climate receive moderate rainfall,
- type of climate

one rainy season stretching for about seven months followed by a dry season lasting about four months. This is called unimodal climate.

- Savannah regions experience hot temperatures for most of the year.
- the activities carried out by people living in the savannah lands are mainly influenced by the hot temperatures and moderate rainfall.
- there are unique problems which are brought about by the climate.

#### Follow-up Activity

Study Figure 2 and do the tasks that follow.

Month	J	F	M	A	M	J
Temp (°C)	24	23	22	21	20	18
Rainfall (mm)	200	175	100	25	20	0

J	A	S	O	N	D
17	18	20	23	24	24
0	0	0	50	100	175

**Figure 2: Mean monthly Temperature and Rainfall for Station H**

5. Draw a suitable graph to represent the information in the table.

6. Determine the:
  - (v) wettest month, and
  - (vi) driest months at Station H.
7. How many rain seasons does Station H experience?
8. Why is it correct to say that Station H experiences a Savannah climate?

## What You Can do if You are at Higher Risk of Severe Illness from COVID-19

### Are You at Higher Risk for Severe Illness?



Based on what we know now, those at high-risk for severe illness from COVID-19 are:

- People aged 65 years and older
- People who live in a nursing home or long-term care facility

People of all ages with underlying medical conditions, particularly if not well controlled, including:

- People with chronic lung disease or moderate to severe asthma
- People who have serious heart conditions
- People who are immunocompromised
  - Many conditions can cause a person to be immunocompromised, including cancer treatment, smoking, bone marrow or organ transplantation, immune deficiencies, poorly controlled HIV or AIDS, and prolonged use of corticosteroids and other immune weakening medications.
- People with severe obesity (body mass index [BMI] of 40 or higher)
- People with diabetes
- People with chronic kidney disease undergoing dialysis
- People with liver disease

### Here's What You Can do to Help Protect Yourself



**Stay home if possible.**



**Wash your hands often.**



**Avoid close contact** (6 feet, which is about two arm lengths) with people who are sick.



**Clean and disinfect** frequently touched surfaces.



**Avoid all cruise travel** and non-essential air travel.

# History

## LESSON 1: The Influence of the 19<sup>th</sup> Century Islamic Movements

### Topic: Islamic Movements of the 19<sup>th</sup> Century Learning Outcomes

By the end of this lesson you will be able to:

1. Define Jihad.
2. Explain causes of Jihads in the 19<sup>th</sup> century in West Africa.
3. Outline the importance of Uthman dan Fodio and Mohammed Bello in the Islamic movements of West Africa.

#### Materials you will need:

- textbooks
- Pens
- Notebooks
- the internet
- the Atlas of West Africa

#### Instructions

1. Use a handbook for Senior 4 history.
2. You can make reference to other related books.
3. If possible, consult an adult and Google/internet while doing an activity.

#### Step 1: Introduction

A Jihad is a holy war ordained by God with the intention of purifying Islam. In simple terms, it is an effort made by believers to live out the Muslim faith as well as possible, to build a good Muslim society and to defend Islam with force if necessary. The holy Quran teaches that soldiers who die in Jihad go to heaven immediately. The Muslim leaders in West Africa tirelessly worked for a spirit of oneness as they fought to purify Islam.

See Figure 4.1 below.



Figure 4.1: Jihadists in Central Mali

#### Step 2: Causes of the 19<sup>th</sup> century Jihads in West Africa

Although Jihads were religious movements, they had a mixture of political, economic and intellectual causes. The Muslim leaders of the Jihads also had an important mission of spreading Islam. They looked at war essentially as a religious duty. The war was an extension of intensive teaching and preaching.

The number of pagans was increasing steadily and it created a need to convert them to Islam with force where it was necessary. There was an increase in evil practices such as adultery, alcoholism and corruption. Some leaders of the Hausa were greedy and their mission was self-enrichment. Leaders such as Uthman dan Fodio launched Jihads because they were sure of defeating the corrupt ones.

Jihads were also caused by political factors such as interstate conflicts. The Fulani were tired of being dominated by the Hausa and, therefore, wanted to get rid of Hausa domination. The Jihad leaders wanted to protect people from all forms of oppression and exploitation. War became one of the means of bringing about meaningful changes in society. The 19<sup>th</sup> century recorded unfair judgements in courts of law. The Muslim leaders were, therefore, focused on ending these unfair judgements since they were against the practices of Islam.

The 19<sup>th</sup> century Jihads also had some economic causes. Governments such as that of Western Sudan overtaxed their subjects. Fulani town merchants always complained of heavy taxes in their trade while Fulani pastoralists were opposed to high taxes on their cattle. Worse still, the methods of collecting taxes were ruthless.

There were also intellectual causes. The Jihad movements aimed at spreading Islamic education in West Africa. They hoped to make an ideal Islamic society through education.

A look at the above factors shows that the situation was ripe for a revolution. All that was needed was a spark to set things ablaze.

#### Task

1. Why were Jihads called Holy Wars?
2. Mention any developments that West Africa experienced during the Jihad movements.

#### Step 3

The Islamic movements of West Africa were largely spearheaded by Muslim leaders such as Uthman dan Fodio and Mohammed Bello. They committed themselves to ensuring that Islam is spread all over West Africa.

#### Usuman (Uthman dan Fodio)

Shaihu Uthman dan Fodio, born Usuman in Foduye, was a religious teacher, revolutionary, military leader, writer and Islamic promoter, and the founder of the Sokoto caliphate. Dan Fodio was one of a class of urbanised ethnic Fulani who

had been living in the Hausa states since the early 1400s in what is now northern Nigeria.



Figure 4.2: Uthman dan Fodio

He was the leader of the first Jihad in Western Sudan Hausa land in the 19<sup>th</sup> century. He was a Fulani preacher and scholar. He played an important role in the wide spread of the West African Jihad movements. He was a great teacher, scholar and Islamic reformer. He was very eloquent and highly learned; he, therefore, built up a large number of followers who looked to him as a saviour. He preached against unfairness in Hausa land, such as over-taxation of the poor; he also revived Islam throughout Hausa land and brought together the different states that were under Fulani leadership.

He brought about national unity in the Sokoto caliphate. As a leader, he treated others fairly, and eventually everyone started treating others as citizens. He preached against all forms of unfairness and became extremely popular.

Uthman was a great scholar who encouraged education. He advocated the building of many Koran schools in the Sokoto caliphate which concentrated on the teaching of Islam and Arabic. He was also a good leader who managed to delegate power and responsibility to other leaders.

#### Importance of Mohammed Bello

Muhammad Bello was the second Sultan of Sokoto and reigned from 1817 until 1837. He was also an active writer of history, poetry and Islamic studies. He was the son and primary aide to Uthman dan Fodio, the founder of the Sokoto caliphate and the first sultan.

He was a great believer in Islam and Islamic reforms. He worked hand in hand with Uthman dan Fodio to establish and administer the Sokoto caliphate. He was a scholar of dan Fodio and when dan Fodio died, Mohammed took on the leadership of the Sokoto caliphate.

He concentrated on the establishment of a modern and competent army (**see Figure 4.4 below**). The army was trained with a promotion strategy based on merit. For every soldier to be promoted, he would first undergo the right training and prove that he was competent enough to serve as required. He also ensured that the army was well supplied with military equipment. Owing to its being competent and well-equipped, the Sokoto caliphate army was able to survive on the battlefield.



**Figure 4.4: Modern soldiers undergoing training**

Mohammed Bello held peaceful negotiations with hostile tribes in order to get them to accept his peaceful administration. This strategy was very favourable, since he did not have to do much to convince the people to practise the good values of Islam.

He improved education by encouraging the establishment of Quranic schools (**see photos below**). He made sure that the teachers in those schools were well facilitated so that they would deliver efficiently and effectively. Many mosques were also built during his time.



**Figure 4.5: Class time in an Islamic school**  
**Figure 4.6: An Islamic school**

Mohammed Bello fought corruption and ensured that all forms of injustice were wiped out from the face of West Africa.

#### Task

Using the library and research, describe the contribution of the following personalities in West Africa:

- i) Seku Ahmadu
- ii) Al Hajj Umar

#### Lesson Summary

The Islamic Jihad movements in West Africa resulted largely from the need to spread Islam as far as possible and also to purify the Muslim religion. In the process of spreading and purifying Islam, the Jihad leaders made an effort to wipe out all forms of injustice in the communities. This, however, was not a smooth operation for some people required force to get them to convert to Islam and follow some of its principles. Much as the movement brought about remarkable changes, some of the results were negative, such as the big death toll that the population suffered.

#### Follow-up Activity

1. Discuss the impact of the Jihad movements on the people of West Africa.
2. Describe the changes that occurred in West Africa during the Jihad movements.

#### LESSON 2: The Influence of Christian Missionaries in the History of West Africa

##### Topic: Christian Missionary Activities in West Africa

#### Learning Outcomes

By the end of the lesson you should be able to:

1. identify the Christian missionary groups that operated in West Africa.
2. explain the motives for their coming.
3. find out the activities of Christian missionaries in West Africa.
4. explain the problems which they faced.

#### Materials you will need:

- a pen
- a pencil
- a notebook

#### Instructions

1. Make sure you have nothing distracting you. Switch off the TV and create a quiet environment for yourself that is suitable for study.
2. Take time to study and understand the information given for each step.
3. In case you find difficulty, it is all right to seek help from any adult that is near you.

#### Step 1: Introduction

- What do you understand by Christianity?
- Think of the different Christian religions around you and the differing beliefs they have.
- These religions started a long time ago and they continue to grow.

Christianity is an Abrahamic monotheistic religion based on the life and teachings of Jesus of

Nazareth. Its believers, known as Christians, believe that Jesus is the Christ, the messiah, whose coming was prophesied in the Hebrew Bible, called the Old Testament in Christianity, and narrated in the New Testament.

A Christian mission is an organised effort to spread Christianity to attract new converts. Missions involve sending individuals and groups, called missionaries, across boundaries, most commonly geographical boundaries, to carry on evangelism or other activities, such as educational or health work.

The activities of Christian missionaries in West Africa first became evident as early as 1456 when the Portuguese launched their mission there. However, they were not successful in their work owing to a number of factors, including the wide spread of Islam. It was only in the 19<sup>th</sup> century that the activities of the Christian missionaries proved successful. The initiative to embark on missionary work was first taken by the Protestant churches of Europe, with the Catholic Church following later.

#### Task

1. Outline the different European Christian missionary groups that operated in West Africa.
2. Identify the challenges that the Christian missionaries faced in West Africa.

#### Step 2: Motives and activities of Christian missionaries in West Africa

The main purposes of missionaries were: First, to make converts to Christ; to build up the Church in the entire world; and to extend Christ's influence by pervading non-Christian societies with his standard of right and wrong. The primary motives of Christian missionaries in West Africa were religious. Many people viewed Africa as a dark continent (**see Figure 5.1 below**). The European missionaries, therefore, wished to save the souls of Africans by converting them to Christianity with the hope to bring them light.



**Figure 5.1: The African dark continent**

Christian missionary interest in West Africa was further stimulated by the desire to stop the spread of Islam. In the 19<sup>th</sup> century, Islam was spreading like a bushfire in West Africa following the Jihad movements. Christian missionaries, therefore, wanted to halt the spread of Islam in West Africa.

European missionaries wanted to wipe the images of slave trade (**see Figures 5.2 and 5.3 below**) from the face of West Africa and clear their name before the Africans. They looked at their effort to spread Christianity in Africa as a way to compensate for the horrible crimes that Europe had committed against Africa.



**Figure 5.2: A slave caravan**



**Figure 5.3: A slave ship**

The missionaries also had humanitarian motives. In the process of spreading Christianity, they hoped to stop all inhuman acts that were rampant in Africa through preaching against them and preaching the love of Christ to Africans who had been dehumanised.

Missionaries had economic motives, too. Through their teaching and preaching, they wanted to create an atmosphere that was conducive to carrying out legitimate trade in Africa. They also encouraged Africans to grow cash crops, which would be a great boost to the economy.

The missionaries also wanted to spread western education so as to spread western cultures and values. That is why they established many schools in West Africa.

Christians also came to West Africa to facilitate the establishment of colonial rule. They worked hand in hand with the colonial governments and even helped them to identify areas in West Africa that were rich in raw materials.

Christian missionaries made an intentional effort to lead others to the saving faith in Jesus Christ. This was their primary task but, in order to accomplish it, they had to do quite a number of things. They cared for freed slaves, and other vulnerable people that needed help.

They spread Christianity and preached the good news of Jesus Christ and made an effort to convert as many people as possible. They shaped the attitude of people towards many things. The Africans changed their attitude towards certain practices such as polygamy, witchcraft and traditional African practices.

The missionaries encouraged the development of education, establishing many schools, such as Fourah Bay College, which was set up by the Church Missionary Society and where prominent historical figures such as Samuel Ajayi Crowther received their education. The missionaries also built many churches in West Africa.



**Figure 5.4: A missionary school**



**Figure 5.5: A Christian church**



**Figure 5.6: A mission church**

The missionaries taught local people many languages, such as English and French. Many people learnt the languages through missionary education. These languages became very important in the development of West Africa. The missionaries also played a significant role in the development of agriculture by teaching Africans better methods of farming. The missionaries taught Africans by example because they knew farming. The missionaries also taught many skills, such as bricklaying and carpentry, which Africans later used as sources of livelihood, hence improving their livelihoods.

### Task

Carry out internet research and find out the careers of the following missionaries in West Africa:

- i) Bishop Samuel Ajai Crowther
- ii) Bishop Joseph Shanahan



**Figure 5.7: A brick-making project**

### Step 3: Problems faced by missionaries in West Africa

Missionaries faced a number of challenges as they performed their activities. They included the following:

The greatest problem faced by the early European Christian missionaries were the tropical climate and health hazards. Many missionaries died because of the climate. This single problem made missionary work very difficult. The missionaries were also affected by tropical diseases such as malaria. Most of them contracted the tropical diseases and because they had no access to medicines, some of them succumbed to the diseases during their missionary work.

Missionaries did not have enough funds to carry out their missionary activities. They depended on alms that came from their mother countries. These alms would always take very long to reach them, thus causing them to lead very difficult lives. When the missionaries came to West Africa, most of the roads and railways were not yet developed so they faced difficulties in moving from place to place to carry out their activities.

The missionaries faced the problem of language barrier. It was very difficult for them to communicate with Africans yet they had to work closely with them. They used interpreters who were not reliable sometimes. In addition, the Africans who worked for them as porters were not honest; they would run away with some of the missionaries' items.

The missionaries also met resistance from Africans who looked at all whites as connected to slave trade. It took some time for the missionaries to convince these Africans that they had come for a good cause.

The missionaries also faced the problem of natural vegetation such as thick forests which were difficult for them to penetrate. They would sometimes encounter wild animals which were a threat to their lives. This put their lives at risk and interfered with their activities.

### Task 3

1. Discuss the social, economic and political impact of Christianity on West Africa.
2. Carry out research and find out the different measures that Christian missionaries used to preach their message.

### Lesson Summary

Christian missionaries in West Africa came with a major intention of spreading the gospel of Jesus Christ. However, they paved the way for the colonisation of West Africa and influenced Africans to adopt foreign cultures and practices. This left African culture partly eroded and western culture and successfully established western education. Regardless of the challenges faced by European missionaries, they successfully accomplished their mission.

# Entrepreneurship Education

## PROJECT: Making charcoal briquettes, designing a poster for advertising them and making a package for the briquettes

By the end of this project, you should be able to:

1. Identify the right materials needed for making charcoal briquettes.
2. Make charcoal briquettes.
3. Explain three benefits of using charcoal briquettes in relation to ordinary charcoal.
4. Write a brief report on making charcoal briquettes explaining some of the challenges faced while making the briquettes, how these were overcome and any lessons learnt from the project work.
5. Design a poster for advertising your charcoal briquettes.
6. Identify the right materials for making packages, design a package for your charcoal briquettes and Label it.

**NOTE:** You can use any material you think will make your package attractive.

### Read the scenario below and respond to the instructions given.

#### SCENARIO

#### HOME MADE SOLUTIONS TO EFFECTS OF THE CORONAVIRUS PANDEMIC

The world registered the first case of Coronavirus (COVID 19) in December 2019, in Wuhan City in China. The disease was declared a global pandemic by the World Health Organisation on 11<sup>th</sup> March 2020. By 14<sup>th</sup> April 2020, the pandemic had spread to 210 countries infecting over 2,000,000 people with close to 120,000 deaths registered.

To mitigate the spread of the virus and to avoid creating a fertile ground for its spread, His Excellency the President of the Republic of Uganda, Mr. Yoweri Kaguta Museveni ordered the closure of public gatherings like Schools, Churches and Bars, and suspended public transport on 20<sup>th</sup> March 2020. He further put in place a Task Force to steer the fight against the **spread** of the disease. Among the measures taken, was to declare a national lock down and curfew from 7:00pm to 6:30am for 14 days.

The effects of the coronavirus are enormous, ranging from health, social and economic among others. Indeed, following the lockdown, a number of people have complained about failure to feed their families. Consequently,

government provided food for such families. However, due to the lock down, fuel specifically charcoal, became expensive and scarce yet majority of families especially in the urban areas use it as a source of energy. As a learner of entrepreneurship, you are expected to provide solutions to business challenges.

#### Activity one

At your home, you have several resources like domestic waste, peelings and soil which you can use to make charcoal briquettes, to solve the problem at hand.

#### Task

- i. Identify the right materials needed for making the charcoal briquettes.
- ii. Make charcoal briquettes using the materials you have identified following the step by step procedure provided below.
- iii. Write a report, explaining some of the challenges you faced while doing the project work. How did you overcome the challenges? Mention any lessons you have learnt from the project work.
- iv. Explain three benefits of using charcoal briquettes.
- v. Assuming you want to make briquettes for sale, design a poster to advertise your charcoal briquettes, using either your exercise book or a plain sheet of paper whichever is available. Make your poster as attractive as possible.
- vi. Design a labelled package for your charcoal briquettes. You will present your report, the poster and the package to your class teacher when schools reopen after the lockdown.

**Note:** The project may not be finished in one day, you may choose to take a few days doing it. You can keep some of the briquettes for home use but keep some for presenting to your teacher as part of your project work when schools reopen.

#### MATERIALS REQUIRED

SN	ITEM	ALTERNATIVE	QUANTITY
1	charcoal dust	Fresh cow dung	4 (tumpeco) cups
2	Soil	Anti-hill soil/brown soil/Clay	2 (tumpeco) cups
3	Water		4 (tumpeco) cups
4	Basins	Container	3
5	Gloves	Polythene bag/open hand	1pair
6	Plastic cup (tumpeco) = $\frac{1}{2}$ litre	Mug	1

#### Instructions

1. Make charcoal briquettes using some of the readily available materials at your home.
2. Use the cup (tumpeco) or mug to measure the materials.
3. Place the materials in different containers.
4. In case you do not have charcoal dust you can use cow dung in the same quantities.
5. Make sure you do not miss out on any step.
6. Record every step followed in the making of briquettes in your note book, because you will have to write the report for submission to your teacher.
7. Using your note book or a sheet of paper, design an advert for your charcoal briquettes.
8. Design a package for your charcoal briquettes. You will submit the report, the advert and the package to your teacher on the day of reporting to school.

#### Step by Step Procedure of Making Charcoal Briquettes

Please pay attention to every detail outlined in the step by step process provided below.

##### Step one: Preparing the waste materials

Using a pair of gloves, polythene bags or your free hands collect the waste materials to use as guided below. Be very careful with the safety of your hands.



**Fig. 1. Putting on Gloves**

Collect four cups of charcoal dust and put it in a container. If you do not have charcoal dust, you can use carbonized charcoal dust or fresh cow dung in the same quantities and follow the same procedure.



**Fig. 2. Charcoal dust**



**Fig.3. Carbonized charcoal dust**



**Fig. 4. Fresh Cow dung Fig. 5. Plastic cup**

### Step two: preparing the charcoal dust

Sieve/filter the charcoal dust and remove the big particles, plastics and any other unwanted materials using your hands to remain with fine charcoal dust. (You can also crush the bigger particles into powder form and use it).



**Fig. 6. A boy sieving charcoal dust.**

### Step three: preparing the soil

Collect two cups of soil preferably brown or anthill soil or Clay soil if its available but normal soil can also be used. Put it in a second container.

Sort the soil removing the bigger particles, sticks, broken glass, stones and plastics.



**Fig.7. Brown Soil  
other soil**

**Fig. 8. Any**



**Fig. 9. Clay Soil**

### Step four: Measuring the quantity of water

Get a small Jerrycan/Jug or any other container and pour in four cups of water.

### Step five: Making the mixture

Measure off two cups of charcoal dust and one cup of soil. Put them in a third container and mix them well using your hands until they are thoroughly mixed.



**Fig.10 Mixing Charcoal dust, soil & water**

**Add water.** Start with a small amount of water and mix it into the mixture using your hands. Keep adding water until the mixture becomes easily moldable. When squeezed, your mixture should hold together easily. When the mixture is too soft add more charcoal or soil, and if it is too hard add more water.

### Step six: Molding the briquettes

Take a hand full of your mixture and mold using your two hands until it is hard enough. The mold or briquette can be in a round shape or any other shape you want. You can make briquettes of any reasonable size.



**Fig. 12. Picking a handful of mixture**



**Fig. 13. Molding the mixture into briquettes**

### Step seven: Drying the briquettes

Place the molded briquettes on a flat surface ready for drying. Set your briquettes in a dry place. Briquettes need 2-3 days to dry properly before you can use them. If placed in an open place do not leave them outside because in case it rains they can get spoilt. Alternatively, you can dry them under a shade.



**Fig.14. Laying molded briquettes on a flat surface for drying.**

### Step eight: Using your briquettes

Light your charcoal stove using a few usual charcoal pieces. When it is hot enough add the

briquettes and cook.



**Fig. 15. Lighting the charcoal briquettes and cooking.**

### Summary

After going through the step by step process, it is assumed that you now know what briquettes are. Below is an explanation of what briquettes are.

These are small, compact blocks made from organic waste which you can use for cooking in the charcoal stove or fire. While some briquettes require expensive machinery to make, others can easily be made at home from the locally available waste materials with no machinery required.



**Fig. 16. Sample of Charcoal briquette**



**Fig. 17. Briquettes burning in a charcoal stove**

### Follow up activity

- Continue practising the making of charcoal briquettes until you perfect the process.
- You can sell the excess briquettes to your neighbours at the end of the lockdown. This will help you to save your earnings.
- In case you have access to the internet, you can make further research using Google on the other ways and materials you can use to make charcoal briquettes.
- Practice designing several adverts for the briquettes to have a variety from which to choose the best.
- Practice designing several packages for the briquettes to have a variety from which to choose the best.

**NOTE:** This project will enable you to answer Paper one at senior four during examinations.

# Art and Design

**Theme: Graphic Design**

**Topic: Designing a Flier**

## Introduction

A Flier is one category of graphic designs which is relatively inexpensive and quick passage of information. Fliers contain selective information in an eye-catching manner. It is usually passed by hand and may have a varying ratio of image to text all put on a single sheet. By practicing this topic, you will be able to create functional designs for the purpose of self-expression and to communicate ideas, information and messages. You will also develop the skill of transforming verbal and text information into graphic design works that communicate ideas

## Resources

You will need:

- Note book, pencils, coloured pencils
- Paper, mathematical set
- Paints, markers and brushes if possible
- Computer with internet if possible

## Project Description: Flier Designing

Fliers being part of graphic designing has similar characteristics and follows the same process of designing like the rest of graphic communications. To remind you of some of the key steps include:

- Determining your format
- Brainstorming the content (idealisation)
- Picking suitable template (orientation)
- Choosing colours
- Integrating graphics with typography (craftsmanship) and
- Cleaning up any clutter (finishing)

## Practice: Analysing Key features of graphic designing

1. Study and discuss examples of fliers presented in figure 4.1a and 4.1b) regarding lay out, choice of fonts, images, and clarity of message.
2. Examine the concept, practices, and vocabulary associated with graphic designing
3. Study the interrelationship of images and or symbols to take the place of words, and consider the effect of illustrations in relation to text.
4. List the common criteria and key purpose of Fliers.

Artists choose to communicate information and/or ideas differently to the public depending on the given circumstances and the targeted audience. Why do you think fliers and posters can serve the same purpose but differently? How are the two designs different?

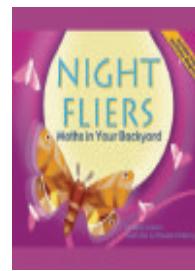


Figure 4.1(a) Examples of Fliers  
4.1(b)

## Create

### Using colour, shape, typography and shapes to communicate a message

1. Study the stages in the graphic making process.
2. If you have access to a computer with internet, search information on the use of fliers.
3. List terms associated with graphic design.

## Task

As part of the campaign to fight the 'COVID-19' the public is being told to keep indoors and avoid gatherings. The cause is not known but the information available is contained in the strategies laid down by the government to containing the pandemic. Create and design a Flier to be circulated to the public illustrating the given strategies to contain the spread of the virus.

## SYMPTOMS OF CORONAVIRUS DISEASE 2019

**Patients with COVID-19 have experienced mild to severe respiratory illness.**



# English Language

## SENIOR 4

**Before we start our lesson, do not forget that COVID19 is a disease affecting every country in the world:**

We are advised:

- not touch our **soft parts (eyes, nose, mouth)** because the virus can pass through them and enter the body
- to wash our hands thoroughly with soap and water
- not to spit anywhere
- to cover our mouth with a tissue when we are **coughing**
- to use a tissue for our nose when **sneezing.**

## LESSON 1

### TOPIC: The Use of Nouns

#### LESSON OUTCOMES:

By the end of this lesson, you should be able to:

1. use nouns as subjects and objects in sentences
2. use nouns as complements in sentences

#### INTRODUCTION

The subject of a sentence is the part which names the person or thing that we are speaking about. Usually the subject comes first in a sentence, just before the verb. For example:

1. **Mary** has a good memory.
2. **Nature** is the best cure.

In the examples above, **Mary** and **Nature** are the subjects in the two sentences. Sometimes, however, other introductory phrases can come before the subject. When this happens, the introductory phrase is separated from the subject by use of a comma. For example:

1. On Monday morning, **Winfred** left for Nairobi.
2. When the pandemic was over, **the schools** reopened.

In questions, the auxiliary verb comes before the subject as shown in the following examples:

1. Has **Winfred** left for Nairobi?
2. Did **the schools** reopen after the pandemic?

In compound and complex sentences, which have more than one clause, each clause has its own subject. For example:

1. Although **Paul** came in late for the lesson, **the teacher** looked calm.
2. **Martin** will tell his mother the truth before **Habiba** is punished.

For the sentences above, the words in thick ink are the subjects while those in italics are the verbs.

#### Activity 1

A) Identify and underline the subject in each of the following sentences. Number 1 has been done for you as an example.

1. The early **bird** catches the worm.
2. Wooden houses are temporary.
3. Muzeeyi Kyijana was a man of courage.
4. After we had been waiting for three hours, the guest of honour arrived.
5. The concert ended at midnight.
6. Should physical education be examined in the examination room?
7. Developed countries attract job seekers from developing countries.
8. Mathematics lessons should always be taught in the morning.
9. The little girl in a red dress is my niece.
10. Do the inhabitants of the islands grow food crops?

- B) Use the following nouns and noun phrases to make sentences. The noun or noun phrase should be the subject of your sentence.
1. Swimming girls
  2. The school captain
  3. Water
  4. Mrs Baale
  5. The papers on the table

#### Activity 2

Look at the words in italics in each of the sentences below:

- i. The doctor treated **the patient**.
- ii. The students took **the books**.
- iii. The Board of Governors built **the classroom**.

The nouns in italics in each of the sentences above is the **direct object** of the verb in that sentence. Some verbs in English have two objects. For example:

- i. Mwesigwa gave **Apio oranges**.
- ii. The tailor made **Raynor a new suit**.
- iii. The students cooked **the parents a tasty meal**.

In each of the sentences above, the verbs: **gave**, **made** and **cooked** have two objects which are written in italics. However, while the nouns **oranges**, **new suit** and **tasty meal** are **direct objects**, the nouns **Apio**, **Raynor** and **the parents** are **indirect objects** which answer the questions **to whom**, **for whom** respectively.

#### Activity 3

In these sentences below, identify the **verb**, the **direct object** and the **indirect object**.

1. The minister donated to the school many books.
2. The headmistress asked the new teacher a number of questions.
3. The citizens lent the school money after the pandemic.
4. The speaker promised the listeners cash awards.
5. My grandmother told George an interesting story.
6. The school bought us new textbooks this term.
7. I will write Mother a letter soon.
8. The missionaries built the community a nursing home.
9. The magistrate gave the lawyer a warning.
10. The doctor wrote the patient a prescription.

#### Activity 4

Rewrite each of the following sentences using the italicized noun as the subject of your sentence.

1. The head teacher gave the street children **food**.
2. Auntie Jessica baked Cissy a cake.
3. My mother sold **the stranger** ripe tomatoes.
4. Racheal will write the manager **an application letter**.
5. The government built **the street families** houses.

#### Activity 5

Look at the sentences below:

- i. Anna Mugoya is **the director** of Kampala Medical Centre.
- ii. She became a **professor** of infectious diseases at the University of Botswana.
- iii. She will remain **the director** of Kampala Medical Centre for four years.
- iv. The United Nations General Assembly elected her **director**.

The words in italics are used as **complements**. They describe a noun or pronoun in the earlier part of the sentence. The **director** in (i), refers to **Anna Mugoya**; a **professor** in (ii) refers to the pronoun **she**; the **director** in (iii) refers to the pronoun **she**; and **director** in (iv) refers to the pronoun **her**.

The **director** in sentence (i) and a **professor** in sentence (ii), are called **subject complements**. **Director** in sentence (iv) which refers to **her** is called **an object complement**.

**Now identify the nouns used as complements in the following sentences.**

1. Dushabe became a director last year.
2. Kasule was appointed principal this year.

3. The meeting named my father a national representative.
4. Judas turned traitor when he found he could earn money that way.
5. Luzzo is a medical doctor.
6. The singer was a rebel soldier.
7. They named the baby Emmanuel.

### Follow Up Activity

After the pandemic you have realized that you need to come up with a family business to support the money earned by your guardian/ parents. Write a letter to the manager of an investment bank in your area, requesting for a loan for a business project. Include in your letter the following:

- i. Start by saying who you are and mention very briefly what you need the loan for.
- ii. Summarize in a couple of sentences your business plan.
- iii. State your own contribution to the project (what you are going to provide).
- iv. State exactly how much you need to borrow and what you need the money for.
- v. Mention that you have enclosed a copy of your business plan.
- vi. Request for an appointment at the bank to discuss your business plan.
- vii. Close the letter.

**NB:** Remember that this is a formal letter and should include the address of the manager.

## LESSON 2

### TOPIC: Interrogative pronouns

#### LESSON OUTCOMES:

By the end of the lesson, you should be able to:

1. use interrogative pronouns in direct questions
2. use interrogative pronouns in indirect questions

#### INTRODUCTION

Interrogative pronouns are used when asking questions. Words such as **what**, **who**, **which** and **whom** are some of the interrogative pronouns used with different meanings. Interrogative pronouns are used with direct and indirect questions. We usually use **who**, **whom**, **whose** to ask direct questions about people. For example:

- i. **Who** is at the door?
- ii. **Whom** did you see in the morning?
- iii. **Whose** shirt was sold yesterday?

We use **what** to ask questions about things. For example:

- i. **What** are you talking about?
- ii. **What** did father buy at the market?

**Which** is used with both people and things. It is used to ask questions about a fixed number of things or people. For example:

- i. **Which** is your friend?
- ii. **Which** is your pen?

Interrogatives are also used to ask indirect questions. However the difference between the direct and indirect questions is that the indirect

questions do not need a question mark. For example:

- i. He asked me **what** the problem was.
- ii. Eria wanted to know **which** team had won the match.
- iii. My boss wanted to know **whom** I had met at the interview.
- iv. Ruth wanted to know **who** was attending the party.

*Study the table below and see the difference between the interrogative as it is used in the direct and indirect questions.*

Direct question	Indirect question
1. Whom do you want to see?	He/She asked me whom I wanted to see.
2. What do you want?	He/She/They asked me what I wanted.
3. Who is reading the novel?	He/She asked me who was reading the novel.

In the direct question, the interrogative pronoun is at the beginning of the sentence and is followed by an auxiliary verb. In the indirect question, the interrogative pronoun is at the beginning of a subordinate clause and is followed by the subject.

#### Activity 1

Complete each of the questions below using an appropriate interrogative pronoun.

1. ----- knows what will happen next?
2. ----- is better, honour or riches?
3. ----- have you decided to do?
4. ----- of the schools voted against holiday work?
5. ----- is to blame for wasting so much public funding?
6. ----- else knew of the existence of the plans?
7. ----- else did you see during your journey to West Africa?
8. ----- was the head teacher talking about?
9. ----- about stopping for a cup of tea?
10. ----- is this?
11. ----- am I speaking to, please?
12. ----- of these boys did you speak to?
13. ----- did she say is the winner?

#### Activity 2

Fill the gaps in the following sentences with the appropriate interrogative pronoun.

1. The doctor asked me ----- had happened to my eye.
2. The police officer wanted to know ----- had invited the troublemaker to the party.
3. His boss asked him ----- he spoke to at the airport.
4. The head teacher asked the senior teacher ----- class the new student had joined.
5. The leader of the band wanted to know ----- I thought of the performance.

6. We don't know ----- uniform was found hidden near the gate.
7. I want to find out ----- match will be played in the afternoon.

#### Activity 3

Complete each of the following sentences by supplying the correct interrogative pronoun.

1. ----- dress is yours and ----- is mine?
2. ----- is the matter with Jane?
3. ----- is performing tonight?
4. ----- of those four actors is still in primary school?
5. ----- wrote this book?
6. ----- subject do you like most in school?
7. ----- bus goes to the showground?
8. ----- knows the answers to both questions?
9. ----- colour is the gate?
10. Here are the books. ----- is yours?

#### Activity 4

**Read the passage and answer the questions which follow.**

#### Why Is Africa So Poor?

What is poverty? Is it the horde of chokoras struggling at the rubbish heap for morsels of rotten food? Or is it the army of underpaid labourers; barefoot, in ragged trousers and tattered shirts, toiling away with crude implements in the scorching sun? One could also suggest that the myriads of scruffy people crammed in hovels in smelly, unhygienic slums are a face of poverty. Out in the countryside, a caring observer may be left heartbroken by those scenes of the semi-starved peasants scratching the denuded soil with sticks and worn-out jembes, trying to eke out a living from what they call 'agriculture'. A herdsman chasing around a few head of scrawny cattle in the name of livestock-keeping is yet another image of poverty. Then you have the perennial gallery of spindle-limbed children with bloated stomachs and wrinkled faces, dying of kwashiorkor, diarrhoea, malaria, measles whooping cough and a hundred other preventable diseases, just because their parents cannot afford available simple cures.

Are these familiar scenes in Africa? That is perhaps an understatement. They are the most familiar images of Africa. Poverty seems to be almost synonymous with Africa. Even the most optimistic and sympathetic assessments of the state of the world's economy list Africa as the poorest continent on the planet. The situation begs three important questions. The first is: Why is Africa so poor? The second is whether we are going to let the situation continue like this forever, or if we can and should do something about it. The last, of course, is: What can we do

and how do we go about it?

The reasons for Africa's poverty are many and varied. Some are historical, some political and others psychological. Historically Africa was, over 500 years, subjected to the dreadful evils of slavery and colonization. First, people came from outside Africa, captured a large number of Africans and took them to their countries to work for them. Since it is obvious that the slavers wanted people who could work, it can be argued that Africa was robbed of its best human power and labour force. Then when the outsiders came and settled in Africa. They took the best African lands to themselves, collected all her riches, including gold, diamonds and other precious minerals, and took them to their countries. Thus Africa was not created poor, and was not always poor. It became poor because it was plundered of its human power and its natural resources.

Though many African countries got their independence over 40 years ago, the 'independent' Africa which the colonialists left behind was a continent riddled with problems. To begin with, it was-- and still is -- fragmented into tiny 'states' and areas of influence, all competing and often fighting against each other and geared towards the interests of their 'home' countries. Africans were never pins to aeroplanes – from Britain, France or America. This situation has not changed much since independence.

Indeed, some people argue that the colonialists all never left at all! They left by the front door, only to come back through the back door. This is what is called 'neocolonialism'; a new form of colonialism. This becomes obvious when you look closely at the people who took control business and trade in Africa, and the economy in general. These are mostly from the same old countries which enslaved and colonized Africa. These days they do not come directly as rulers, but as transnational monetary organizations or international monetary organizations. These companies and organizations have a lot of money and power. Once they are in Africa, they tell us what they want us to do or not to do, if we want to get any of their money. Quite often, what they want us to do is not what is best for our people, but is likely to benefit them and their countries.

What can Africa do in the face of such disadvantages? First and foremost, we must free our minds from the dependency syndrome. We can, and we must, learn to do things for ourselves. We cannot always run to our former enslavers and colonizers, and beg them to give us knowledge, technology and money. As long as we continue doing that, the neocolonialists will continue to despise and exploit us. If Africans can show that we can stand on our own and run our own business, outsiders will cooperate with us fairly and respectfully. Otherwise, beggars cannot be choosers.

Secondly, Africa must unite. The scores of tiny units into which Africa was broken by colonialists, without any consideration for the interests of the Africans, are a major cause of African weakness and poverty. To begin with, a lot of resources are squandered on running services and institutions for tiny countries, some of them with less than a million people. Besides, these countries impoverish one another and the ordinary African by placing all sorts of barriers in the way of anyone who wants to do business and earn a living across artificial borders created by the colonialists. If Africa was united into one, viable, political and economic entity, or at least into large, viable regions, Africans would find it great deal easier to earn a living anywhere on the continent. We would be building up our resources instead of squandering them on petty competitions against one another. Moreover, even those outsiders who want to exploit us would find it difficult to bully and exploit us; we would find it difficult to bully and exploit a big, strong united Africa. Today, the transnationals and other international bodies can intimidate any African country because none of these countries is big or strong enough to stand up to them on its own.

Finally, Africans must start getting their priorities right. Many Africans, especially African leaders, are not poor. Some of them, indeed, are very rich. But what they do with their riches? They kept their money in Swiss bank accounts. Some buy houses and castles in Europe. Others buy fleets of limousines, even in countries where there are no roads fit for use even by bicycles. Do these people, especially in leadership positions, ever stop to ask themselves which is more important; buying a new customized limousine for their teenage daughter or son, saving five thousand starving children who could be fed for the next twelve months using the money spent on the car?

We are not talking about charity. We are talking about honesty and fairness. The starving, diseased and dying people did not elect those leaders so that the leaders could enrich themselves at the people's expense. The people expect their leaders to be selfless and lead the way out of the cycle of poverty. Much of the so-called African destitution is not due to lack of resources. It is due to the greed and dishonesty of some African leaders who loot and hoard all the available resources for their selfish gratification.

*Adopted from: Head Start Secondary English Form 4 by Austin Bukenya, Angelina Kioko and David Njeng're*

#### **Now answer the questions below:**

1. Find the sentences in the passage containing the following words and work out their meanings.
  - a) Horde
  - b) Morsels

- c) Denuded
  - d) Scrawny
  - e) Understatement
  - f) Squandering
  - g) Hoard
  - h) Gratification
2. How does the author's description of the labourers show their poverty?
  3. In about 30 words, explain how historical factors made Africa poor.
  4. Do you agree with the writer that African destitution is not due to lack of resources? Explain your answer.

#### **Follow Up Activity**

Read the following text and then paraphrase it. Notice that in a paraphrase you need to:

- i. rewrite the original text in your own words
- ii. convey the content of the original text accurately.
- iii. use reported speech

What is poverty? Is it the horde of beggars struggling at the rubbish heap for morsels of rotten food? Or is it the army of underpaid labourers, barefooted and in ragged trousers and tattered shirts, toiling away with crude implements in the scorching sun? One could also suggest that myriads of scruffy people crammed in hovels in smelly, unhygienic slums are a face of poverty. Out in the countryside, a caring observer may be left heartbroken by those scenes of semi-starved peasants scratching the denuded soil with sticks and worn-out jembes. Trying to eke out a living from what they call 'agriculture'. A headsman chasing around a few herd of scrawny cattle in the name of live-stock-keeping is yet another image of poverty. Then you have the perennial gallery of spindle-limbed children with bloated stomachs and wrinkled faces, dying of kwashiorkor, diarrhea, malaria, measles, whooping cough and a hundred other preventable diseases, just because their parents cannot afford the available simple cures.

#### **LESSON 3**

##### **TOPIC: Relative Clauses**

##### **LESSON OUTCOMES:**

By the end of this lesson you should be able to:

1. use relative clauses as subjects and objects in sentences
2. use relative clauses as conjunctions in sentences
3. know when to omit a relative clause.

#### **INTRODUCTION**

Relative clauses are sometimes called adjective clauses and follow the noun which they describe. They are dependent clauses which

give additional information about a noun in the main clause, and they follow that noun in the complex sentence they create. Dependent clauses start with a relative pronoun: **that, which, where, when, who**. **Whose** is also used as a relative pronoun but must be followed by a noun in the dependent clause. The correct relative pronoun depends on what noun the relative clause describes.

For example:

1. I saw the man **who** came yesterday.
2. I saw the man **whom** you met at the river.
3. Wambuzi bought the car **which** was on sale.
4. The books **that** you gave me are here.

In each of the sentences above, the relative pronouns in italics refer back to a noun in the same sentence without repeating the noun. This repetition is clearly seen in the sentences below which do not have the relative pronouns used. From these sentences you can see how ridiculous the sentences are as a result of the repetition of the noun phrases: **the man, the car and the books**.

1. I saw the man. **The man** came yesterday.
2. I saw the man. You met **the man** at the river.
3. Wambuzi bought the car. **The car** was on sale.
4. The books are here. You gave me **the books**.

These examples show that the noun phrases that are replaced by relative clauses in numbers 1 and 3 are subjects, while the nouns replaced by relative clauses in 2 and 4 are direct objects.

The relative pronoun **who** is always used as a subject, **whom** is always used as an object, while, **which** and **that** can be used as either subject or object pronouns.

When the relative pronoun is an object, it can be left out without losing the meaning of the sentence. In this case sentences in 2 and 4 can be rewritten as follows:

- I saw the man you met at the river.
- The books you gave me are here.

Relative pronouns are also used to link clauses. They function as **clause connectors** by linking a relative clause to a main clause. See the following examples:

1. a. The coffee is from Tanzania. I bought the coffee from the supermarket.  
b. The coffee which I bought at the supermarket is from Tanzania.
2. a. James found the keys. My brother had lost the keys.

- b. James found the keys that my brother had lost.

Note that the second sentences given in part 'a' are made into a relative clause and joined to the first sentences to make the sentences in 'b'.

### Activity 1

Use relative pronoun to join each of the following pairs of sentences.

1. I know a man. The man has been to the moon.
2. My friend migrated to Zambia. I loved my friend.
3. I saw a soldier. He has lost an arm.
4. The man is deaf. You spoke to the man.
5. The ladies have arrived. I was speaking of them.
6. I heard some news. The news astonished me.
7. This is my cousin. I was speaking of her.
8. We got into a bus. It was full of people.
9. A man came running up. He heard me calling.
10. The grapes were very sweet. You bought them.

### Activity 2

Fill in the blanks with the suitable relative pronoun.

1. He has gone to Tororo ----- is his home district.
2. I do not know the man ----- answered the question.
3. I know the girl ----- left a message for you.
4. Is this the road --- leads to Kamdin?
5. Truth provokes those ----- it does not convert.
6. Bring the letters ----- the postman delivered.
7. We met the sailors ----- ship wrecked.
8. He plays the game ---- he liked best.
9. Only she ----- bears the burden knows the weight.
10. I know to --- this box belongs.

### Activity 3

Rewrite the following pairs of sentences into relative clauses. Use a relative pronoun only when necessary and remember to use the essential commas.

1. This is a beautiful piece of music. It was compared by Beethoven.
2. The bomb exploded in the cinema yesterday evening. At the time there were several hundred people present.

3. The official gave me a travel warrant and some other documents. I needed them for my journey.
4. She bought a new tennis racquet. It was quiet expensive.
5. Do you like suit? I've just bought it.
6. Here are the tablets. The doctor prescribed them.
7. We crossed the river. We crossed it at a point where it was narrow.
8. He learnt to speak French. It is the official language in some West African countries.
9. He didn't give me any reason. He said I should wear a tie.
10. You were telling me about a singer. How old is he?

### Activity 4

**Read and enjoy the passage below.**

#### Traditional African Values

**This text is written by the first president of Zambia, Dr Kenneth Kaunda. In it, he describes traditional values and compares them with those of modern Western society.**

The traditional community was an accepting and inclusive community. It did not take account of failure in an absolute sense. The slow, the less able, and the incapable were accepted as any other member in community life, provided that they were socially well-behaved. Social qualities weighed much heavier in the balance than individual achievement. In the best tribal society, people were values not for what they could achieve but because they were there. Their contribution, however limited, to the material welfare of the village was acceptable, but it was their presence not their achievement which was appreciated.

Take, for instance, the traditional African attitude to old people. Here it should be pointed out how horrified an African is, in most cases, on the first occasion of his acquaintance with the Western phenomenon of old people's homes. In traditional societies, old people are respected and it is respected and regarded as a privilege to look after them. Their counsel is sought on many matters and, however infirm they might be, they have valued and constructive role play in teaching and instructing their grandchildren. Indeed, to deny a grandparent the joy of the company of his grandchildren is a terrible sin. The fact that old people can no longer work, or not as alert as they used to be or even have developed the handicaps of old age, in no way affects our regard for them. We cannot do enough to repay them for all they have done for us.

The experts have all kinds of standards by which

judge the degree of civilization of a people. In African traditional society the test is this. How does that society treat its old people and, indeed, all its members who are not useful and productive in the narrowest sense? Judged by this standard, the so-called advanced societies have a lot to learn that the so-called backward societies could teach them.

The traditional society was an Inclusive society. In other words, the web of relationships which involved some degree of mutual responsibility was widely spread. One could describe industrial society as an exclusive society because its members' responsibilities are often confined to the immediate family, and it may be a self-entire little universe, preventing the acceptance of wider commitments.

Here is an example of the inclusiveness of the traditional society. An African does not restrict the title 'father' to his male parent. He also addresses his father's brothers as father. And he calls his mother's sisters as 'mother' also. Only his father's sisters would be addressed as 'aunt' and his mother's brothers as 'uncle'. 'Brothers' would include not only male children but also certain cousins and even members of the same clan who have no blood relationship in the western sense. Now the eastern mind, confusing state affairs is not merely a matter of terminology. These are not just courtesy titles. With the title of 'father', for example, goes all the responsibilities of parenthood and in return all the 'fathers' receive parental devotion. Hence, no child in a traditional society is likely to be orphaned. Should his literal parents die, then others automatically assume the responsibility for his upbringing? By the same token, no old person is likely to end his days outside a family circle. If his own offspring cannot care for him then other 'children' will accept the duty and privilege.

The extended family provides for richness in knowledge and experience for those fortunate enough to be part of it. Granted, the characteristics of small-scale societies have been described and it could be argued that such a scheme would not work where hundreds of thousands people are gathered together in cities and towns. But the attitudes to human beings as described above are not solely a function of social organization. They are now part of the African psychology.

From; Kenneth Kaunda: Humanism in Zambia *Adopted from English in Use by B Webb, et al.*

## Activity 5

Now answer these questions

1. In what ways do you think modern society (for example, in towns) is different from traditional society (in rural areas)? Make a list.
2. What do you think are the writer's attitudes towards traditional and modern societies? Find evidence from the passage to support your choice of attitude.
3. Comment on what the author means by these phrases:
  - a) Socially well-behaved (paragraph 1)
  - b) Old people's homes (paragraph 2)
  - c) The handicaps of old age (paragraph 2)
  - d) The so-called advanced societies (paragraph 3)
  - e) Literal parents (paragraph 5)
4. Explain the following in your own words.
  - a) Horrified (paragraph 2)
  - b) Acquaintance (paragraph 2)
  - c) Counsel (paragraph 2)
  - d) Infirm (paragraph 2)
  - e) Alert (paragraph 2)
5. Do you agree with the writer's viewpoint about the advantages of the extended family?
6. Do the traditional values the writer describes in the text apply to your society in today's modern world?

## Follow Up Activity.

The Local Council chairperson has identified you to help develop a radio announcement to help the members of the community to stay safe during the CORONA virus pandemic. Write the announcement which will be aired on the local FM station in your area.

## LESSON 4

### TOPIC: Forming adjectives from other words

#### LESSON OUTCOMES:

By the end of this lesson, you should be able to:

1. form adjectives from nouns
2. form adjectives from verbs and other adjectives

## Introduction

There are many adjectives that are formed from

other words. Such adjectives are easy to identify because they have typical endings. We will start with adjectives formed from nouns. These are formed by the addition of a suffix to a noun as seen in **Table I** below:

**Table I**

suffix	noun	Adjective	Sentence example
-al	environment	Environmental	Environmental factors influence character.
-ial	Influence	influential	Mazru is an influential scholar.
-ual	Fact	factual	Scientist give us factual information.

There are also adjectives formed from other adjectives as seen in **Table II** below:

**Table II**

suffix	verbs	adjectives	Sentence example
-able	manage	manageable	The work I need to do today is manageable.
-less	relent	relentless	The rebels were subjected to relentless bombing by the loyal soldiers.
-ful	resent	resentful	She was resentful at having been ignored at the party.

Lastly there are a few adjectives formed from other adjectives such greenish from the adjective green; wearisome from the adjective weary and elderly from the adjective elder.

## Activity 1

Draw a table similar to the Table I and II above and use the following suffixes to create your own examples of nouns, adjective and sentence examples.-al, -ial, -ual, -less, -en, -ese, -ful, -ly, -ic, -some.

## Activity 2

Form adjectives from the following words:

Compassion hope swell demonstrate examine awe child rebel prevent fear.

## Activity 3

Use the adjectives you have formed above to make sentences.



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# SENIOR FOUR SELF STUDY MATERIALS SCIENCE PACKAGE



## CHEMISTRY

### Topic: Reaction Rates and Reversible Reactions

By the end of this topic, you should be able to observe and explain the effects of different factors on reaction rates.

#### Introduction

Why are some reactions much faster than others? Is it possible to change how fast a reaction occurs? In this **lesson**, you will learn what the rate of a chemical reaction is. You will also discover how factors such as temperature, concentration, surface area, and catalysts impact reaction rates.

#### Reaction Rate

When you hear the word rate, what do you think of? A loan interest rate? A rate of speed? A growth rate? Or maybe a rate of pay? Most rates have something happening in a specific amount of time, like the percentage of interest you pay on a bank loan every month, how far you drive in an hour, how fast you grow in a year, or how much you are paid every hour.

In Chemistry, the rate of a reaction describes how fast a reaction proceeds over time. In other words, a rate of reaction measures how quickly **reactants are changed into products**.

Reaction rate is the change in concentration of reactants over time or the change in concentration of products over time. Units for reaction rates are in terms of Mass/time. For faster reactions, seconds are used for units of time; for longer reactions, minutes are used.

Reaction rates may be expressed in terms of any chemical substances involved in the reaction. Reaction rate can be written for the disappearance of a reactant or the appearance of a product.

As an example of a reaction, take the reaction between hydrochloric acid and zinc metal. When combined, the acid "eats away" the metal to produce hydrogen gas and some dissolved metal salts. The rate of this reaction could be measured in terms of the disappearance of the zinc or the rate of appearance of hydrogen gas.

If we were expressing reaction rate in terms of disappearance of zinc metal, we would write:

$$\text{Reaction rate} = \frac{-\text{change [zinc]}}{\text{time}}$$

**(If you were to draw a graph for this reaction, the slope of the line would be negative, because the concentration of our reactant is constantly decreasing.)**

If we were expressing reaction rate in terms of appearance of hydrogen gas, we would write:

$$\text{Reaction rate} = \frac{\text{change [hydrogen gas]}}{\text{time}}$$

**(If you were to draw a graph for this reaction, the slope of the line would be positive, because the concentration of our reactant is constantly increasing.)**

This reaction happens quickly, but think ... What are some ways that we could increase the rate of reaction? What are some ways that we could decrease the rate of reaction?

Before we talk about factors that influence reaction rate, let us look at a chemical reaction on the molecular level.

#### Chemical Reactions: A Molecule's View

Remember, molecules are made up of atoms bonded together by the sharing of electrons. These bonds are relatively strong and require a certain amount of energy to break. The random bumping and colliding of molecules with each other generally does not contain enough energy to break these bonds and cause a **chemical reaction**. Additionally, molecules must collide with proper orientation.

According to the collision theory, in order for a chemical reaction to happen, there needs to be an effective collision between the reactants. To be effective, a collision must meet the following two requirements:

- i) Molecules collide with enough energy to break bonds
- ii) Molecules collide with a favourable orientation

Any factor that affects the likelihood of an effective collision also affects the rate of reaction. Chemical reaction rates can differ when different factors are

present. In this lesson, you will focus on the main rate changing contributors: temperature, concentration, surface area, and catalysts.

#### Temperature

**Activity 1: You will investigate the effect of temperature on the rate of the reaction.**

**Things you will need:** An anti-acid tablet (e.g. magnesium/activated charcoal tablets) two plastic cups labelled A and B, cold/iced water, hot water

#### Procedure

1. In cup A, put the iced/cold water and add ½ a tablet of anti-acid tablet.
2. In cup B, put the hot water add ½ a tablet of anti-acid tablet.
3. Observe which reaction is the quickest.

#### Questions

1. Which reaction had the fastest rate? How were you able to tell this?
2. Explain what could be occurring at the molecular level. (How are the molecules moving or acting?)

#### Concentration

**Activity 2: You will investigate the effect of concentration on the rate of a reaction.**

You will use the different concentrations of vinegar and baking soda for these reactions.

**Things you will need:** Vinegar/lemon juice, baking soda, water, cup, tea spoon

#### Procedure:

1. In one cup, use pure vinegar/lemon juice (3mL) and place one tea spoonful of baking soda.
2. In another cup, add pure vinegar/lemon juice (1.5mL) and water (1.5 mL) before you add the tea spoonful of baking soda.
3. Observe what is happening in the cups.

#### Questions

1. Which reaction had the fastest rate? How were you able to tell this?

- Explain what could be occurring at the molecular level in each example. (How are the molecules moving or acting?)
- Why are high concentration reactions faster than low concentrations?

### Surface area

**What is surface area?** Surface area is the exposed matter of a solid substance. Imagine that you are holding a perfect cube of magnesium. The surface area is the sum of the area of all six sides of the cube. The surface area of the cube can be increased by dividing the cube into smaller cubes. Surface area is maximized when a single large cube is crushed to fine powder.

#### Activity 3: You will investigate the effect of surface area on the rate of a reaction.

You will use **steel wool** and the lighter/source of heat for the reactions.

**Things you will need:** Steel wool, box of matches

### Procedure

- Ball up pea size amount of steel wool. Burn the piece for 10 seconds.
- Spread out the same amount of steel wool. Burn the spread-out piece for another ten seconds.
- Make observations of what happens in both cases.

### Questions

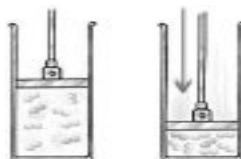
- Which reaction had the fastest rate? How were you able to tell this?
- Explain what could be occurring at the molecular level for the balled piece versus the spread-out piece. (How are the molecules

- moving or acting?)
- If left to burn for more than 10 seconds, which would take longer, the balled piece or the spread-out piece? Explain your answer.

### Pressure

#### How does pressure affect the reaction rate?

The concentration of a gas is a function of the pressure on the gas. Increasing the pressure of a gas is exactly the same as increasing its concentration. If you have a certain number of gas molecules, you can increase the pressure by forcing them into a smaller volume.



Under higher pressure or at a higher concentration, gas molecules collide more frequently and react at a faster rate. Conversely, increasing the volume of a gas decreases pressure which in turn decreases the collision frequency and thus reduces the reaction rate.

It is important to note, however, that there are reactions involving gases in which a pressure change does not affect the reaction rate. For this reason, the rates of reactions involving gases have to be determined by experiment. Also note that solids and liquids are not affected by pressure changes.

### Catalyst

#### Activity 4: You will investigate the effect of catalysts on the rate of a reaction.

You will use the catalyst provided with the vinegar and baking soda for these reactions.

**Things you will need:** Vinegar, baking soda, yeast, balloon, plastic bottle

### Procedure

- In a small plastic bottle, use pure vinegar and place one tea spoonful of baking soda and cover with a balloon.
- In another small plastic bottle, add pure vinegar and add catalysts (yeast) before you add the tea spoonful of baking soda covered with a balloon.
- Make observations of what happens in both cases.

### Questions

- Which reaction had the fastest rate? How were you able to tell this?
- Explain what could be occurring at the molecular level in each example. (How are the molecules moving or acting?)
- How does the catalyst cause this effect?  
**Hint:** Think of the structure of the catalyst

### Follow-up Activity

- Utilise your knowledge of reaction rates to explain why we keep most foods in the refrigerator.
- Utilise your knowledge of reaction rates to explain why highly concentrated medications can be deadly.
- If the temperature, concentration or surface area were increased in the following scenario, hypothesize how it would change the reaction.  
Reactant A + Reactant B → Product

# PHYSICS

## INTRODUCTION TO CURRENT ELECTRICITY

### Lesson 1

#### Competence:

By the end of this lesson, you should be able to:

- Explain what is meant by electromotive force (emf).
- Construct a simple electric cell using local materials.
- Describe how dry cells convert chemical energy into electrical energy.

#### Introduction:

Have you ever used a torch that uses a dry cell (battery)? Have you ever noticed that such a torch does not work

without the dry cell(s)? What is it that these dry cells have that make the torch to light?

#### Materials you need:

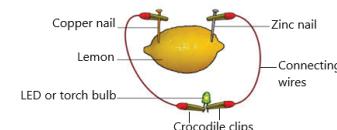
- A lemon/orange fruit
- A dry cell (e.g. Tiger head)
- Two copper nails
- Two zinc nails
- Four crocodile clips
- A torch bulb or LED
- Two connecting wires

#### Procedures:

- Look around your home/community and get the following: Two copper nails
  - Two zinc nails
  - Four crocodile clips

- A torch bulb or a LED
- Connecting wires.

- Pick a lemon or an orange fruit (You can buy one from the market).
- Connect the circuit shown in Figure 1.1. (In absence of the crocodile clips you may connect the connecting wires directly to the nails and the terminals of the LED or bulb).



**Figure 1.1: The lemon cell**

4. Explain what you observe.
5. Remove the crocodile clip from the zinc nail. Explain what you observe.
6. Replace the copper nail with another zinc nail. What happens to the LED?
7. Replace the zinc nails in procedure 5 with two copper nails. What happens to the LED?
8. Reconnect **Figure 1.1**, this time replacing the connecting wires with pieces of cotton thread. What do you observe?
9. Replace the lemon fruit with a dry cell e.g. a Tiger head cell and repeat procedures 3 to 8.

**Activity:**

1. Explain your observations in procedures 6, 7 and 8.
2. Describe the energy transformations that take place in Figure 1.1.

**For your knowledge:**

1. An electrochemical cell is a device which can convert chemical energy into electrical energy. The lemon acts like an electrochemical cell.
2. A closed path connected to an electric cell is called an electric circuit.
3. The energy which the lemon cell produces to drive the electrons round the electric circuit connected to it is called electromotive force (emf).
4. The rate of flow of electrons in an electric circuit is known as electric current or simply electricity.
5. Electric current cannot flow through an open circuit or an insulator like the cotton thread.

**Activity:**

Connect **Figure 1.1** using an apple, a pineapple, a mango, an Irish potato and a tomato. Explain your observations in relation to the brightness of the bulb.

**Lesson 2**

By the end of this lesson, you should be able to:

1. Identify the different types of electric cells.
2. State the uses of electric cells and their limitations.
3. Describe different sources of emf.

**Introduction:**

In lesson 1, you learnt that electricity is the rate of flow of electrons in an electric circuit. Can you name some of the equipment in your home or community which needs electricity to operate? You will now need to understand the different sources of electricity used in different equipment.

**For your knowledge**

1. When two or more electrochemical cells are connected together, they form a battery.
2. There are two types of electrochemical cells/batteries, namely:
  - i. Primary cells/batteries which are not rechargeable.
  - ii. Secondary cells/batteries which are rechargeable.

**Materials you need:**

- Primary cells/batteries.
- Secondary cells/batteries.

**Procedures:**

1. Name some of the commonly used primary cells/batteries in your home or community.
2. Repeat procedure 1 for the commonly used secondary cells/batteries.

3. Study Figure 1.2 and identify the primary and secondary cells/batteries.



**Figure 1.2: Primary and secondary cells/batteries**

4. Name the equipment in which each type of cell/battery shown in Figure 1.2 is applied in your home/community.
5. What are the advantages and disadvantages of using primary cells over secondary cells?

**Project:**

Visit a place where batteries are charged (e.g. where car or phone batteries are charged). Ask the mechanic or the person charging the phone batteries to explain to you what happens during discharging and recharging of a battery and take notes.



**Other sources of electricity**



**Figure 1.3: Some sources of electricity**

**Procedures:**

1. Study images shown in Figure 1.3. Identify the sources of electricity in (a), (b), (c), (d) and (e).
2. Which of these sources of electricity are commonly used in your home/community?
3. Describe how the device shown in (e) produces electricity. (You may ask some technical person in your community to assist you).
4. Do you have some people in your community who use the source of electricity shown in (d)?
5. Inquire on the advantages and disadvantages of using the source of electricity in (d) over the source of electricity in (e), and take notes in your notebook.

6. Compare and contrast the electrochemical cells as a source of electricity to the source of energy shown in Figure 1.1 (b).

**For your knowledge**

1. Direct current is the type of electricity in which the electrons (charges) flow in only one direction. All electrochemical cells and solar cells produce direct current.

Hydro electricity and all electricity produced from generators are alternating currents. Alternating currents vary continuously in magnitude and direction with time.

**Project**



**Figure 1.4**

1. State the economic activities taking place in Figure 1.4.
2. Discuss the suitability of the choice of the source of electricity used in Figure 1.4.
3. Design an economic activity which requires use of electricity. Suggest with reasons, the source of electricity you would employ for your project.

**Lesson 3**

By the end of this lesson, you should be able to:

1. Identify instruments used for measuring current and voltage.
2. Draw the circuit symbols in circuit diagrams.

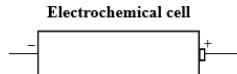
**Introduction:**

An electric circuit has got many components like the source of emf, the connecting wires, the gadget used for measuring the amount of current flowing in the circuit, the bulbs and many others. Scientists have developed standard symbols to identify these components in the electric circuit. In this lesson you will appreciate the use of symbols in circuit diagrams.

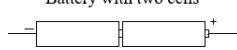
**Circuit symbol for sources of emf**

The emf sources that generate direct currents have one of their terminals (ends or connecting points) labelled positive (+) and the other terminal is labelled negative (-). The circuit symbols are shown below:

**Symbol of a cell**



**Battery with two cells**



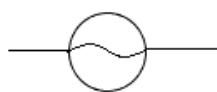
**Circuit symbol for two cells**

**Figure 1.5: Circuit Symbols**

**Activity:**

- Draw a circuit symbol for a battery with six (6) cells.

As you learnt earlier, the emf produced by electric generators yield alternating currents. The circuit symbol for emf sources that generate alternating currents is as below:

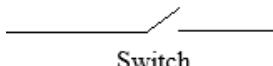


**Circuit symbol for source of alternating emf**

Note that the terminals of the source of an alternating emf do not have + or - signs.

#### Switch

A switch in a circuit component is used to open or close the circuit. The circuit symbol is shown below:

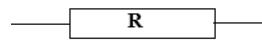


**Switch**

#### Electrical Appliances

When any electrical appliance like a bulb, flat iron, radio, heater, etc is connected in an electric circuit, it opposes the flow of current through itself. Therefore, work must be done to force electric current through the appliance. Such an appliance which opposes the flow of electric current through itself is called a **resistor** in the circuit.

The circuit symbol for any resistor in a circuit is as below:



**Symbol of a Resistor**



**Special symbol for a bulb**

A measure of the amount of opposition to the flow of current through any electrical appliance is called the Electrical Resistance ( $R$ ) of the appliance. The unit for measuring resistance is **Ohm** ( $\Omega$ ).

#### Measurement of Current

The instrument used to measure the amount of current flowing in a circuit is called an **Ammeter**. The unit for measuring electric current is the **Ampere** (symbol **A**). The circuit symbol for an Ammeter is shown below:

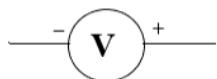


**Circuit symbol of an Ammeter**

The Ammeter has a positive and a negative terminal. In a circuit, the positive terminal of the Ammeter must be connected to the positive terminal of a direct current source of electricity. Traditionally, the positive terminal of the Ammeter was always coloured red while the negative terminal had a black colour. To measure the amount of current flowing through an appliance, the appliance and the Ammeter must be connected in line (series).

#### Potential difference

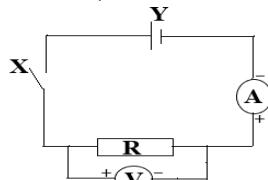
This is the amount of energy required to move current through an electrical appliance against its opposition to the flow of current through itself. Potential difference (pd) is measured in volts (V) using an instrument called the voltmeter. The circuit symbol for a voltmeter is shown below:



**Circuit symbol for a Voltmeter**

When measuring the potential difference across an appliance, the voltmeter should be connected opposite (parallel) to the appliance with the positive terminal of the voltmeter connected to the positive terminal of the source of emf.

All these components can be drawn in a single circuit diagram as shown in Figure 1.6:



**Figure 1.6: Components of an electric circuit**  
**Procedures**

- Identify the components A, R, V, X and Y in Figure 1.6.
- Draw a circuit diagram for Figure 1.1.

#### For your knowledge

- Not all circuit components are very necessary in a circuit e.g. if you do not want to measure the current in the circuit, you can remove the Ammeter from the circuit and hence you do not include it in the circuit diagram.
- Some circuits have a combination of the same components e.g. different brands of bulbs. These must be drawn as resistors with their different resistance values indicated.

### Lesson 4

#### Competence:

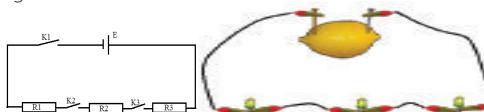
By the end of this lesson, you should be able to explain the series connection of electrical appliances (Resistors).

#### Introduction:

At times you may have many components to connect in a circuit. One of the ways to connect these components is to arrange them in a series.

#### Series arrangement of resistors:

In this case, the electrical appliances (resistors) are connected in line, one following the other as shown in Figure 1.7.



**Figure 1.7: Series connection of resistors**

#### Materials you need:

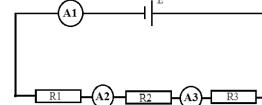
- One dry cell (1.5V size 3D)
- Three torch bulbs
- Three switches
- Seven connecting wires

#### Procedures:

- Connect the circuit shown in Figure 1.7 using the materials listed above.
- Close switch K1. Do the bulbs R1, R2 and R3 light?
- Open switch K1.
- Repeat procedures 2 and 3 for switches K2 and K3.
- Now, close all the three switches K1, K2 and K3. Comment on your observation.
- Remove bulb R3 from the circuit and close all the switches. Compare the brightness of bulbs R1 and R2 before and after removing bulb R3.
- Remove bulb R2 so that only bulb R1 remains in the circuit. Close all the switches and compare the brightness of bulb R1 to its brightness in cases 5 and 6 above.
- What conclusions can you draw from your observations in 5, 6 and 7?

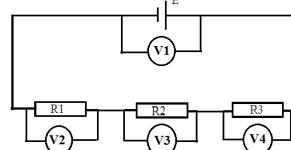
#### Activity:

- Replace the dry cell with a lemon fruit and repeat the procedures 1 to 8 above.
- If you can get Ammeters, replace all the switches with Ammeters as shown in the Figure 1.8:



**Figure 1.8**

- Compare the readings of Ammeters A1, A2 and A3. What conclusion can you draw?
- Look for Voltmeters and connect the circuit shown in Figure 1.9.



**Figure 1.9**

- Compare the readings of Voltmeters V1, V2, V3 and V4. What conclusion can you draw?

#### For your knowledge

- The same current flows through all resistors connected in a series.
- The sum of the potential drops across the individual resistors is equal to the emf of the source of electricity.
- The potential drop across each resistor is directly proportional to the resistance of the resistor.

#### Project

Check the electrical appliances in your home or community which are connected in series to an emf source. What happens when one of them blows? Explain your response.

### Lesson 5

#### Competence:

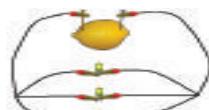
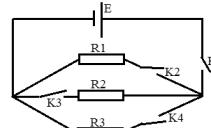
By the end of this lesson, you should be able to explain parallel connection of electrical appliances (Resistors).

#### Introduction:

In lesson 4, you learnt that one way to connect many components in a circuit is to arrange them in a series. Another alternative of arranging these components is to connect them in parallel.

#### Parallel arrangement of resistors:

In this case, the electrical appliances (resistors) are connected side by side as shown in Figure 1.10.



**Figure 1.10: Parallel connection of resistors**

#### Materials you need:

- One dry cell (1.5V size 3D)
- Three torch bulbs
- Three switches
- Seven connecting wires

#### Procedures:

- Connect the circuit shown in Figure 1.10 using the materials listed above.
- Close switch K1. Do the bulbs R1, R2 and R3 light?
- Open switch K1.
- Repeat procedures 2 and 3 for switches K2, K3 and K4.

- and K4.
5. Close switch K1.
  6. Close switch K2 as switches K3 and K4 remain open. Comment on your observation.
  7. Open switch K2.
  8. Repeat procedure 6 and 7 for K3 and K4.
  9. Close switches K2 and K3, leaving switch K4 open. Comment on your observation.
  10. Close all the switches and comment on your observation.

#### Activity:

1. Replace the dry cell with the lemon fruit and repeat procedures 1 to 10 above.
2. If you can get Ammeters, replace all the switches with Ammeters as shown in the Figure 1.11:

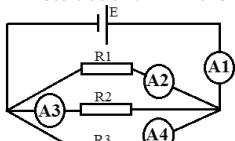


Figure 1.11

3. Compare the readings of Ammeters A1, A2, A3 and A4. What conclusion can you draw?
4. Look for Voltmeters and connect the circuit as shown in Figure 1.12;

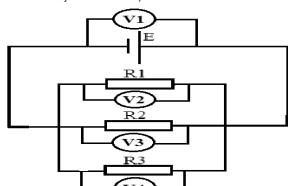


Figure 1.12

5. Compare the readings of Voltmeters V1, V2, V3 and V4. What conclusion can you draw?
6. Discuss the advantages and disadvantages of a series connection over the parallel network of resistors.

#### For your knowledge

1. The potential drop across each of the resistors in a parallel network is the same.
2. The current flowing through each resistor is inversely proportional to the resistance of the resistor. This means that less current flows through components with higher resistance.
3. The current in the circuit is the algebraic sum of the currents flowing through the individual resistors.

#### Activity:

Check the electrical appliances in your home or community which are connected in a series to an emf source. What happens when one of them blows? Explain your response.

#### Project

1. Construct two model houses using ply wood or hard paper with each house having four rooms. Wire the houses such that each room has one bulb. In one house the bulbs should be wired in series while in the other the bulbs should be wired in parallel.
2. Two tenants, A and B, live in different rooms but in the same house. Whenever tenant A switches on his electric stove to start cooking, the bulbs in the room of tenant B go dim. This has brought about conflict between the two tenants. As a Physician, write an explanation to the landlord on the root cause of this problem and suggest a solution.

## Lesson 6

#### Competence:

By the end of this lesson, you should be able to explain a series connection of sources of emf.

#### Introduction:

Most batteries in the market produce emf of up to 1.5V. This value is often written on the cell or battery. However, some of the electrical appliances you use at home require more emf than this to operate. The only way to obtain these high voltages is by combining the cells/batteries.

#### Series arrangement of cells:

In case a higher voltage is required to operate an appliance, the cells are connected in line, one following the other as shown in Figure 1.13.



Figure 1.13: Series connection of resistors

#### Materials you need:

- Three lemon fruits
- One torch bulb or LED
- Four connecting wires
- Eight crocodile clips
- Three copper nails
- Three zinc nails

#### Procedures:

1. Connect the circuit shown in Figure 1.13 (a). Observe the brightness of the bulb/LED.
2. Connect the circuit shown in Figure 1.13 (b). Compare the brightness of the bulb/LED now and in case 1 above.
3. What conclusion can you draw?

#### Materials you need:

- Three dry cells
- Two switches
- One torch bulb
- Six connecting wires

#### Procedures:



Figure 1.14: Cells in series

1. Connect the circuit shown in Figure 1.14 (a) using the materials listed above.
2. Close switch K and note the brightness of bulb B.
3. Open switch K1.
4. Add a third cell E3 to the circuit so that the circuit is as shown in Figure 1.14 (b).
5. Close switch K1 leaving switch K2 open. Comment on your observation.
6. Repeat procedure 5 with switch K1 open and switch K2 closed.
7. Close both switches K1 and K2. Comment on your observation.
8. Compare your observations in procedure 2 to that in procedure 7.

#### Materials you need:

- Three dry cells
- An Ammeter
- One torch bulb
- Six connecting wires

#### Procedures

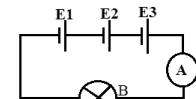
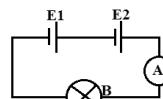


Figure 1.15: Current generated by cells in series

1. Connect the circuit in Figure 1.15 (a). Read and record the Ammeter reading.
2. Connect the circuit in Figure 1.15 (b). Read and record the Ammeter reading.
3. Explain the variations in the ammeter readings in procedures 1 and 2 above.

#### Materials you need:

- Three dry cells
- Four Voltmeters
- One torch bulb
- Six connecting wires

#### Procedures

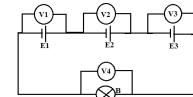


Figure 1.16: Potential different across a bulb connected to cells in series

1. Connect the circuit shown in Figure 1.16.
2. Read and record the readings of the Voltmeters V1, V2, V3 and V4.
3. Remove cell E1 and Voltmeter V1 from the circuit.
4. Close the circuit and take the readings of the remaining Voltmeters V2, V3 and V4.
5. What conclusion can you draw?

#### For your knowledge

When cells are connected in series:

1. They supply more current to the circuit.
2. They supply more energy to drive the charges round the circuit.

#### Project

Check the electrical appliances in your home or community which use sources of emf that are connected in series. What happens:

1. When the terminals of one of the emf sources is reversed?
2. To the aging of the individual sources of emf?

## Lesson 7

#### Competence:

By the end of this lesson, you should be able to explain the parallel connection of sources of emf.

#### Introduction:

In lesson 6, you learnt that one way to connect many sources of emf in a circuit is to arrange them in series. Many cells can also be connected in a circuit in parallel.

#### Parallel arrangement of cells:

In this case, the cells are connected side by side as shown in Figure 1.17.

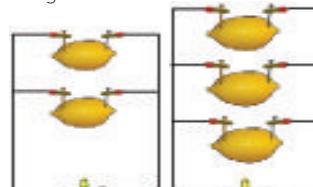


Figure 1.17: Parallel connection of emf sources

#### Materials you need:

- Three lemon/orange fruits

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- One torch bulb/LED
- Seven connecting wires

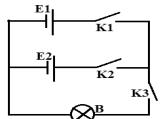
#### Procedures:

1. Connect the circuit shown in Figure 1.17 (a) using the materials listed above.
2. What happens to the bulb/LED?
3. Add a third lemon to obtain the circuit shown in Figure 1.17 (b).
4. What happens to the bulb/LED?
5. Comment on the brightness of the bulb/ LED in procedures 1 and 3.

#### Materials you need:

- Two dry cells
- One torch bulb/LED
- Seven connecting wires
- Three switches

#### Procedures:



**Figure 1.19: The behaviour of cell in parallel connection**

1. Connect the circuit shown in Figure 1.19.
2. Close switch K3. What happens to the bulb?
3. With switch K3 closed, close switch K1 and leave switch K2 open. Comment on your observation.
4. Open switch K1 and close switch K2. Comment on your observation.
5. Close all the switches K1, K2 and K3. Comment on your observation.
6. Compare the brightness of the bulb in procedures 2, 4 and 5.

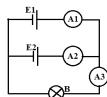
#### Project

Connect three (3) cells in parallel to a bulb and carryout the investigations as prescribed in the above procedures.

#### Materials you need:

- Two dry cells
- One torch bulb
- Seven connecting wires
- Three Ammeters

#### Procedures:



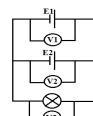
**Figure 1.20: Current supplied by cells in parallel**

1. Connect the circuit shown in Figure 1.20.
2. Read and record the readings of the Ammeters A1, A2 and A3.
3. Comment on the values of current read from Ammeters A1, A2 and A3.
4. What conclusion can you draw?

#### Materials you need:

- Two dry cells
- One torch bulb
- Seven connecting wires
- Three Voltmeters

#### Procedures:



**Figure 1.21: Pd across a bulb connected to cells in parallel**

1. Connect the circuit shown in Figure 1.21.
2. Read and record the readings of the Voltmeters V1, V2, and V3.
3. What conclusion can you draw?

#### Activity:

Check the electrical appliances in your home or community in which the cells are connected in a parallel arrangement. Did you locate these appliances easily? Give reasons for response.

## CHAPTER 2

### VOLTAGE, RESISTANCE AND OHM'S LAW

#### Lesson 1

##### Competence:

By the end of this lesson, you should be able to:

1. Calculate the electric current or charge flowing through a conductor.
2. Determine effective resistances.

##### Introduction:

In chapter 1, you learnt that electric current is the rate of flow of electric charges. Mathematically this can be expressed as:

$$\text{Electric current} = \frac{\text{Quantity of charge}}{\text{Time taken}}$$

$$\text{Electric current} = \frac{\text{Quantity of charge}}{\text{Time taken}}$$

The symbol for electric charge is  $I$ , and that for the quantity of charge is  $Q$ . Therefore, the above equation can be expressed as:

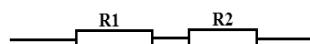
$$I = \frac{Q}{t} I = \frac{Q}{t}$$

The unit of current is Amperes if the quantity of charge is measured in Coulombs ( $C$ ) and time is measured in seconds ( $s$ ).

##### Exercises 2.1:

1. Find the current flowing through a point in a circuit if:
  - i. 20C of charge flows through the point in 3min.
  - ii. It takes 5s for 20C of charge to flow through the point.
  - iii.  $1.2 \times 10^{-6}C$  of charge flows through the point in  $4 \times 10^{-3}s$ .
2. A current of 2.4A flows through a circuit for 1hour, 30min, 10s respectively. Find the charge that flows through a point in the circuit in the respective times.

#### Effective resistance of resistors in series arrangement



**Figure 2.1: Resistors in series**

If two resistors of resistances  $R_1$  and  $R_2$  are connected in series as shown in Figure 2.1, their effective resistance,  $R$ , is given by addition:

$$R = R_1 + R_2$$

Recall the unit of resistance is the Ohm ( $\Omega$ ).

##### Exercise 2.2:

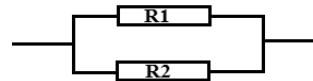
1. Given that the following resistors are in a series arrangement, find their effective resistance:
  - a) 5 $\Omega$  and 7 $\Omega$ .

- b) 12 $\Omega$  and 28 $\Omega$ .

- c) 3 $\Omega$ , 8 $\Omega$  and 9 $\Omega$ .

2. The effective resistance of two resistors connected in series is 15 $\Omega$ . If the resistance of one of the resistors is 7 $\Omega$ , find the resistance of the other resistor.
3. The resistance of one resistor is twice the resistance of another resistor. When the two resistors are connected in series, their effective resistance is 21 $\Omega$ . Find the resistance of each of the resistors.

#### Effective resistance of resistors in parallel arrangement



**Figure 2.2: Resistors in parallel**

If two resistors of resistances  $R_1$  and  $R_2$  are in a parallel arrangement as shown in Figure 2.2, their effective resistance,  $R$ , is given by addition:

$$\frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2} = \frac{1}{R_1R_2}$$

##### Special case:

If there are only two resistors in parallel arrangement, the effective resistance, according to equation (3) is given by:

$$\frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2} = \frac{R_1+R_2}{R_1R_2}$$

$$\therefore R = \frac{R_1R_2}{R_1+R_2} \therefore R = \frac{R_1R_2}{R_1+R_2}$$

From equation (4), the effective resistance,  $R$ , is given by:

$$R = \frac{\text{Product of resistances}}{\text{Sum of resistances}}$$

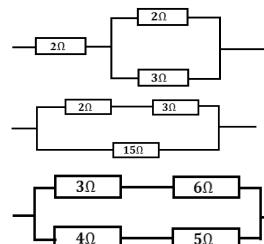
$$R = \frac{\text{Product of resistances}}{\text{Sum of resistances}}$$

##### Exercise 2.3:

1. Find the effective resistances of the following resistors if connected in a parallel arrangement:
  - a) 3 $\Omega$  and 6 $\Omega$
  - b) 6 $\Omega$  and 6 $\Omega$
  - c) 8 $\Omega$  and 12 $\Omega$
  - d) 2 $\Omega$ , 5 $\Omega$  and 10 $\Omega$
2. The effective resistance of two resistors in a parallel arrangement is 2.4 $\Omega$ . If the resistance of one of the resistors is 4 $\Omega$ , find the resistance of the other resistor.

#### Resistors in both series and parallel arrangement

Now that you can find the effective resistance of resistors in a series arrangement or in a parallel arrangement, try to find the effective resistance of the following resistors:



# BIOLOGY

## Topic: Growth and Development

### Introduction

By the end of this topic, you should be able to conduct an experiment on plant growth over time. You should also be able to plot a growth-time graph on the growth observed.

You can easily determine the growth in plants by using a germinating seedling. The rate at which a seedling grows shows the availability of nutrients in the soil and the overall health of the plant.

### Activity: Determining the growth rate of a seedling

In the activity below, you will germinate seeds and take measurements on the shoot of the seedlings to determine the rate of growth.

**Things you will need:** Maize grains, empty plastic water bottle, water, knife or razor blade, ruler, pen / pencil, graph paper

### Procedure

- Half way the length of the water bottle, make a mark with pencil / pen.
- Cut the bottle using a knife or razor blade from the marked part.
- Remove the top part of the bottle.

- Put soil in the remaining part of the bottle.
- Put maize grains in the soil but on the side nearer the wall of the bottle where you can see.
- Sprinkle water onto the soil. Why is this so? Keep checking on the seeds.
- Note down when the shoot appears. Record this as day 0 in the table.

Time (days)	Length of shoot (cm)
Day shoot appears (day 0)	0
Day 2	
Day 4	
Day 6	
Day 8	
Day 10	

- Then after two days, measure the height of the shoot in millimeters. Continue with measurement and record the result after every two days for the next 5 days.
- From the records obtained, plot a graph of growth rate against time (number of days).

### Follow-up activity

During germination and growth of maize, the dry weight of the endosperm, the weight of the embryo and the total dry weight were determined at two-day intervals. The results are shown in the table below.

Time after planting (days)	Dry weight of endosperm (mg)	Weight of embryo (mg)	Total dry weight (mg)
0	43	2	45
2	40	2	42
4	33	7	40
6	20	16	37
8	10	25	35
10	6	33	39

- On the same axes, draw a graph of the dry weight of the endosperm, weight of the embryo and the total dry weight against time.
- Determine the total dry weight on day 5
- Explain:
  - the decrease in dry weight of the endosperm from days 0 to 10.
  - the increase in dry weight of embryo from days 0 to 10.
  - the decrease in total dry weight from day 0 to 8.
  - the increase in total dry weight after 8 days.

# MATHEMATICS

## Class: SENIOR FOUR

### Mathematics

#### Topic: Algebra

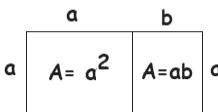
**Introduction:** By the end of the topic you will be able to expand, factorise and solve quadratic equations with degree polynomial of 3.

In S.2 and S.3 you learnt how to expand algebraic expressions, we will begin by revising what we did.

#### Lesson 1

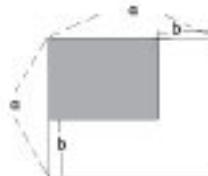
##### Let us review how to expand $a(a+b)$

We shall use a rectangle with length  $(a+b)$  and width  $a$



**Learning Tip:** To find the area of the rectangle, you need to divide it into a square of length  $a$  and rectangle of width  $b$  and length of  $a+b$ .

Total area of Rectangle = Area of square + Area of Rectangle

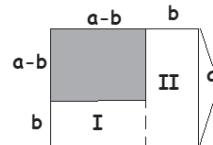


**Learning Tip:** dimension of the square is  $a-b$

Find the Area of shaded Part =  $(a-b)(a-b)$

**Area of Shaded part = Area of big square - Area of Un shaded part**

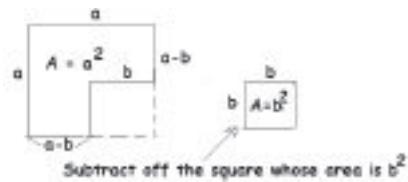
Let us find the area of the shaded part



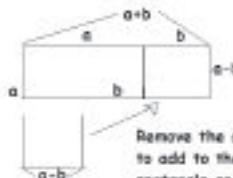
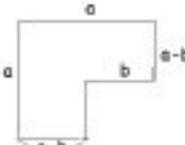
**Learning Tips:** The unshaded part is further subdivided into two portions to enable us find the area

Area of (I+II)

$$A = b(a-b) + ab$$



The remaining area is  $a^2 - b^2$  represented by the shape



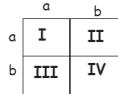
Clearly from the figure;  $(a+b)(a-b) = a^2 - b^2$

**IDENTITY 3:**  $a^2 - b^2 = (a+b)(a-b)$

$$a(a+b) = a^2+ab$$

**Learning Tip:** Finding the area of the rectangle has enabled us to expand  $a(a+b)$  to obtain  $a^2+ab$ . The process introduces us to expansion by opening the brackets.

Using the same approach let us expand  $(a+b)(a+b)$



**Learning tips:** The dimensions of the four-sided figure are  $(a+b)$  and  $(a+b)$

The area of the four-sided figure = Area of  $(I+II+III+IV)$

$$= (a^2+ab+ab+b^2)$$

Area of the four-sided figure =  $= a^2+2ab+b^2$

Hence Expanding  $(a+b)(a+b) = a^2+2ab+b^2$

**IDENTITY 1:**  $(a+b)(a+b) = a^2+2ab+b^2$

### Activity 1

Expand the following

- a.  $(a+2)(a+3)$
- b.  $(a+1)(a+2)$
- c.  $(a+1)^2$
- d.  $(a+2)^2$

**Lesson 2:** Let us now expand  $(a-b)(a-b)$

We use a four-sided square of dimension  $a$ , to find the area of the shaded part.

$$A=ab-b^2+ab$$

The Area of the Unshaded area is  $2ab-b^2$

$$A=2ab-b^2$$

**Therefore, the area of the unshaded part**  
=Area of the big square- The area of the Unshaded part

We have been able to expand  $(a-b)(a-b)$  to obtain the answer as  $a^2+2ab-b^2$

$$(a-b)(a-b) = a^2+2ab-b^2$$

**IDENTITY 2:**  $(a-b)(a-b) = a^2+2ab-b^2$

### Activity 2

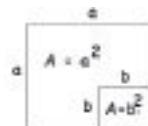
Expand the following

- e.  $(a-2)(a-3)$
- f.  $(a-1)(a-2)$
- g.  $(a-1)^2$
- h.  $(a-2)^2$

**Lesson 3:** Let us expand  $(a+b)(a-b)$

If we consider two squares whose dimensions are  $a$  and  $b$  respectively.

Then we take cut out the square whose Area is  $b^2$  we shall be left with  $a^2$

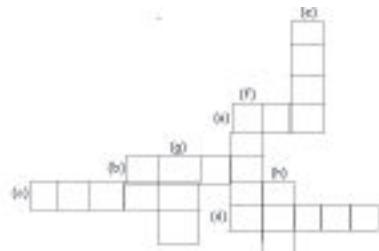


### ACTIVITY

1. Expand the following
  - a)  $(a+3)(a-3)$
  - b)  $(b+4)(b-4)$
  - c)  $(d+5)(d-5)$

### Cross Number Puzzle

You have to solve the given cross number puzzle to qualify for the next round of Mathematics quiz competition. Evaluate the values of given expression at  $x = 0, y = 1, z = 2$ . Fill the cross number along Across and Downward with the help of given clues, (Numbers to be written in words)



### Across

- (a)  $xy + yz + zx$
- (b)  $x^2y^2 + z^2 - 2xyz$
- (c)  $8 - (x+y)$
- (d)  $x^2y^2 + y^2z^2 + z^2x^2$

### Down

- (e)  $x^2 - 2xy (y-z)$
- (f)  $\frac{x^3+y^3+z^3}{3}$
- (g)  $x^3 + y^3 + z^3 - 2yz^2$
- (h)  $2x + 2y + 2$