THE REPUBLIC OF UGANDA

Ministry of Education and Sports

A' LEVEL

SELF STUDY MATERIALS

SCIENCE PACKAGE

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BIOLOGY

Senior Five

Topic: Cell Biology

By the end of this topic, you should be able to describe the structure and functions of the animal cell ultra-structure as visible under the electron microscope. You should also be able to describe the fluid-mosaic model of the plasma membrane.

Activity 1: Revision

Figure 1 below shows the structure of a liver cell as seen using the electron microscope.

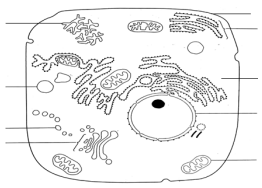


Fig. 1

1. Name the parts of the cell labeled on the diagram.
2. From the diagram, identify the cell organelles which are bound by:
   i) a single membrane
   ii) a double membrane
3. State the functions of membranes within a cell.
4. Figure 2 below shows the bacterial cell.

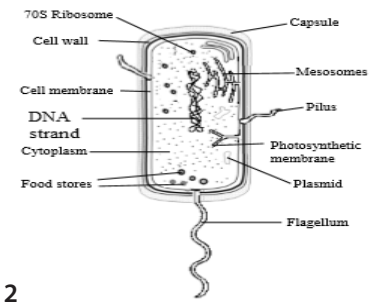


Fig. 2

1. Discuss the adaptations of a bacterial cell.
2. State the differences between the animal cell and a bacterial cell.

Activity 2

Figure 3 is a fluid mosaic model of a plasma membrane.

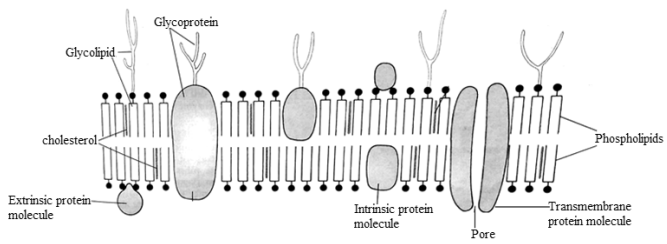
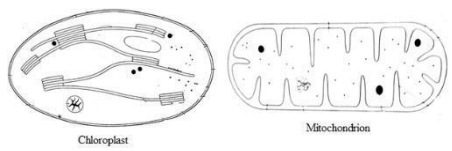


Fig. 3

1. Describe the structure of the plasma membrane as shown above.
2. State the functions of the plasma membrane.
3. How is the structure of the plasma membrane related to its functions?

Activity 3

Observe the following drawing of chloroplast and mitochondrion.



1. State the function of each of organelles in a cell.
2. Describe the structure of each organelle.
   i) chloroplast
   ii) mitochondrion
3. State differences between the chloroplast and mitochondrion.
4. Discuss the adaptations of each structure to its function.

Senior Six

Topic: Nutrition

By the end of this topic, you should be able to explain the environmental and internal factors influencing the rate of photosynthesis.

Activity 1: Revision

Figure 1 shows the rate of photosynthesis of tomato plants under different environmental conditions.

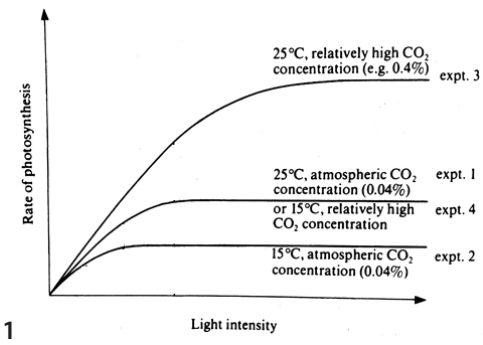


Fig. 1

What is meant by a limiting factor?

1. State the limiting factor in each of the experiments 1, 2, 3, and 4.
2. Explain the results in:
   i) Experiment 1
   ii) Experiment 2
   iii) Experiment 3

Activity 2

In an investigation to study the effect of light intensity on the physiology of Spirogyra, the amount of Phosphoglyceric acid (PGA), Ribulose biphosphate (RuBP), and Sucrose, were determined at different times in the presence of light. At the 35th minute, light was removed completely.

Figure 2 below shows the variation of the amount of PGA, RUBP and Sucrose with time.

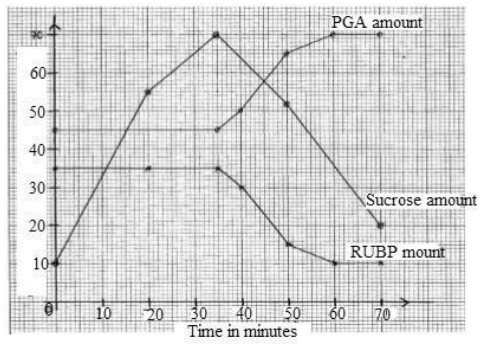


Fig. 2

1. Compare the changes in the amounts of PGA and RUBP with time.
2. Account for the changes in the amount of:
   i) PGA
   ii) RUBP
3. Explain the changes in the amount of PGA and RUBP with time if carbon dioxide was used instead of light.
4. State how the chloroplast is adapted for:
   i) light dependent reactions of photosynthesis.
   ii) light independent reactions of photosynthesis.

Topic: Homeostasis

By the end of this topic, you should be able to describe the structure and function of the nephron.

Activity 1

Figure 3 shows changes in salt (ion) concentration in region C and of the fluid as it passes through part of the nephron of a mammalian kidney.

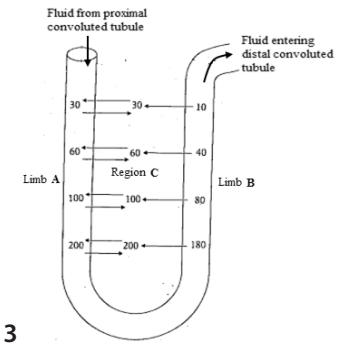


Fig. 3

1. State and explain the principle illustrated in Figure 3 in relation to osmoregulation.
2. Explain the changes in concentration of the fluid in:
   i) Region C
   ii) Limb A
   iii) Limb B
3. State the significance of the changes in concentration of the fluid in Figure 3 to a mammal.
4. Suggest the change in structure of Figure 3 in a mammal living in conditions drier than that of the mammal whose nephron is shown. Give reasons for your answer.

Senior Five

Topic: LIGHT

Sub-topic: Reflection of light at plane surfaces

Lesson 1

Introduction

Light is the energy which is given off by very hot bodies in the form of electromagnetic waves. It makes objects visible to our eyes. Light travels in straight lines. Thus, we may use ray diagrams in order to explain reflection and refraction, as well as their applications.

REFLECTION

Lesson 1

By the end of this lesson, you should be able toexplain and apply the laws of reflection at plane surfaces.

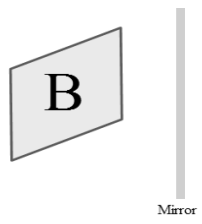
1. A boy stands 3m from a plane mirror in a room. A wall clock is hung on the opposite wall 2m away from the boy. The boy looks at the mirror and sees the image of the wall clock.

(a) What is the distance between the boy and the image of the wall clock?

(b) The boy then walks 1m towards the plane mirror. What is the distance between him and the image of the wall clock at this new position?

(c) The time shown by the wall clock is 9.00 a.m. Draw the hands of the clock on the diagram to show what the boy observes.

2. Kate and John are standing at a distance of 2 m from a big plane mirror. Kate is at a distance of 3 m from John. What is the distance between John and Kate's image?



Draw a ray diagram to show formation of the image of letter B.

Using this diagram, state the characteristics of the image formed.

4. Akello is 1.8m tall. She stands in front of a mirror which is as high as she is. If she can see her full length image in the mirror,

(a) What is the shortest length of mirror that will still show her full length, if her eyes are 12 cm from the top of her head?
(b) Illustrate your answer with a ray diagram.
(c) Akello has a mirror that is far shorter than her full length. She would like to fit in one of her bedroom walls so that she is able to view her full image. Advise her on how best she can do it.

Lesson 2

By the end of this lesson, you should be able to discuss the design and demonstrate the mode of operation of a periscope as an application of reflection.

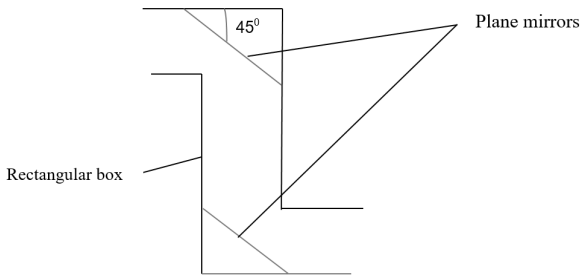
Project: **Construction of a periscope**

A **mirror periscope** is used to view objects in an elevated position from behind an obstruction.

What you need

- Card board
- Two plain mirrors
- Glue
- Knife/razor

Caution: use the knife/razor carefully. It could cut you.



3. Using rays, describe how a periscope is able to view objects behind obstacles.

4. Give practical examples where a periscope is used.

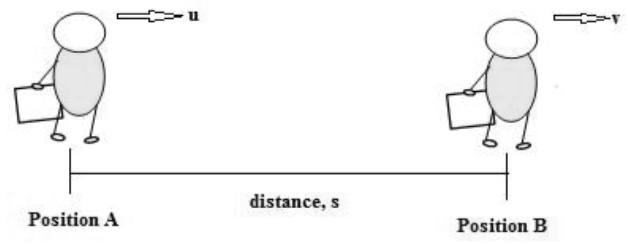
MECHANICS

Introduction

Mechanics is a branch of Physics concerned with the behaviour of physical bodies when subjected to forces or displacements and the subsequent effects of the bodies on their environment.

Lesson 1

By the end of this lesson, you should be able to derive the dimensions of physical quantities and use them to check the consistency of equations.



The illustration in the above figure shows John's initial velocity at position A as u, which increases steadily to a final velocity, v, at position B in a time t.

Represent this information on a velocity-time graph and use it to get the expression:

$v = u + at$ ..... (i)

Using your knowledge of average velocity and equation (i), obtain the expression:

$s = ut + 1/2at^2$ .....(ii)

Using equations (i) and (ii), obtain the expression $v^2 = u^2 + 2as$ .....(iii)

Check for the consistency of the equations in each case.

1. In trees, or generally plants, fluids rise through the xylem. If we assume the pressure at the base of the tree trunk to be atmospheric pressure P_A, then the pressure at which the fluid is rising at a height h above the ground is given by

$P_h = P_A - \rho gh$ where ρ is the density of the fluid and g is the acceleration due to gravity.

Show that this equation is consistent.

If the tree is so tall, P_h can be negative. Explain why this is so.

Would the equation still be consistent?

Senior Six

Topic: ELECTROSTATICS
Lesson 1
Competences:
By the end of this lesson, you should be able to:

- Explain charging by friction.
- Describe the nature of charges in conductors and insulators.

Introduction:
You should remember that all materials are made of tiny indivisible particles called atoms. In the atoms there are protons (particles that carry positive electric charges), electrons (particles that carry negative electric charges) and neutrons (particles which have no electric charges). The protons and neutrons are contained in the central part of the atom called the nucleus. Hence, the nucleus is positively charged due to the charge on the protons. An electrically neutral atom has the same number of protons and electrons.

Charging materials by Friction:
When any two materials are rubbed together, their contact surfaces feel warm (hot). Thus, the surface electrons gain energy. If the energy gained by the electrons exceeds the work function of the material, the electrons escape from one surface to another. The material that gains excess electrons becomes negatively charged while the other becomes positively charged.

Exercise:

- Explain why electrons are able to escape from one surface onto another when two materials are rubbed together.
- What property does the surface which accepts electrons have which differs from the surface that loses the electrons?
- What charge does the material which accepts electrons acquire? Explain your response.

For your knowledge

1. The study of electric charges at rest is called ***Electrostatics***.
2. There are two types of electric charges, namely:
   a) Positive electric charges (carried by protons).
   b) Negative electric charges (carried by electrons).
3. In some materials, the electrons are not strongly bound to the nucleus. Such electrons have some freedom of movement.

Law of electrostatics:
"Like charges repel, unlike charges attract."

Activity 1.1: Investigating charging by friction
Materials you need:

- Perspex (Plastic glass for making rulers or pen casing).
- Fur or hair (No oil should be applied to the hair).
- Small pieces of paper or dirty particles.

Procedures:

1. Spread small pieces of paper on a table.
2. Get a transparent foot ruler and move it slowly over the small pieces of paper. What do you observe?
3. Rub the ruler on fur or on your hair. Move it slowly over the small pieces of paper. What do you observe?
4. Repeat procedures 2 and 3 using the transparent casing of a pen.
5. Explain your observations.

For your knowledge
When Perspex is rubbed against fur, the Perspex acquires a positive charge while the fur acquires a negative charge.

Exercise
Ask friends or search in textbooks and identify materials which acquire:

1. A positive charge by friction.
2. A negative charge by friction.

Insulators and conductors
All electrons in the atoms of electrical insulators such as polythene, cellulose, acetate, ebonite and glass are considered to be firmly bound to their nuclei. The addition or removal of an electron at one point in these materials does not cause the flow of electrons elsewhere.

Electrical conductors such as metals on the other hand have electrons, which are quite free to move within the entire metal. Such mobile electrons are not bound to individual atoms. If a conductor gains an electron, it causes the mobile electrons within the material to move to new equilibrium positions of minimum potential energy. In so doing, the effect of the additional negative charge is spread throughout the entire conductor. A loss of an electron from a conductor causes a resolution of the remaining ones throughout the conductor, which acquires a partial positive charge. The human body, the earth and water are also good conductors.

Exercise

1. What precautions must be taken when handling a charged material to ensure that it does not lose its charge?
2. Why is it not easy to charge metals by friction?

Lesson 2

Competence:
By the end of this lesson, you should be able to explain charging by electrostatic induction.

Introduction:
In lesson 1, you learnt that metals have electrons which move freely within the entire material. You also learnt about the law of electrostatics. Therefore, what do you think will happen to the mobile electrons in a metal when a charged material is brought close to the metal? This should help you to explain the following activities:

Activity 1.2: Charging a single sphere by induction
What you need:

- One metal sphere (e.g. a metallic ball bearing).
- A transparent ruler.
- One wooden stand.

Procedures:

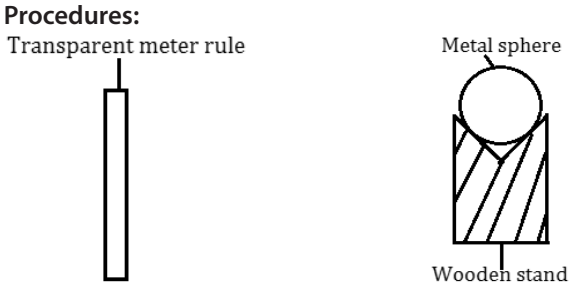


Figure 1.1: Charging a metal sphere by induction

1. Rub the meter ruler on the hair of your head (make sure the hair has no oil).
2. Explain what happens to the meter ruler.
3. Place the metal sphere on a wooden stand as shown in Figure 1.1.
4. Move the rubbed meter ruler close to the metal sphere and hold it in position.
5. Explain what happens to the charges in the sphere.
6. Why is it necessary to place the metal sphere on the wooden stand?
7. While on bare feet, touch the sphere with your bare hand. Explain what is likely to happen to the charges in the sphere.
8. Remove your hands from the sphere and then take away the ruler. Explain the expected condition of the sphere.

For your knowledge

- Electrostatic induction is the process of charging a conductor by bringing a charged material near it.

Activity 1.3: Charging two spheres simultaneously with similar charges. What you need:

- Two metal spheres (e.g. a metallic ball bearing).
- A transparent ruler.
- Two wooden stands

Procedures:

1. Place the metal spheres on wooden stands as shown in Figure 1.2. Ensure that the metal spheres are in contact.
2. Move a negatively charged rod close to the metal sphere A and hold it in position as shown in Figure 1.2.

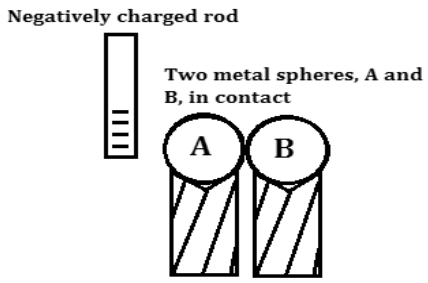


Figure 1.2: Charging two spheres simultaneously by induction

3. Explain what is expected to happen to the charges in the two spheres.
4. Explain what you expect to happen to the charges in the spheres if the two spheres are separated in the presence of the charged rod.
5. What would happen to the charges in the spheres if the charged rod is removed before separating the spheres?
6. Explain what happens if the negatively charged rod was replaced with a positively charged rod in procedures 2 to 5.

Assignment
Design and describe an experiment in which the two spheres would acquire the same charge simultaneously by induction.

Lesson 3

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

1. Describe the structure of the Gold-Leaf Electroscope (GLE).
2. Explain the uses of the GLE.

Introduction:

At O'level, you were introduced to the GLE as an instrument used to detect and measure static charges. In Figure 1.3, you are presented with the structure of the GLE.

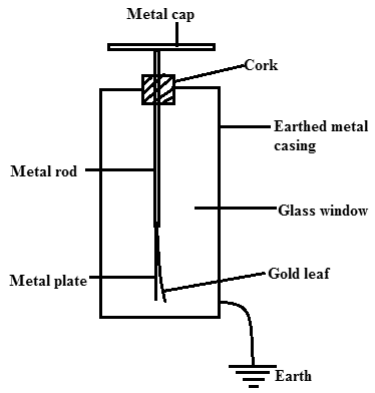
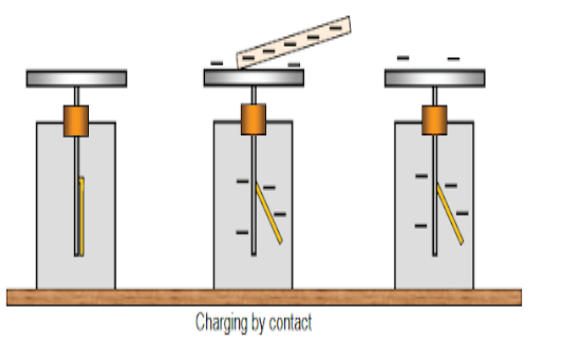


Figure 1.3: Gold Leaf Electroscope

Exercise
Explain the essential features of the GLE.

Charging the GLE by contact



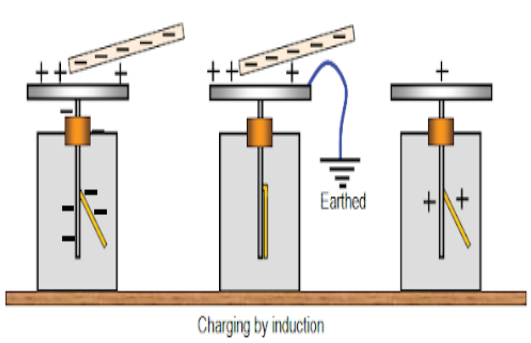


Figure 1.4: Charging the GLE by either contact or by induction

With reference to Figure 1.4, describe the process of charging a GLE by:
1. Contact
2. Induction

Project

Using locally available material (e.g. nails and aluminum foil), construct a GLE and charge it by induction.

Detecting Charge

Materials you need:
- A piece of wood.
- A nail (Iron).
- An aluminum foil.
- Transparent ruler.

Procedure
1. Push the nail into the piece of wood as shown in Figure 1.5 and attach the aluminum foil to it using cello tape.

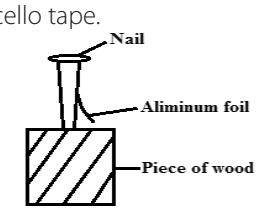


Figure 1.5: Locally made GLE

2. Rub the transparent ruler on your hair so that it acquires some charge.
3. Bring the ruler close to the nail as you observe the aluminum foil. Comment on your observation.
4. Move the ruler away from the nail. What do you observe?
5. Bring the ruler to have contact with the top of the nail. What do you observe even when the nail is moved away?
6. Explain the conclusion you can draw from this experiment.

Assignment:
How would you improve the GLE shown in Figure 1.5 to measure the amount of charge on a material?

Testing charge

This is the process of establishing whether a material is having a positive charge or a negative charge.

Materials you need:
- A piece of wood.
- A nail (Iron).
- An aluminum foil.
- A transparent ruler.

Procedures:
1. Using the materials listed above construct a GLE as shown in figure 1.5.
2. Charge the transparent ruler by friction by rubbing it against the hair on your head.
3. Place the ruler in contact with the nail of the GLE then remove the ruler.
4. Rub the ruler again against your hair and then move it close to the nail of the GLE. What do you observe?
5. Explain your observation in 4 above.
6. Enter your observations in the table below:

Charge on GLE	Test charge	Gold leaf divergence
Positive	Positive	Increases
Positive		
Negative		
Negative		

7. Explain your solutions in each of the rows in the table of procedure 6.

Chemistry

Senior Five

Topic 1: Matter

Lesson 1: What matter is, Atoms, molecules and ions as building blocks of matter

By the end of this lesson, you should be able to:
- explain what matter is
- describe the structure of an atom
- describe the building blocks of matter
- identify the sub-atomic particles
- describe the properties of sub-atomic particles
- explain the fundamental particles of the atom
- write isotopic notation

Step 1: What is matter?

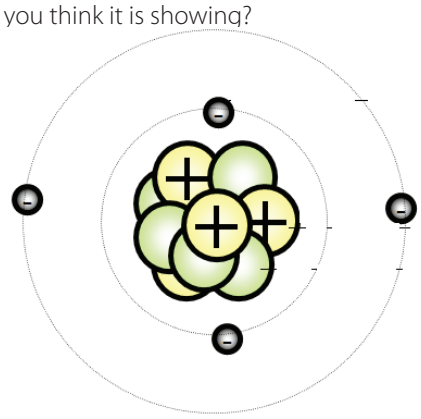
You probably already know from O' level that anything that has mass and takes up space (volume) is called matter. Can you give examples of substances in your surrounding that make matter?

- Examples:
  - A brick has mass and takes up space
  - A desk has mass and takes up space
  - A pencil has mass and takes up space
  - Air has mass and takes up space

All of the above examples are considered matter because they have **mass and take up space**. Can you think of anything that would not be considered matter?

Step 2: What are the building blocks of matter?
You have always come across the terms: Atoms, molecules and ions as building blocks of matter. What do these terms refer to as concerns matter? What is the smallest unit of matter? When you break a piece of chalk or charcoal repeatedly into tiny particles, what product do you get? Is it still chalk or charcoal?

Look at the diagram below:
What do you think it is showing?



The diagram shows the structure of an atom. **The smallest possible unit into which matter can be divided, while still maintaining its properties is called the atom.**

Step 3: How small is the atom?

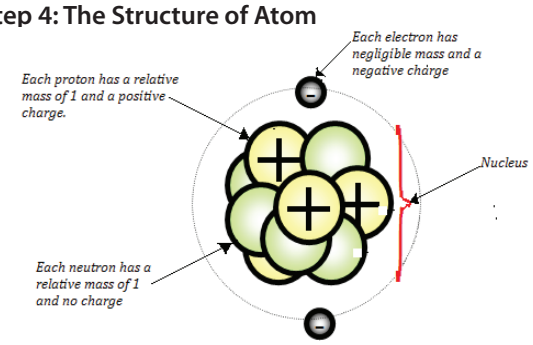
Can you predict the size of an atom?

Atoms are so small that…

- a speck of dust might contain $3x10^{12}$ (3 trillion) atoms.
- it would take a stack of about 50,000 aluminum atoms to equal the thickness of a sheet of aluminum foil from your kitchen.
- it would take you around 500 years
- to count the number of atoms in a grain of salt.
- a human hair is about 1 million carbon atoms wide.

C-C-C-C-C-... + 999,995 more

Step 4: The Structure of Atom



Using the diagram above, give responses to the following questions:

a) In your own words, can you completely describe the structure of an atom?
b) Why an atom is described electrically neutral particle of an element which can take part in a chemical reaction?

Summary of the properties of sub-atomic particles of an atom

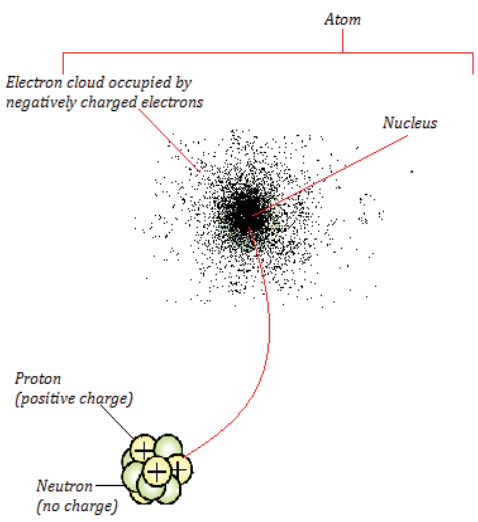


Table 1.1 Selected properties of the proton, neutron and electron

Name	*Relative charge*	*Mass (amu)*	*Mass (gram)*
Electron (e)	*-1*	5.4×10^{-4} $\times 10^{-4}$	9.1095×10^{-28} $\times 10^{-28}$
Proton (p)	*+2*	*1.00*	1.675×10^{-24} $\times 10^{-24}$
Neutron (n)	*0*	*1.00*	1.675×10^{-24} $\times 10^{-24}$

a) Do all atoms of different types have the same number of the fundamental particles? If not, what determines the identity of an atom?
b) What determines the chemical properties of an atom?
c) What determines the mass of an atom of an element?

Atoms of various types differ in their number of protons, neutrons and electrons. The number of protons determines the identity of the atom.

The number of protons is equal to the number of electrons in a neutral atom.
The particles that are found in the nucleus of an atom is termed as a nucleon.

- **Proton number, z,** is the total number of protons found in the nucleus of the atom.
- **Nucleon number**, **A**, is the total number of protons and neutrons found in the nucleus of the atom.

Every element can be identified by the proton number.

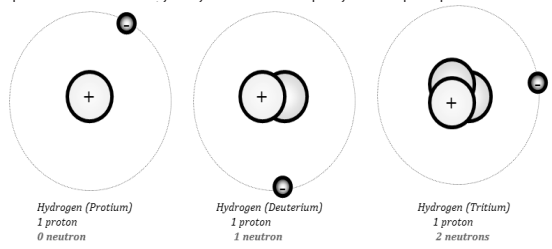
The chemical properties of an atom are influenced by the number of electrons it contains.

Step 5: Can the same element have different atoms?

Yes, the same element can have different atoms. These different atoms are called **isotopes**.

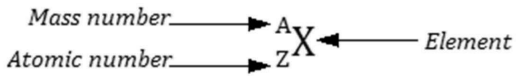
Isotopes are two or more atoms of the same element having the same proton number but different nucleon (mass) numbers.

Isotopes of an element have the same chemical properties but slightly different physical properties.



How can you represent the different isotopes of an element?

Isotopic notation $^{A}_{Z}X$ is a symbol used to designate a particular atom of an element. The mass number (A) and the atomic number (Z) are written as superscript and subscript, respectively, to the left of the element.



Mass numbers are used to identify isotopes. Isotopes are often written with the name of the element followed by the mass number. For example, chlorine atom with 17 protons and 20 neutrons has a mass number of 17 + 20, or 37, and is written as chlorine-37. Using the symbol, chlorine-37 is written as $^{37}_{17}Cl$.

WORKED EXAMPLE 1

Determine the number of protons, neutrons and electrons in the following species: $^{90}_{38}Sr$

Solution

$^{90}_{38}Sr$

number of protons = proton number
= subscript to the left
= 38
number of neutrons = nucleon – proton number
= 90 – 38
= 52
number of electrons = proton number (because the species is neutral)
= 38

Exercise

1. ***Find number of neutrons in chlorine isotope given:*** $^{35}_{17}Cl^{-}$
2. ***Find number of neutrons and electrons in aluminium ion isotope given,*** $^{27}_{13}Al^{3+}$

Lesson 2: Mass Spectrometer and Atomic Mass

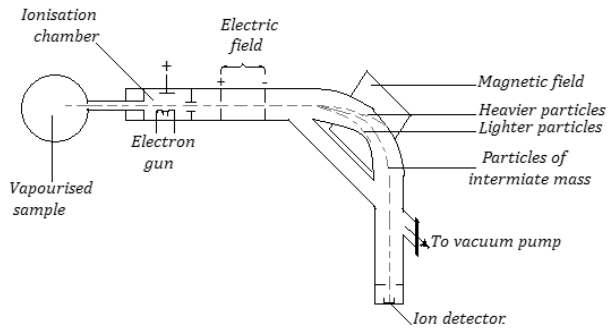
By the end of this lesson, you should be able to:

- describe the essential components of a mass spectrometer
- describe the operation of the mass spectrometer
- calculate the average atomic mass

Who invented the mass spectrometer? Why was its invention important?

In 1919, Francis William Aston invented the mass spectrometer. This gave chemists a reliable and accurate method of comparing the relative masses of atoms.

Step 1: Essential components of modern mass spectrometer



a) What is a mass spectrometer used for?
b) The diagram above shows the essential components of a modern mass spectrometer. In your own words, can you describe how it works?

Table 1.... ***Relative abundance of chlorine isotopes***

Facts	**Numbers**
Proton number	17
Chloride ions	
Mass of isotopes	
Chlorine-35	34.969u
Chlorine-37	36.966u
Relative abundance of isotopes	
Chlorine-35	75.53%
Chlorine-37	24.47%
Average atomic mass	35.46u

Step 2: Results of spectrometer measurements

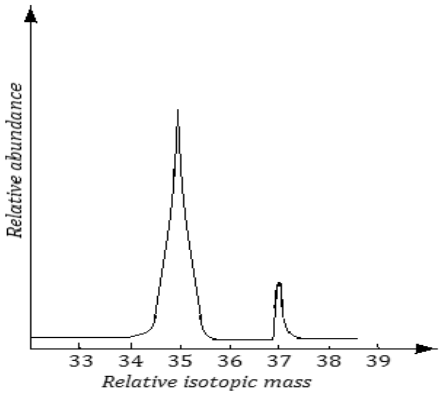


Fig. 1... *A mass spectrum of chlorine from a*

spectrometer

The Average atomic mass

Francis William Aston reported that the atomic mass of each substance was very close to, but not exactly, a whole number. Chlorine, for example, has two isotopes with atomic masses very close to 35u (34.969u) and 37u (36.966u).

Thus, the average atomic mass (atomic weight) of an element **is the weighted average of the masses of the naturally occurring isotopes(not the nucleon numbers of the isotopes), expressed in atomic mass unit (u).**

The contribution of a particular isotope to this average value depends on its abundance, m.

$$Average\ atomic\ mass = \frac{\sum f_i m_i}{\sum f_i}$$

Where, f_i = the relative abundance of the ith isotope

m_i= *the mass of i^{th} isotope*

WORKED EXAMPLE 2

Determine the average atomic mass of chlorine if the chlorine isotope with atomic mass of 34.969u makes 75.53% of a sample of chlorine gas, and the chlorine isotope with an atomic mass of 36.966u makes up the other 24.47%.

SOLUTION

$$Average\ atomic\ mass = \frac{(75.53 \times 34.969) + (24.47 \times 36.966)}{100}$$

= (26.41u + 9.05u)

= 35.46u

= the mass of ith isotope

The average atomic mass of chlorine is 35.46u, which is a weighted average of the masses of the naturally occurring chlorine isotopes.

Exercise

a) An element has two isotopes with masses 120.9u (57.5%) and 122.9u (42.5%) respectively. What is the relative atomic mass (Ar) of the element? (Ar C = 12.00)

b) Naturally occurring isotopes of copper are 63Cu and 65Cu respectively. Given that the relative atomic mass of copper 63.5. What is the proportion of each isotope?

Senior Six

Chemistry – inorganic chemistry

Topic: Group VII elements

Sub-topic: Trends in physical properties of elements in the group

Lesson 1

Introduction:

The halogens are a group in the Periodic Table consisting of five chemically related elements: fluorine, chlorine, bromine, iodine, and astatine. The elements are called halogens because halogen is a Greek word which means 'salt producing'. They all are non-metals; they react with metals to form compounds called salts. These elements are too reactive to occur freely in nature, but their compounds are widely distributed. Chlorides are the most abundant; although fluorides, bromides, and iodides are less common, they are reasonably available. In this section, we will examine the preparation, of halogens.

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

- Describe the general methods of preparing halogens
- Attempt a follow-up exercise

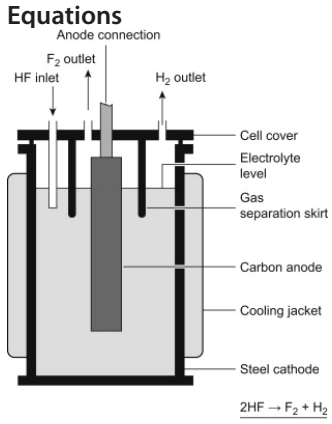
Preparation of halogens

The best sources of halogens (except iodine) are halide salts. It is possible to oxidize the halide ions to free diatomic halogen molecules by various methods, depending on the ease of oxidation of the halide ion. Fluoride is the most difficult to oxidize, whereas iodide is the easiest.

a) **Preparation of fluorine.**

Fluorine is largely prepared by electrolytic oxidation. The most common electrolysis procedure is to use a molten mixture of potassium hydrogen fluoride, (KHF_2), and anhydrous hydrogen fluoride. Electrolysis causes HF to decompose, forming fluorine gas at the anode and hydrogen at the cathode. It is necessary to keep the two gases separated to prevent their explosive recombination to reform hydrogen fluoride.

Equations



KHF_2 (l) KF(l) + HF(g)

KF(l) K^+(aq) + F^-(aq)

At cathode:

K^+ (aq) + e^- K (s)

At anode

$2F^-$ (aq) F_2(g) + $2e^-$

b) **Preparation of chlorine**

Most commercial chlorine comes from the electrolysis of the chloride ion in aqueous solutions of sodium chloride Chlorine is also a product of the electrolytic production of metals such as sodium, calcium, and magnesium from their fused chlorides. It is also possible to prepare chlorine by the chemical oxidation of the chloride ion in acid solution with strong oxidizing agents such as manganese dioxide (MnO2) or sodium dichromate ($Na_2Cr_2O_7$). The reaction with manganese dioxide is:

$$MnO_2 + 4HCl \rightarrow Cl_2 + MnCl_2 + 2H_2O$$

Try this at home:
Do it from outside the house in open.
Keep urine in an open plastic container for at least a day. Add this urine to any bleaching agent like jik in a transparent glass and close it. Do you see a greenish yellow gas in the bottle? This is chlorine gas. (Empty this bottle a way your nose). Chlorine gas can be accidently produced by combining cleaning products that containing bleach with those containing ammonia. Be careful as you stay safe at home.

c) Preparation of bromine

The commercial preparation of bromine involves the oxidation of bromide ion by chlorine:

Br^-(aq) + Cl_2 (aq) Cl^- (aq) + Br_2 (aq)

Chlorine is a stronger oxidizing agent than bromine. This method is important for the production of essentially all domestic bromine.

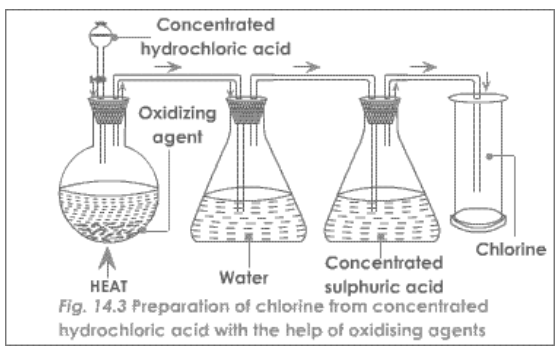


Fig. 14.3 Preparation of chlorine from concentrated hydrochloric acid with the help of oxidising agents

d) **Preparation of iodine**

Some iodine comes from the oxidation of iodine chloride, ICl, or iodic acid, HIO_3. The commercial preparation of iodine utilizes the reduction of sodium iodate, $NaIO_3$ with sodium hydrogen sulphite. In the laboratory the oxidation of potassium iodide with hydrogen peroxide can liberate iodine gas

$$H_2O_2 + 2KI \longrightarrow 2KOH + I_2$$

Exercise:

Generally, halogens can be prepared by oxidation.

a) What do you understand by the term oxidation?

b) How is oxidation applied in preparation of halogens?

c) Using equation of reaction show how Chlorine can be used to prepare bromine and explain why this is possible.

Essay questions

(1) Assess the role and impact of mass Media in the fight against COVID 19.
(2) "Although Media is playing an important role in the COVID-19 response, it still poses challenges to the industry". Discuss
(3) Discuss the economic effects of COVID-19 around the world
(4) To what extent is the global impact of COVID 19 attributed to human error?
(5) Discuss the factors that have inhibited positive behavioral change in the fight against COVID 19 pandemic.
(6) Discus the Important lessons that you have learnt from COVID 19 pandemic.
(7) Assess the effectiveness of government intervention to combat COVID 19 in Uganda
(8) To what extent is the Government of Uganda prepared to handle calamities like landslides, COVID 19, and the recent invasion of Locusts?

Read the following articles from 'The monitor Newspaper' Uganda and respond to the question that follows.

Community strategies to deal with Covid-19

By Prof. Francis Omaswa

Gentlemen, it is the microbes who will have the last word."
This quotation is attributed to the French microbiologist Louis Pasteur. How soon this will happen depends on how we humans recognise and seriously respond to this threat from microbes – the viruses and bacteria.

The Covid-19 pandemic presents yet another challenge and opportunity following Ebola, SARS, and MERS. It is also a loud call for the world to relearn and hopefully to remember once again that infectious diseases are a grossly neglected dimension of global security. In 2016, I was a member of an independent Commission on a Global Health Risk Framework for the Future that published a report titled, 'The Neglected Dimension of Global Security: A Framework to Counter Infectious Disease Crises.'This Commission recommended three strategies namely; strengthening public health as the foundation of the health system and first line of defense, Strengthening global and regional coordination and capabilities as well as accelerating (Research and Development) R&D to counter the threat of infectious diseases.

African governments have so far responded by raising awareness and restricting entry of the virus from other countries with screening at airports and total closure of borders. They have also imposed restrictions on the movement of people inside the countries. However, travel and movement restrictions are time-bound measures and not permanent solutions.

Today, Covid-19 has already been reported in 46 African countries and the next critical and strategic level of preparedness and response is to empower populations to stop transmission of the virus within the communities. This can be achieved by institutionalisation of Integrated People-Centered Primary Healthcare that will become the foundation of the health system and the first line of defense even after this pandemic has gone.

On March 25, the Director General of WHO, Dr Tedros Adhanom Ghebreyesus recommended six key actions to attack and suppress the virus and all of them were about strengthening the public health system, which significantly included a multi-sector action. Controlling this epidemic, is first about prevention of transmission, early detection, contact tracing, isolation, treatment of new infections, and safe handling of body fluids and the remains of those who die. These things can only happen through closely inclusive collaborative work, that involves all individuals and households, in society; "A Whole of Society Approach".

The Guiding principle is that good health starts with, and is created by individuals, their families and the communities, and is supported, where necessary by skills, knowledge and technology of the professionals. It is empowered individuals who have the primary responsibility for maintaining their own health and that of their communities. Government steps in to provide the overall enabling environment and resources beyond the capacity of communities.

It is, therefore, essential to build and sustain community trust for the public health system, where individuals participate actively as both a duty and a right in the prevention and control of outbreaks using existing structures, systems and resources as much as possible. This should be led and overseen by trusted local formal and informal community leaders. These leaders exist in all communities and go by different names such as political leaders, chiefs, and technical officials, cultural and religious leaders.

These community structures and systems should be activated in all countries so that the routine governance of society integrates Covid-19 control measures into its routine activities. This should become the foundation of Community Health Systems for Integrated People-Centered Primary Healthcare that will prevent entry of the virus into the community as well as enable prompt identification, isolation, testing and treatment when necessary.

Examples of practical activities by rural communities may include sharing correct locally understood information and ensuring that measures announced by the government are followed, that communal water sources are protected and water is available equitably using effective ways of hand washing that hygienic practices take place in households, those who fall ill are isolated and reported and social support is provided to affected families. Communities will be in charge of their destiny as the first line of defense against epidemics and take care of their health within Integrated People Centered Primary Health Care that "leaves no one behind".

The challenge and opportunity presented by Covid–19 should be used to activate and institutionalise this approach so that after the current crisis, it becomes the routine component of the public health system that puts priority on health promotion and disease prevention. Indeed the Whole of Society Approach goes beyond outbreak control and can also ensure that mothers attend antenatal clinics, children are immunised, the nearest health facility has required personnel and supplies, the referral system is in place, the correct food crops are grown and stored properly, all children are going to school, the rural road network is maintained, the water sources are safe and law and order is enforced, etc.

This Whole of Society Approach can be rolled out immediately and quickly in most countries once the African leaders call for them and assign roles in the same way that they have demonstrated unparalleled leadership by taking charge and issuing various directives on Covid -19 control across the continent

https://www.newvision.co.ug/new_vision/news/1517172/community-strategies-deal-covid-19

UK-based Ugandan nurse who survived Covid-19 narrates ordeal By TOM MALABA

A UK based Ugandan nurse who survived the deadly coronavirus in London has cautioned Ugandans against panicking.
She also urged Ugandans to equip themselves with functional information about the pandemic that has so far killed more than 40,000 people worldwide and infected more than 800,000 others.
Narrating her two- week- ordeal on phone, the young lady who requested not to be named because she is not supposed to speak to the media but works at a high-end hospital in South East London, said she caught the virus from a patient at the hospital.

"We had been receiving many such cases with high temperatures and we were attending to them like any other patient without protection. So on March 14, I was sent to work in the wing where there was this patient with high temperature, at one time he stood up to go to the toilet, he stumbled and I grabbed him," she narrated what happened before she caught the deadly coronavirus.
The former journalist now turned nurse said, after the incident, on March 17, she started presenting with high temperatures. Sometimes her temperatures would go up to 39.8 degrees but didn't know what the problem was. She suspects she infected other people in the process.

"When I told my bosses, I was told to quarantine myself. So whenever the temperatures would rise I would use paracetamol to control the temperature. The amount of paracetamol I have swallowed in the ten days, is more than what I have used in the last seven years," she said.
Though she had high fever, she was breathing normally even at night. She said, people with breathing problems that are the most affected because they will need oxygen.

She has advised Ugandans to stop panicking and join the fight against the pandemic. She has asked people to stay at home as much as possible, wash hands with soap or sanitizer and avoid crowds.
She said knowledge is the most important part of fighting the virus. She said every home should limit the people going out for shopping.
"If anybody returns to the house either from work, they should not make contact with people at home before bathing. Let them remove any protective gear and even the clothes and bathe. Even the bag find, a place you can hang it, the virus can even cling on clothes, bags and even hair," she said.

Anybody who feels doing all that is a tall order should not leave the house.
She said other than being swallowed up with fear, Ugandans should follow the advise of medical personnel and follow their instructions.
At a household level, she urged Ugandans to use more ginger, garlic, lemon and honey to boost their immunity and that of the children. She said this mixture should be taken in the morning and evening

https://www.monitor.co.ug/News/National/UK-based-Ugandan-nurse-who-survived-Covid-19-narrates-ordeal/688334-5511874-8fwr3/index.html

With reference to the two articles above, summarise the strategies recommended to deal with COVID 19 pandemic in not more than 100 words.