FORM 2 - INTEGRATED SCIENCE

Lesson 1

TOPIC/ASPECT - Diversity of Matter

SUBTOPIC - Classifying matter into elements, compounds and mixtures

OBJECTIVES: By the end of the lesson, the pupil will be able to

(i) define the term element
(ii) define the term compound
(iii) define the term mixture
(iv) classify common household substances into element compound and mixtures

RPK

Pupils can explain that matter is made up of smaller particles. (F1)

Pupil can group reactions physical and chemical changes (F1)

INTRODUCTION

Facilitate discussion on the question:

"What are things around us made of?"

Use chalk to explain the concept of matter and atom by powdering the solid chalk into more granular form.

ACTIVITIES

1. With the aid of counters and chalk from the activity above explain the term element.
2. Emphasize that atoms of pure substance is made up same kind of atoms
3. Review the concept of chemical and physical change (F1)
4. Let pupils brainstorm and come out with meaning of mixtures and compound based on physical and chemical change review.
5. Explain that mixtures may be formed by compound – compound; element – element (alloy) and element – compound combinations. In short we call them substances.

6. Let pupils' observation some substances and group them into elements, compounds and mixtures.

CLOSURE

Summarize the salient points. Give exercise pupils for pupils to copy and complete.

TLM

Chalk, counters of different colours (bottle tops), periodic table, water, sand, sulphur etc.

CONTENT

What are things made of?

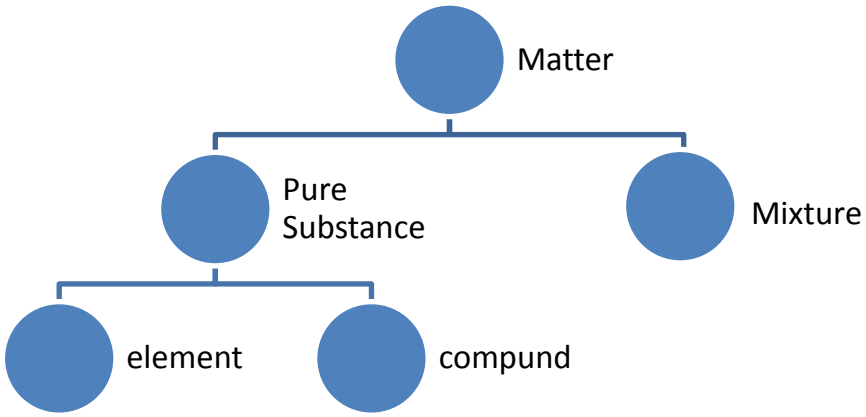
Water is a substance containing three atoms; 2 hydrogen atoms and 1 oxygen atom.

Matter is made up of *atoms, ions* and *molecules*.

Element is a pure substance made up of atom of only one kind. eg. Hydrogen, oxygen

Compound is a pure substance made up of two or more elements chemically combined. E.g. Water

Mixture is a substance made by physical combination of two or more elements (compounds). E.g., Bronze (copper and tin), sand and water, sugar and water etc.



ASSIGNMENT

Ask pupils to make a list of more substance they can identify at home and classify them into elements, compounds and mixtures.

FORM 2 - INTEGRATED SCIENCE

Lesson 2

TOPIC/ASPECT - Diversity of Matter

SUBTOPIC - Identifying elements by their chemical symbols

OBJECTIVES: By the end of the lesson, the pupil will be able to

(i) List at least the first 20 elements of the periodic table
(ii) Mention the sources of at least 10 elements in everyday life.
(iii) Identify common elements by their chemical symbols.

RPK

Pupils can explain the term element to mean a pure substance with atoms of one kind.

INTRODUCTION

Review R.P.K through questioning.

ACTIVITIES

1. Guide pupils to list the first 20 elements of the periodic table indicating
   (i) Atomic Number
   (ii) Chemical Symbols
   (iii) Element name
2. Guide pupils through the elements with their respective symbols as accepted by **IUPAC**.
3. Explain that every element has a Capital first letter and may be derived from English and Greek names of elements.
4. Guide pupils with mnemonics to memorize the elements in their respective order of atomic numbers.
5. Let pupils discuss the sources of some elements they may be familiar with from the first 20 elements eg. Fluoride and calcium in toothpaste

CLOSURE

Review and summarize the salient points of the lesson and give exercise for pupils to copy and complete.

TLM

Periodic table chart

CONTENT

Element is a pure substance made up of atom of only one kind. E.g. hydrogen, oxygen. Elements are made of atoms that cannot be broken into simpler for and take part in chemical reactions.

Guidelines *on assigning chemical symbols of elements*

- Symbols are usually the First letter of names of elements written in capitals. E.g. Hydrogen - **H**
- Some may be two letters, the first capital and second being lowercase. E.g. Beryllium - **Be**
- Some may have their symbols derived from other languages like German and Latin. E.g. Tungsten – **W** and Potassium – **K**
- **Other elements, symbol and source of symbol**

Element	**Other name**	**Symbol**
Potassium	**K**alium	K
Sodium	**Na**trium	Na
Gold	**Au**rum	Au
Lead	**P**lum**b**um	Pb
Silver	**Arg**entine	Ag
Tin	**S**ta**n**num	Sn
Mercury	**H**ydra**g**yrum	Hg

Mnemonic (Guide)

Hello, Hello, Listen, B, B, C, Now, Operate, Foreign, News, Allegation, So, Please, Send, Crocodile, Away, Kofi, Charles.

ASSIGNMENT

Ask pupils to make a list of the first twenty elements according to their proton number.

FORM 2 - INTEGRATED SCIENCE

Lesson 3

TOPIC/ASPECT - Diversity of Matter

SUBTOPIC - Structure of an atom

OBJECTIVES: By the end of the lesson, the pupil will be able to

(i) Describe each subatomic particle in terms of charge and location
(ii) Explain the term nucleon
(iii) Use concept diagram to describe the structure of an atom
(iv) State at least three differences between protons and electrons.

RPK

Pupils can identify an atom as components of matter.

INTRODUCTION

Review RPK through questioning

ACTIVITIES

1. Explain to pupils that atoms, even though indivisible, cutting through will reveal smaller particles that define its kind. The collective name for these particles is subatomic particle.
2. Guide pupils to sketch the structure of an atom as a spherical mass with nucleus at its center; surrounded by electrons.
3. Help pupils to tabulate the characteristics of subatomic particles in terms of
   (i) Location
   (ii) Mass (atomic mass unit)
   (iii) Charge
   (iv) Change in number of particles
4. Guide pupils to tabulate differences between protons and electrons.

CLOSURE

Review and summarize the salient points of the lesson and give exercise for pupils to copy and complete.

TLM

Periodic table chart

Counters

Chart containing a well labeled diagram showing structure of an atom

CONTENT

Atoms form the building block of things around us. They are so tinny that they cannot be seen by unaided eye.

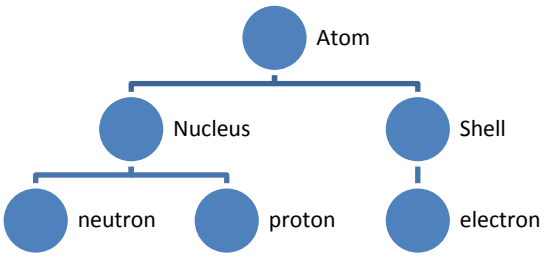
An atom contains smaller particles in its spherical structure.

Each atom irrespective of the element contains three particles namely

- **P**roton (**p**ositively charged)
- **N**eutron (**n**eutral)
- Electron (n**e**gativ**e**ly charged)

The spherical atom is made up of a central **nucleus** with electrons clouds around it. The path that electron appear to take as they move around the nucleus is called orbitals or **shells**. They also show the principal quantum numbers of shells. They indicate the energy levels of electrons.

The entire mass of an atom is sourced from the atomic mass unit of protons and neutrons. They are collectively called **nucle***ons* (particles in nucleus).



Comparing protons, neutrons and electrons

	Protons	Neutrons	Electrons
mass	1 amu	1amu	Negligible (1/1840) or 0

charge	Positive	No charge	Negative
location	Nucleus	Nucleus	shell / orbit

ASSIGNMENT

Ask pupils to write three differences between protons and electrons

FORM 2 - INTEGRATED SCIENCE

Lesson 4

TOPIC/ASPECT - Diversity of Matter

SUBTOPIC - Exploring particles in matter as charged particles

OBJECTIVES: By the end of the lesson, the pupil will be able to

(i) State the electrical charges on each subatomic particles
(ii) Demonstrate the fact that matter contains charged particles
(iii) Describe the nature of attraction or repulsion of charged particles

RPK

Pupils can state the charges of subatomic particles

INTRODUCTION

Use keywords from textbook for dictation

Review RPK through questioning

ACTIVITIES

1. Use the activity below to conclude on the evidence that particles in matter contain charges.
2. Use video model to illustrate the charges of protons and electrons. (Use opposite ends of bar magnets as alternatives). Explain that unlike charges attract each other whiles like charges repel.

- Cut a strip of plastic material (alt. use comb)
- Rub vigorously for 3 to 4 minutes through the hair.
- Bring particles near pieces of paper and record your observation

3. Discuss pupil's observations and relate it to particles in matter and their charges.
4. Explain that atoms of different charges may come together on the bases of charges to form new substances (ionic compounds).

CLOSURE

Summarize the lesson and review salient points. Give exercise for pupils to copy and complete.

TLM

Plastic strip or comb

Video on charges of particles

CONTENT

	Protons	**Neutrons**	**Electrons**
*M*ass	1 amu	1amu	Negligible (1/1840) or 0
*C*harge	Positive	No charge	Negative
*L*ocation	Nucleus	Nucleus	shell / orbit

Positive + Positive = **Repel**

Negative + Negative = **Repel**

Negative + Positive = **Attract**

ASSIGNMENT

Ask pupils to find information on how thunder and lightning come about. (electrostatics).

FORM 2 - INTEGRATED SCIENCE

Lesson 5

TOPIC/ASPECT - Diversity of Matter

SUBTOPIC - Determining the number of particles in an atom

OBJECTIVES: By the end of the lesson, the pupil will be able to

(i) Define the term atomic number (Z)
(ii) Define the term atomic mass (A)
(iii) Interpret the ^{A}X and $_{z}X$ representation of atoms.
(iv) Establish a relationship between mass, proton and neutron number.

RPK

Pupils can use the periodic table to identify elements.

INTRODUCTION

Use keywords from textbook for dictation

Review RPK through questioning

ACTIVITIES

1. Revise the difference between proton, neutron and electrons in terms of mass.
2. Guide pupils to define the terms atomic (proton) number and mass (nucleon) number and state the symbols for each.
3. Guide pupils to show atomic and mass numbers of elements on the symbols of their respective symbols by writing them as subscripts and superscripts to the left side of the symbols.
4. Guide pupils to explore more examples using the periodic table. Emphasize the fact that atomic number defines an atom and that change in proton number means change in name of element.
5. Provide examples of elements represented as $_{z}X$ and ^{A}X and help pupils to answer question on the number of protons, electrons and neutrons on each atom.

CLOSURE

Summarize the lesson and give exercise for pupils to copy and complete.

TLM

Periodic table chart

CONTENT

Atomic number (Z) is the number of **protons** in an atom. The symbol means number (German).

In a neutral atom, the number of **protons is equal to the number of electrons**.

It is represented on elements as $_{z}X$. Eg. $_{8}\mathbf{O}$ for oxygen with atomic number **8**

Mass number (Nucleon number) is the **sum of protons and neutrons** in an atom.

It is denoted as **(A).**

It is represented on elements as ^{A}X. Eg. $^{16}\mathbf{O}$ for oxygen with atomic number **8**

EXAMPLE

An atom has 6 protons and 7 neutrons. Calculate

(i) the number of electrons
(ii) the mass number

SOLUTION

(i) 6 electrons
(ii) 6+7= 13

ASSIGNMENT

Ask pupils to perform calculations on more examples to deduce neutron, proton and electron numbers of atoms.

FORM 2 - INTEGRATED SCIENCE

Lesson 6

TOPIC/ASPECT - Diversity of Matter

SUBTOPIC - Distributing electrons in shells of an atom according to energy level

OBJECTIVES: By the end of the lesson, the pupil will be able to

(i) Explain what the shell of an atom is
(ii) Identify shells by letters
(iii) Illustrate the general structure of an atom
(iv) Use atomic numbers to show electron arrangement of elements

RPK

Pupils can define an atom and describe its subatomic particles in terms of location.

INTRODUCTION

Use keywords from textbook for dictation

Review RPK through questioning

ACTIVITIES

1. Use counters to model the concept of elements as atoms of the same kind i.e atoms identifiable by a common proton number. Example Beryllium has four protons.
2. Explain that for particular specie of element, there may be equal number of protons but different mass numbers (isotopes). Example cabon – 12, 13 and 15
3. Discuss the locations of subatomic particles as it appears in the longitudinal cut through the spherical atom.
4. Help pupils to label the shells of an atom using the letters K, L, M and N to name the shells according to proximity to the nucleus.
5. Guide pupils to establish the relationship between energy levels and the maximum number of electrons each can carry. Use the formula $2n^2$ to calculate the number of electrons each level can carry. Explain that the formula works for the 1^{st} and 2^{nd} shells only because of the **octet rule.**

6. Guide pupils to make models of electronic configurations for given elements of the periodic table.

CLOSURE

Summarize the lesson and give exercise for pupils to copy and complete.

TLM

Periodic table chart

CONTENT

Electronic configuration is the *arrangement of electrons in orbits* in the nucleus according to increasing energy levels.

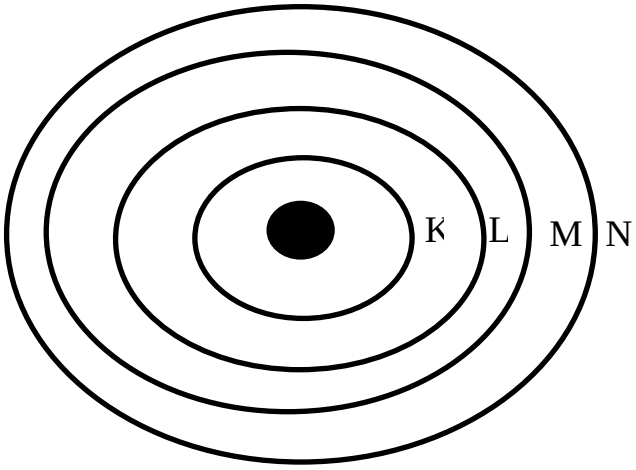
Oxygen = 2, 6

Calcium = 2,8,8,2

Neon = 2, 8

Argon = 2, 8, 8

H**elium** = 2



APPLICATION

Knowledge of electronic configuration is used in predicting the valency of elements.

ASSIGNMENT

Ask pupils to make electronic configurations of given elements in the first 20 elements.