MODULE 1 MEANING, HISTORY OF SCIENCE AND SCIENCE TEACHING IN NIGERIA

Unit 1 Understanding Science and History of Science
Unit 2 Primary Science Education

UNIT 1 UNDERSTANDING SCIENCE AND HISTORY OF SCIENCE

CONTENTS

1.0 INTRODUCTION

Science is the systematic study of the physical world. Scientists observe and try to impose meaning to what is observed. They infer a set of pattern in what they observe. Such observations require the use of their sense organs. The observations are made into logical sequence involving formulation of hypotheses and probably the development of theories after the hypotheses have been tested through experimentation. Even after the development of theories, scientists have suspended judgments because science is dynamic, involves doing and being curious. This unit examines the meaning of science, its history in terms of development and teaching.

2.0 OBJECTIVES

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

- explain the meaning of science
- discuss the history of science
- identify science programs in developed countries
- discuss the history of science teaching in Nigeria.

3.0 MAIN CONTENT

3.1 Definitions of Science

These are some working definitions of science.

(a) Science is a human activity, where people are actively searching, seeking and verifying new knowledge.

(b) Science involves content and process. **Content** refers to library of knowledge and the linguistic aspect of science. **Process** is the way of doing something e.g. experimentation and observation.

(c) Science is an all embracing process. It is what scientists do. Scientists describe, try to answer questions about nature in the universe and explain events in nature and make predictions, thereby extending knowledge to new situations.

(d) Science is a product oriented process. This involves two aspects

(i) Applied product of technological benefits i.e. material products, and

(ii) Laws of nature, theories, facts, principles, linguistic, materials etc.

(e) Science involves the development of attitudes e.g. how scientists behave towards the world and respond to situations. Scientific attitudes include curiosity, open-mindedness, suspended judgment, search for cause and effect, accuracy etc.

3.2 Brief History of Science

The history of science could be traced to the period between 4000-3000 BC when ancient scientists were pre-occupied with useful art such as melting, heating and building.

Greek philosophers adopted speculations which heralded scientific theories. For example, Thales (640BC-546BC) proposed theories on the universe and its materials. In his logical theory, he affirmed that water is the fundamental substance of all things since it can exist in all the three states of matter- Solid, Liquid and Gas. He pointed out that the earth was in form of a disc floating on water and with water above serving as the source of rain. His student, Anaximander (611BC-541BC) proposed an opposing theory on solid substance as fundamental, stating that something that can constitute the material world should not be made up of any specific substance but must be characterless.

Anaximander Menses (585BC – 525BC) based his cosmology on four elements – Earth, Air, Fire and Water. He affirmed that any two or more of these can form the materials in the universe.

The popular pupil of Socrates, Plato (428BC – 347BC), later introduced logic to explain nature. He explained that the universe has geometrical existence. He asserted that fire, water, air and earth form the solid base of the universe but they all derived from water. Not long after, Democritus (470BC-380BC) conceived the atomic concept and he is often referred to as the Father of Atom.

To Aristotle (384BC – 322 BC), all things below the sphere of man are composed of water, air, fire and earth just like Empedocle. He also viewed the heaven as composing the fifth element quintessence to form the universe.

It must however be noted that the theories were based on speculations, not on sound data and observation and predictions were absent from the processes. By 1750, academic discipline of Science became institutionalized.

3.3 Science Programmes in Developed Countries

In the 60's, movements started in USA and Britain to reform science. A major development in the field of science was the launching of the first satellite into space by the U.S.S.R in 1957 at a time the USA was unable to do same. A number of reforms were then put in place in the USA which included the setting up of curriculum development projects at the Primary, Junior and Senior Secondary School Levels. These projects include:

a) Elementary Science Study (ESS) in 1960
b) Science Curriculum Improvement Study (SCIS) in 1962 (c) Science – A Process Approach (SAPA) in 1962
c) The Physical Science Study Committee (PSSC) in 1956. (e) Biological Science Curriculum Study (BSCS) in 1959.
d) Chemical Bond Approach or Chemical Education Material Study (CHEM Study) in 1960.

In Britain, Nuffield Science Project (NSP) was established in 1962 under the auspices of Nuffield foundation. In 1965, Africa also came into limelight with the inauguration of the African Primary Science Programme (APSP) which later became Science Education Programme for Africa (SEPA).

3.4 History of Science Teaching in Nigerian Schools

The first known primary school in Nigeria is the Methodists' Missionary in Badagry which was established in 1843. Only rudiments of science were introduced by missionary doctors attached to the theological and medical centres.

Between 1861and 1897, rudiments of science were also taught in the Secondary and Teacher Training College levels.

The Education ordinance of 1908 which stipulated grants to schools encouraged the acquisition of scientific educational equipment.

In 1909, Kings School, Lagos was established as the first secondary school and it had a chemistry laboratory with a European teaching staff to teach science.

In 1927, the Government established the Queens School in Lagos for girls, one Government College each in Ibadan and Umuahia with provisions for the teaching of science.

In 1934 a major development at the tertiary level was the establishment of Yaba Higher College, a Science tertiary institution to provide intermediate manpower development in Medicine, Engineering, Survey and Teaching of basic sciences at the Secondary School Level.

Other major initiatives include:

(i) The establishment of the University College, Ibadan in 1948 to admit students including science students.
(ii) Formation of the Science Teachers Association of Nigeria in1957.

In spite of current efforts in the field of science teaching, a number of factors still militate against effective science teaching. Some of these factors are:

(i) Inadequate number of quality science textbooks in Nigeria
(ii) High cost of setting up science laboratory
(iii) Inadequate number of trained teachers
(iv) Poor motivation for science teachers
(v) Poor funding of schools in general.

SELF ASSESSMENT EXERCISE 1

1. Explain the meaning of the term "Science".
2. Discuss the contributions of three named Greek philosophers to the development of Science.

SELF ASSESSMENT EXERCISE 2

1. Enumerate the major curriculum development projects instituted between 1957 and 1965.
2. Trace the historical development of science in Nigeria between 1843 and 1957.

4.0 CONCLUSION

The importance of science cannot be overemphasized and efforts towards its development in Nigeria would bring about monumental growth and development.

5.0 SUMMARY

In this unit, we have learnt that:

(i) The history of Science could be traced to the period between 4000 BC – 3000 BC when the then Greek Philosophers adopted Speculations in the formulation of their theories instead of sound data.
(ii) A number of science programmes were put in place in USA

and Britain in the 60's and subsequently in Africa in 1965.

(iii) Elements or rudiments of science teaching started in Nigeria in 1843 with the establishment of the first missionary school in Nigeria.

6.0 TUTOR-MARKED ASSIGNMENT

1 (a) Explain the meaning of science as a human activity, an all embracing process and as the development of a peculiar attitude.
(b) Briefly explain the history of science teaching in Nigeria.

2 (a) Discuss the problems militating against the development of science in Nigeria.
(b) Suggest possible ways of remediating them.

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UNIT 2 PRIMARY SCIENCE EDUCATION

CONTENTS

1.0 INTRODUCTION

Science is taught in the primary school for the sake of the child and the society. This helps to release the child's potential and ensures a better understanding of the world around him. Primary science has to a large extent, contributed to the physical, emotional and social development of children and consequently to the achievement of the goals of the National Policy on Education. It is meant for children between 5 – 12 years old which is the period of primary education for normal children.

2.0 OBJECTIVES

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

- highlight the rationale for teaching primary science
- enumerate the objectives of teaching primary education
- Describe the steps to follow for effective learning of primary Science

SELF ASSESSMENT EXERCISE 1

Could you explain the necessity for formulating a philosophy for science education in Nigeria?

3.0 MAIN CONTENT

3.1 The Rationale for the Teaching of Primary Science

The Rationale behind Science education in Nigeria are:

(i) To enable the learner to utilize science for self-realization.
(ii) Equip the learners with intellectual knowledge, skills and scientific attitudes which will enable them to contribute significantly to the development

of the country.

(iii) To prepare the more able youths for higher education in science.

The Federal Government stated the specific rationale for teaching primary science as to:

(i) prepare pupils for useful living in the society
(ii) provide an increasing number of primary school pupils with the opportunities for education of a higher quality irrespective of sex, social, religious or ethnic background.
(iii) diversify the curriculum to cater for differences in talent, opportunities and roles possessed by or open to students.
(iv) equip pupils to live effectively in our modern age of science and technology
(v) raise a generation of people who can think of themselves, respect the views and teachings of others, respect the dignity of labour and appreciate those values specified.

3.2 Objectives of Teaching Primary Science

In the revised edition of the National Core Curriculum for Primary School Science, the objectives of elementary science are stated below:

(i) to observe and to explore the environment
(ii) to develop basic science process kills including observing, manipulating, classifying, inferring, hypothesizing, interpreting data and formulating models.
(iii) to develop a functional knowledge of science concepts and principles
(iv) to explain simple natural phenomena
(v) to develop a scientific attitude including curiosity, critical reflection and objectivity
(vi) apply the skills and knowledge gained in science to solve everyday problems in his environment
(vii) to develop self-confidence and self reliance through problem-solving activities
(viii) to develop a functional awareness and sensitivity to the orderliness and beauty of nature.

It is suggested that the stated objectives should include the following:

(a) The understanding that the achievement of the national objectives depends on the use of science and technology
(b) An understanding of the methods of investigation used by scientist
(c) An appreciation of the excitement and satisfaction involved in a career in science

(d) An understanding of the contributions of science to the achievement of optimum physical health.
(e) Preparation for effective participation in local and national decision making on issues that involve the understanding of scientific information and principles.

SELF ASSESSMENT EXERCISE II

Explain to what extent the objectives of teaching primary science are being achieved. Give specific examples.

3.3 Suggested Steps for Effective Primary Science Learning

Broadly, the objectives of science teaching is a set of goals or behaviour expected of a learner after exposure to learning instructions in science therefore the teacher must ensure the following steps are taken by the student. He must be:

(i) actively involved in the learning process
(ii) develop motivation and ability to work independently
(iii) recall information
(iv) derive schemes for solving problems
(v) use and classify information
(vi) interpret information showing subjection and assessment
(vii) communicate effectively and selectively
(viii) relate experiences from one subject area to another.

4.0 CONCLUSION

Being the foundation for effective science learning, primary science education, if well handled and supported, would be a catalyst for the achievement of national goals and objectives in science and technology.

5.0 SUMMARY

In this unit, we have learnt:

(i) The rationale for teaching of science by emphasizing the basic philosophy of science education in Nigeria.
(ii) The specific rationale of primary science in Nigeria
(iii) The objectives of teaching primary science through the analysis of the revised edition of the National Core Curriculum for Primary School Science.

6.0 TUTOR-MARKED ASSIGNMENT

1 (a) Enumerate the rationale for teaching of Primary Science in Nigeria
2 (a) What are the main objectives of teaching primary science?

(b) Which other objectives will you suggest for effective teaching and learning of Primary science?

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MODULE 2 CURRICULUM AND PRIMARY SCIENCE TEACHING METHODS

UNIT 1 BASIC PRINCIPLES OF CURRICULUM DEVELOPMENT AND PRIMARY SCIENCE

CONTENTS

1.0 INTRODUCTION

Curriculum is a term which means different things to different people. On many occasions, people interchange curriculum for course of study, syllabus, subject matter or even lesson note. It is therefore, not surprising that even students at various levels who have had courses in different areas of curriculum design development and implementation still exhibit partial or complete ignorance of basic concepts in issues relating to curriculum development. Some of these concepts are explained below.

2.0 OBJECTIVES

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

- Define the term curriculum
- Differentiate between curriculum and other terms like syllabus, subject matter and lesson note
- Highlight the elements of curriculum.

3.0 MAIN CONTENT

3.1 The Meaning of Curriculum

Curriculum is said to have been derived from the Latin word "currere' meaning "a running course". It then means literarily that curriculum is a running course leading to the attainment of a goal.

In education, it is more than this, but one must quickly point out that curriculum has been variously defined with a lot of disagreement among scholars. Some of these definitions are:

(i) A curriculum is all the learning of students which is planned and directed by the school to attain educational goals - Tyler (1949).
(ii) A curriculum is all planned learning experiences provided by the school to assist the pupils in attaining the designated learning outcomes to the best of their ability- Neagley and Evans (1967).
(iii) It is all the learning which is planned or guided by the school, whether it is carried on in groups or individually inside or outside the school- John P. Kerr (1968).
(iv) A good curriculum is the total environment in which education takes place; that is the child, teacher, subject, content, the method, the physical and psychological environment (Fafunwa, 1997).
(v) A curriculum is a programme of learning planned for a target group of learners for a specific period of time in order to achieve certain predetermined educational goals (Dada, 1999).

SELF ASSESSMENT EXERCISE I

What is your own understanding of the term "curriculum?"

3.2 What Curriculum is Not

A lot of misconceptions exist in respect of the term "curriculum". Some people use curriculum interchangeably with subject content syllabus, schemes of work, lesson note or even course of study as stated earlier.

3.3 Curriculum and Subject Content

One often hears Biology Curriculum, Agricultural Science Curriculum, and Mathematics Curriculum etc. From the definitions above, it would be understood that the concept curriculum is broad and extends beyond subjects or subject contents.

3.4 Curriculum and the Syllabus

A syllabus is just the condensed outline of the main points of a course or subject to be covered within a specified period (usually year by year). It contains topics, provisions for practical activities, learning methods and resources required including textbooks.

3.5 Curriculum and Schemes of Work

The scheme is the adaptation of the syllabus to the needs of a particular class in a school. It is the breakdown of the syllabus into clear and logical instructional units according to the number of lesson periods allotted to a particular topic or subject in the school timetable. It is usually shows what the teacher wants to do for each class, each week, each term and the three terms in a year. It helps to ensure continuity of the learning process. It is a guide and should allow for flexibility.

3.6 Curriculum and Lesson Notes

Lesson notes interpret the actual learning activities from the scheme of work. It explains what is to be done within a lesson period of twenty- five to forty minutes and in some cases double period of eighty minutes. Each lesson unit must have its own lesson note. It is a record of what is taught and learnt during each lesson period. It shows the steps to be taken to ensure learning takes place. It is a product of lesson preparation which itself is a process in which the teacher considers what to teach, whom to tech and how to teach it.

3.7 Curriculum and Course of Study

This refers to the content area to which a learner is exposed in a particular subject or educational programme. It could be an Agricultural Science course, a Yoruba course, an NCE course, an OND course, a Bachelor of Science course etc.

In summary, the above terms are just different aspects of the curriculum.

3.8 Elements of Curriculum

Curriculum design is influenced by many factors but there are common denominators. There is what is referred to as elements of curriculum. These are: aims and objectives, content, learning experiences and evaluation.

These four elements would answer those questions posed by Tyler (1949) in his own attempt at offering a definition for curriculum. He posited that the curriculum attempts to answer four fundamental questions about the child's learning.

(i) What educational purposes should the child seek to attain?
(ii) What educational experiences can be provided that are likely to attain these purposes?
(iii) How can these educational experiences be effectively organized?
(iv) How can we determine whether these purposes are being attained?
(v) How can we determine whether these purposes are being attainted?

SELF ASSESSMENT EXERCISE II

Write short notes:

1. Curriculum and Subject Content
2. Curriculum and the Syllabus
3. Curriculum and Schemes of Work
4. Curriculum and Course of Study
5. Curriculum and Lesson Notes

4.0 CONCLUSION

From the foregoing, importance of the curriculum cannot be over- emphasized as it takes place amongst learners.

5.0 SUMMARY

In this unit, we have learnt that:

(i) Curriculum literarily means a running course leading to the attainment of educational goal

(ii) Curriculum is neither subject content nor syllabus, nor schemes of work nor lesson notes

(iii) Subject content, syllabus, schemes of work and lesson notes are all aspects of the curriculum

6.0 TUTOR-MARKED ASSIGNMENT

1. Examine the definition of curriculum by three scholars.
2. Explain in a tabular form how curriculum is not synonymous with syllabus and scheme of work.

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UNIT 2 THE ELEMENTS OF CURRICULUM

CONTENTS

1.0 INTRODUCTION

As it was noted in the previous unit, the common denominators of curriculum design referred to as elements of curriculum. These are aims and objectives, content, learning experiences and evaluation.

2.0 OBJECTIVES

At the end of this unit, you should be able to:

- explain the meaning of aims and objectives of the curriculum
- discuss the term content in curriculum design
- explain what learning experiences mean in curriculum design
- enumerate and explain the different forms of evaluation.

3.0 MAIN CONTENT

3.1 Introduction to Aims and Objectives

Aims refer to broad statements of purpose and intention. In education it helps to guide educational activities to its long term ends. However, before the aims can be

achieved there would be the need to break them down to short-term ends. These short term ends are referred to as objectives.

A lot of confusion exists in literature about the terms aims, objectives and goals. It should be noted that aims and goals are more or less synonyms referring to long term ends. Objectives as stated earlier are short term ends.

Generally however, aims are stated in terms of what the educational system intends to achieve with respect to the learner while objectives indicate what the learner would achieve.

The National Policy on Education (2004) states the aims of our educational system as:

(i) the inculcation of national consciousness and national unity
(ii) the inculcation of the right type of values and attitudes for the survival of the individual and the Nigerian Society.
(iii) The training of the mind in the understanding of the world around, and
(iv) The acquisition of appropriate skills abilities and competencies both mental and physical as equipment for the individual to live and contribute to the development of his society.

In respect of primary school level, the aims are specifically stated as follows:

(i) The inculcation of permanent literacy and numeracy and the ability to communicate effectively
(ii) The laying of a sound basis for scientific and reflective thinking
(iii) Citizenship education as a basis for effective participation in and contribution to the life of the society.
(iv) Character and moral training and the development of sound attitudes.
(v) Developing in the child the ability to adapt to his changing environment.
(vi) Giving the child the opportunities for developing manipulative skills that will enable him to function effectively in the society within the limits of his capacity.
(vii) Providing basic tools for further educational advancement including preparation for trades and crafts of the locality.

3.2Sources of Aims and Objectives

The main sources of aims and objectives are:

(i) The learner – Aims and objectives should be formulated based on the needs of the learner. This is to ensure the development of his physical, mental, and emotional potentials.
(ii) The society - Aims and objectives can also be derived through the study of the nature of the society. In the national policy, the need for the learner to develop a sense of togetherness as a nation in spite of our ethnic and

religious differences informed the inclusion of the development of national consciousness and national unity.

(iii) The subject matter-objectives are also derived from available learning experiences within subject area. In fact, most teachers concentrate their objectives on "learning" the subject matter. It is however important that teachers should incorporate and utilize all the three sources to arrive at their objectives.

3.3 Classes of Objectives

Objectives can be classified according to the kinds of learning that they lead to. Bloom (1956) and his associates referred to these classes as Taxonomies of objectives. They are placed into three domains – cognitive, affective and psychomotor.

(i) **Cognitive domain –** It is the domain of intellectual development involving reasoning, understanding, memory etc six levels of cognition have been identified and include knowledge, comprehension, application, analysis, synthesis and evaluation starting from the simple to the complex.

1. Knowledge: this involves simple recall of previous learned materials, specific facts, concepts, theories, methods etc.
2. Comprehension: this involves ability to grasp the meaning of materials.
3. Application: Ability to use learned Materials in new concrete situation.
4. Analysis: ability to break down materials in to its various component parts so that its organizational structure may be understood.
5. Synthesis: ability to put parts together to form a new whole. They may involve the productions of a unique communication, a plan of operations, or a set of abstract relations.
6. Evaluation: ability to judge the value of material statement, novel, poem, research, report for a given purpose.

(ii) **Affective domain:** It is the domain of interest, attitude, feelings, appreciation etc. It could be in five levels: receiving, responding, valuing, organization of values and characterizing values when arranged from the lowest to the highest.

1. Receiving: refers to student's wiliness to respond to a particular phenomena or stimuli (classroom activities, textbooks, music etc). Receiving represents the lowest level of learning outcomes in the effective domain.
2. Responding: refers to active participation on the part of the student to particular phenomena, reflecting interest but not commitment.
3. Valuing: refers to perception of worth or value in Phenomena.
4. Organizational: refers to bringing together different values, resolving conflicts between them and beginning the building of No.2 on internally consistent value system.

(iii) **Psychomotor domain –** this is the domain that emphasizes motor skill manipulation. This domain is reflected in five levels of human activity, namely: physical movement, showing conceptual ability of the human senses, showing abilities related to physical actions such as strength, endurance, dexterity etc, making skilled movements in games, sports and art and lastly communicating non-verbally.

1. Observing: refers to attending of performance of a more experienced person
2. Imitating: refers to the basic rudiments of skill acquired.
3. Practicing: refers to the repetition of the sequence of phenomena as conscious effort decrease.
4. Adapting: refers to perfection of the skills, although further improvement is possible.

3.4 Implication of Bloom's Taxonomy of Educational Objectives to the Teaching and Learning of Science.

In the theory of learning, the science teacher must observe the following:

1. Must consider the cognitive aspect of stated behavioral objectives, so that at the lesson preparation, and evaluation stage, questions will be asked to ascertain the attainment of the cognitive domain.

2. Must consider the affective aspect of the stated behavioral objective, so that at lesson preparation and evaluation stage, questions will be asked to check the effective domain.

3. Must consider the psychomotor aspect of the stated behavioral objective, so that at lesson preparation and evaluation and evaluation stage questions will be asked to check the acquisition of skill or the teacher will direct student to apply then acquired skill, so as to ascertain its acquisition or otherwise.

SELF ASSESSMENT EXERCISE 1I

Differentiate between aims and objectives.

3.5 Content

The content or subject matter is usually organized in disciplines. Each discipline has its own structure built up over the years by experts in that area. It consists of what is known and believed in various disciplines. The choice of content is a dynamic one because of knowledge explosion and the fact that it is rapidly changing as the society itself changes. It is therefore imperative that certain criteria must be established for the inclusion of some areas of learning and exclusion of others.

3.6 Criteria for Selection of Content

(i) Significant of the content: Only important aspects of content that would contribute significantly to the body of knowledge and thinking process are selected. Trivial issues are left out.

(ii) Balance between scope and depth: Attempt is often made to ensure a balance between coverage of wide area and in depth study of specific areas.
(iii) Appropriateness of the content to the needs and interests of the learner
(iv) Ability of content to withstand the test of time (durability)
(v) Incorporation of related topics from other fields to emphasize the interdependence of contents.
(vi) Relevance of topics to the needs of the society
(vii) The contents should be such that the learner can learn i.e. they should not be too difficult for the learner.

3.7 Learning Experiences

These refer to the various activities learners engage in which brings about the desired learning or change. The changes could be mental, physical or behavioral.

3.8 Criteria for Selection of Learning Experiences

(i) Nature of subject matter – The nature of Agricultural Science is different from that of History. Ditto other subjects. The activities that are relevant to the subject matters would also be different.
(ii) Nature of learning – While some learning activities require only memorization, others may require understanding and analysis.
(iii) Nature of learners - It is easier for some learners to understand simple information but others require stress and emphasis.
(iv) Nature of interest and capabilities of teacher – Learning experiences to be selected should be those that an average teacher in that area would be able to handle, otherwise he would attempt to avoid it.
(v) Nature of the objectives. The intended objectives could also be selection of learning experiences. For instance, some objectives may include ability to solve some practical problems and this will require solving the problems together in the class.
(vi) Available learning resources. The instructional materials available to the teacher and learner will directly influence the selection of learning activities.

3.9 Evaluation

Evaluation is the process of determining the extent to which educational programme objectives and expected learning outcome have been achieved. It also includes the worth of data generated from the exercise as a decision making tool. Evaluation is carried out before, during and after the teaching – learning process. Assessment and

measurement are just aspects of evaluation.

3.9 Forms of Evaluation

There are two main forms:

(i) Formative
(ii) Summative

Formative Evaluation

This is the periodic assessment activities that take place during the course of the programme. It could be during and at the end of a lesson or unit. It is not a once and for all affair. It helps in monitoring progress and making necessary adjustments.

Summative Evaluation

This is a comprehensive evaluation that takes place at the completion of an instructional programme. It is used to assess the worth of the products of the programme.

Evaluation Instruments

There are a number of devices for evaluating performance or achievement. They include:

(i) Interview
(ii) Observation
(iii) Questionnaires
(iv) Paper and Pencil Tests

The most important thing however is that the instrument must measure what it is supposed to measure, it must be reliable and should discriminate among tastes by showing that weak candidates perform worse those strong candidates.

SELF ASSESSMENT EXERCISE II

Clearly differentiate the following types of evaluation – short test during classes, JAMB examination, terminal examination, assignment and verbal questions during the class?

4.0 CONCLUSION

Finally, each element of the curriculum is interlinked with other elements. The realization of this will ensure an effective teaching learning process.

5.0 SUMMARY

In this unit, we have learnt that:

(i) Aims are broad statements of purpose and intention. They are long term ends.
(ii) Objectives are short term ends
(iii) Objectives are classified into the following taxonomies of objectives – cognitive, affective and psychomotor domains
(iv) Content is usually organized in disciplines
(v) Learning experiences are various activities learners engage in which brings out desired learning
(vi) Evaluation is the process of determining the extent to which educational programme objectives and expected learning Outcome have been achieved

6.0 TUTOR-MARKED ASSIGNMENT

Briefly discuss the four elements of curriculum.

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UNIT 3 METHODS OF TEACHING PRIMARY SCIENCE

CONTENTS

1.0 INTRODUCTION

The method of teaching science, resources available for teaching it and its evaluation are known to greatly affect achievement in science. It is therefore, important to examine these concepts in relation to primary science.

2.0 OBJECTIVES

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

- discuss the major methods of teaching primary science
- discuss the human and material resources available for teaching primary science
- explain improvisation in primary science
- identify innovations in teaching of primary science
- define and enumerate the importance of evaluation in primary science.

3.0 MAIN CONTENT

3.1 Methods of Teaching Primary Science

It is the duty of a teacher to transmit the subject matter to the learner. In doing this, at least one teaching method is required. A number of these methods however exist.

A teaching method can be defined as a systematic and orderly procedure in teaching and learning. The method or technique is a way of impacting knowledge while strategies are the required skills to impact such knowledge. There is really no good or bad method per se but the handling makes the difference. Sometimes a combination of methods would be required for effective learning to take place. Some of the methods used in teaching primary science are:

Problem–solving method, field trip method, project method, discussion method, lecture method etc.

3.2 Problem solving Method

This is a method which involves the identification of a problem for students to solve with minimum guidance from the teacher. It consists of placing before the learners a true-to-life, specific and well defined problem requiring solutions. Such problems would have grown out of the learners' experiences and the problem solving skills acquired helps in moulding their existing knowledge and skill. The learner is able to pay attention to details which may later influence the outcome of the problem and identifies similarities and differences between typical situations. The learner is guided to identify problem, have a fair knowledge of what he intends to accomplish and how to gather necessary data for the solution to the problem.

The learner passes through the following stages in arriving at a solution.

- Identification of the problem requiring solutions
- Definition and delimitation of the problem
- Collection of necessary data required to solve the problem
- Formulation of hypothesis for solution
- Testing of the hypothesis

Checking whether the result leads to the solution otherwise the procedure is revised and the process repeated until the problem is solved or he gives up.

It is the duty of the teacher to ensure the learner is guided at every stage of the process.

3.3 Advantages of Problem-Solving Method

(i) It encourages creativity among learners
(ii) It really engages learner leading to real understanding
(iii) It allows the learner to relate class work to true-to-life situation
(iv) It allows the learner to learn at his own pace
(v) The learner learns from his successes and failures.

3.4 Disadvantages of Problem-Solving Method

(i) It could waste a lot of time
(ii) Confusion can set in leading to loss of interest by the learner
(iii) Learner may not benefit much from the process if too much guidance is given by the teacher

3.5 Project Method

This is a planned activity undertaken by a person to achieve a particular goal. The person or persons involved investigate(s) and solve(s) problem. It is advisable that the project must be of measurable benefit to the learner.

Meaningful projects often involve three major stages, namely; planning, implementation and evaluation. The teacher is only involved in providing guidance on the procedure.

Projects could be done individually or in small groups such as weaving of baskets or planting of portions of farm land by agricultural science students in groups.

Projects could be on individual or group basis depending on whether it is carried out by a single pupil or more than one student.

A good project must be meaningful to students, and useful to some other subjects. It must be beneficial and a source of motivation to the students. It must instill self-discipline and encourage the development of imaginative and initiative skills.

3.6 Advantages of Project Method

(1) It is practical and real in nature which improves learning
(2) It encourages learners to know how to gather information without depending on the teacher
(3) Students are able to appreciate the benefit of working as a team
(4) Students integrate other experiences.

3.7 Disadvantages of Project Method

(i) It could be time consuming

(ii) It allows lazy students to go undetected because of the group work involved.
(iii) Projects may be expensive
(iv) There is the tendency to over concentrate on some aspects of the curriculum and neglect the others
(iv) Students may not know much about the projects others are doing. They concentrate more on their own project.

SELF ASSESSMENT EXERCISE I
Compare and contrast problem solving method with project method

3.8 Discussion Method

This is a participatory approach in which learners are involved in the process of learning by allowing them to also raise issues of their own and arriving at solutions through participants' analysis and synthesis. The teacher is also involved but he must not dominate the discussion.

3.9 Advantage of Discussion Method

(i) It can help in achieving attitudinal change among learners.
(ii) It encourages logical and constructive thinking by the students.
(iii) It is a good way of finding solution to problems
(iv) It makes students to be actively involved in lessons
(v) There is a cordial relationship and interaction among students and between them and their teacher

3.10 Disadvantages of Discussion Method

1. It can only be used among mature students since the level of knowledge and expression of young pupils may be low.
2. It is only useful where the participants are knowledgeable otherwise it becomes an expression of ignorance
3. There is the tendency of a few outspoken and bold ones to dominate the discussion
4. Unless rightly guided, the discussion may not be focused.

3.11 Field-Trip Method

This is perhaps the best method when there is the need for direct or real- life experience. It is used to discover knowledge in a real-life situation.

It involves leading students into natural life setting or for excursion. It could also involve leading students to natural settings such as forest reserves, lakes, sea, factories, industries and other similar establishments. It helps to break the monotony of class teaching.

3.12 Advantages of Field-Trips

(i) It enhances learning and arouses the interest of students
(ii) It exposes students to new learning experiences
(iii) It helps to reinforce what has been taught in the classroom through practical experience
(iv) It promotes interaction amongst the students

3.13 Disadvantages of Field Trip Method

(i) It could be time consuming
(ii) It is expensive especially in terms of transportation
(iii) It could sometimes be risky

3.14 Lecture Method

This is perhaps the oldest method. It is an organized verbal presentation of a subject matter dominated by the teacher. It is a system in which the teacher gives out all the facts he wants the learner to know and master without caring whether or not the students participate. The teacher may sometimes use illustrative materials. It is however highly discouraged at the primary level.

3.15 Advantages of Lecture Method

(i) It helps to teach a large number of students at a time
(ii) It helps in covering much ground at a time
(iii) It helps the students to write very fast and improve their coordination
(iv) It promotes learners oral and written expression.

3.16 Disadvantages of Lecture Method

(i) It is teacher dominated
(ii) It does not take care of individual differences
(iii) It could easily become boring
(iv) It is not ideal for young learners
(v) It gives no room for students' participation and interaction during lessons

SELF ASSESSMENT EXERCISE II

Despite the disadvantages of the lecture method, why is it still being used?

4.0 CONCLUSION

It would be noted that even though there are different teaching methods, none is perfect. A good teacher should therefore, learn to use appropriate method or a combination of methods at the right time.

5.0 SUMMARY

In this unit, five teaching methods have been examined, namely; problem solving, project, discussion, field-trip and lecture methods. Advantages and disadvantages of each method were highlighted. None of the method is however suggested as the best.

SELF ASSESSMENT EXERCISE 1

Suggest the best method of teaching. Give reasons for your choice.

6.0 TUTOR-MARKED ASSIGNMENT

(a) Explain the importance of teaching methods to potential teachers
(b) Hundred percent use of Lecture method should be discouraged in teaching primary science. Why?
(c) Write short notes on the following teaching methods.

(i) Problem-solving method
(ii) Discussion method
(iii) Field trip
(iv) Project method

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UNIT 4 RESOURCES FOR PRIMARY SCIENCE TEACHING

CONTENTS

1.0 INTRODUCTION

Meaningful learning can only take place when teaching is properly and professionally handled by the teacher. For teaching to be effective necessary resources must be available and utilized properly. These resources include both human and material resources.

2.0 OBJECTIVES

At the end of this unit, you should be able to:

- classify resources required for teaching primary science
- discuss human resources required for teaching primary science
- discuss materials resources necessary for teaching primary science
- discuss the need for innovation in teaching primary science.

3.0 MAIN CONTENT

3.1 Introduction to Resources for Primary Science Teaching

In teaching primary science, learning is facilitated by individuals and instructional materials. All these form what is referred to as resources in education. Resources are those materials and people or places which make easy and effective the course of teaching and learning. Effective development and management of such resources lead to the teachers and learners' benefits and advantages. Resources could be materials, devices, idea/strategies, resource persons or community resources. Such resources can broadly be grouped into two:

(i) Human Resources
(ii) Material Resources

3.2 Human Resources

Human resources refer to individuals that one way or the other aid learning. These individuals include the science teacher, laboratory assistants, other science students, technicians and other individuals from outside the school such as invited guest speakers, carpenters, blacksmiths etc.

Qualitative primary science education can only be provided where there is the availability of human resources even when material resources are available.

The effectiveness of these human resources especially teachers is however hampered by a number of factors. Some of these include insufficient fund, use of unqualified teachers, lack of retraining programmes and absence of attractive welfare packages for primary science teachers.

3.3 Material Resources

All equipment, apparatus, good textbooks and any other physical object used as an instructional-aid in the teaching – learning process are referred to as Material Resources.

These materials significantly aid learning. Like human resources inadequate funding seriously affects the availability of these resources. This is why a good teacher would sometimes have to improvise to ensure some learning at least takes place where these resources are either not available or are available in insufficient quantities.

3.4 Innovations in Primary Science Teaching

Innovations can be defined as changes or new ways of doing things. In this context, it refers to creative ways with which a primary science pupil is transformed from a passive knowledge receiver into an active creator of the process in which he learns.

Innovations can occur or take place in all aspects of teaching – learning of primary science including curriculum structure, methodology, teaching and learning environment, evaluation and usage of instructional materials. The attention here is on instructional materials

In the early days, lessons were taught without recourse to instructional-aids or materials but because of the importance and relevance of these materials, primary science teaching today requires science equipment and other materials. These include textbooks, charts, models, improvised materials etc.

Today video-tape cameras, multi-media projectors, close circuit television, simulation and computers are innovations that are used in teaching primary science. These have made science teaching and learning more interesting.

However, development and implementation of innovations require skill, time and adequate funding. It also poses a lot of challenges to teachers who are stagnant and are not moving with the ICT trend of our time.

SELF ASSESSMENT EXERCISE 1

Identify various resources required in teaching this course

3.5 Rationale for use of Resource Materials in Science Teaching

The rationale for use of resource materials for the teaching of science at all levels of educational sector cannot be over emphasized. Among them are the following:

1. hey concretize learning and make pupils to develop interest in the subject. Modern technology has provided the teacher with a lot of teaching materials that can save him from mere verbalism to concretized learning.
2. They also help to promote understanding and make retention of what was learnt permanently.
3. They complement and supplement the teacher's tasks, by providing him useful reference points or live specimens that he can use to describe the concept.
4. They provide reality on the environment to the learners and ensure change of behaviour.
5. They also generate desire for further study to the learners, as they provide clear images of what is taught.

SELF ASSESSMENT EXERCISE II

In what ways do you think ICT can aid meaningful learning of primary science?

4.0 CONCLUSION

The teachers should have sufficient skills of sourcing and using relevant available resource materials to teach primary science. If primary science is to survive and be made more attractive and interesting to pupils, there has to be improved funding by the government.

5.0 SUMMARY

In this unit we have learnt that

(i) Resources in primary science teaching can be classified into human and material resources
(ii) These resources are hampered by poor funding
(iii) A lot of innovations and improvisations have come into primary science teaching

6.0 TUTOR-MARKED ASSESSMENT

1. (a) List five human resources available for teaching primary science.
   (b) List five material resources for teaching primary science.

2. a). Discuss five factors militating against the availability and effective use of resources in the teaching of primary science
   b). why do you think it is necessary for basic science teacher to use various resources in his lesson?

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MODULE 3 BASIC FOUNDATIONS OF PRIMARY SCIENCE

UNIT 1 INTRODUCTION TO BIOLOGY

CONTENTS

1.0 INTRODUCTION

Primary Science is at attempt all presenting complex scientific processes and activities to pupil in a simple form that will ensure learning amongst the pupils. This may involve leaving out the details to simplify the understanding of scientific concepts.

Primary science contents are mainly fragments of Biology, Chemistry and Physics. It is indeed an integration of these three science subjects. This is combined as Integrated Science in Junior Secondary level. It would therefore, not be out of place to have basic knowledge of these subjects.

2.0 OBJECTIVES

At the end of this unit, you should be able to

- define Biology
- enumerate the characteristics of living things
- classify living things into plants and animals
- mention the differences between plants and animals.

3.0 MAIN CONTENT

3.1 Introduction to the Study of Biology

Biology is the study of living things, both plants and animals. All living things possess common features and can be separated on the basis of their similarities.

Living things can move, feed, sense their environment or respond to stimuli, reproduce, grow, get rid of waste products and respire (breath). These characteristics can be used to sort out things in the environment into living and non-living things.

3.2 Characteristics of Living Things

3.3 Movement

All living things can move. Animals can move from place to place while plants show side movement or growth movement in response to stimuli. Animals move in search of food, shelter etc. but non-living things cannot move unless they are pushed by external force e.g. wind.

3.4 Reproduction

Living things produce young ones which resemble them and this is necessary for continuity of life.

3.5 Nutrition

Living things feed on one type of food or the other. The food provides energy for daily activities, body-building and growth. Non-living things cannot feed.

3.6 Respiration

Living things break down the food eaten in order to release stored energy through respiration. It involves breathing in and out of oxygen and carbon IV oxide respectively by animals. Plants breathe in carbon IV oxide and release oxygen. There are two types of respiration.

Aerobic Respiration which requires oxygen for releasing energy.

$C_6H_{12}O_6 + 6O_6 \longrightarrow 6CO_6 + 6H_2O + \text{Energy}$

Anaerobic respiration which does not require oxygen for energy release.

For respiratory process, human beings use their lungs, fishes use their gills, while plants use openings in their leaves (stomata) or stems (lenticels).

3.7 Growth

Living things increase in size and height from time to time. This biological growth is not reversible. Non-living things do not grow. For example, an expansion of football or balloon is not growth. It can also be depressed (reversible).

3.8 Excretion

This is the removal of waste products of metabolism. Metabolism is all the chemical processes taking place within the cells of the body e.g. building up and using up energy and wastes accumulation. Such wastes are not useful to the body and may be poisonous or toxic and need to be removed. Examples of wastes are sweat, carbon IV oxide, urine etc.

3.9 Irritability

Living things are sensitive and respond to changes in their environment e.g. when the leaves of a plant grow towards light rays (phototropism) the immediate withdrawal of the horn of a snail on touch etc. Such response to external stimuli is called Irritability. Non-living things do not respond to stimuli.

SELF ASSESSMENT EXERCISE 1
Differentiate how plants and animals exhibit each of these characteristics of living things. Movement, reproduction, nutrition, growth, excretion, irritability.

3.10 Classification of Living Things

Living things comprise mainly of plants and animals that can be classified into different groups.

3.11 Classification of Plants

Plants can be classified into four main groups.

3.12 Simple Plants

They are plants that have neither root, stem nor leaf e.g. Mushroom, yeast, moulds on bread, fungi, spyrogyra, lichens etc. They have simple body structure (thallus). Most of them are not green in colour.

3.13 Bryophyte e.g. Moss and Liverwort

They are mostly found in damp wall of fence or trees, logs and rocks. They lack true root, stem and leaf. They are attached to the soil or substrate with their rhizoid. They have specialized reproductive organ.

3.14 Pteridophyte e.g. Fern

They have roots, stems and leaves (that resemble palm frond). They are commonly found in ponds or stagnant streams.

3.15 Seed-bearing Plants e.g. Banana, Grasses, Cacao, Pawpaw, Weeds etc.

They are plants with true roots, stems and leaves. They have green leaves and are able to photosynthesize. They also have well developed reproductive organs. They may be monocotyledons or dicotyledons.

3.16 Classification of Animals

Animals can be classified into classes on the basis of common characteristics. These include;

(i) Vertebrates
(ii) Invertebrates

3.17 Vertebrates

These are animals with backbone.

They are classified into the following classes.

(i) Pisces e.g. skate, shark, bony fish etc.
(ii) Amphibians e.g. frog, toad etc
(iii) Reptiles e.g. lizards, snakes
(iv) Aves (birds) e.g. hen, owl, turkey, duck etc
(v) Mammals e.g. cat, man, goat, lion etc.

3.18 Invertebrates

These are animals without backbone. They can be classified into:

(i) Coelentrates (2 – layered animals) e.g. hydra
(ii) Platyhelminthes (flatworm) e.g. tapeworm, planaria.
(iii) Segmented worm e.g. earthworm, ringworm etc
(iv) Mollusca – shelled animals e.g. snail
(v) Arthropoda (6 – legged animals) e.g. insects like housefly cockroach etc
(vi) Many legged animals e.g. crabs
(vii) Eight –legged animals e.g. spider and scorpion
(viii) Multi-legged animals e.g. millipedes and centipedes.

SELF ASSESSMENT EXERCISE II

Mention three differences between vertebrates and invertebrates

3.19 Differences between Plants and Animals

S/no	Plants	Animals
1	They remain in one place but move by growth or tropism	They move from one place to another (locomotion)
2	They are producers. They produce their food through photosynthesis	They are consumers. They obtain already made food or eat other animals
3	Possess chlorophyll and chloroplast. And most higher plants are green	They lack chlorophyll and chloroplast
4	They respond slowly to changes in their environment	They respond quickly to changes in their environment
5	They have branching bodies	They have compact bodies
6	Growth continues throughout their live span	Growth is limited

SELF ASSESSMENT EXERCISE II

Briefly identify the differences between living and non-living things

3.20 Taxonomic Groups/Nomenclature

Plants and animals are classified into broad groups based on their common features. They classification include kingdom, phylum, class, order, family, genus and species.

In the binomial system of nomenclature, each organism has both genetic and specific names. The name starts with a capital letter while the specific name is written in small letters. The names are usually written in italics or underlined. E.g. *Homo sapiens.*

4.0 CONCLUSION

Biological Science unfolds the reality of living things and ensures better understanding of the features of living things.

5.0 SUMMARY

In this unit, we have learnt the:

- Definition of biology as the study of living things
- Characteristics of living things – movement, respiration, nutrition, irritability, growth, excretion, reproduction (MR NIGER).
- Different methods of classifying plants and animals
- Major differences between plants and animals.

6.0 TUTOR-MARKED ASSIGNMENT

1. (a) What is Biology?
   (b) Enumerate and explain four (4) characteristics of living things
2. List the main differences between plants and animals.

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UNIT 2 INTRODUCTION TO CHEMISTRY

CONTENTS

1.0 INTRODUCTION

As earlier stated, Primary Science is a fragment of the 3 major science subjects. A major input comes from Chemistry which explains a number of reactions that take place in nature. It exposes pupils to the nature of matter.

2.0 OBJECTIVES

At the end of this unit, you should be able to:

- define chemistry
- classify matter physically and chemically
- explain the meaning of change of state
- state the characteristics and uses of air
- state the characteristics and uses of water
- explain the meaning and sources of air pollution
- describe the separation of constituents of mixtures.

3.0 MAIN CONTENT

3.1 Introduction to the Study of Chemistry

Chemistry is the study of matter around us. Matter is defined as anything that occupies space and has mass.

3.2 Classification of Matter

Matter can be classified in two ways

(i) Physical classification
(ii) Chemical classification

3.3 Physical Classification

Based on their physical properties, matter can be classified into solids, liquids and gases. This is generally referred to as state of matter.

3.4 Solid

This refers to the state of matter in which the particles are closely packed together to make them rigid. The particles cannot move but can vibrate. Solid have fixed shape and volume.

3.5 Liquids

In this state, particles are arranged in a manner which makes them flow. The particles are not as tightly packed but have fixed volume, this explains why liquids are difficult to compress. They have slightly high density.

3.6 Gases

In this state, particles are loosely packed and can move freely about and flow very fast. Gas particles can therefore, be compressed. The looseness allows gases to fill the container in which they are put.

SELF ASSESSMENT EXERCISE 1

In tabular form, list four differences between solids liquids and gases

3.7 Change of State

Exposing matter to heating or cooling can bring about a change of state. For instance, water is normally in liquid form but it can be converted into solid as ice and into gas as vapour.
The temperature at which liquids become solid is known as the freezing point while the temperature at which a solid becomes liquid is known as the melting point.

Solid + heat ⟶ Liquid + heat ⟶ Gas
Ice + heat ⟶ Water + heat ⟶ steam
Steam + cool ⟶ water + cool ⟶ Ice.

3.8 Air and Water

3.9 Air

Air is a mixture of gases consisting of Nitrogen, Oxygen, Carbon IV oxide, Water Vapour and noble gases namely Argon, Neon, Xenon, Krypton and Helium. Air is present everywhere. The gases are present in slightly different percentages by volume.

Nitrogen (78.09%), Oxygen (20.95%), Carbon IV oxide (0.03%), Argon (0.93%). Other gases (0.003%), Water Vapour (varies depending on the degree of humidity). Activities such as burning can increase the quantity of carbon 11 oxide in the air.

3.10 Characteristics of Air

(i) We can feel air e.g. when wind blows across the branches or when we fan ourselves
(ii) Air occupies space
(iii) Air has mass
(iv) Air expands especially when heated
(vi) Air supports burning
(vii) Air exists in the soil
(viii) Air can be compressed

SELF ASSESSMENT EXERCISE II

Lit 2 candles cover the first with a bell jar and leave the second open. What do you observe?

3.11 Uses of Air

(i) Oxygen is used to remove excess carbon from molten iron & steel industry
(ii) Used by divers & mountaineers for breathing

(iii) For respiration by mammals/animals
(iv) Carbon IV oxide is used by plants for synthesizing food (photosynthesis)
(v) Carbon IV oxide is used as refrigerant
(vi) Nitrogen serves as a plant food
(vii) Neon is used for producing advertising light

3.12 Air Pollution

Air pollution is the discharge of pollutant materials into the air to contaminate or render it impure.

3.13 Sources of Air Pollution

Industrial and internal combustion engines of machines, cars and vehicles. Pollutants from these sources include:

(i) Soot – from unburnt fuel, industrial ashes and furnaces
(ii) Coal (with substantial content of sulphur)
(iii) Smoke (from burning of wood which produces carbon IV oxide and sulphur IV oxide)
(iv) Hydrocarbons (from incomplete combustion of petrol and engine oil) e.g. benzopyrene which causes cancer
(v) Sulphur IV oxide (from fuel burning)
(vi) Carbon II oxide – (from fuel burning in automobiles)
(vii) Nitrogen oxide gas (burning of Nitrogen compounds) (viii) Petroleum and nuclear fallout (toxic waste)

3.14 Effects of Air Pollution

(i) It causes injury to plants and animals, especially respiratory problem e.g. sulphur dioxide and carbon monoxide combines with blood to reduce blood efficiency
(ii) It poisons the atmosphere which can cause health hazards e.g. cancer
(iii) Air pollutants (e.g lead) accumulate in the body and impair body health e.g. lead and chlorine poison
(iv) Radioactive damage tissues and causes gene mutation e.g. strontium 90, uranium etc.
(v) Radiation from nuclear fall outs causes blood cancer or leukaemia
(vi) It upsets ecological balance of biotic life
(vii) Air pollutants (e.g. Carbon IV oxide) causes melting of ice, leading to flood (in temperate regions).

3.15 Water

Water is an indispensable substance to life. It can be obtained from different sources such as well, pond, river, tap, rain, spring, lakes, ocean or seas.

3.16 Uses of Water

(i) For domestic purposes such as bathing, washing, drinking, food preservation etc.

(ii) Used in industry as coolant and chemical raw materials for manufacturing variety of items
(iii) To drive turbine to generate electricity
(iv) It serves as habitat for some plants and animals e.g. fish, water, lettuce.

3.17 Common Treatment of Water

Impure water can be purified by

(i) Adding-Alum to muddy water
(ii) Filtration, to remove dust and other dissolved particles
(ii) Passing away through the filter beds (using primary and secondary filters and disorders)
(iv) Boiling water to kill deadly micro-organisms
(v) Carrying our distillation to remove dissolved impurities and to kill microbes
(vi) Adding calculated quantity of chlorine

3.18 Physical Properties of Water

(i) Pure water is colourless, odourless, tasteless and has insipid taste
(ii) The density of pure water is $1g/cm^3$ at 40^0C
(iii) Water dissolves many solids such as salt, acid, gases etc
(iv) Pure water boils at 100^0C
(v) Water is neutral to litmus test

3.19 Chemical Properties of Water

1. Water reacts with metals to liberate hydrogen gas (reactive metals) e. g.

$$Ca + 2H_20 \longrightarrow Ca(OH)_2 + H_2$$

Calcium Cold water Hydrogen

$$Mg + 2H_2O \longrightarrow Mg(OH)_2 + H_2$$

Magnesium Steam

2 Water reacts with non-metals e. g. Chlorine to produce hydrochloric acid solution.

3 Water dissolves some oxides to produce alkaline solution e.g.

$$Na_2O + H_20 \longrightarrow 2NaOH$$

Sodium oxide Water Alkaline

4 Water also dissolves some oxides to produce acidic solution e. g.

$$SO_2 + H_2O \longrightarrow H_2SO_3$$

3.20 Hardness of Water

Water which does not form lather readily with soap is hard water. There are 2 forms of hardness: Temporary and Permanent hardness.

(a) Temporary Hardness: It is caused by the present of Calcium hydrogen carbonate in water and can be removed by boiling
(b) Permanent Hardness: It is caused by the presence of Calcium sulphate salt in water and cannot be removed by mere boiling

3.21 Removal of Hardness of Water

(i) By boiling – which decomposes the sodium hydrogen carbonate (in temporary hardness)
(ii) By adding slaked lime i.e. Calcium carbonate (for temporary hardness)
(iii) Addition of washing soda (sodium carbonate) by participating insoluble carbonate
(iv) Addition of chemical called permutit (using ion-exchange principle) for treating large water (permanent method)

3.22 Economic Importance of Hard Water

(i) It wastes a lot of soap (in laundry)
(ii) It contains soluble calcium which helps to build up bones & strong teeth.

3.23 Elements, Compounds, and Mixture

There are now 103 known elements on earth surface. Many of these elements are not found pure but in mixtures. To obtain the pure element, it has to be separated from the other substances in the mixture. However, it is necessary to recognize a difference in properties between the constituents of the mixture.

Technique for separating Mixtures

Technique	Type of Mixture
1. Filtration	An insoluble substance from soluble solution
2. Crystallization	A crystalline solid from its solution
3. Separating funnel or Decantation	Immiscible liquids (lighter and denser liquids)
4. Distillation	A liquid from a solution of two liquids with widely different boiling points
5. Fractional Distillation	Liquids with boiling points close together
6. Sublimation	Solids, one of which sublimes on heating
7. Chromatography	Substances which are absorbed to differing extents on paper or columns which differ in solubilities in particular solvents

Examples of Mixtures

(i) Mixture of solid and liquid (e.g. salt and water)
(ii) Mixture of liquid and gas e.g. carbonated drinks (iii) Mixture of solid and solid e.g. brass
(iv) Mixture of a gas and gas e.g. air

Methods of Purifying Substance. These are:

(i) Sublimation
(ii) Crystallization
(iii) Precipitation

Sublimation

Solids when heated can change directly to gaseous state without changing to liquid state. This process is called sublimation e.g. Ammonium chloride, Iodine, Sulphur etc.

Crystallization

The impure solid is dissolved, in a suitable solvent, leaving the impurities as an insoluble residue. The solution is filtered, then concentrated and crystallized. The crystals are now pure solid substance. This process is called crystallization.

Precipitation

If one substance is soluble, and the other insoluble in a solvent, the soluble one remains in solution while the insoluble one comes down as solid or precipitates and they can be removed by decantation or filtration.

(1) Solid and liquid: (a) Decantation (b) Filtration (c) Evaporation (d) Distillation
(2) Liquid and Liquid: (a) Distillation (b) Fractional distillation (c) Chromatography

SELF ASSESSMENT EXERCISE III

In tabular form, list 3 differences between Elements, Compounds and Mixtures

3.24 Stoichiometry, Thermodynamics and Equilibra

Chemical reactions have a profound effect on our lives, for example, food is converted to energy in human beings, nitrogen and hydrogen are combined to form ammonia used for fertilizers; fuels and plastic are produced from petroleum; the production of starch in plants from carbon IV oxide and water using sunlight energy; production of human insulin from bacteria in laboratories; cancer is also induced in human by substances from our environment, etc. In Chemistry, an attempt is made

to study these chemical changes – why reactions occur, how fast they occur, and their specific pathways.

3.25 Stoichiometry

Stoichiometry deals with the quantities of materials consumed and produced in chemical reactions.

The average atomic mass for each element is obtained by calculating the average of the masses of naturally occurring isotopes.

$$\text{Mass percent} = \frac{\text{mass of element in 1 mole of substance} \times 100}{\text{Mass of 1 mole of substance.}}$$

In a chemical reaction, atoms are neither created nor destroyed, but are merely reorganised. Therefore, all atoms present in the reactants must be accounted for among the products. A chemical equation shows that the chemical reaction, with reactants on the left side of an arrow and products on the right. A balanced equation therefore gives the relative numbers of reactant and product molecules. Amounts of reactants consumed and products formed can be calculated from the balanced equation in a reaction by using the mole ratios relating both reactants and products.

3.26 Thermodynamics

This is the study of energy and its interconversions. The law of conservation of energy is often referred to as the **"FIRST LAW OF THERMODYNAMICS"** which states that the energy of the universe is constant.

The internal Energy E of a system is the sum of the kinetic and potential energies of all the particles in the system. The internal energy of a system can be changed by a flow of Work, heat or even both.

$E = q + w$

E = the change in the system's internal energy.

q = heat, w = work

Thermodynamics quantities consist of two parts – a number and a sign. A number gives the magnitude of the change

A sign indicates the direction of the flow.

For instance, if a quantity of energy flows into the system via heat **(endothermic process),** q = +x, that is system's energy is increasing. But when energy flows out of the system via heat **(an exothermic process)**, q = -x, that is system's energy is decreasing.

3.27 Equilibra

Chemical reactions are reversible, for example, when Nitrogen dioxide NO_2 decomposes, it breaks down to NO and O_2. This is forward reaction.

$2N0_2$ (g) ⟶ 2NO (g) + O_2 (g) forward reaction

The reverse reaction can also occur, when NO and O_2 accumulate, they can react to re-form NO_2.

O_2 (g) + 2NO(g) ⟶ $2NO_2$ (g) reverse reaction
Oxygen Nitrogenoxide Nitrogen dioxide.

When forward and reverse reaction rates are equal, there will be no changes in the concentrations of reactants, or products. This is referred to as **Chemical Equilibrium.**

In doing stoichiometry calculations, it is assumed that reactions proceed to completion, that is, until one of the reactants runs out. But there are many chemical reactions that do not proceed to completion. e.g. Dimerization of nitrogen dioxide:

NO_2 (g) + NO_2 (g) ⟶ N_2O_4(g)
Dark brown gas colourless gas

When placed in an evacuated sealed glass vessel at 25^0C, the NO_2 dark brown colour is converted to colourless N_2O_4 but the brown colour can still remain. Then, we say that the system has reached chemical equilibrium, the state where the concentrations of all reactants and products remain constant with time. Any chemical reactions carried out in a closed vessel will always reach equilibrium. The law of mass action was proposed as a general description of the equilibrium condition.

SELF ASSESSMENT EXERCISE IV

1. Differentiate between endothermic and exothermic processes with relevant examples
2. Explain the term "Chemical Equilibrium"

4.0 CONCLUSION

Chemistry is essentially the study of anything that occupies space and has mass. Air and water are of immense benefit to man and other living things.

5.0 SUMMARY

In this unit, we have learnt:

(a) the definition of chemistry as a study of matter
(b) the characteristics and uses of water and air
(c) the meaning, sources and effects of air pollution
(d) that there are now 103 known elements on earth surface most of which are not found pure but as mixtures.
(e) that stoichiometry deals with the quantities of materials consumed and produced in chemical reactions
(f) that thermodynamics is the study of energy and its interconversions.

(g) that most chemical reactions involve both forward reverse actions, but when forward and reverse reactions are equal, there will be no changes in the concentration of reactants or products. This is referred to as chemical equilibrium.

6.0 TUTOR-MARKED ASSIGNMENT

1 (a) With a specific example, explain the process of change of state.

(b) (i) Explain the term 'Air pollution"

(ii) Identify two sources of Air pollution in locality

(iii) Enumerate three effects of Air pollution noticed in your environment.

2 (a) Differentiate between temporary and permanent hardness of water

(b) Explain three ways by which hardness of water can be removed.

3 Explain the term (i) stoichiometry (ii) thermodynamic

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UNIT 3 INTRODUCTION TO PHYSICS

CONTENTS

1.0 INTRODUCTION

Physics is a science that deals mainly with concrete objects and measurement of materials. To a large extend it provides the framework for other sciences.

2.0 OBJECTIVES

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

- explain the meaning of physics
- define and enumerate the importance of measurement
- define light
- identify sources and properties of light
- identify the colours of light
- define sound
- list the characteristics of sound.

3.0 MAIN CONTENT

3.1 Introduction to the Study of Physics

Physics explains why many things around us behave the way they do.
This process usually involves measurements such as distance, area, volume, current, resistance etc. These measurements provide the exact descriptions of the objects. The measurements are in different units e.g. metres, grammes etc.

3.2 Measurement

Measurement is one of the process skills of science by which objects or events are quantified by assigning numbers to them. Measurement explains scientific results.

3.3 Importance of Measurements

(i) It helps to provide accurate, reliable and reproducible information
(ii) It gives room for easy and meaningful communication among scientists
(iii) It standardizes the report made by scientists after the completion of an experiment

Modern scientists adopt in measurement common units called system International Units (CS. 1. Units)

Fundamental Quantities	S.I. Units	Sub-Units	Instruments used for measurements
Length [L]	Metre (m)	Millimeter Centimetre Kilometre	Metre rule, tape, ruler, vernier, calipers, micrometer screw gauge
Mass [M]	Kilogram (kg)	Grammes Tones	Chemical balance, compression balance and equal arm balance
Time [T]	Second (S)	Minutes, hour, day etc	Watches, clocks
Volume [V]	Cubic metre (m^3)	Cubic millimeter (mm^3) cubic centimeter (cm^3)	Measurement cyclinder, beaker, Jerry can

Other measuring units apart from the fundamental units are called Derived Units. Examples include.

(i) Unit of velocity is metre per second (m/s) or (LT^{-1})
(ii) Volume – Cubic metre derived from unit of length (m^3) or (L^3)
(iii) Area – Metre square derived from unit of length (m) or (L)
(iv) Acceleration – Metre per second square from the unit of length and

time etc. (m/s^2) or (LT^{-2})

(v) Atmosphere pressure – the unit is Newton per square metre. (N/m^2) or ($ML^{-1}T^{-2}$)

Unit for Length	Unit for Mass	Unit for Volume
10mm = 1cm	10mg = 1cg	1000mm3 = 1cm3
10cm = 1dm	10 cg = 1dg	1000cm3 = 1 litre
10dm = 1m	10 dg = 1g	
1000m = 1km	1000g = 1kg	

*Derived units are derived from the fundamental units through simple mathematical process.

Quantity	S.I. Unit	Instrument
Relative density	Kilometer per cubic metre (Kg/M3)	Hydrometer
Atmosphere pressure	Newton per metre square	Barometer
Electronic current	Ampere	Ammeter
Voltage	Volts	Voltmeter
Relative humidity	Percentage	Hygrometer

3.4 Use of Measuring Instruments

Measurement of Distance: The instrument to be used will depend on the distance to be measured. For instance, measuring the distance from Iwo to Ibadan, a speedometer will be appropriate; for the distance of a school compound, a metre rule or tape rule would be useful. Smaller distance like length of wire can be measured by using vernier caliper or micrometer screw gauge (it measures small places of decimal).

3.5 Light

Light is a form of energy. It is the energy obtained when an object become brighter. Sunlight is the natural and main source of light. Light energy is used by plants during photosynthesis. Light makes things visible. Light can make a plant (or tree) to bend towards it, hence it is a form of energy.

3.6 Sources of Light

There are two sources of light. These are natural sources and artificial sources

(i) Natural sources: Objects which produce light on their own are natural sources of

light e.g the sun, stars, firefly. They are self- luminous.

(ii) Artificial sources: These are man-made objects which produce light with the support of man e.g. torch-light, candle light, electric bulb.

Certain substances do not produce their own light but they reflect light from luminous objects e.g plain glass, clear liquid etc while the non-luminous are book, moon, ground etc. Objects which allow light to pass through are said to be transparent e.g. plain glass, clear liquids. Certain objects which allow light to pass through them but do not allow object to be seen are said to be translucent e.g. oiled paper. Other objects that do not allow light to pass through them are called Opaque object e.g. wood, rock, moon etc.

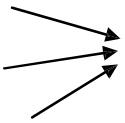
3.7 Properties of Light

(1) Light can travel from one place to the other. The direction along which light travels is called Ray of Light ⟶ A collection of rays of shinning stream of light is called Beam of Light.
They are of 3 types.

(i) **Parallel Beam** - Distant objects like the sun gives parallel beam

(ii) **Diverging beam of light** - Beam formed by rays that spread out. e.g. a torchlight or a lamp that emits diverging beam.

iii) **Converging beam** – Beam formed by rays that narrows in as **source of light in a projecting lantern.**



(2) Light travels in a straight line. A pin-hole camera works on the principle that light travels in a straight line.

(3) Shadows are formed when light travels in straight lines. When light rays fall on an opaque object, the rays gazing the edges from shadow. There are two types of shadow – Umbra (full shadow) and penumbra (partial shadow).

3.8 Phenomena Resulting from Light Traveling in a Straight Line

(i) The inversion of images in camera

(ii) The eclipse of the sun and moon

(iii) When light falls on shinning surfaces e.g. mirror, they are reflected – bouncing back of light rays on shinning surfaces

(iv) When light passes from one medium to the other, the rays of light are refracted i.e. light rays change direction.

3.9 Sound

Sound is a form of energy which causes an object to vibrate. When thunder cracks, buildings shake, when musical instruments are beaten, when building vibrates, sound is produced.

3.10 Characteristics of Sound

(i) Sound is due to vibrations e.g. vibrating musical drum produces sound
(ii) Sound travels through a medium e.g. air, liquid, or solid
(iii) Sound waves when reflected, it bounces back on hitting an obstacle e.g. cliff or high mountain to form an ECHO
(iv) Sound travels in the form of waves
(v) Sound waves can be compressed and refracted, leading to sound waves on entering different medium
(vi) When sound waves interfere, the wave path crosses, leading to NOISE. Echo can be used:

(a) to measure the speed of sound as shown by Isaac Newton
(b) in underwater exploration for gas and oil
(c) to mop the depths of the sea beds

SELF ASSESSMENT EXERCISE II

Explain what the following are used to measure – metres, grammes, ampere, volts and %.

4.0 CONCLUSION

Physics is a science subject that requires greater understanding of mathematics. In most instances physical sciences facilitates the achievement of the objectives of other sciences.

5.0 SUMMARY

In this unit, we have learnt about;

a) the meaning and importance of measurement in physics

b) how measurements are taken in metres, grammes, ampere, volts and percentages.

c) light as a source of energy and its natural and artificial sources.

d) sound as a form of energy which causes an object to vibrate.

6.0 TUTOR-MARKED ASSIGNMENT

1 (a) Define the term 'Measurement'

(b) Enumerate five importance of measurements

(c) Explain briefly the phenomena resulting from light traveling in a straight line

2. Explain four characteristics of sound

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UNIT 4 CELL STRUCTURE AND PHYSIOLOGY

CONTENTS

1.0 INTRODUCTION

A cell is the basic unit of life. When cells combine together, they form tissues which also combine to form organs. The combination of organs form systems and systems combine together to form a whole individual organism.

How organisms perform their normal body functions is studied under physiology. An understanding of these units and processes would serve as a necessary foundation in the study of biological science.

2.0 OBJECTIVES

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

- define the term cell
- draw and label plant and animal cells
- identify similarities and differences between plants and animal cells
- differentiate between reproduction in plants and animals

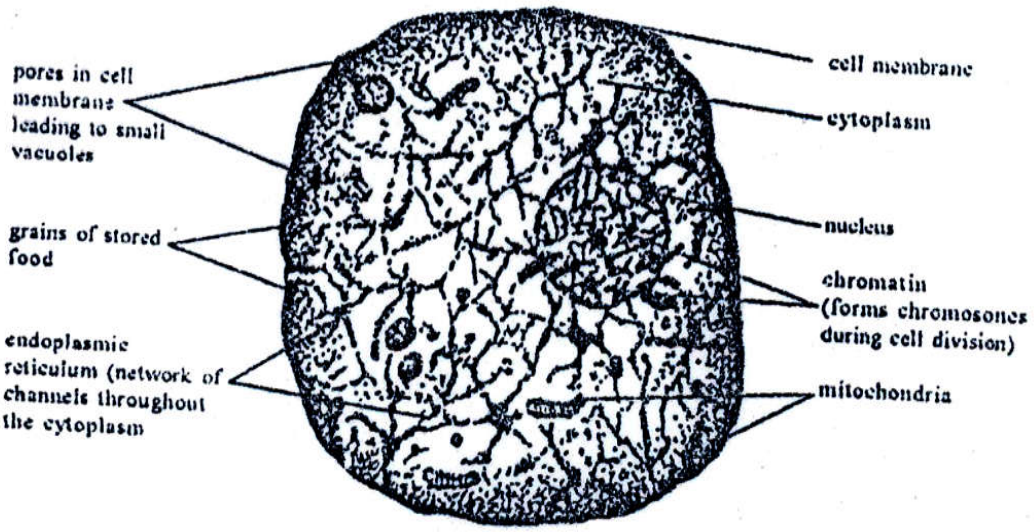
- discuss heredity and practical application of genetics to agriculture
- explain Darwin's theory of natural selection.

3.0 MAIN CONTENT

3.1 Introduction to the Study of Cell Structure and Physiology

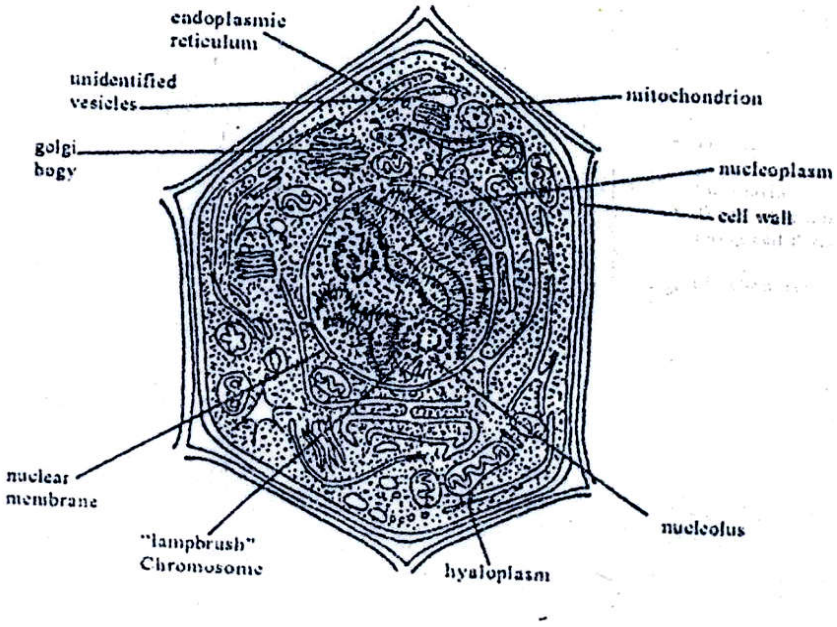
The cell is the basic unit of all living matter. It is the unit of life and it is able to carry out life's functions. It grows, reproduces and dies. Some living organisms are one-celled or unicellular e.g. amoeba and paramecium while others are multicellular, made up of millions of cells. The shapes of cell vary, ranging from rods to spiral, spheres, squares, irregular shapes etc. Plant cell is hexagonal/square while animal cell is spherical.

A Typical Animal Cell



Source: Federal Government Book Programme Practical Biology for Senior Secondary Schools – page 2

A Typical Plant Cell



Source: Senior Secondary Biology Book 2 by FOC Ndu et al page 3

A typical cell consists of the following parts:

(i) **Cell Membrane –** It is the outer cover or boundary of the cell. It controls the in and out flow of substance into the cell

(ii) **Nucleus –** It controls the living processes occurring in the cell. It is the centre for heredity

(iii) **Cytoplasm –** This is every other part of the cell apart from the nucleus

(iv) **Mitochondria –** It is responsible for respiratory activity and release of energy. It is termed the power house of the cell.

(v) **Golgi bodies –** It is the part responsible for secretions in the cell for secretion

(vi) **Vacuole –** It contain cell sap meant for osmosis in plants

(vii) Endoplasmic reticulum – It is responsible for the conduction of materials from one place to another within the cell

(viii) **Ribosome –** It is responsible for the building of body protein

(ix) **Centriole –** These forms poles during cell divisions

(x) **Chloroplast** are green organelles or plastids which contain chlorophyll and gives rise to the green colour of leaves and stems and are essential for the manufacture of carbohydrates in plants.

The cytoplasm and the nucleus contain two types of acids: Deoxyribonucleic acid (DNA) and Ribonucleic acid (RNA). These substances contain sugars, phosphates and certain forms of nitrogenous basis. The nucleus consists of threadlike structure known as

Chromosomes and a small, dense, spherical structure known as nucleus.

The chromosomes contain genes which are units of inheritance or carriers of hereditary traits from parents to offspring. The nucleus contains nucleoproteins.

Lysosomes – are sites of enzymes responsible for the breakdown of large molecules

Microsomes – for manufacture of proteins

Cell-wall – outer covering of plant cells, which is made up of different substances such as lignin, pectin, tannin and cellulose. The cell wall is thick, rigid and permeable.

SELF ASSESSMENT EXERCISE II

Draw and level plant and animals showing their details

3.2 Similarities between Plant and Animal Cells

(i) Plant and animal cells are unit of life
(ii) They contain cytoplasm and nucleus
(iii) They are bounded by cell membrane

3.3 Differences between Plants and Animal Cells

Plant Cell	Animal Cell
1. The outer boundary is bounded by rigid cellulose cell wall	1. The outer boundary is bounded by thin flexible membrane.
2. Their cell wall contains cellulose chloroplast which gives rise to chlorophyll especially in green plant	2. The contain no cellulose
3. Has centrally located vacuoles which are few and large	They do not contain chloroplast, hence no chlorophyll
4. The vacuole is at the main centre of the cell, displacing nucleus to the side	4. Hardly contain vacuole, if present, they are small and not at the centre. Nucleus is at the centre
5. Middle lamella is present	5. Middle lamella is absent

3.4 Reproduction and Heredity

3.5 Reproduction

Is the process of producing new living individuals in all living organisms.

3.6 Reproduction in Plants

Plants can reproduce in two different ways

(i) Asexual Reproduction

Here, an individual plant divides into two or more portions to produce new individuals e.g. chlamydomonas and Euglena

(ii) Sexual Reproduction

Here, male and female individuals produce reproductive gametes (or cells) which fuse in pairs to form ZYGOTES. Each zygotes then undergoes division and multiplication of cells to produce a new multicellular individual or organism.

In flowering plants, the reproductive organs are the flowers which may be bisexual or unisexual. The male gametes (pollen grains) fuse with the female gametes (ovules) of the same flower resulting in fertilization. A flower has 2 parts; the reproductive part or flowers and a vegetable part or roots, stem, leaves and buds.

Some plants undergo asexual method of reproduction called Vegetable propagation. For example, each cutting of the stem of Hibiscus plant is able to grow into a new Hibiscus plant.

3.7 Reproduction in Animals

(i) Asexual Reproduction in Animals

Unicellular animals like Amoeba and Paramecium reproduce by a simple process of division or fusion. The nucleus and cytoplasm of the mature organism divide into two equal halves, each of which grows into an adult.

(ii) Sexual Reproduction in Animals

In higher multicellular animals like worms, insects and vertebrates, reproduction is by sexual method. Each species of animal has specialized reproductive organs, testes in males and ovaries in the females.

There are some other animals with both male and female reproductive organs in each individual, such as hydra, earthworm and snail, such animals are referred to as HERMAPHRODITES.

The female gametes or egg cells are reproduced by ovaries of the female organism and sperms from testes of the male. The nuclei of the two gametes fuse with each other to form ZYGOTE, which develops to become an adult animal. The process of fusion is called FERTILIZATION. When the process of development involves several intermediate states, it is referred to as METAMORPHOSIS. When fertilization occurs inside the body of the female, it is referred to as INTERNAL FERTILIZATION and when it occurs outside the body of the female, it is EXTERNAL FERTILIZATION.

Mammals like rabbit and man are viviparous organisms because they give birth to living young that develops from eggs within the mother and feeds on the milk from the mammary glands of the mother.

3.8 Heredity

Heredity is a process of transmitting heritable traits from parents to their offsprings at conception or birth. Such heritable characteristics in man include mental, physical

and social traits e. g. eye colour, hair colour, albinism, baldness, skin colour, height, diseases e.g Sickle cell anaemia, facial appearance, body stature and posture, head, forehead, nose, jaw, legs, neck and shoulders, eyes, ears, mouth, fingers, voice, speech, intelligence etc.

In plant, heritable characters include height, size and weight of fruits, colour of leaves, flowers, fruits, and seeds, taste of fruits etc.

In human beings, at conception the male gamete fuses with the female gamete to form a Zygote. The Zygote is unicellular with a Nucleus.

The nucleus contains 23 pairs of chromosomes (23 X from the mother, 22X + Y from the father). The chromosomes contain genes which are the carrier of hereditable characters from parents to offspring. There are 2 types of Genes. They are Dominant and Recessive genes.

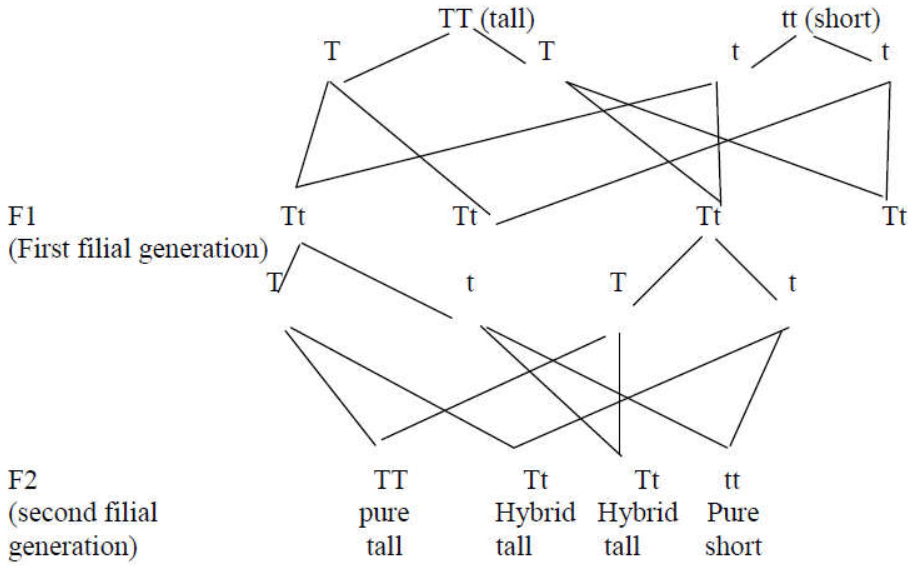
However, not all characters are inheritable; some are acquired through adaptations to the environment e. g. stunted growth due to mal- nourishment.

3.9 Dominant Genes

These are genes that show physically in heterogygous individuals.

3.10 Recessive Genes

These are genes that do not show physically in heterozygous individuals. Mendel proposed laws of heritance to explain the principles of inheritance. His first law is the Law of Segregation of germinal units. He crossed two plants with contrasting characters such as tallness and shortness. All the offspring in F1 generation showed dominant character while in the F2 generation, some offspring showed the dominant character while others showed the recessive character.



Chromosomes are the carriers of hereditary factors.

Heredity sets the potentials of an individual but environment determines how an individual can attain the set limit. Hence nurture and nature determine individual's potentialities.

Identical twins results when a fertilised egg divides into two halves and develops. The two individuals develop from a single cell or cytoplasm.

Fraternal twins results when two eggs are released by the mother and are fertilised separately.

3.11 Application of Genetics to Agriculture

1. Development of high yielding varieties of plants (e. g maize, rice, oil-palm etc.) and animals (e. g. cattle, pigs, chickens, etc.)
2. Development of early maturing varieties e. g. coconut, cassava, oil-palm, etc.
3. Improvement in quality of yield e. g. tomatoes, mangoes, oranges, oil-palm with more flesh and better taste.
4. Development of disease-resistant varieties e. g. cassava, maize, groundnuts, (plants) and chickens, goats, sheep (animals).

3.12 Evolution

Organic evolution implies that present day species have not always existed as such, but must have arisen from previously existing organisms or their ancestors. However, over several years, organisms have changed tremendously. In this sense, probably monkeys and man have similar lines of descent or ancestors. The theories of Lamarck and Darwin attempted to explain how evolutionary changes occur. Lamarck postulated that new organs or characteristics arose in an animal when they are needed, organs not needed were discarded, or passed on to the next generation. Darwin postulated **the theory of natural selection.** According to Darwin, there is a struggle for survival among members of a population. Moreover, there is a survival of the fittest and the elimination of the unfit. In essence, all members of a species vary and some variations are inheritable. Example of evolutionary trends that occurred in plants and animals include movement from:

a. aquatic to terrestrial forms.
b. unicellular to multicellular
c. simple to complex organisms.
d. specialisation of cells for particular functions e. g. earthworms, vertebrates, etc.

In animals, there are the development of organ systems e. g. arthropods and vertebrate. There are many kinds of evidence in support of organic evolution. For example, evidence from embryology especially from fossils, geographical distribution, comparative anatomy, artificial selection and breeding.

SELF ASSESSMENT EXERCISE 1I

List the nine systems present in a human being

SELF ASSESSMENT EXERCISE III

Mention in a tabular form two differences between sexual and asexual reproduction in plants

4.0 CONCLUSION

The continuity of life depends on the ability of organisms to reproduce their likes. Life is passed from parents to offspring when organisms reproduce.

5.0 SUMMARY

In this unit, we have learnt that:

(a) A cell is the smallest unit of life

(b) Plant cells are mainly hexagonal or square while animal cells are spherical.

(c) Sexual and asexual reproduction occur in both plants and animals depending on species.

(d) Mendel proposed laws of inheritance including law of segregation of genes which shows that genes are responsible for the development of individuals.

(e) Genetics is widely applied in agriculture for the development of high yielding, resistant, early maturing and improved varieties of plants

(f) Darwin postulated the theory of natural selection which show that only the fittest members of a population survive while the unfit are eliminated

6.0 TUTOR-MARKED ASSIGNMENT

(a) Draw and label an animal cell.

(b) List three differences between a plant cell and animal cell.

(c) Enumerate two applications of the knowledge of genetics in agriculture.

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UNIT 5 MACHINES, PULLEYS AND FRICTION

CONTENTS

1.0 INTRODUCTION

Machines when developed, brought a lot of relief to man and encouraged him to venture into areas he would never have dreamt of. They make work easier, faster and less tedious. They vary from simple to very complex types.

2.0 OBJECTIVES

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

- explain what a machine means
- define the terms pulley and friction
- enumerate the advantages of friction
- explain terms like stoichiometry, thermodynamics and equilibra.

3.0 MAIN CONTENT

3.1 Introduction to the Study of Machines, Pulleys and Friction

3.2 A Machine

It is defined as a device by means of which a large load is overcome by small effort. OR any devise which makes work easier. For example, a carpenter wishing to pull a nail from a wall makes use of a plier to make the work easier. The plier here is a machine. There are two types of machine viz:

3.3 Simple Machine

This includes levers, inclined planes, wheel and axle, screws and pulleys. Other examples include bottle opener, knives, scissors, brooms etc.

3.4 Complex Machine

his includes sewing machine, a bicycle, car jerk.

3.5 Machine and Friction

The mechanical advantage of pulley and its efficiency depends on friction. To prevent these:

(a) Ball-bearing is used to ensure that the machine parts are rolling instead of sliding.
(b) Machine should have streamline shape.
(c) The application of an appropriate lubricant to the parts of the various machine in order to increase the mechanical advantage and efficiency of the pulley.

SELF ASSESSMENT EXERCISE I

Explain how friction affects the performance of machine.

Note: it is easier to pull downwards (with one's weight helping) than it is to pull upwards. It is equally easier to lift a load when the rope goes round two pulleys. One end of the rope is fixed and the pushing is made at the other end to lift the bottom pulley and the load.

FRICTION: Is a type of force. A force is something which:

(a) sets a stationary object in motion, changes the direction of a moving object or stops a moving object completely. If a ball is rolled along the ground,

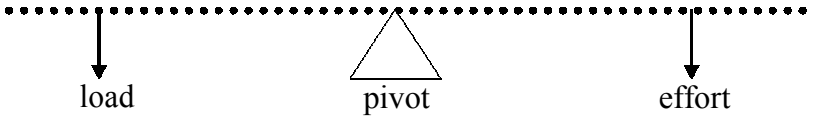
it will eventually come to rest. This is due to the frictional force between the ball and the ground. Therefore, frictional force is a force which opposes motion.

3.6 Types of Simple Machines

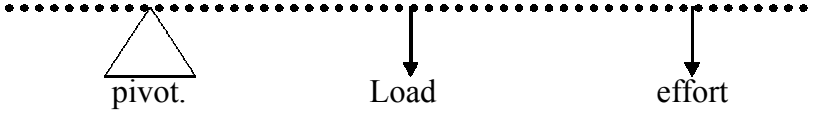
1 Levers – These are common simple machines consisting of arms, and a pivot or fulcrum. Usually, an effort force is applied on one section of the arm in order to lift up a load force. The arrangement of the load, effort and the pivot form the basis of classification of levers.

2 Types of Lever

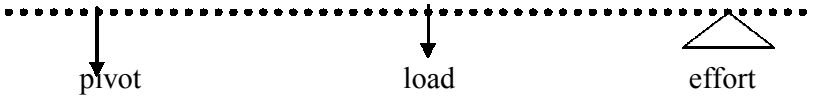
(A) ***First class lever –*** the pivot is between the load and the effort. Example is the scissors, crowbar, seesaw, spade, etc.



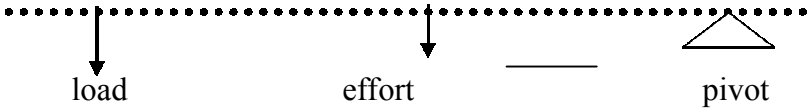
(B) ***Second class lever –*** the load is between the effort and the



(C) Example is wheel barrow, nut cracker, bottle opener.



(D) ***Third class lever –*** the effort is between the load and the pivot. E. g. forearm, fishing rod etc.



The study of machine may involve the following simple calculations.

(i) How much the effort force is magnified by the machine is indicated by the mechanical advantage of such machine. Mechanical Advantage [M.A] = $\frac{\text{Load}}{\text{Effort}}$

(ii) Velocity ratio of a machine = $\frac{\text{distance moved by the effort}}{\text{distance moved by the load in the same time.}}$

(iii) The efficiency of a machine = $\frac{\text{work done on the load}}{\text{Work done by the effort}}$

3.7 Inclined Machine

An inclined plane is a sloping surface e. g. a staircase, a ramp, a slope on the road etc.

It is easier to raise a load by pulling it along an inclined plane than by lifting it vertically.

The mechanical advantage of a machine depends upon friction. The more the friction, the less the mechanical advantage of simple machine. However, the velocity ratio does not depend upon friction.

The efficiency of a machine depends upon friction. The more the friction, the less the efficiency.

3.8 Screw

The thread of a screw is an inclined plane wrapped round the screw, the distance between successive threads on the screw is known as pitch.

3.9 Pulleys

Are simple machines employed in lifting loads. The purpose of a pulley is easily observed in laboratories, construction sites especially where tall buildings are being constructed, sea ports (for loading and discharging ships) etc. The pulleys are useful in lifting loads vertically.

The velocity ratio of a pulley is equal to the number of pulleys used and number of ropes supporting the pulleys.

SELF ASSESSMENT EXERCISE II

What is the mechanical advantage (M A)? On what factor does M. A. depends?

In order to improve the mechanical advantage and efficiency of simple machine by reducing friction, the following things are required:

(i) By lubricating the machine parts with oil

(ii) By using ball bearings to ensure that the machine parts are rolling instead of sliding.

(iii) Designing the machines to have streamline shapes since this would reduce frictions in fluid. Since it is difficult to totally eliminate friction in real life, the efficiency of a machine is always less than 100%.

3.10 Advantages of Friction

(a) It helps in walking because without friction, we would slip.

(b) Friction enables a nail to stay tightly on a hole and so hold two pieces of wood together.
(c) In automobile industry, trains are built with brakes, the friction between the wheels and brakes blocks or slows down the wheels.

(d) Belt drives on various machine do not slip because of friction.

(e) Sand is usually thrown onto railway lines in bad weather (e. g ice and snow) in order that the locomotives wheel can grip the lines better.

(f) The provision of seat-belts in cars to exert opposing force (frictional) that would stop the occupants of a motor from moving when the driver applies brake suddenly or when there is accident or when motor stops suddenly.

SELF ASSESSMENT EXERCISE III
How can you illustrate that friction opposed motion?

4.0 CONCLUSION
Machines are simply mechanical devices that make work easier less tiring and of course more interesting.

5.0 SUMMARY
In this unit, we have learnt:

(a) About simple machines such as levers, inclined planes, screws etc and complex machines such as sewing machine, bicycle, car jeck etc.
(b) That friction is a type of force which opposes motion.

6.0 TUTOR-MARKED ASSIGNMENT

(a) Briefly explain the following terms machine, pulley, friction and inclined plane
(b) No machine can be 100% efficient. Explain this assertion.

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MODULE 4 CURRENT INFUSION INTO PRIMARY SCIENCE CURRICULUM

UNIT 1 ENVIRONMENTAL EDUCATION

CONTENTS

1.0 INTRODUCTION

Environment means different means different things to different people. Some of the definitions are:

1. Environment is the surroundings in which an organization operates
2. including the air, water, land, natural resources, flora, fauna, humans and their interrelatedness.
3. Environment is the natural surroundings of the organism which directly or indirectly influences there growth and development of the organism
4. Environment is the sum total of all living organisms (biotic components) and non living variables (abiotic components) that composed the surroundings of man

The environment we live deteriorates rapidly every passing second as a result of human activities. The fragile biosphere land, water and air on which all living organisms depend for survival experience constant high level of degradation. This

subsequently results in serious negative effects on man and other living organisms.

Activities that have brought about this serious issue of concern include global warming, ozone layer depletion, air and water pollution, desertification and deforestation.

2.0 OBJECTIVES

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

- explain what environmental education mean
- enumerate the aims and objectives of environmental education
- explain issues like global warming, ozone depletion, water pollution and loss of biodiversity.

3.0 MAIN CONTENT

3.1 Introduction to Environmental Education

Environmental Education (EE) has been variously defined differently by different authors. Some of the common definitions therefore include:

(i) EE is an integrated process which deals with man's interrelationship with his natural and man-made surrounding. It is the study of factors influencing eco-systems, mental and physical growth, living conditions, decay of cities and population problems.

(ii) EE is the study of activities of people in relation to the physical world around them and the study of the socio-political institutions which regulates relationship in the interest of the society as a whole.

(iii) EE is education from the environment, education about the environment and education for the environment.

3.2 Aims of Environmental Education

(i) To foster a clear awareness of and concern about economic, social, political and ecological inter-dependence in urban and rural areas.

(ii) To provide every person with opportunities to acquire the knowledge, values, attitudes, commitments and skills needed to protect and improve the environment.

(iii) To create new patterns of behaviour of individuals groups and society as a whole towards the environment.

3.3 Objectives of Environmental Education

(i) Awareness: To create awareness for social groups and individuals about total environment and its allied problems.

(ii) Knowledge: To enable social groups and individuals gain a variety of experience in, and acquire a basic understanding of the environment and its associated problems

(iii) Attitudes: To enable social groups and individuals acquire a set of values and feelings of concern for the environment and motivation for activity and participating in environmental improvement and protection.

(iv) Skill: To enable social groups and individuals acquire the skills for identifying and solving environment problems.

(v) Participation: To provide social groups and individuals with an opportunity to be actively engaged at all levels in working towards the resolution of the environmental problems.

3.4 Global Warming and Ozone Depletion

Global warming has been defined as a natural or human induced increase in the average global temperature of the atmosphere near the earth's surface.

The earth and its atmosphere can be likened to a giant green house whose temperature is influenced by the amount of sunlight it receives and reflects, heat retained by the atmosphere, evaporation and condensation of water vapour.

The atmosphere is only transparent to short-wave and visible solar radiation but absorbs much of the long-wave radiation before partially re-radiating it back to the surface. This is what is responsible for the warming up of the earth's surface.

The presence of carbon IV oxide and water vapour allows the atmosphere to absorb long-wave radiations. The amount of these gases in the atmosphere therefore dictates its heat retaining and radiating capacity.

Burning of coal, fuel, oil, petrol, kerosene, diesel and natural gas releases large quantities of carbon IV oxide into the atmosphere. This is coupled with the depletion of forest trees that would have absorbed carbon IV oxide for photosynthesis. The result is that the unabsorbed carbon IV oxide prevents the re-radiation of solar energy into the space leading to the development of harsh climatic changes, devastating hurricanes, skin cancer etc.

Ozone layer depletion is caused by the presence of chlorofluoro carbon (CFC) in the atmosphere. Ozone gas, which is present in the atmosphere is responsible for the absorption of most of the ultra-violet radiations that are potentially damaging to life on earth. The ozone layer in the atmosphere is called ozone shield/screen.

A lot of public products such as shaving cream, hair spray, deodorants, paints and insecticides are packaged in many containers that carry CFC as propellant. The CFC causes the depletion of the Ozone layer. This depletion make it easy for ultra-violet rays emitted by the sun to pass directly into the earth's surface.

SELF ASSESSMENT EXERCISE 1

1. Mention two effects of "pure water" sachets on the environment
2. Enumerate the negative effects of dumping refuse along major road sides
3. Identify three effects of global warming on agricultural production

3.5 Water Pollution

This is the contamination of water by foreign matter. The major pollutants of water include sewage and other oxygen demanding wastes, plant nutrients stimulating the growth of aquatic plants which interfere with water uses, inorganic substances such as pesticides and active substances in detergents. Inorganic minerals and chemical substances can also cause water pollution.

Polluted water gives rise to water-related diseases such as typhoid, cholera, dysentery, diarrhoea and skin diseases. There is also reduction in productivity, biomass and diversity of communities.

3.6 Loss of Biodiversity

Biodiversity is the totality of genes species and ecosystems in a region. Biodiversity loss is a concomitant of series of interdependent man induced processes which include population growth, expansion of cultivated land and soil deterioration with their implications on the ecosystem. Excessive and unsustainable., consumption of resources by a small but rich minority of the world's population combined with the destructive impact of the world's poor and hungry result in loss of biodiversity.

4.0 CONCLUSION

The serious negative effects of environmental degradation make it imperative to develop an environmentally conscious citizenry to save the world from self- destruction.

5.0 SUMMARY

In this unit, we have learnt that:

(i) EE is the education from the environment, about the environment and for the environment.
(ii) The objectives of environmental education include awareness, knowledge, attitudes, skill and participation in respect of the environment.
(iii) Global warming, Ozone depletion, water pollution and loss of biodiversity have very negative effects on life.

6.0 TUTOR-MARKED ASSIGNMENT

(1) (i) What is Environmental Education?

(ii) List three aims of EE

(iii) Enumerate five objectives of Environmental Education.

(2) Briefly explain the following terms

(i) Global Warming
(ii) Ozone layer depletion
(iii) Water Pollution
(iv) Loss of Biodiversity.

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UNIT 2 DRUGS ABUSE AND DRUG MISUSE

CONTENTS

1.0 INTRODUCTION

Drug abuse is another emergent global issue that has been infused into Primary Science Curriculum. It is an issue whose understanding and implications would be of immense benefit to the child and the society.

2.0 OBJECTIVES

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

- define drug abuse and misuse
- identify commonly abused and misused drugs
- enumerate the consequences of drug abuse and misuse.

SELF ASSESSMENT EXERCISE 1

List 4 reasons why people use drugs without prescription from doctors or pharmacists

3.0 MAIN CONTENT

3.1 Introduction to Drug Abuse and Misuse

Drug can simply be defined as any substance(s) that influences positively or negatively the mood or well-being of an individual. The use of these substances has specifications.

Drug abuse is therefore the indiscriminate use of drugs or medicinal products without specific instruction of the doctor or pharmacist. It is the duty of the doctor or pharmacist

to recommend which drug to use, how and when to use it for a particular disease.

Drug misuse is defined as the act of using drug in the wrong way or for the wrong purpose. An example is when malaria drug is used as a pain reliever.

3.2 Causes of Drug Abuse and Misuse

A number of factors could lead to drug abuse and misuse. Some of these factors are:

(i) False pleasurable sensation derived from medication
(ii) Proliferation of non-professional handling of drugs and medicinal products
(iii) Ignorance of simple rules that would prevent the risks of wrong use of medicine.
(iv) Inferiority complex
(v) Failure to recognize that the same drugs are been taken under different trade names e.g. Phensic, Cafenol, Phengo etc all contain aspirin for analgesic.
(vi) Misleading information provided by the manufacturers and distributors
(vii) Deliberate recklessness
(viii) Incomplete medication and self-medication
(ix) Fear of the unknown if doctor is allowed to diagnose one
(x) Level of education
(xi) Socio-economic status of people.

3.3Types of Drugs Commonly Abused and Misused

(i) Non-narcotic analgesic or pain killers e.g. Paracetamol, Aspirin, chloroquine etc.
(ii) Narcotic analgesic or strong pain-killer e.g. Heroine, Cocaine, Codeine etc.
(iii) Antibiotics e.g. drugs for treating infectious disease e.g. Tetracycline, (Red and Yellow), Ampicillin, Ampiclox etc.
(iv) Anti-inflammatory drugs e.g. Indocid, Buta etc
(v) Sleep Inducers (Anxiolytic agents) e.g. Diazepam (valium), Liberum cap etc.
(vi) Hematinics i.e. blood supplements. e.g. Iron tablets, folic acid, B. complex etc.
(vii) Anti-ulcer drugs e.g. Gelusil, MMT.

3.4 Consequences of Drug Abuse and Misuse

Drug abuse or misuse can lead to:

(i) Madness or Schizophrenes disorder such as mania, depression, manic- depression etc.
(ii) Development of resistance to drugs leading to reduced efficacy.
(iii) Super infection which results from persistent assaults on the micro- organism.
(iv) Therapeutic failure
(v) Addiction and dependence. This is common among users of narcotic analgesic (Psychotherapy agents) such as cocaine, heroine, and Codeine etc.
(vi) Gradual and progressive death
(vii) Increased rate of suicide

(viii) Psychological problems
(ix) Economic burden for the government, parents and society because of the amount spent on rehabilitation and settlement of victims.
(x) Increased incidences of crime such as armed robbery, rape, arson, assassination etc.

SELF ASSESSMENT EXERCISE 1I

1. Mention two effects of "pure water" sachets on the environment
2. Enumerate the negative effects of dumping refuse along major road sides

SELF ASSESSMENT EXERCISE III

From your observation, list five common drugs people abuse or misuse in your area.

4.0 CONCLUSION

The serious consequences of drug abuse and misuse make it pertinent to enlighten and educate citizens about the need to refrain from these condemnable acts.

5.0 SUMMARY

In this unit, we have learnt about:
(i) the meaning of drug abuse and misuse as indiscriminate use of drugs and wrong purpose or way of using drugs respectively.
(ii) the causes of drug abuse such as incomplete and self-medication, recklessness etc.
(iii) the serious consequences of drug abuse and misuse such as madness, super infection, gradual and progressive death etc.

6.0 TUTOR-MARKED ASSIGNMENT

1 (a) What does drug abuse mean?

(b) Identify eight causes of drug abuse and misuse in your locality

(2) Explain five consequences of drug abuse and misuse.
(3) Suggest five ways you think drug abuse and misuse could be reduced

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UNIT 3 HIV/AIDS

CONTENTS

1.0 INTRODUCTION

Today the world is confronted by a scourge that has defied all solutions. It would be of interest to note that in 1986, when HIV/AIDS was first reported in Nigeria, only two persons were found infected. In 1994, the number increased to 148 cases and about 8077 in 1997. By 2004 statistics revealed that about 6% of Nigerians were living with the virus. This amounts to over 6.5 million. This percentage must have increased with time. Education is a major way of stopping this trend.

2.0 OBJECTIVES

At the end of this unit, you should be able to:

- explain what HIV and AIDS mean
- trace the origin of HIV/AIDS
- enumerate the symptoms of HIV/AIDS
- explain the methods of HIV transmission
- highlight the various methods of preventing HIV/AIDS
- educate people on the importance of accommodating people living with HIV/AIDS.

3.0 MAIN CONTENT

3.1 Introduction to HIV and AIDS

HIV stands for "Human Immuno-deficiency Virus". This is the virus that causes AIDS. It is retroviral in nature because it is capable of copying itself and multiplies within the body. HIV has a viral protein called V. This virus disables and destroys antibodies whose role is to protect the body against diseases. The antibodies encircle and destroy foreign bodies called Antigens. The antigens cause diseases. It is these antibodies that the virus destroys leaving the body unprotected against diseases.

The virus is present in the body fluids of an infected person such as blood, semen, vaginal secretions and breast milk. HIV, destroys the body's immune system (antibodies defence system) slowly until the system could no longer resist disease.

AIDS means Acquired Immune Deficiency Syndrome. This is the condition that occurs when HIV has successfully weakened the immune system. The term syndrome refers to a combination of signs and symptoms.

3.2 The Origin of HIV/AIDS

A number of suggestions have been made about the origin of HIV/AIDS. There is the monkey theory which says it originated from infected green monkeys; some say it is a mutant and so on.

However, what is certain is that the first cases of HIV/AIDS were reported in United States in 1981. Those who were involved were five young men who were homosexuals and drug addicts. They were admitted into different hospitals in Los Angeles for unusual type of pneumonia. More cases were reported in New York. AIDS cases were reported at the end of 1981 in England.

Different names were first given to the disease such as Gay-related Immune Deficiency Syndrome (GRIDS).

The cause of the disease and its mode of transmission was established by French Scientists in 1984. An American, Jay Levy later discovered the AIDS virus and named it AIDS – Associated Retro Virus (ARV).
In 1986, it was officially named "Human Immune Deficiency Virus (HIV).

It is believed that tourists brought it to Africa with high rate in Botswana (36% of the Population), South Africa, Cameroon and Swaziland (20%). Currently, it is estimated that over 40 million people are presently living with the virus all over the world. 28 million among them are from sub-Saharan Africa. Over 6 million are in Nigeria as estimated in 2001. it is estimated that currently over 6% of Nigerians are infected.

SELF ASSESSMENT EXERCISE 1

Explain why AIDS was first referred to GRIDS.

3.3Transmission and Symptoms of HIV/AIDS

3.4 Transmission

HIV is contracted when the body fluid of an infected person gain entry into the body of another person by any means. These include unprotected sexual intercourse, transfusions of unscreened blood, sharing unsterilized skin- piercing instruments such as needles, syringes, razor blade, circumcision instruments etc. It can also be transmitted from infected mother to the baby during pregnancy, child birth or through breast feeding of the child.

HIV cannot be contracted through physical contact (i.e. It is non-contagious) e.g. touching, sharing clothes, dishes, toilet seat, swimming pools or through eating together.

3.5 Gender and HIV Transmission

Gender is an important factor which affects the possibility of an individual becoming infected with HIV. Women are more vulnerable to sexual infection with HIV for the following reasons.

a. Biological
   (i). in unprotected heterosexual intercourse, women are twice as likely as men to acquire HIV from an infected partner
   (ii) the large surface of the vagina wall exposed during intercourse increases the likely hood of the transmission of the virus.
   iii Very small lessons that can occur during intercourse are believed to be entry points for the virus
   iv young women/girls are more at risk, because they have all reached maturity. the lining of the vagina is fragile and more likely to be bruised during intercourse
   v. more quantity of the virus are present in Sperm than in Vaginal Fluids.

3.6 Certain Communal/ Traditional Practices That Promotes Infections

Some traditional practices help to promote the spread of HIV. Such practices include:

a. Wife-Sharing and wife inheritance: in some communities, when a man dies, his brother is made to inherit the late brothers' wife irrespective of the cause of death. Some communities share their wives.
   Such practices help to spread HIV as it is not easy to know who has AIDS

just by mere looking the person.

b. Circumcision: the use of unsterilized knives or blades or both on the body is still a common practice. In some cases, one blade or knife is used for the exercise on several people. This a sure way of spreading HIV, if any of the people circumcised has AIDS, those circumcised after him with with the same unsterilized instrument run the risk of getting HIV

c. Tribal Marks: some community tribes' identification marks to their children, those marks are given with razors, knives or other sharp objects. Sometimes, the same object is used to give marks to several people at a time without sterilizing the objects. The practice can also be an avenue for spreading HIV. As in the case of circumcision, if any one uses the untreated or unsterilized object after an infected person, such have a chance of been infected with HIV

d. Rituals and Sacrifices: performing some rituals demands cutting some part of the skin with a razor or other sharp objects. The objects are often not sterilized and when been used on some other persons, promotes the spread of HIV.

3.7 Symptoms

Before the manifestation of signs of disease, there is a period called ASYMPTOMATIC period in between the time of infection and manifestation of signs. It may be as short as 6 months and as long as 15 years depending on individuals. In some people, HIV will never become AIDS. These people are called Long Term Non-progressors .

HIV is detected after about 6 months or more of infection, using the ELISA test. However, if transmission is through blood transfusion, detection takes about 6 – 8 weeks of infection, using the same test.

Symptoms of HIV/AIDS include:

(i) Rapid loss of weight
(ii) Prolonged diarrhea
(iii) Loss of appetite
(iv) Skin infection (kaposisurcoma)
(v) Enlargement of glands in the neck, groin and armpit
(vi) White coating of the tongue.

It must however be emphasized that until HIV becomes full blown AIDS, one may not be able to recognize an infected person unless a test is carried out. A person with the HIV infection is said to be HIV positive or is living with the virus.

(vii) Constant cough
(viii) Easy bruising or unexplained bleeding
(ix) Memory loss or difficulty in thinking clearly

(x) Persistent severe fatigue
(xi) Fever lasting for more than one month
(xii) Others are severe pneumonia, tuberculosis and some form of cancer.

3.8 Methods of Prevention

1. Safe Sex: This is the type of sexual relationship that removes the possibility of contracting HIV. This includes complete abstinence which is the best method (90% of infection is through unprotected casual sexual intercourse)

Mutual faithfulness among uninfected couples will also prevent HIV infection. Regular and right use of condom also provides high level of protection. Individuals should also keep away from indecent sexual habits which include lesbianism, homosexualism, oral sex, etc.

2. Avoiding sharing of skin piercing instruments. People should avoid sharing needles, blades, syringes and other skin- piercing instruments that have not been sterilized. People who visit saloons should also be advised to own their own clipper or ensure the clipper to be used is sterilized in methylated spirit.

3. Use of only screened blood for transfusion and does not contain HIV should be used for transfusion.

5. Mass education of people on HIV/AIDS
6. Diverting the attention of youths or young people towards studies, sports/recreation; and away from sexual intercourse.
7. Control of sexual liberation which allows pornography and film encouraging all manners of sexual exploits and unnatural lifestyles.

SELF ASSESSMENT EXERCISE II

Mention 3 possible effects of not showing love and understanding to people living with HIV/AIDS.

3.7 The Society and People Living with HIV/AIDS

The society would cause a lot of harm to itself if a feeling of love and understanding is not exhibited towards the people living with HIV/AIDS. They should not be stigmatized or discriminated against. One should realize that many HIV/AIDS patients did not contract it through immoral sexual acts. It could happen to anyone innocently, ignorantly, forcefully or by sheer act of providence.

The society should support them and encourage them not to hide their condition so that further spread of the disease would be minimized.

SELF ASSESSMENT EXERCISE III

How can you help people with HIV/AIDS in your environment?

4.0 CONCLUSION

The scourge of HIV/AIDS is one that could consume a whole nation within a short time. Over 36% of the total population of Botswana is infected by the virus. It is therefore, very important that adequate information and education must be provided to Nigerians of all age grades in order to assure our future.

5.0 SUMMARY

In this unit, we have learnt that:

(i) HIV is a virus that destroys the body's immune system while AIDS is the condition that occurs when HIV has weakened the immune system.
(ii) No one can confidently say where HIV originated from but that the first cases were reported in USA in 1981.
(iii) HIV/AIDS is transmitted through unprotected sexual activities and skin piercing instruments apart from mother to child transmission.
(iv) Abstinence and mutual fidelity between couples are major ways of preventing the spread of the virus.

6.0 TUTOR-MARKED ASSIGNMENT

(a) Identify and explain three facts about HIV
(b) Explain the reason why women are more vulnerable to sexual infections (HIV).
(c) Enumerate four symptoms of HIV/AIDS
(d) Explain four ways by which the spread of HIV/AIDS can be stopped
(e) Identify and discuss traditional practices in your environment that promotes HIV infection.
(g) What advice do you have for the society on people living with HIV/AIDS and why?

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