

REPUBLIC OF GHANA
MINISTRY OF EDUCATION, SCIENCE AND SPORTS



Republic of Ghana

TEACHING SYLLABUS FOR INTEGRATED SCIENCE
(JUNIOR HIGH SCHOOL)

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September, 2007

TEACHING SYLLABUS FOR INTEGRATED SCIENCE (JHS)

RATIONALE FOR TEACHING INTEGRATED SCIENCE

Modern life requires general scientific literacy for every Ghanaian citizen, a requirement that will result in the creation of a scientific culture in line with the country's strategic programme of achieving scientific and technological literacy in the shortest possible time. Scientific culture should therefore become the common property of every citizen of this country because it is the antithesis to superstition and the catalyst that will help us toward faster development.

The focus of the study of Science is to understand the natural world. There are generally two main goals of Science education. First, it inculcates scientific literacy and culture for all, so that people can make informed choices in their personal lives and approach challenges in the workplace in a systematic and logical order. Second, it aims to produce competent professionals in the various scientific disciplines who can carry out research and development at the highest level. For meaningful scientific education, it is important for pupils to be trained in the investigative process of seeking answers to problems. This requires pupils to physically explore and discover knowledge within their environment and in the laboratory to be able to contribute new scientific principles and ideas to the body of knowledge already existing in their culture.

The integrated science syllabus is a conscious effort to raise the level of scientific literacy of all students and equip them with the relevant basic integrated scientific knowledge needed for their own survival and for the development of the country. It is also expected that scientific experiences in Junior High School will cultivate in pupils an interest and love for science that will urge some of them to seek further studies in science as preparation for careers in science. The study of science will also provide excellent opportunities for the development of positive attitudes and values which include:

- Curiosity to explore their environment and question what they find
- Keenness to identify and answer questions through investigations
- Creativity in suggesting new and relevant ways to solve problems
- Open-mindedness to accept all knowledge as tentative and to change their view if the evidence is convincing
- Perseverance and patience in pursuing a problem until a satisfying solution is found
- Concern for living things and awareness of the responsibility they have for the quality of the environment
- Honesty, truthfulness and accuracy in recording and reporting scientific information
- Love, respect and appreciation for nature and desire to conserve natural balance.

GENERAL AIMS

The syllabus is designed to help the pupil to:

1. develop a scientific way of life through curiosity and investigative habits
2. appreciate the interrelationship between science and other disciplines.
3. use scientific concepts and principles to solve problems of life.
4. use basic scientific apparatus, materials and appliances effectively.
5. take appropriate measures for maintaining machinery and appliances used in everyday life.
6. acquire the ability to assess and interpret scientific information and make inferences.
7. recognize the vulnerability of the natural environment and take measures for managing the environment in a sustainable manner.
8. appreciate the importance of energy to the living and non living things and adopt conservation methods to optimize energy sources.
9. take preventive measures against common tropical diseases
10. live a healthy lifestyle.

SCOPE OF CONTENT

The content of the Junior High School Integrated Science covers the basic sciences and includes topics in Health, Agriculture and Industry. The course has been designed to offer a body of knowledge and skills to meet the requirements of everyday living, and provide adequate foundation for those who want to pursue further education and training in science and science related vocations.

Specific issues covered are the following:

1. Science for all students
2. Science as an active inquiry process
3. Science and the satisfaction of individual needs
4. Science as a profession
5. Science and culture.

The approach in this syllabus is based on scientific themes that pupils can relate to in their everyday experiences, and related also to commonly observed phenomena in nature. The basic aim is to enable pupils to appreciate the links between seemingly different topics and thus allow the eventual integration of scientific ideas. The five themes chosen are: Diversity of matter (the Living and Non Living things), Cycles, Systems, Energy and Interactions of matter. These themes provide a broad based understanding of the environment and scientific phenomena, and should help build a foundation upon which pupils can rely for further study.

Although the content of the syllabus is organized into five themes, the units under each theme are not to be viewed as separate blocks of knowledge. In general, there are no clear boundaries between the themes since there are some common topics between the different themes. In particular, it should be noted that Systems, Energy and Interactions are closely related.

Another feature of the syllabus is the *Spiral Approach*. This is characterized by revisiting concepts and skills at different levels with increasing degrees of depth at each stage. The spiral approach has the benefit of matching scientific concepts and skills to pupils' cognitive development. It therefore helps pupils to build a gradual mastery of scientific skills.

The titles of the sections are the same for each class level. However, the knowledge, understanding as well as the activities and range of process skills presented have been extended at the different class levels. The focus of each theme is provided below.

ORGANIZATION OF THE SYLLABUS

The syllabus covers three years of Junior High School education. Each year's work is organized under the five themes or sections. The themes are: *Diversity of matter (living and non living things)*, *Cycles*, *Systems*, *Energy and Interactions of matter (living and non living things)*. Under each theme or section are a set of units or topics. The knowledge, understandings as well as the activities and range of process skills presented in each theme have been extended at the different class levels. The focus of each theme is provided below.

Section 1 - Diversity of matter

The study of diversity should enable pupils to appreciate that there is a great variety of living and non-living things in the world. It also aims at helping pupils to recognize that there are common threads that connect all living things and unifying factors in the diversity of non-living things that help to classify them. The study of diversity in the world will allow pupils to appreciate the importance of living and non living things and the necessity for sustaining them.

Section 2 – Cycles

The study of cycles should enable pupils to recognize that there are repeated patterns of change in nature. Examples of these cycles are the day and night cycle, life cycles of living things, the recycling of resources and the cyclic nature of agricultural production. Studying these cycles helps us to predict events and processes and understand the Earth as a self-sustaining system.

Section 3 - Systems

The study of systems should enable pupils to recognize that a system is anything that consists of parts that work together to perform a function. There are systems in nature as well as artificial systems. Examples of systems in nature are the digestive and respiratory systems. Examples of artificial systems are electrical systems. A study of these systems allows humans to understand how they operate and how parts influence and interact with one another to perform a function.

Section 4 – Energy

The study of energy should enable pupils to appreciate that energy affects both living and non-living things. Energy makes changes and movement possible in everyday life. There are many forms of energy and one form can be converted to another. Humans use energy in many ways for many different purposes. Humans are not the only animals that use energy; all living and non-living things obtain and use energy. The study of this theme should help pupils to develop energy conservation habits.

Section 5 – Interactions of matter

The study of interactions between living and non-living things within systems helps humans to better understand the environment and the roles they should play in it. There are many types of interactions. There are interactions between the living world and the environment at various levels; i.e. interactions which occur within an organism, between organisms as well as between organisms and the environment. There are also interactions between forces and objects. At the societal level, the interaction of humans with the environment drives the development of Science and Technology. At the same time, Science and Technology influence the way humans interact with the environment. By studying the interactions between humans and the environment, pupils can better appreciate the consequences of their actions.

The structure and organization of the syllabus is indicated in the chart on the next page.

STRUCTURE AND ORGANIZATION OF JUNIOR HIGH SCHOOL INTEGRATED SCIENCE

SECTIONS	JHS1	JHS2	JHS3
DIVERSITY OF MATTER	Unit 1: Introduction to Integrated Science Unit 2: Matter Unit 3: Measurement Unit 4: Nature of Soil Unit 5: Hazards	Unit 1: Elements, Compounds and Mixtures Unit 2: Metals and Non Metals Unit 3: Chemical Compounds Unit 4: Water	Unit 1: Acids, Bases and Salts Unit 2: Soil and Water Conservation
CYCLES	Unit 1: Life Cycle of Flowering Plants Unit 2: Vegetable Crop Production Unit 3: Fish Culture	Unit 1: Carbon Cycle Unit 2: Climate	Unit 1: Life Cycle of the Mosquito Unit 2: Animal Production
SYSTEMS	Unit 1: Respiratory System of Humans Unit 2: Farming Systems	Unit 1: Reproduction and Growth in Humans Unit 2: Heredity Unit 3: Diffusion and Osmosis Unit 4: Circulatory System in Humans	Unit 1: The Solar System Unit 2: Dentition in Humans Unit 3: Digestion in Animals
ENERGY	Unit 1: Sources and Forms of Energy Unit 2: Conversion of Energy Unit 3: Basic Electronics Unit 4: Light Energy	Unit 1: Photosynthesis Unit 2: Food and Nutrition Unit 3: Electrical Energy Unit 4: Basic Electronics	Unit 1: Heat Energy Unit 2: Basic Electronics
INTERACTIONS OF MATTER	Unit 1: Ecosystems	Unit 1: Physical and Chemical Changes Unit 2: Infections and Diseases Unit 3: Pests and Parasites Unit 4: Force and Pressure Unit 5: Machines	Unit 1: Magnetism Unit 2: Technology and Development Unit 3: Machinery Unit 4: Entrepreneurship

PRE-REQUISITE SKILLS AND ALLIED SUBJECTS

Average performance in Integrated Science and Mathematics at Basic Stages 4 – 6 is necessary for success in this course.

SUGGESTED TIME ALLOCATION

A total of six periods a week, each period consisting of forty minutes, is allocated to the teaching of Integrated Science at the Junior High School level. It is recommended that the teaching periods be divided as follows:

Theory:	4 periods per week (two 40-minute periods)
Practicals:	2 periods per week (one double-period)

SUGGESTIONS FOR TEACHING THE SYLLABUS

For effective teaching and learning in this course, it is recommended that schools should have science equipment and materials. Other requirements include space for raising crops and animals. Schools which lack land space can use containers such as the Earth-box for gardening. It is also recommended that crops and farm animals in at least one of each of the following groups must be reared.

Crops

1. A Vegetable crop
2. A Cereal/Legume
3. An Ornamental plant

Animals

1. Fish (Tilapia)
2. Chickens/ducks/turkeys,
3. Goats/sheep/cattle
4. Rabbits and Guinea Pigs

Schools must adopt a team teaching approach for this course since many science teachers currently in schools were trained as physicists, biologists, chemists, agriculturists etc. This deficiency will be remedied in the future if the teacher development universities start programmes in integrated science from where a new crop of integrated science teachers will be drawn. In the meantime, teachers are encouraged to tap the abilities of their colleagues in agriculture and in other science fields for effective teaching of this course.

A class may consist of pupils of different physical problems and mental abilities. Some of the children may have high mental ability, while others may be slow learners; some may be dyslexic and not able to read or spell well as the others in the class. All these are special needs children who need special attention. Ensure that you give equal attention to all pupils in your class to provide each of them equal opportunities for learning. Pupils with disabilities may have hidden talents that can only come to light if you provide them the necessary encouragement and support in class.

General Objectives

General Objectives have been listed at the beginning of each section of the syllabus, that is, just below the theme of the section. The general objectives flow from the general aims for teaching natural science listed on page (ii) of this syllabus. The general objectives form the basis for the selection and organization of the themes and their unit topics. Read the general objectives very carefully before you start teaching. After teaching all the units, go back and read the general aims and general objectives again to be sure you have covered both of them adequately in the course of your teaching.

Years and Units

The syllabus has been planned on the basis of Years and Units. Each year's work is covered in a number of units sequentially arranged and in a meaningful manner such that each unit's work will provide the necessary and enabling skills for the next unit. A description of the contents of each column is as follows:

Syllabus Structure

The syllabus is structured in five columns: Units, Specific Objectives, Content, Teaching and Learning Activities and Evaluation. A description of the contents of each column is as follows:

Column 1 - Units: The units in column 1 are the major topics of the year. You are expected to follow the unit topics according to the linear order in which they have been presented. However, if you find at some point that teaching and learning in your class will be more effective if you branched to another unit before coming back to the unit in the sequence, you are encouraged to do so.

Column 2 - Specific Objectives: Column 2 shows the Specific Objectives for each unit. The specific objectives begin with numbers such as 1.2.5 or 3.4.1. These numbers are referred to as "Syllabus Reference Numbers". The first digit in the syllabus reference number refers to the year/class; the second digit refers to the unit, while the third refer to the rank order of the specific objective. For instance 1.2.5 means Year 1 or Primary 1, Unit 2 (of Class 1) and Specific Objective 5. In other words 1.2.5 refers to Specific Objective 5 of Unit 2 of Primary 1. Similarly, the syllabus reference number 3.4.1 simply means Syllabus Objective number 1 of Unit 4 of Primary 3. Using syllabus reference numbers provide an easy way for communication among teachers and educators. It further provides an easy way for selecting objectives for test construction. For instance, if Unit 4 of Primary 3 has seven specific objectives 3.4.1 - 3.4.7, a teacher may want to base his/her test items/questions on objectives 3.4.4 to 3.4.7 and not use the other first three objectives. In this way, a teacher would sample the objectives within units to be able to develop a test that accurately reflects the importance of the various specific objectives and skills taught in class.

You will note also that specific objectives have been stated in terms of the pupil i.e. what the pupil will be able to do during and after instruction and learning in the unit. Each specific objective hence starts with the following "*The pupil will be able to.....*" This in effect, means that you have to address the learning problems of each individual pupil. It means individualizing your instruction as much as possible such that the majority of pupils

will be able to master the objectives of each unit of the syllabus. The teaching of Natural Science should be activity-oriented for two important reasons. The activity approach challenges the children to develop their own ideas, and secondly makes the subject more meaningful and relevant to them.

As has been said already, the order in which the topics appear should not necessarily be the teaching order. There should however, be a linkage in the order in which the units and specific objectives are treated. The teacher will have to study the syllabus carefully and plan ahead the activities the pupils will carry out during a particular period. Knowing the requirements of a particular lesson, the teacher should assemble the materials which will be required for the activities well in advance. The collection must be done by both the teacher and the pupils. Other materials like bottles, cans, match boxes, etc. may be continually collected and stored to be used when required. When materials are not available in the immediate environment, the teacher should try to contact resource persons or persons in higher institutions for help.

As pupils begin work on the activities of each lesson, the teacher should serve as a facilitator and motivate the pupils in various ways to sustain their interest. The teacher should pay particular attention to children's questions and should also ask questions that will guide them to other areas of useful investigation. During the last ten minutes of the class activity, all pupils should come together to discuss their observations. The teacher must involve all pupils in the discussion.

Column 3 - Content: The "content" in the third column of the syllabus presents a selected body of information that you will need to use in teaching the particular unit. In some cases, the content presented is quite exhaustive. In some other cases, you could add some more information based upon your own training and based also on current knowledge and information.

Column 4 - Teaching/Learning Activities (T/LA): T/LA that will ensure maximum pupil participation in the lessons is presented in Column 4. The General Aims of the subject can only be most effectively achieved when teachers create learning situations and provide guided opportunities for pupils to acquire as much knowledge and understanding of science as possible through their own activities. Pupils' questions are as important as teacher's questions. There are times when the teacher must show, demonstrate, and explain. But the major part of a pupil's learning experience should consist of opportunities to explore various mathematical situations in their environment to enable them make their own observations and discoveries and record them. Teachers should help pupils to learn to compare, classify, analyze, look for patterns, spot relationships and come to their own conclusions/deductions. Avoid rote learning and drill-oriented methods and rather emphasize participatory teaching and learning in your lessons. You are encouraged to re-order the suggested teaching/learning activities and also add to them where necessary in order to achieve optimum pupil learning.

A suggestion that will help your pupils acquire the capacity for analytical thinking and the capacity for applying their knowledge to problems and issues is to begin each lesson with a practical problem. Select a practical problem for each lesson. The selection must be made such that pupils can use knowledge gained in the previous lesson and other types of information not specifically taught in class. The learning of any skill considered important must start early. From age six, engage your pupils in analytical thinking and practical scientific problem solving techniques.

Column 5 - Evaluation: Suggestions and exercises for evaluating the lessons of each unit are indicated in Column 5. Evaluation exercises can be in the form of oral questions, quizzes, class assignments, essays, project work, etc. Try to ask questions and set tasks and assignments, etc. that will challenge pupils to apply their knowledge to issues and problems as has already been said, and that will engage them in developing solutions, and in developing observational and investigative skills as a result of having undergone instruction in this subject. The suggested evaluation tasks are

not exhaustive. You are encouraged to develop other creative evaluation tasks to ensure that pupils have mastered the instruction and behaviours implied in the specific objectives of each unit.

Lastly, bear in mind that the syllabus cannot be taken as a substitute for lesson plans. It is necessary that you develop a scheme of work and lessons plans for teaching the units of this syllabus.

DEFINITION OF PROFILE DIMENSIONS

The concept of profile dimensions was made central to the syllabuses developed from 1998 onwards. A 'dimension' is a psychological unit for describing a particular learning behaviour. More than one dimension constitutes a profile of dimensions. A specific objective may be stated with an action verb as follows: The pupil will be able to describe, state..... etc. Being able to "describe" something or "state" a fact or principle after the instruction has been completed means that the pupil has acquired "knowledge". Being able to explain, summarize, give examples, etc. means that the pupil has understood the lesson taught.

Similarly, being able to develop, plan, solve problems, construct, etc. means that the pupil can "apply" the knowledge acquired in some new context. Each of the specific objectives in this syllabus contains an "action verb" that describes the behaviour the pupil will be able to demonstrate after the instruction. "Knowledge", "Application", etc. are dimensions that should be the prime focus of teaching and learning in schools. It has been realized unfortunately that schools still teach the low ability thinking skills of knowledge and understanding and ignore the higher ability thinking skills. Instruction in most cases has tended to stress knowledge acquisition to the detriment of the higher ability behaviours such as application, analysis, etc. The persistence of this situation in the school system means that pupils will only do well on recall items and questions and perform poorly on questions that require higher ability thinking skills such as application of mathematical principles and problem solving. For there to be any change in the quality of people who go through the school system, pupils should be encouraged to apply their knowledge, develop analytical thinking skills, develop plans, generate new and creative ideas and solutions, and use their knowledge in a variety of ways to solve mathematical problems while still in school. Each action verb indicates the underlying profile dimension of each particular specific objective. Read each objective carefully to know the profile dimension toward which you have to teach.

The dimensions for teaching, learning and testing in Integrated Science at JHS and their respective weights are as follows:

Knowledge and Comprehension	20%
Application of Knowledge	40%
Experimental and Process Skills	40%

Each of the dimensions has been given a percentage weight that should be reflected in teaching, learning and testing. The weights indicated on the right of the dimensions show the relative emphasis that the teacher should give in the teaching, learning and testing.

You will notice that “Application of knowledge” and “Practical and Experimental Skills” have equal weight that is higher than the weight for “Knowledge and Comprehension”. This means that the second and third dimensions are considered more important and will therefore need more emphasis in the teaching and testing system.

The explanation and key words in each of the profile dimensions are indicated below.

Knowledge and Understanding (KU)

Knowledge The ability to:
Remember, recall, identify, define, describe, list, name, match, state principles, facts and concepts. Knowledge is simply the ability to remember or recall material already learned and constitutes the lowest level of learning.

Understanding The ability to:
Explain, summarise, translate, rewrite, paraphrase, give examples, generalize, estimate or predict consequences based upon a trend. Understanding is generally the ability to grasp the meaning of some material that may be verbal, pictorial, or symbolic.

Application of Knowledge (AK)

Ability to use knowledge or apply knowledge, as implied in this syllabus, has a number of learning/behaviour levels. These levels include application, analysis, synthesis, and evaluation. These may be considered and taught separately, paying attention to reflect each of them equally in your teaching. The dimension “Application of Knowledge” is a summary dimension for all four learning levels. Details of each of the four sub-levels are as follows:

Application The ability to:
Apply rules, methods, principles, theories, etc. to concrete situations that are new and unfamiliar. It also involves the ability to produce, solve, operate, plan, demonstrate, discover etc.

Analysis The ability to:
Break down material into its component parts; to differentiate, compare, distinguish, outline, separate, identify significant points etc., recognize unstated assumptions and logical fallacies recognize inferences from facts etc.

Synthesis The ability to:
Put parts together to form a new whole. It involves the ability to combine, compile, compose, devise, plan, revise, design, organize, create, generate etc.

Evaluation The ability to:
Appraise, compare features of different things and make comments or judgement, contrast, criticize, justify, support, discuss, conclude, make recommendations etc. Evaluation refers to the ability to judge the worth or value of some material based on some criteria.

You will note from the above that evaluation is the highest form of thinking and is therefore the most difficult behaviour. Start to develop this important skill early in your pupils by giving them a lot of practice in evaluation.

The action verbs and the definitions provided in the explanations of the three profile dimensions should help you to structure your teaching such as to achieve the effects needed. Select from the action verbs provided for your teaching, in evaluating learning before, during and after the instruction. Use the action verbs also in writing your test questions. This will ensure that you give your students the chance to develop good thinking skills, and the capacity for excellent performance in integrated science and in examinations. Check the weights of the profile dimensions to ensure that you have given the required emphasis to each of the dimensions in your teaching and assessment.

Experimental and Process Skills (EPS)

Experimental skills involve the enquiry/investigative process of planning and designing experiments, carrying out case studies and field studies to be able to compare phenomena or to observe phenomena closely to be able to identify causes and reasons for the occurrence of phenomena and develop practical solutions to problems and tasks.

Process skills involve demonstration of practical manipulative skills using tools, machines and equipment for problem solving in science. Process skills also involve the processes of observation, classification, drawing, measurement, interpretation, recording, reporting, and expected scientific conduct in the laboratory/field.

A summary of the skills required for effective experimental and process work are the following:

1. Equipment Handling
2. Planning and designing of experiments
3. Observation
4. Manipulation
5. Classification
6. Drawing
7. Designing
8. Measuring
9. Interpretation
10. Recording
11. Reporting
12. Conduct in Laboratory/Field

i **Equipment Handling:**

Proper handling and use of tools and equipment for practical and experimental work; The teacher would ensure that students acquire a high level of proficiency in the use of tools and equipment for scientific work.

ii. *Planning and designing of Experiments:*

Development of hypotheses; planning and designing of experiments; persistence in the execution of experimental activities; modification of experimental activities where necessary in order to reach conclusions.

Research evidence shows that when confronted with a problem, scientists who excel in their respective fields of work develop a number of hypotheses within a short time, review and criticize each hypothesis and then select the best one. Weaker scientists on the other hand, tend to focus on only one or two hypotheses. The implication of this for the teacher of integrated science is to lead students to learn to generate a number of hypotheses for every problem tackled in class; criticize each hypothesis generated before selecting the best one. Some of the critical characteristics to encourage in pupils are:

- Ø Hypotheses generation,
- Ø Ability to modify and change procedures when difficulties arise,
- Ø Creativity,
- Ø Persistence

iii. *Observation:*

Use of the senses to make accurate observations; The student for instance, should be able to tell the colour, form, texture and the structure of specimens provided and be able to classify them.

iv. *Manipulation:*

Manipulation involves the skillful handling of scientific objects and tools for accomplishing specific tasks. It involves setting up laboratory apparatus, preparing specimens and other material for observation.

v. *Classification:*

Group specimens and objects according to their common properties or characteristics.

vi. *Drawing:*

Draw clearly and label specimens, objects etc.

vii. *Designing:*

Visualize and draw new objects or gargets from imagination, etc.

viii. *Measuring:*

Refers to the accurate use of measuring instruments and equipment for measuring, reading and making observations.

- ix. Interpretation:*
The ability to
- (i) evaluate data in terms of its worth: good, bad, reliable, unreliable etc.
 - (ii) make inferences and predictions from written or graphical data
 - (iii) extrapolate
 - (iv) derive conclusions
- Interpretation is also referred to as “Information Handling”.
- x. Recording:*
Draw or make graphical representation boldly and clearly, well labeled and pertinent to the issue at hand.
- xi. Reporting:*
Students should be able to present pertinent and precise reports on projects they undertake. Reports, oral or written, should be concise, clear and accurate.
- xii. Generalizing*
Being able to use the conclusions arrived at in an experiment to what could happen in similar situations
- xiii. Conduct in Laboratory/Field:*
Observation of safety measures in the laboratory; care and concern for the safety of one’s self and for others; ability to work alone and with others; good co-operative spirit, economical use of materials; maintenance of clean and orderly work area; persistence in achieving results; creative use of materials

FORM OF ASSESSMENT

It must be emphasized that both instruction and assessment be based on the profile dimensions of the subject. In developing assessment procedures, try to select specific objectives in such a way that you will be able to assess a representative sample of the syllabus objectives. Each specific objective in the syllabus is considered a criterion to be achieved by the student. When you develop a test that consists of items or questions that are based on a representative sample of the specific objectives taught, the test is referred to as a “Criterion-Referenced Test” In many cases, a teacher cannot test all the objectives taught in a term, in a year etc. The assessment mode you use i.e. class tests, homework, projects etc. must be developed in such a way that it will consist of a representative sample of the important objectives taught over a period.

End-of-Term Examination

The end-of-term examination is a summative assessment system and should consist of a sample of the knowledge and skills pupils have acquired in the term. The end-of-term test for Term 3 should be composed of items/questions based on the specific objectives studied over the three terms, using a different weighting system such as to reflect the importance of the work done in each term in appropriate proportions. For example, a teacher may build an end-of-Term test in such a way that it would consist of the 30% of the objectives studied in Term 1 and 70% of the objectives studied in Term 2. For the Term 3 examination, the test could be based on 20% of the objectives in Term 1, 20% of the objectives in Term 2 and 60% of the

objectives in Term 3. It is important to link knowledge and skills gained in each term in the various end of term test. This will make pupils realize that they cannot learn something in Term 1 and just leave it. Knowledge is always continuous. Linking the end of term tests across the objectives studied in the various terms will bring this important concept home to pupils. The percentage of objectives to select for end-of-Term 3 is indicated as follows:

- 20% of objectives taught in Term 1
- 20% of objectives taught in Term 2
- 60% of objectives taught in Term 3.

Combining SBA marks and End-of-Term Examination Marks

The new SBA system is important for raising pupils' school performance. For this reason, the 80 marks for the SBA will be scaled to 50. The total marks for the end of term test will also be scaled to 50 before adding the SBA marks and end-of-term examination marks to determine pupils' end of term results. The SBA and the end-of-term test marks will hence be combined in equal proportions of 50:50. The equal proportions will affect only assessment in the school system. It will not affect the SBA mark proportion of 30% used by WAEC for determining examination results at the BECE.

Basic School Certificate Examination

The Basic Education Certificate Examination (BECE) consists of an examination paper divided into Section A and Section B. Section A is an objective answer test and will generally consist of items on knowledge and comprehension with some items on application of knowledge. . Section B is of two parts: Part 1 is a test of practical skills made up of items that test application of knowledge, and experimental and practical skills. Part 2 consists of essay type questions based on Knowledge and Comprehension and Application of Knowledge.

The examination structure presented in the chart below, shows a similar structure paper as the BECEC Integrated Science paper. Section A of the paper is marked out of 30; Part 1 of Section B is marked out of 40 while Part 2 is marked out of 50. The SBA is based on all three profile dimensions and is marked out of 80, giving a total of 200 marks. The last row shows the weight of the marks allocated to each of the four test components. The three papers are weighted differently. Paper 2 of Section B is a more intellectually demanding part of the examination and is therefore weighted more than the other parts of the examination.

Distribution of Examination Paper Weights And Marks

Dimensions	Section A	Section B		SBA	Total Marks	% Weight Of Dimensions
	Objective Test	Test of Practical Skills	Essay type test			
Knowledge and Comprehension	20	-	10	10	40	20
Application of Knowledge	10	-	40	30	80	40
Experimental and Practical Skills	-	40	-	40	80	40
Total Marks	30	40	50	80	200	-
% Contribution of Exam Papers	10	15	25	50	-	100

You will note that Section A has a contribution of 10% to the total marks; Part 1 of Section B has a contribution of 15% to the total marks and Part 2 of Section B has a contribution of 25% to the total marks. The SBA component has a contribution of 50% to the total marks. The numbers in the cells indicate the marks to be allocated to the items / questions that test each of the dimensions within the respective test papers.

The last but one column shows the total marks allocated to each of the dimensions. Note that the numbers in this column are additions of the numbers in the cells and they agree with the profile dimension weights indicated in the last column. Of the total marks of 200, 40 marks, equivalent to 20% of the total marks, are allocated to Knowledge and Comprehension. 80 marks, equivalent to 40% of the total marks, are allocated to each of Application of Knowledge and Practical and Process Skills. The weight of each of the three dimensions is indicated in the last column. The ratio of theory to practice in integrated science at the Junior High School level is 60:40.

Test Item bank

The structure of assessment recommended in the syllabus will need extra effort on the part of the teacher. In preparation for setting examination papers, try to develop an item bank. The term “item bank” is a general term for a pool of objective test items, a pool of essay questions or a pool of practical test questions to fit selected specific objectives which you consider important to be tested. If you proceed diligently, you will realize you

have written more than 100 objective test items and more than 30 essay questions in a space of one year or less. Randomly select from the item bank to compose the test papers. Select with replacement. This means, as items / questions are selected for testing, new ones have to be written to replace those items / questions already used in examinations. Test items that have been used in examinations may also be modified and stored in the item bank.

Test wiseness

An important issue in the preparation for a major examination such as the BECE is the issue of test wiseness. To be test wise means that the pupil understands the mechanics for taking a test. These mechanics include writing your index number and other particulars accurately and quickly on the answer paper; reading all questions before selecting the best questions to answer; apportioning equal time to each question or spending more time on questions that carry more marks. For the essay part, help your pupils to understand the necessity of making notes on each question attempted before writing the answer. Pupils should leave extra time to read over their work. Finally, check to see that your personal particulars supplied on the answer sheet are accurate. Some good students sometimes fail to do well in major examinations because of weakness in the mechanics of test taking; because they are not test wise. Take your pupils through these necessary mechanics so that their performance on major examinations may not be flawed by the slightest weakness in test taking.

GUIDELINES FOR SCHOOL BASED ASSESSMENT

A new School Based Assessment system (SBA), formally referred to as Continuous Assessment, will be introduced into the school system from September 2008. SBA is a very effective system for teaching and learning if carried out properly. The new SBA system is designed to provide schools with an internal assessment system that will help schools to achieve the following purposes:

- Standardize the practice of internal school-based assessment in all schools in the country
- Provide reduced assessment tasks for each of the primary school subjects
- Provide teachers with guidelines for constructing assessment items/questions and other assessment tasks
- Introduce standards of achievement in each subject and in each class of the school system
- Provide guidance in marking and grading of test items/questions and other assessment tasks
- Introduce a system of moderation that will ensure accuracy and reliability of teachers' marks
- Provide teachers with advice on how to conduct remedial instruction on difficult areas of the syllabus to improve pupil performance

The new SBA system will consist of 12 assessments a year instead of the 33 assessments in the previous continuous assessment system. This will mean a reduction by 64% of the work load compared to the previous continuous assessment system. The 12 assessments are labeled as Task 1, Task 2, Task 3 and Task 4. Task 1-4 will be administered in Term 1; Tasks 5-8 will be administered in Term 2, and Tasks 9-12 administered in Term 3. Task 1 will be administered as an individual test coming at the end of the first month of the term. The equivalent of Task 1 will be Task 5 and Task 9 to the administered in Term 2 and Term 3 respectively. Task 2 will be administered as a Group Exercise and will consist of two or three instructional objectives that the teacher considers difficult to teach and learn. The selected objectives could also be those objectives considered very important and which therefore need pupils to put in more practice. Task 2 will be administered at the end of the second month in the term. Task 3 will also be administered as individual test under the supervision of the class teacher at the end of the 11th or 12 week of the term.

Task 4 (and also Task 8 and Task 12) will be a project to be undertaken throughout the term and submitted at the end of the term. Schools will be supplied with 9 project topics divided into three topics for each term. A pupil is expected to select one project topic for each term. Projects for the second term will be undertaken by teams of pupils as Group Projects. Projects are intended to encourage pupils to apply knowledge and skills acquired in the term to write an analytic or investigative paper, write a poem 9 (as may be required in English and Ghanaian Languages), use science and mathematics to solve a problem or produce a physical three-dimensional product as may be required in Creative Arts and in Natural Science.

Apart from the SBA, teachers are expected to use class exercises and home work as processes for continually evaluating pupils' class performance, and as a means for encouraging improvements in learning performance.

Marking SBA Tasks

At the JHS level, pupils will be expected to write reports as part of their home work assignments and as part of the SBA. The suggested guideline for marking such assignments and projects is as follows:

1.	Introduction	20%
2.	Main text – descriptions, analysis, charts etc.	40%
3.	Conclusion and evaluation of results/issues	20%
4.	Acknowledgement and other references	20%

In writing a report on an experiment or any form of investigation, the pupil has to introduce the main issue in the investigation, project or report. The introduction carries a weight of 20%. The actual work, involving description of procedures and processes, use of charts and other forms of diagram, and the analysis of data is given a weight of 40%. Conclusions and generalizations from the investigation, project etc. is weighted 20%. The fourth item, that is, acknowledgement and references is intended to help teach young people the importance of acknowledging one's source of information and data. The pupil should provide a list of at least three sources of references for major work such as the project. The references could be books, magazines, the internet or personal communication from teacher or from friends. This component is given a weight of 20%.

The marks derived from projects, the end of month SBA tests and home work specifically designed for the SBA should together constitute the School Based Assessment component and weighted 60 per cent. The emphasis is to improve pupils' learning by encouraging them to produce essays, poems, and artistic work and other items of learning using appropriate process skills, analyzing information and other forms of data accurately and make generalizations and conclusions. The SBA will hence consist of:

- Ø End-of-month tests
- Ø Home work assignments (specially designed for SBA)
- Ø Project

Other regulations for the conduct of SBA will reach schools from GES.

GRADING PROCEDURE

To improve assessment and grading and also introduce uniformity in schools, it is recommended that schools adopt the following grade boundaries for assigning grades on students' test results.

Grade A:	80 - 100%	-	Excellent
Grade B:	70 - 79%	-	Very Good
Grade C:	60 - 69%	-	Good
Grade D:	45 - 59%	-	Pass
Grade E:	35 - 44%	-	Weak
Grade F:	≤ 34%	-	Very weak

In marking your class examination scripts, it is very important that you develop a marking scheme. A marking scheme, consists of the points for the best answer you expect for each question, and the mark allocated for each point raised by the student as well as the total marks for the question. For instance, if a question carries 20 marks, and you expect 6 points in the best answer, you could allocate 3 marks or part of it (depending upon the quality of the points raised by the student) to each point, hence totaling, 18 marks, and then give the remaining 2 marks or part of it for organization of answer. For objective test papers you may develop an answer key to speed up the marking.

In assigning grades to students' test results; you may apply the above grade boundaries and the descriptors which indicate the meaning of each grade. The grade boundaries are also referred to as grade cut-off scores. For instance, the grade cut-off score for a B grade is 65% in the example. When you adopt a fixed cut-off score grading system as in this example, you are using the criterion-referenced grading system. By this system a student must make a specified score to be awarded the requisite grade. This system of grading challenges students to study harder to earn better grades. It is hence a very useful system for grading achievement tests.

UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
UNIT 1(CONT'D) INTRODUCTION TO INTEGRATED SCIENCE	The pupil will be able to : 1.1.6 explain how science and technology affect society. 1.1.7 outline some instances where science and technology have been misused.	Effects of science and technology on society in areas like, agriculture, communication, education, health, transportation, provision of shelter and clothing Misuse of science and technology e.g. warfare.	Let pupils: - give examples of areas of life where science and technology have brought improvements in life. - discuss some of the applications of science and technology in fields as listed in content. - discuss how science helps us to obtain knowledge and also to explain superstitions, beliefs and taboos. discuss how science and technology are misused in e.g. warfare, etc.	State four areas of life where science and technology have brought improvements.
UNIT 2 MATTER	1.2.1 explain matter 1.2.2 describe the nature and states of matter. 1.2.3 demonstrate how matter can be changed from one state to another.	Definition of matter Nature of matter States of matter <u>Changing the state of matter:</u> Melting, Evaporation, Boiling, Solidification/freezing, Condensation, Sublimation	- review lesson on characteristics of states of matter in Primary 6. - brainstorm to bring out the meaning of matter. - use models or digital content to explain the nature of matter - discuss the fact that the particles which make up matter are atoms, molecules or ions. - Collect various substances and group them into the three states of matter - describe the three states of matter - make sketches to show the arrangement of particles in solids, liquids and gas. - use water or any suitable materials to demonstrate the change of state of matter.	Build models of atoms and molecules. What particles constitute matter? Give the differences between the particles. Explain how matter can be changed from one state to another.

UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
UNIT 2 (CONT'D) MATTER	<p>The pupil will be able to:</p> <p>1.2.3 outline the differences between plants and animals</p> <p>1.2.4 distinguish between plant and animal cells</p> <p>1.2.5 differentiate between unicellular and multi-cellular organisms</p>	<p>Differences between plants and animals in terms</p> <ul style="list-style-type: none"> - feeding and movement. <p>Plant and animal cells:</p> <ul style="list-style-type: none"> - Cell structure - components of the cells - Functions of components/parts of the typical cell <p>Differences between plant and animal cells</p> <p>Unicellular and multi-cellular organisms</p>	<p>Let pupils:</p> <ul style="list-style-type: none"> - review characteristics of living and non- living things studied in Primary school - Collect different living things from the environment. - group the living things above into plants and animals. - list the differences between plants and animals. <ul style="list-style-type: none"> - examine models and charts of plant and animal cells. - explain and define what a living cell is. <p>Teacher to assist pupils to draw and label a typical cell.</p> <ul style="list-style-type: none"> - mention the various parts of the typical cell as in content. - state the functions of the parts of the cell labelled in the drawing. - observe cells from the onion epidermis, and from the inside of the cheek under a microscope. <ul style="list-style-type: none"> - discuss the differences plant and animal cells in terms of shape, thickness of the outer wall, size of the spaces in the cell and the presence of a green pigment. <ul style="list-style-type: none"> - examine a unicellular (amoeba) organism using microscope - mention organisms which are made of one cell and those made of many cells. - examine a multi-cellular organism.(e.g. human being) 	<p>Examine a plant and animal cell under a microscope and state four differences between them.</p> <p>Give the common characteristics and the differences between plant and animal cells.</p>

UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
UNIT 3 MEASUREMENT	<p>The pupil will be able to:</p> <p>1.3.1 distinguish between base and derived units of measurement.</p> <p>1.3.2 measure length, time, mass and temperature using appropriate instruments.</p>	<p>Base Units of Measurement: Length – metre (m) Mass – kilogram (kg) Time – second (s) Temperature – kelvin (K) Current – amperes (A) Amount of substance – mole (mol) Luminous intensity- candela (cd)</p> <p>Derived Units: Volume – cubic metre (m³) or litre (l) Density – kg/m³ or kgm⁻³ Area – square metre (m²)</p> <p>Measurement of length</p> <p>Measurement of mass using lever balance and/or beam balance.</p> <p>Measurement of time using watches and/or clocks.</p> <p>Measurement of temperature using a thermometer.</p>	<p>Let pupils:</p> <ul style="list-style-type: none"> - list the base units of measurement. - explain why these are referred to as base units of measurement. - list derived units of measurement. - explain why volume, density and area are referred to as derived units. - measure the height of each other using a metre rule, and the circumference of the head of each other using a tape measure. Record the measurements and report in class. - measure the mass of objects in the classroom e.g. exercise book, pen, a shoe etc. - take a quick walk around the school park, record the time and report in class. - measure the temperature of warm water and cold water, using a thermometer; record their observations and report in class. - give reasons why accurate measurements are important in everyday activities. <p>NOTE: Measurements should be accurate - to prevent wastage; to prevent cheating; to prevent overdose and under-dose in the preparation and dispensing of medicine.</p>	<p>Explain the term Derived units? Give three examples.</p> <p>List measuring instruments and indicate their uses.</p> <p>Role-play a market scene where a customer is arguing with a seller over the volume of cereal sold /bought.</p> <p>State the importance of accuracy in measurement.</p>

UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
UNIT 3 (CONT'D) MEASUREMENT	<p>The pupil will be able to:</p> <p>1.3.3 measure area, and volume using appropriate instruments.</p> <p>1.3.4 measure the densities of regular and irregular objects.</p> <p>1.3.5 demonstrate sinking and floating</p>	<p>Measurement of area using metre rule or tape measure.</p> <p>Measurement of volume using graduated cups/containers.</p> <p>Definition of Density</p> <p>Densities of regular and irregular objects. Regular objects: cuboids, cones, spheres, cylinders. Irregular objects: stones and other objects without definite shape.</p> <p>Sinking and Floating</p>	<p>Let pupils:</p> <ul style="list-style-type: none"> - measure the area of the classroom in m^2, cm^2 record and report. - measure the volume of liquids e.g. glass of water, small bottle of cooking oil, using graduated cylinder/ cup/container. Record measurements and report. - brainstorm to bring out the meaning of density - fill three identical containers to the brim with water, sand and sawdust respectively - compare the heaviness of the containers - record and discuss their observations - measure the masses of cubes or rectangular blocks of various materials, aluminium, cork, iron, lead, rubber, wood. - determine their volumes - calculate their densities. - determine mass of irregular objects. - determine volume through the displacement of water. - calculate the densities. - place the cubes used in 1.3.4 in water in a container. - explain their observations. - place an empty milk tin in a bowl of water. - add some pebbles gradually until the tin sinks. - explain their observations. 	<p>Explain how the density of an irregular object e.g. stone could be determined.</p> <p>Explain why some objects float in water while others sink. Devise three ways by which a sinking object may be made to float.</p>

UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
<p>UNIT 4</p> <p>NATURE OF SOIL</p>	<p>The pupil will be able to:</p> <p>1.4.1 describe the nature and importance of soil</p> <p>1.4.2 explain the importance of soil profile in crop production</p>	<p>Meaning, composition and soil types</p> <p>Functions and uses of soil Crop growth: - supports plants - supply of nutrients to plants - source of water Construction: - Laterite for constructing buildings - Sand used in mortar for building Industry - Clay for ceramics, tiles, pots etc.</p> <p>Physical properties of soils and their importance: soil texture and structure, soil air, soil water, soil temperature and soil organic matter</p> <p>Soil Profile, meaning, description and importance.</p>	<p>Let pupilso:</p> <p>- perform experiments to demonstrate that soil is made up of minerals, air, water and living organisms. Teacher to demonstrate separation of soil into gravel, sand, silt, clay and organic fractions. - brainstorm to explain the term 'soil'</p> <p>- discuss the various ways by which soil helps plants to grow and other uses of soil.</p> <p>- show and discuss the importance of living organisms in the soil.</p> <p>i – perform an experiment to demonstrate soil texture by the feel method. ii- perform experiments to demonstrate Water Holding Capacity and Drainage of sandy, loamy and clayey soils. iii. perform experiment to demonstrate the capillarity of sandy, loamy and clayey soils. - note the effects of physical properties of soils on crop growth.</p> <p>- dig a pit or visit a dugout pit, examine and identify the different horizons of the soil profile. - describe each horizon under the following headings: Colour, Texture, Porosity, Depth, and Organic Matter Content.</p> <p>- discuss the importance of the soil profile in crop production.</p>	<p>List components of the soils.</p> <p>Collect living organisms from the soil and preserve them.</p> <p>Describe each horizon of a soil profile under the following headings: Colour, Texture, Porosity, Depth, and Organic Matter Content.</p> <p>Discuss the importance of the soil profile in crop production.</p>

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SECTION 2: CYCLES

General Objectives: The pupil will:

1. recognise that there are repeated patterns of change in nature and understand how these patterns arise
2. develop an understanding that agricultural production is cyclic in nature
3. appreciate the cyclic nature of the life of plants and its importance in crop production.
4. develop skills in vegetable crop and Tilapia production

UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
<p>UNIT 1</p> <p>LIFE CYCLE OF FLOWERING PLANTS</p>	<p>The pupil will be able to:</p> <p>2.1.1 classify crop plants according to their growth cycle and uses</p> <p>2.1.2 describe the life cycle of flowering plants</p> <p>2.1.3 demonstrate the conditions necessary for germination of a seed and sustained growth of the seedling.</p>	<p>Classification of crop plants on the bases of growth cycle and uses</p> <p>Stages in the life cycle of flowering plants: Flowering, pollination, fertilization, fruit/seed formation, maturation of fruit/seed, seed germination, seedling, planting.</p> <p>Conditions for germination: air (Oxygen), water, suitable temperature and viability of the seed.</p>	<p>Let pupils:</p> <ul style="list-style-type: none"> - bring different types of crop products to school to be classified - give examples of crops that are classified as annual, biennial and perennial - name crops that are used as cereals, legumes, root tubers, stem tubers, vegetables, fruits, beverages, spices, drugs, oils, latex, fibres, pastures, forages and ornamentals. - give examples of leafy, fruit and root vegetable crops - give examples of ornamental plants - discuss the uses of ornamental plants. <ul style="list-style-type: none"> - brainstorm to list the stages flowering plants go through to continue their generation - discuss the stages in the life cycle of flowering plants <ul style="list-style-type: none"> - set up an experiment which combines all the conditions for growth and also promotes sustained growth using soil or without soil (hydroponics) 	<p>Classify the following crops according to their uses: Okra, Spinach, Oil Palm, Cocoa plant, Rubber plant, Ginger, Yam, Elephant grass, Citrus and Guinea corn.</p> <p>Explain the importance of the stages in the life cycle of flowering plants in crop cultivation.</p> <p>How would you verify one of the conditions necessary for germination through an experiment?</p>

UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
UNIT 3 FISH CULTURE	<p>The pupil will be able to:</p> <p>2.3.1 identify main parts of a fish</p> <p>2.3.2 outline the importance of fish farming.</p> <p>2.3.3 describe the conditions suitable for rearing Tilapia.</p> <p>2.3.4 perform some of the activities involved in rearing Tilapia</p>	<p>Main parts of a fish and their functions</p> <p>Importance of fish farming.</p> <p>Conditions suitable for rearing Tilapia</p> <p>Activities in rearing Tilapia</p>	<p>Pupils to:</p> <ul style="list-style-type: none"> - use a chart and digital content to identify and discuss the major parts of a fish and their functions. - visit a fish landing site e.g.: beach, riverside, lake, lagoon, pond/dam site and observe various types of fish caught from the water bodies. - discuss the benefits derived from fish farming. - discuss conditions suitable for rearing Tilapia. - discuss activities involved in rearing Tilapia (pond stocking, feeding, harvesting, processing, packaging and marketing). <p>Project: In groups pupils, Use an aquarium or a fish pond, to practise activities involved in rearing Tilapia(pond stocking, feeding, harvesting, processing, storage, packaging and marketing,</p>	<p>List and discuss the functions of four (4) parts of a fish.</p> <p>State four (4) benefits derived from fish farming.</p> <p>List and discuss four activities involved in rearing Tilapia.</p> <p>List four equipment used in harvesting fish. Pupils to describe two methods of processing fish.</p>

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SECTION 3: SYSTEMS

General Objectives: The pupil will

1. show an understanding of the role of the respiratory system in the life of an organism.
2. appreciate the basic principles underlying various farming systems.

UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
UNIT 1 RESPIRATORY SYSTEM OF HUMANS	<p>The pupil will be able to:</p> <p>3.1.1 draw and label the human respiratory system</p> <p>3.1.2 distinguish between the two types of respiration.</p>	<p>Structure of the respiratory system</p> <p>Types of respiration:</p> <ul style="list-style-type: none"> o External respiration o Internal respiration 	<p>Let pupils:</p> <ul style="list-style-type: none"> - explain the meaning of respiration - identify the organs that form the respiratory system using charts. - draw and label the respiratory system using charts <p>NOTE: Structure of individual organs not required</p> <ul style="list-style-type: none"> - use digital content for the discussion of types of respiration - observe each other as they breathe in and out - discuss what happens to the chest as they breathe in and out. <p>NOTE: Tissue respiration should be limited to burning of food to release energy , water and carbon dioxide.</p>	<p>Distinguish between external respiration and internal respiration.</p>

UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
	The pupil will be able to:		Let pupils:	

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SECTION 4: ENERGY

General Objectives: The pupil will

1. recognise that energy has a source, can be transformed into various forms
2. be aware of renewable and non renewable sources of energy.
3. trace transformation pathways of various sources of energy.
4. develop skills in using transistors
5. be aware of some of the characteristics and uses of light energy.

UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
<p>UNIT 1</p> <p>SOURCES AND FORMS OF ENERGY</p>	<p>The pupil will be able to:</p> <p>4.1.1 describe the various sources of renewable and non renewable energy</p> <p>4.1.2 demonstrate the production of some renewable forms of energy</p>	<p>Sources of energy: renewable and non renewable sources</p>	<p>Let pupils:</p> <ul style="list-style-type: none"> - brainstorm to give the meaning of renewable and non renewable sources of energy - brainstorm and list various sources of energy - classify the sources of energy into renewable and non renewable <p>Project: Design and construct any of the following:</p> <ol style="list-style-type: none"> i. Biogas digester ii. Solar Heater iii. Wind Mill for Pumping water 	<p>List four sources of energy that can be replenished.</p>
<p>UNIT 2</p> <p>CONVERSION OF ENERGY</p>	<p>4.2.1 state the various forms of energy</p> <p>4.2.2 demonstrate how various forms of energy can be transformed</p> <p>4.2.3 give reasons for conserving energy.</p>	<p>Forms of energy</p> <p>Energy transformation</p> <p>Conserving energy</p>	<ul style="list-style-type: none"> - list various forms of energy - discuss expressions for potential and kinetic energy <p>- explain the energy transformation as shown by the following activities:</p> <ol style="list-style-type: none"> i. use torch battery to produce light in a bulb ii. using electric iron ii. using public address system iii. dissolving Calcium Carbide in water <ul style="list-style-type: none"> - discuss the effects of increase in human population on the demand for energy - discuss various ways of conserving energy - discuss the effects of using old electrical gadgets. 	<p>What energy change is involved in dissolving calcium carbide in water.</p> <p>Why has the issue of energy conservation assumed greater importance in Ghana?</p>

UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
UNIT 3 BASIC ELECTRONICS	<p>The pupil will be able to:</p> <p>4.3.1 describe the composition and types of transistors</p> <p>4.3.2 describe the characteristics of transistors</p>	<p>Composition of transistors Emitters, Base and Collector</p> <p>Types of transistors: NPN, PNP.</p> <p>Characteristics of transistors</p> <ul style="list-style-type: none"> - Active region for amplification action - Saturation region for switching action 	<p>Let pupils:</p> <ul style="list-style-type: none"> - identify two P-N junctions of the transistors - identify the Emitter lead, Base lead and Collector lead. - Investigate how the transistor is turned on and off - Identify the types of transistors - connect the transistor with Base Emitter junction forward biased and base Collector junction reversed biased - investigate the effect on an LED connected between the collector and the emitter - connect transistor with both junction forward biased and investigate the effect of the collector emitter path. 	<p>Draw symbols for NPN and PNP transistors.</p>

UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
UNIT 4 LIGHT ENERGY	<p>The pupil will be able to:</p> <p>4.4.1 group light sources into natural or artificial lights.</p> <p>4.4.2 distinguish among transparent, translucent and opaque materials</p> <p>4.4.3 demonstrate that light travels in a straight line.</p> <p>4.4.4 describe the operation of the Pin Hole Camera</p> <p>4.4.5 describe the formation of shadows</p>	<p>Sources of light; Natural and Artificial Lights.</p> <p>Transparent, Translucent and Opaque materials.</p> <p>Rectilinear propagation of light</p> <p>Operation of the Pin Hole Camera.</p> <p>Formation of shadows</p>	<p>Let pupils:</p> <ul style="list-style-type: none"> - discuss different sources of light - group light from different sources into natural or artificial . - place different materials in the path of light and determine whether the materials are, translucent, transparent or opaque - arrange three card boards, each with a hole in the centre so that their holes are aligned. - place a lighted candle behind the cards and observe the light through the holes. - move one of the cardboards slightly and observe again. - record and discuss their observations. - examine a model of the Pin Hole Camera and discuss how it works - place an opaque object between a small source of light and a screen - record and discuss their observation - identify umbra and penumbra from the demonstration above. 	<p>Mention three sources of Light.</p> <p>Distinguish between transparent, translucent and opaque materials.</p> <p>Draw a diagram too show that Light travels in a straight line.</p> <p>Project: Pupils to construct a Pin Hole Camera and use the camera to take the picture of an object and compare with a picture of the object taken with a modern camera.</p>

UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
UNIT 4 (CONT'D) LIGHT ENERGY	<p>The pupil will be able to:</p> <p>4.4.4 demonstrate the formation of eclipse</p> <p>4.4.5 demonstrate the reflection and refraction of light</p> <p>4.4.6 demonstrate the reflection and refraction of light</p>	<p>Formation of eclipse</p> <p>Reflection of light</p> <p>Refraction of light</p>	<p>Let pupils:</p> <ul style="list-style-type: none"> - use the globe or tennis ball and torchlight to demonstrate the formation of eclipses. <p>NOTE: Discuss eclipse of the Sun and that of the Moon. Annular eclipse excluded.</p> <ul style="list-style-type: none"> - arrange a light source, plane mirror and screen to demonstrate reflections of light - identify the incident and reflected rays and draw their paths <ul style="list-style-type: none"> - discuss the characteristics of images formed by a plane mirror <p>NOTE: Discussion should include distinction between real and virtual images.</p> <ul style="list-style-type: none"> - demonstrate the change in path of light as it travels from one medium to another. - Explain why an object at the bottom of a pond appears closer to the surface. 	<p>In groups, demonstrate that the angle of incidence is equal to the angle of reflection.</p>

SECTION 5: INTERACTIONS OF MATTER

General Objectives: The pupil will

1. appreciate that interactions between and within matter helps humans to better understand the environment and their role in it.
2. show understanding of ecosystems.
3. trace the interdependency of organisms in an ecosystem.
4. develop skills of managing waste in the environment.

UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
UNIT 1 ECOSYSTEM	<p>The pupil will be able to:</p> <p>5.1.1 explain the meaning of ecosystem</p> <p>5.1.2 describe the characteristics of different habitats</p> <p>5.1.3 explain the relationship between plants, animals and the chosen habitat.</p>	<p>Meaning of ecosystem</p> <p>Meaning of habitat Types of Habitats</p> <p>Relationship between organisms and their habitats</p>	<p>Let pupils:</p> <ul style="list-style-type: none"> - brainstorm to bring out the meaning of ecosystem - brainstorm to bring out the meaning of habitat - discuss the characteristics of different types of habitats - select an ecosystem to be studied as a project <p>NOTE: Records of types of plants and animals found in the area to be kept.</p> <ul style="list-style-type: none"> - discuss the relationship between plants, animals and the chosen habitat. 	<p>What is an ecosystem?</p> <p>List and discuss two types of habitats.</p> <p>Name and discuss two types of habitats under the following:</p> <ol style="list-style-type: none"> i. types of plants and animals ii. climatic conditions

UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
UNIT 1 (CONT'D) ECOSYSTEM	<p>The pupil will be able to:</p> <p>5.1.3 describe how organisms adapt to their environment</p> <p>5.1.4 explain the Interdependence of plants and animals</p> <p>5.1.5 describe how the energy derived from the sun is used by organisms in an ecosystem</p> <p>5.1.6 describe the activities that disrupt the balance in the ecosystem and the effects of the disruption in the balance.</p>	<p>Adaptations of organisms to the environment</p> <p>Protective mechanisms of living organisms.</p> <p>Interdependence of living organisms in habitats.</p> <p>Energy transfer in an ecosystem</p> <p>Threats to ecosystem: Earthquakes, volcano eruptions hunting, farming, mining, pollution, pesticides, etc. Protection of endangered species: turtles, hippopotamus, elephants, eagle, odum, mahogany, pitcher plant, etc.</p> <p>Effects of the disruption of balance in nature</p>	<p>Let pupils:</p> <ul style="list-style-type: none"> - collect and examine animals and plants found on land, in water and air and discuss how they are adapted for life in these environments, eg. Streamlined shape of birds and fish <p>NOTE: Shape, body structure, movement, reproduction, feeding habits, structural modifications for life in the environments of the following organisms: fish, frog, common water- plants, rabbits, bats, birds, to be studied.</p> <ul style="list-style-type: none"> - discuss devices employed by living organisms for protection. - discuss how plants and animals depend on each other for food (e.g. herbivores, carnivores and omnivorous) and shelter to maintain a balance in nature. - discuss the importance of the balance in nature. <p>NOTE: Food chains and food webs should be mentioned.</p> <ul style="list-style-type: none"> - demonstrate through a food chain and food web how energy from the sun is used in an ecosystem <ul style="list-style-type: none"> - discuss how the balance in nature may be disrupted <ul style="list-style-type: none"> - discuss effects of the disruption of the balance in nature - discuss ways to maintain balance in nature. 	<p>Give reasons why a fish from the sea may not survive in a fresh water environment.</p> <p>Describe how some named plants and animals you have observed protect themselves from danger</p> <p>Explain how the balance in nature can be maintained.</p>

JUNIOR HIGH SCHOOL 2

SECTION 1: DIVERSITY OF MATTER

General Objectives: The pupil will

1. recognise variety of living and non-living things in nature and their connectedness
2. develop an awareness of elements, compounds and mixtures.
3. be aware of the differences between metals and non metals.
4. use the knowledge of corrosion to take care of metallic objects.
5. acquire skills in the separation of mixtures.
6. be aware of the properties of water

UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
<p>UNIT 1</p> <p>ELEMENTS, COMPOUNDS AND MIXTURES</p>	<p>The pupil will be able to:</p> <p>1.1.1 classify materials into elements, compounds and mixtures</p> <p>1.1.2 write the chemical symbols for the first twenty elements of the periodic table correctly.</p> <p>1.1.3 draw and label the structure of an atom.</p>	<p>Meaning of elements, compounds and mixtures</p> <p>Chemical substances are represented by symbols such as the following:</p> <p>Sodium - Na Calcium – Ca Potassium - K</p> <p>The atomic structure</p>	<p>Let pupils:</p> <ul style="list-style-type: none"> - brainstorm to bring out the meaning of elements, compounds and mixtures - prepare a list of elements, compounds and mixtures - give the definition of an element with examples. <p>- write chemical symbols of the first twenty elements of the periodic table.</p> <p>NOTE: Teacher to check each pupils work to ensure that the symbols are correct.</p> <ul style="list-style-type: none"> - use models to explain the structure of an atom. - draw the structure of an atom and label its parts - mention the sub-atomic particles - draw the distribution of electrons in the atoms of the first twenty elements of the periodic table. - label the shells of the atoms. <p>NOTE: Detailed electronic structure not required.</p>	<p>Classify the following materials into elements, compounds and mixtures: Water, salt, iron fillings, salt water.</p> <p>Design a periodic table showing the first twenty elements.</p> <p>Draw the sodium atom showing the distribution of its electrons.</p>

UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
UNIT 2 (CONT'D) METALS AND NON-METALS	<p>The pupil will be able to:</p> <p>1.2.2 explain why non-reactive metals are preferred in making ornaments and jewellery.</p> <p>1.2.3 outline the composition of some common alloys and their uses.</p>	<p>ii. Chemical Properties of metals: Reactivity of metals</p> <p>Non-reactive metals do not react with atmospheric oxygen, and they retain their lustre for a long time.</p> <p>Differences between metals and non-metals</p> <p>Meaning of alloy: An alloy is a combination of two or more metals to form a mixture</p> <p>Composition of alloys: Steel – iron and carbon Brass- copper and zinc Bronze- copper and tin</p>	<p>Let pupils:</p> <ul style="list-style-type: none"> - discuss their observations in all cases. - drop a small piece of a metal into dilute acid solution/lime juice - state their observations in each case and draw conclusion. <p>NOTE: Magnesium ribbon, iron filings, zinc nails, copper, lead may be used. Bubbles of air/gas are seen on reactive metals</p> <ul style="list-style-type: none"> - discuss why certain metals are used to make jewellery and ornaments. - visit a goldsmith to observe him/her at work. - discuss the differences between metals and non-metals. - discuss the meaning of an alloy. <ul style="list-style-type: none"> - discuss the composition of some common alloys e.g. steel, stainless steel, brass, bronze. <p>NOTE: An alloy may contain a non-metal.</p>	<p>List four physical properties of metals.</p> <p>Name three metals that are:</p> <ol style="list-style-type: none"> i. reactive ii. non-reactive <p>Name four alloys and state their composition.</p>

UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
<p>UNIT 2 (CONT'D)</p> <p>METALS AND NON-METALS</p>	<p>The pupil will be able to:</p> <p>1.2.4 define and outline the effects of corrosion</p> <p>1.2.5 describe ways for preventing rusting.</p>	<p>Uses of alloys: Alloys are used in making currency coins, silver cup, brass bowl, sardine tin, spoon, aeroplane, cars, wrist watch.</p> <p>Corrosion of metals is the wearing away of the metal by the action of chemicals</p> <ul style="list-style-type: none"> - Acid rain corrodes the paint work of buildings - Old dry cells corrode the metal container of electric torches - Skin toning creams corrode the faces and bodies of users. <p>Process of rusting: the reaction of a metal with atmospheric oxygen in the presence of moisture.</p> <p>Effects of rusting e.g. metallic iron loses its strength and structure.</p> <p>Prevention of rusting: Oiling, greasing, painting. Zinc/Chromium-coating.</p>	<p>Let pupils:</p> <ul style="list-style-type: none"> - discuss the uses of alloys - brainstorm to bring out the meaning of corrosion of metals - discuss the effects of corrosion - perform activities to demonstrate the process of rusting using water, iron nails/steel sponge - discuss the effect of rusting on objects. <p>NOTE: Rusting occurs only in iron.</p> <ul style="list-style-type: none"> - discuss how surfaces of metals can be protected to prevent rusting. - mention examples of iron – containing materials used in the home. - bring some metallic items and use different processes for rust prevention on the items. 	<p>Explain the effects of corrosion of metals in buildings</p> <p>Explain how rusting takes place.</p> <p>Explain how oiling prevents rusting.</p>

UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
UNIT 3 CHEMICAL COMPOUNDS	The pupil will be able to:		Let pupils:	
	1.3.1 define a chemical compound	Definition of a chemical compound	<ul style="list-style-type: none"> - brainstorm the definition of a compound - list and discuss the composition of some compounds - write the formulae of compounds. . <p>NOTE: Binary Compounds only required.</p>	Write down the formulae of three simple compounds.
	1.3.2 write the formulae of some compounds	FeS, NaCl, CuO	<ul style="list-style-type: none"> - discuss the systematic names of binary compounds 	
	1.3.3 write the systematic names of simple compounds	Iron (II) Sulphide (FeS) Sodium Chloride (Na Cl) Copper (II) Oxide (Cu O)	<ul style="list-style-type: none"> - write word equations for some simple reactions. 	
	1.3.4 write word equations for some simple reactions	Iron + Sulphur → Iron (II)Sulphide, Sodium +Chlorine → Sodium Chloride		
	1.3.5 balance simple chemical equation	<ul style="list-style-type: none"> - $2\text{H}_2 + \text{O}_2 \rightarrow 2\text{H}_2\text{O}$ - $\text{N}_2 + 3\text{H}_2 \rightarrow 2\text{NH}_3$ - $2\text{Na} + \text{Cl}_2 \rightarrow 2\text{NaCl}$ 	<ul style="list-style-type: none"> - balance simple equations. 	Balance the following simple equations: $\text{H}_2 + \text{O}_2 \rightarrow \text{H}_2\text{O}$ $\text{Na} + \text{Cl}_2 \rightarrow \text{Na Cl}$
UNIT 4 MIXTURES	1.4.1 define a mixture and give examples	Definition of mixture Types of mixtures: Solid – liquid, solid – gas, Solid – solid, gas – liquid, gas – gas, liquid – liquid mixtures	<ul style="list-style-type: none"> - brainstorm to bring out the meaning of a mixture. - discuss examples of mixtures - assemble and identify different types of mixtures 	Explain the term 'mixture'. Mention four examples of mixtures.

UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
UNIT 4 (CONT'D) MIXTURES	The pupil will be able to: 1.4.2 prepare salt solution	Preparation of salt solution.	Let pupils: <ul style="list-style-type: none"> - put salt in water - stir for the salt to dissolve - taste and discuss their observation NOTE: The substances which form a mixture retain their individual properties.	
	1.4.3 define solute, solvent, solution	Definition of Solute, solvent and solution Types of solvents and their uses	<ul style="list-style-type: none"> - brainstorm to bring out the definitions of solute, solvent and solution - list some solvents in the home and discuss their uses - list some common solutes and name their appropriate solvents. 	Explain why it is not possible to find water which is completely pure in the environment
	1.4.4 explain the importance of shaking or stirring some mixtures well before using them	Importance of shaking or stirring mixtures before use	<ul style="list-style-type: none"> - obtain some paints (e.g. lime) mix with water and stir . - leave for some time and observe. - deduce from their observations of mixtures the need to stir or agitate paints and some liquid medicines before use. 	Explain what will happen if a baker does not mix the dough well enough before baking.
	1.4.5 demonstrate some methods of separating mixtures.	Methods of separating mixtures	<ul style="list-style-type: none"> - discuss methods of separating mixtures. - use appropriate methods to separate different types of mixtures e.g. salt from salt solution 	How will you separate salt when it is mixed with sand.
	1.4.6 demonstrate the difference between a mixture and a compound.	Differences between mixtures and compounds	<ul style="list-style-type: none"> - use sulphur and Iron filings mixture, a bar magnet and heat to perform simple experiments to identify and discuss the differences between a mixture and a compound. - NOTE: Discuss other differences between compounds and mixtures. 	Explain why it is difficult to separate the following mixtures after heating: <ol style="list-style-type: none"> i. Sulphur and Iron filings ii. Coconut chaff and sugar

JUNIOR HIGH SCHOOL 2

SECTION 2: CYCLES

General Objectives: The pupil will

1. recognise that there are repeated patterns of change in nature and understand how these patterns arise.
2. recognise the repeated pattern of carbon and its effects in nature.
3. recognise the interdependency of plants and animals in relation to gaseous exchange.
4. understand the concept of climate change and its effects on plants and animals.

UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
UNIT 1 CARBON CYCLE	The pupil will be able to:		Let pupils:	
	2.1.1 describe how carbon is cycled in nature	The Carbon Cycle	- discuss and illustrate the carbon cycle - identify and explain the stages in the carbon cycle - draw the carbon cycle Teacher to design a role-play for pupils to perform showing the relationships between the various stages of the cycle.	Pupils to explain how the carbon cycle is disrupted by humans.
	2.1.2 outline the importance of the carbon cycle	Importance of the carbon cycle	- discuss the importance of the carbon cycle	
	2.1.2 describe ways the carbon cycle is disrupted	Ways the carbon cycle is disrupted	- gather information from library and the internet on human activities which disrupt the carbon cycle - describe ways by which the activities disrupt the cycle	List and discuss three ways the carbon cycle is disrupted
	2.1.3 explain the effects of the disruption of the carbon cycle on the environment	Effects of disrupting carbon cycle on the environment	- list and explain the effects of the disruption of the cycle on the atmosphere and the environment	
2.1.4 outline ways to maintain the carbon cycle	Maintaining the carbon cycle	- suggest ways to maintain the carbon cycle.	Pupils to discuss ways to sustain the carbon cycle	

UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
UNIT 2 CLIMATE	<p>The pupil will be able to:</p> <p>2.2.1 distinguish between weather and climate</p> <p>2.2.2 explain that weather and climate change do occur in a cyclic manner</p> <p>2.2.3 use weather measuring equipment.</p> <p>2.2.4 prepare a weather chart</p> <p>2.2.5 relate climate to vegetation zones</p>	<p>Meaning of weather and climate</p> <p>Elements of Climate.</p> <p>Cyclic nature of weather and climate: Incidences of weather and climatic changes- The 1983 drought, 1969 Heavy rains, 1963 Heavy rains, etc.</p> <p>Weather Measuring Equipment: rain gauge, wind vane, sun dial, thermometer etc.</p> <p>Weather chart</p> <p>Relationship between climate and vegetation zones</p>	<p>Let pupils:</p> <ul style="list-style-type: none"> - brainstorm to bring out the meaning of weather and climate. - discuss the differences between weather and climate - identify the elements of climate, and discuss how each element affects agriculture. - collect information on the incidences and effects of weather and climatic changes that occurred over the past 30 – 50 years from people, libraries, internet and scientific journals. - discuss the effects that these changes had on the environment (agriculture, vegetation, water cycle, etc). - visit a Meteorological Station, observe various weather measuring equipment and satellite images and how they are used. - list the various weather measuring equipment and discuss how each one is used. - practise the use of some of the equipment - collect data by using the equipment and make a simple weather chart. - relate the weather charts to activities undertaken by humans in the locality. - collect information on the climate of the various vegetation zones in Ghana from libraries and the Internet - compare the information on climate to the vegetation zones and note the differences - draw the map of Ghana showing the vegetation zones and the distribution of crops and animals. - list agencies involved in providing weather and climatic information to the public and discuss their roles. 	<p>How have climatic changes affected your daily activities?</p> <p>Explain why the climate of Tamale is different from that of Axim.</p> <p>Give reasons why sorghum thrives best in Northern Ghana. while cocoa does well in the rain forest belt..</p>

JUNIOR HIGH SCHOOL 2

SECTION 3: SYSTEMS

General Objectives: The pupil will

1. recognise that a system is a whole, consisting of parts that work together to perform a function
2. be aware of the physiological processes in reproduction
3. be aware of the dangers of indiscriminate sex
4. appreciate that offspring inherit certain characteristics of parents
5. be aware of the role of diffusion and osmosis in life processes
6. show an awareness of the circulatory system in humans

UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
<p>UNIT 1</p> <p>REPRODUCTION AND GROWTH IN HUMANS</p>	<p>The pupil will be able to:</p> <p>3.1.1 explain the functions of the parts of the reproductive system</p> <p>3.1.2 describe the stages of development of the zygote until birth.</p>	<p>Parts of the reproductive system of male and female (humans).</p> <p>Functions of the parts of the reproductive system</p> <p>Stages of reproduction</p>	<p>Let pupils:</p> <ul style="list-style-type: none"> - identify the parts of the reproductive system of male and female using charts - draw and label the male and female reproductive systems. - discuss the functions of the parts of the reproductive systems of male and female. <p>NOTE: A dissected small mammal e.g. rabbit, showing the reproductive organs may be provided.</p> <ul style="list-style-type: none"> - using charts, discuss the stages of reproduction: copulation/mating, fertilization, implantation, development of zygote and foetus, birth <p>NOTE: Discussion should include formation of twins: identical, fraternal(non identical) and Siamese</p>	<p>Draw and label the female reproductive system of humans. State the functions of the parts labelled.</p> <p>Outline the stages of reproduction in humans.</p> <p>Explain how the foetus obtains food and oxygen</p> <p>Read the story and answer the question based on it. <i>A woman gave birth to twins who are attached at the shoulders. The elders of the family considered the twins to be from evil spirits.</i> How would you explain the problems faced by the twins?</p>

UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
UNIT 1 (CONT'D) REPRODUCTION AND GROWTH IN HUMANS	<p>The pupil will be able to:</p> <p>3.1.3 outline the various stages of growth and development in humans.</p> <p>3.1.4 explain the effects of teenage pregnancy.</p>	<p>Stages of growth and development in humans: Pre-natal and Post-natal</p> <p>Effects of teenage pregnancy</p> <p>Dangers of indiscriminate sex: Unwanted pregnancies on the part of girls; possible drop-out of school; early fatherhood for boys; possibility of contracting sexually transmitted diseases including HIV/AIDS</p>	<p>Let pupils:</p> <p>NOTE: Parental care should be stressed for good physical and emotional development of children.</p> <p>- discuss the stages of development in humans</p> <p>- use the Future's Wheel to discuss the effects of teenage pregnancy. Ectopic pregnancy, damaged pelvic bone, under weight babies</p> <p>- abortion, death, increase in population, drop out from school,</p> <p>- invite a Community Health Nurse to talk on teenage pregnancy, its implications and prevention</p> <p>NOTE: The best method to prevent teenage pregnancy is to abstain from sexual intercourse.</p> <p>- use the 'Future's Wheel' to discuss the dangers of indiscriminate sex.</p>	<p>What are some of the dangers faced by a teenage pregnant girl?</p> <p>What are some of the dangers of indiscriminate sex?</p>

UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
UNIT 3 HEREDITY	The pupil will be able to: 3.3.1 explain the term heredity 3.3.2 mention some characteristics that can be inherited from parents.	Meaning of heredity Inheritable Characteristics	Let pupils: - brainstorm to bring out the meaning of heredity - mention some of the traits or characteristics they have in common with their mother, father or other relatives. - explain why they have common traits with their parents or relations. NOTE: Include genes in your explanation	Give three reasons why offspring look like their parents.
UNIT 3 DIFFUSION AND OSMOSIS	3.3.1 demonstrate the process of diffusion.	Process of Diffusion and Osmosis	- observe and explain what happens when: i. a drop of ink or crystals of potassium permanganate is dropped gently into a glass of water ii. a perfume is sprayed in one corner of the classroom - brainstorm to bring out the meaning of diffusion - give examples of every day activities involving diffusion	Why can a person at one end of a room smell perfume sprayed at the other end of the room. Explain how the scent of a flower gets to the bee.

UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
UNIT 3 (CONT'D) DIFFUSION AND OSMOSIS	<p>The pupil will be able to:</p> <p>3.3.2 demonstrate the process of osmosis in living tissues.</p> <p>3.3.3 distinguish between diffusion and osmosis.</p> <p>3.3.4 identify the various ways in which the principles of diffusion and osmosis can be applied in daily life.</p>	<p>Osmosis in living tissue</p> <p>Differences between Diffusion and Osmosis</p> <p>Applications of diffusion and osmosis: absorption of water by the root hair (osmosis) and selective absorption of water in kidneys (osmosis); absorption of digested food in the small intestine (diffusion), movement of CO₂ through the stomata (diffusion)</p>	<p>Let pupils:</p> <ul style="list-style-type: none"> - demonstrate osmosis in living tissues e.g. using yam - comment on their observations - define osmosis <ul style="list-style-type: none"> - discuss the differences between diffusion and osmosis <ul style="list-style-type: none"> - discuss some processes in living organisms which involve diffusion and osmosis: - discuss the application of diffusion and osmosis in food preservation e.g. salted fish, concentrated forms of fruit juices, etc. 	<p>Differences between diffusion and osmosis using different examples.</p> <p>Give two examples each of diffusion and osmosis in:</p> <ul style="list-style-type: none"> i. plants ii. animals <p>Why is a plant likely to wilt if too much fertilizer is applied to it.</p>

UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
<p>UNIT 4</p> <p>CIRCULATORY SYSTEM IN HUMANS</p>	<p>The pupil will be able to:</p> <p>3.4.1 outline the functions of the parts of the circulatory system.</p> <p>3.4.2 describe the composition of and functions of blood.</p> <p>3.4.3 mention some diseases of the circulatory system and how to prevent them.</p>	<p>Parts of the circulatory system in humans</p> <p>Functions of the parts of the circulatory system in humans</p> <p>Composition and functions of blood</p> <p>Diseases of the circulatory system: High and Low blood pressure, Leukaemia, Varicose Haemorrhoids (Piles)</p> <p>Prevention of diseases of the circulatory system.</p>	<p>Let pupils:</p> <ul style="list-style-type: none"> - use charts, digital content and models to identify parts of the circulatory system and discuss their functions. - draw and label parts of the heart - draw and label a simplified form of the circulatory system <p>NOTE: The structure of arteries, veins and capillaries to be simply treated.</p> <ul style="list-style-type: none"> - discuss the composition of human blood and its functions - list some diseases of the blood and circulatory system. - outline ways by which diseases of the circulatory system can be prevented. - describe ways of managing high blood pressure 	<p>Name three components of the blood.</p> <p>State three functions of the blood.</p>

JUNIOR HIGH SCHOOL 2

SECTION 4: ENERGY

General Objectives: The pupil will

1. recognise the Sun as the primary source of energy.
2. recognise food as main source of energy to living organisms.
3. be aware of the uses of electrical energy.

UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
UNIT 1 PHOTOSYNTHESIS	<p>The pupil will be able to:</p> <p>4.1.1 explain why the Sun is the primary source of energy in the ecosystem</p> <p>4.1.2 describe how energy from the sun is converted into plant food.</p> <p>4.1.3 outline the factors necessary for photosynthesis and give the functions of each factor.</p> <p>4.1.4 state the importance of photosynthesis to plants and animals.</p>	<p>The sun as primary source of energy</p> <p>Process of photosynthesis</p> <p>Factors necessary for photosynthesis: sunlight, water ,chlorophyll and carbon dioxide</p> <p>Importance of photosynthesis to plants and animals</p>	<p>Let pupils:</p> <ul style="list-style-type: none"> - discuss the sun as the source of energy - examine leaves to identify stomata using hand lens - squeeze leaves to identify chlorophyll - state the raw materials used in photosynthesis. - describe the process of photosynthesis. - state the final product in photosynthesis. <p>NOTE: Teacher to emphasise that oxygen is produced as a by-product during photosynthesis.</p> <ul style="list-style-type: none"> - list and discuss the factors necessary for photosynthesis. - work in groups to perform simple experiment to show that light is necessary for photosynthesis. - perform an experiment to test for the presence of starch in a leaf. - outline various ways in which photosynthesis is important to both plants and animals 	<p>Explain how energy from the sun is converted into food.</p> <p>Explain how the raw materials get to the leaf for photosynthesis.</p> <p>State the factors and the raw materials for photosynthesis.</p>

UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
UNIT 2 FOOD AND NUTRITION	<p>The pupil will be able to:</p> <p>4.2.1 classify food items based on their nutritive value</p> <p>4.2.2 state the importance of food nutrients</p> <p>4.2.3 test for proteins, carbohydrates, fats and oil</p> <p>4.2.4 explain malnutrition and outline the effects in animals</p> <p>4.2.5 describe a balanced diet and state its importance</p>	<p>Classification of different food item based on their nutritive value</p> <p>Importance of food nutrients</p> <p>Test for proteins, carbohydrates, fats and oil</p> <p>Meaning and effects of malnutrition</p> <p>Balanced diet and its importance</p>	<p>Let pupils:</p> <ul style="list-style-type: none"> - bring different food items and classify them as follows: <ul style="list-style-type: none"> i. carbohydrates or energy giving food ii. protein or body building food iii. fat and oil or energy giving food iv. vitamins and minerals as protective foods - discuss the importance of food nutrients to the body - perform simple tests for the presence of protein, carbohydrates fats and oil. - explain malnutrition and discuss some of the effects such as deficiency diseases - explain a balanced diet and balanced ration - give examples of balanced diet and differentiate it from unbalanced diet - bring animal feed ingredients to class and prepare a balanced ration for feeding poultry. 	<p>Make a chart to show the groups of food substances</p> <p>Give reasons for adding iodated salt to food.</p> <p>State four effects of malnutrition humans.</p> <p>State the components of a balanced broiler ration.</p>
UNIT 3 ELECTRICAL ENERGY	<p>4.3.1 describe ways of generating electrical energy.</p>	<p>Means of generating Electricity: Hydro-power, windmills, solar energy, fuel cells, voltaic cells, chemical (acids and other electrolytes)</p>	<ul style="list-style-type: none"> - discuss ways by which electrical energy is generated - open up a dry cell and discuss the parts observed. <p>NOTE: Pupils should wear gloves to prevent poisoning. Chemical reactions not required.</p>	<p>State four ways of generating electrical energy.</p>

SECTION 5: INTERACTIONS OF MATTER

General Objectives: The pupil will

1. appreciate that interactions between and within matter helps humans to better understand the environment and their role in it.
2. recognise the changes in the state of matter
3. recognise common pests, parasites and diseases of plants and animals.
4. show understanding of the negative effects of pests, parasites and diseases.
5. develop skills in preventing and controlling pests, parasites and diseases.
6. recognise basic principles underlying the operation of basic machines.
7. be aware of the influence of science on the development of society.

UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
<p>UNIT 1</p> <p>PHYSICAL AND CHEMICAL CHANGES</p>	<p>The pupil will be able to:</p> <p>5.1.1 demonstrate the difference between physical and chemical changes</p> <p>5.1.2 give examples of physical and chemical changes in daily life.</p>	<p>Meaning of physical and chemical changes</p> <p>Examples of physical and chemical changes.</p>	<p>Let pupils:</p> <ul style="list-style-type: none"> - brainstorm to explain the meaning of physical and chemical change - light a candle and observe for some few minutes - discuss their observations in terms of physical or chemical changes - bum magnesium ribbon in air and explain what happens in terms of physical or chemical changes. - discuss examples of physical and chemical changes 	<p>Classify the following changes as chemical or physical change</p> <p>a) dissolving salt in water.</p> <p>b) Heating nails.</p> <p>c) Burning wood.</p> <p>d) Sodium reacting with water.</p>
<p>UNIT 2</p> <p>INFECTIONS AND DISEASES</p>	<p>5.2.1 identify common infectious diseases and describe their symptoms.</p>	<p>Common Infectious diseases: Tuberculosis (T.B.), Chicken Pox, Cerebrospinal Meningitis (CSM), HIV/AIDS, Buruli Ulcer, Typhoid, Cholera, Anthrax, Bird Flu and Black Pod</p> <p>Causes, mode of transmission, symptoms, prevention and control of common diseases of animals and crops</p>	<ul style="list-style-type: none"> - name some common infectious diseases and describe their symptoms 	

UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
UNIT 2 (CONT'D) INFECTIONS AND DISEASES	The pupils will be able to: 5.2.2 describe the causes, mode of transmission, prevention and control of some common diseases of humans, animals and crops.		Let pupils: - tabulate the causative organisms, methods of spread, prevention and control of the following infectious diseases of humans, animals and crops: Tuberculosis (T.B.), HIV/AIDS, Burullu Ulcer, Cerebrospinal Meningitis (CSM), Anthrax, Bird Flu and Black Pod. NOTE: Other infectious diseases listed in content should be mentioned.	In a tabular form give the causative organism, mode of transmission, control and prevention of the following diseases: Bird Flu, Chicken Pox and HIV/AIDS. Make a poster with a message to stop the spread of AIDS
UNIT 3 PESTS AND PARASITES	5.3.1 differentiate between pests and parasites and give examples. 5.3.2 differentiate between vectors and parasites. 5.2.3 demonstrate methods of controlling pests and parasites.	Meaning and identification of pests and parasites Vectors and parasites Control of pests and parasites; Pesticides, Biological: -use of resistant breeds Cultural: - good sanitation Physical: - hand picking Integrated pest management	- brainstorm to bring out the meaning of pests and parasites with examples. - note differences between pests and parasites. - collect different pests and parasites and classify them as vectors, ecto-parasites and endo-parasites. Examples: ticks, lice, mites, fleas, housefly, tsetsefly. - discuss the effects of pests, parasites and vectors on humans and farm animals. Teacher to arrange a visit to a farm to observe how pests and parasites are controlled. - control pests and parasites on the school farm. NOTE: Invite a Resource Persons to give a talk on pests and parasites of humans, farm animals and crops.	Distinguish between vectors, ecto-parasites and endo-parasites of farm animals and give two examples of each. State four effects each caused by ecto-parasites and endo-parasites in humans. State at least four (4) control methods of pests and parasites.

UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
UNIT 4 FORCE AND PRESSURE	The pupil will be able to: 5.4.1 describe the different types of forces	Types of forces	Let pupils: - brainstorm to define force - perform the following activities to demonstrate types of forces: i. drop small objects e.g. pieces of chalk, pebbles to the ground ii. throw the same objects up in the air iii. drag objects on rough and smooth surfaces iv. stretch a rubber band v. attract pins and small nails with magnets. vi. bring the ends of two magnets near each other vii. reverse the ends of one of the magnets and bring them close to each other vii. pass a comb vigorously through dry hair and quickly touch a very small piece of paper with it - discuss their observations of the activities above - identify the types of forces involved in the activities.	Name four types of force. Explain the effects of different types of force. Build a toy and identify the forces that i. sets it in motion ii. change its direction. bring it to a stop.
	5.4.2 demonstrate 'Surface Tension'	Surface Tension	- fill a drinking glass with water to the brim. - gently add paper clips or small nails one at a time and observe the shape of the water surface. - continue until the water overflows. - place a razor blade on a filter paper. - carefully place the filter paper on the surface of water in a container. - repeat the activity using a needle - discuss their observations.	Explain what is meant by Surface Tension.

UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
<p>UNIT 4 (CONT'D)</p> <p>FORCE AND PRESSURE</p>	<p>The pupil will be able to:</p> <p>5.4.3 define pressure and demonstrate its effects in fluids and solids</p> <p>5.4.4 demonstrate that pressure acts equally in all directions in fluids</p>	<p>Pressure and its effects</p> <p>Demonstration of directions of pressure in fluids</p>	<p>Let pupils:</p> <ul style="list-style-type: none"> - brainstorm to bring out the definition of pressure - demonstrate the effect of the motion of air on objects <p>- hold a piece of cardboard in a vertical position. Move the cardboard up and down. Record their observation. Now move the cardboard, still in a vertical position from side to side and record their observation.</p> <ul style="list-style-type: none"> - punch holes around the lower section of an empty Milo tin or any suitable container - fill the tin with water - record and discuss their observation. <p>NOTE: Water springs to equal distances from the tin at a given depth in a fluid. Pressure acts equally in all directions</p>	<p>Define pressure.</p> <p>Draw a diagram to show that pressure in a fluid increases with depth.</p>

UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
UNIT 4 (CONT'D) FORCE AND PRESSURE	<p>The pupil will be able to:</p> <p>5.4.5 demonstrate that pressure in fluids increases with depth</p> <p>5.4.6 describe the application of pressure in fluids</p> <p>5.4.7 relate the streamline shape of objects to their motion in fluids</p>	<p>Demonstration of relationship between fluid pressure and depth</p> <p>Application of pressure in fluids</p> <p>Adaptation to motion in fluids E.g. Fish, Aeroplane and Submarine</p>	<p>Let pupils:</p> <ul style="list-style-type: none"> - punch three holes along one side of an empty tin at different heights. - fill the tin with water. - record their observations and discuss. - discuss uses of fluid pressure in: syringes, water pumps and car brakes, pumps on dugout wells, syringes for injections, etc. - observe the movement of fish in an aquarium or fish pond and describe features that enable it to move in water. 	<p>In groups, design a water pump and present your plans and drawings to the class for discussion.</p> <p>Explain how the aeroplane and the submarine are adapted to move smoothly in air and water respectively</p>

UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
UNIT 5 MACHINES	<p>The pupil will be able to:</p> <p>5.5.1 give examples of simple machines</p> <p>5.5.2 describe the types of levers and the principles involved in their use.</p> <p>5.5.3 explain the terms work, energy and power.</p>	<p>Simple machines: Levers, inclined plane, gears, wheel and axle, screw.</p> <p>Types of levers</p> <p>Classification of levers First Class, Second class and Third class levers</p> <p>Work, energy and power</p>	<p>Let pupils:</p> <ul style="list-style-type: none"> - explain what a simple machine is - give examples of simple machines. - explain what a lever is - use the lever to demonstrate the principles involved in making work easier - explain why some joints in the human body act as levers (e.g. hinge joints) - classify levers into the three classes. - pull each other and use this activity to explain work, energy and power 	<p>List five examples of simple machines used in:</p> <ol style="list-style-type: none"> i. Homes ii. Workplaces, and iii. Farms <p>List five different types of machines and state their uses.</p> <p>Give two examples for each of the three classes of levers.</p>

JUNIOR HIGH SCHOOL 3

SECTION 1: DIVERSITY OF MATTER

General Objectives: The pupil will

1. recognise variety of living and non-living things in nature and their connectedness
2. understand the concept of acids bases and salts and their application in everyday life.
3. develop skills in soil and water conservation.
4. be aware of effects of chemical fertilizers on the environment.

UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
<p>UNIT 1</p> <p>ACIDS, BASES AND SALTS</p>	<p>The pupil will be able to:</p> <p>1.1.1 distinguish between an acid and a base</p> <p>1.1.2 classify substances as acids or bases</p> <p>1.2.3 prepare Sodium Chloride by neutralization method.</p> <p>1.1.4 identify uses of compounds in medicine, agriculture and in industry.</p>	<p>Differences between an acid and a base.</p> <p>Classification of substances into acids and bases.</p> <p>Preparation of Sodium Chloride</p> <p>Acids are neutralised by bases to form salts and vice versa, e.g. common salt, Epson salt, smelling salts.</p> <p>Uses of chemical compounds. Medicine – drugs and other pharmaceutical products. Agriculture – insecticides, pesticides, fertilizers. Industrial chemicals.</p>	<p>Let pupils:</p> <ul style="list-style-type: none"> - use litmus paper to distinguish between acids and bases - bring different substances from home - rub litmus papers over each of the substances brought - record their observations - classify the substances as acidic or basic <p>NOTE: Moistened litmus paper should be used for solid substances.</p> <ul style="list-style-type: none"> - use small quantities of dilute sodium hydroxide and hydrochloric acid to prepare sodium chloride. - evaporate the product from the reaction to obtain Sodium Chloride crystals (common salt) - discuss various products made from compounds and used in medicine, agriculture and in industry. 	<p>Classify the following substances as acids or bases: unripe lemon, aspirin, liquid in car battery, vinegar, salt-petre, wood ash, bicarbonate of soda.</p> <p>When you have indigestion, milk of magnesia is often recommended. Explain why?</p>

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UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
UNIT 2 SOIL AND WATER CONSERVATION	<p>The pupil will be able to:</p> <p>1.2.1 explain the factors which lead to the depletion of soil resources</p> <p>1.2.2 assess the effects of erosion on farming and the environment</p> <p>1.2.3 prevent and control soil erosion.</p> <p>1.2.4 give reasons for the application of Fertilisers in farming.</p>	<p>Factors leading to depletion of soil resources</p> <p>Agents of soil erosion</p> <p>Types of soil Erosion</p> <p>Factors of Soil Erosion</p> <p>Effects of Soil Erosion</p> <p>Methods of preventing and controlling soil erosion</p> <p>Meaning of soil fertility.</p> <p>Major and Minor Nutrients.</p> <p>Major e.g. N,P,K, Ca, Mg Minor e.g. Cu, Zn, Mo, Fe Importance of N,P,K, and deficiency symptoms in plants</p>	<p>Let pupils:</p> <ul style="list-style-type: none"> - discuss the meaning of soil and water conservation. - identify the factors that cause depletion of soil resources. - explain how the factors cause the loss of soil resources. - brainstorm to bring out the meaning of soil erosion. - demonstrate how wind and water cause soil erosion. - undertake a field trip to observe the various types of soil erosion and the assess the destruction caused by soil erosion. - construct a mud-hill model using clay and top soil to demonstrate the factors which influence soil erosion. <p>- discuss the effects of soil erosion on farming and the environment.</p> <p>- demonstrate the methods of checking soil erosion</p> <p>- discuss what a fertile soil is in relation to crop yield.</p> <ul style="list-style-type: none"> - make a list of plant nutrients and group them into major and minor nutrients. - discuss the differences between major and minor soil nutrients. - discuss the roles of nitrogen, phosphorus and potassium (N. P. K) in plant growth and development. 	<p>List five causes of soil depletion.</p> <p>Differentiate between soil depletion and soil erosion.</p> <p>Distinguish between splash, rill and gully erosion.</p> <p>List and explain 4 factors that cause soil erosion.</p> <p>State four effects of soil erosion on farming.</p> <p>State five methods of controlling soil erosion.</p> <p>List five (5) major and five (5) minor nutrients.</p> <p>State three (3) functions each of Nitrogen, Phosphorus and Potassium in plants.</p>

JUNIOR HIGH SCHOOL 3

SECTION 2: CYCLES

General Objectives: The pupil will

1. recognise that there are repeated patterns of change in nature and understand how these patterns arise.
2. recognise the developmental stages in some pests.
3. be aware of the importance of farm animals in the economy.
4. develop skills in raising farm animals.

UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
<p>UNIT 1</p> <p>LIFE CYCLE OF A MOSQUITO</p>	<p>The pupil will be able to:</p> <p>2.1.1 draw and label the life cycle of a mosquito</p> <p>2.1.2 outline methods of controlling mosquitoes</p>	<p>Life cycle of a mosquito</p> <p>Methods of controlling the mosquito</p> <p>i. Environmental control method.</p> <p>ii. Chemical control method</p> <p>iii. Biological control:</p> <p>iv. Genetic control method:</p> <p>Advantages and disadvantages of the control methods</p>	<p>Let pupils:</p> <ul style="list-style-type: none"> - using an experiment , discuss the developmental stages of the mosquito from the egg stage to full grown mosquito. - prepare report and present to class - demonstrate the various methods of controlling mosquito , e.g. using insecticide sprays, pouring oil into mosquito breeding grounds, etc. - discuss the advantages and disadvantages of the control methods. <p>Teacher to organise a film to show on the life cycle of the mosquito.</p>	<p>Draw and label the life cycle of the mosquito.</p> <p>How would you control mosquito with the knowledge of its life cycle.</p>

JUNIOR HIGH SCHOOL 3

SECTION 3: SYSTEMS

General Objectives: The pupil will

1. recognise that a system is a whole, consisting of parts that work together to perform a function
2. gain an understanding of the motion of bodies in the solar system.
3. develop skills in managing fish culture.
4. develop understanding of the digestive systems of animals

UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
<p>UNIT 1</p> <p>THE SOLAR SYSTEM</p>	<p>The pupil will be able to:</p> <p>3.1.1. describe the components of the solar system</p> <p>3.1.2 explain what a star is.</p> <p>3.1.3 list the planets of the solar system.</p>	<p>Components of the solar system</p> <p>A star and Galaxy</p> <p>The Planetary System:</p> <p>Planets of the solar system are Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, Neptune and Pluto</p>	<p>Let pupils:</p> <ul style="list-style-type: none"> - use charts and digital content to describe the various components of the solar system - explain what a star is. - explain the meaning of 'galaxy' - What is meant by the 'milky way'. - explain the relationship between the sun and the earth in the galaxy. - list the planets of the solar system in the correct order by their distances from the sun. <p>NOTE: Pluto is in dispute and more planets are being discovered.</p> <p>Project: Construct the solar system using beads and strings</p>	<p>What is the solar system?</p> <p>List all planets of the solar system.</p>

UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
<p>UNIT 3</p> <p>DIGESTION IN ANIMALS</p>	<p>The pupil will be able to:</p> <p>3.3.1 identify the parts of the digestive system and state their functions.</p> <p>3.3.2 compare the digestive systems of Monogastrics and Ruminants</p> <p>3.3.3 describe the changes that occur to different food substances as they pass through the alimentary canal</p>	<p>Structure of the digestive system in humans</p> <p>Functions of the parts of the digestive system in humans, chicken and ruminant</p> <p>Digestion of food substances</p>	<p>Let pupils:</p> <ul style="list-style-type: none"> - review topics on digestion of humans from Primary 6. - observe and identify the parts of the alimentary canal of humans from models and charts <p>NOTE: A dissected mammal e.g. rabbit, rat, showing the alimentary canal may be provided.</p> <ul style="list-style-type: none"> - draw and label the digestive systems of humans, chicken and ruminant - compare the digestive systems of monogastrics and ruminants. - state the functions of the parts of the digestive systems of the animals <p>Teacher to display charts/specimens of digestive system of humans, chicken and ruminant.</p> <ul style="list-style-type: none"> - discuss the processes of digestion in monogastrics and ruminants and note the differences. - discuss the changes that occur to different types of food substances (carbohydrates, proteins, fats and oils) as they pass through the regions of the alimentary canal. - demonstrate the action of saliva on cooked starch solution, record and discuss their observations. <p>NOTE: The term “enzyme” should be introduced. Only general names of digestive enzymes e.g. amylases, lipases, proteases required</p> <ul style="list-style-type: none"> - mention the end products of digestion 	<p>Explain the changes that take place when a meal of kenkey and fried fish passes through the alimentary canal.</p> <p>Pupils to tabulate the similarities and differences in the digestive tracts of monogastrics and ruminants.</p>

UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
UNIT 3 (CONT'D) DIGESTION IN ANIMALS	<p>The pupil will be able to:</p> <p>3.3.4 describe how undigested food substances are eliminated from the body.</p> <p>3.3.5 explain the absorption of end-products of digestion in animals.</p>	<p>Ejection of undigested food substances through the anus.</p> <p>Absorption of end products of digestion</p> <p>Uses of end-products of Digestion</p> <p>Causes of indigestion</p> <p>Effects of indigestion in animals</p>	<p>Let pupils :</p> <ul style="list-style-type: none"> - discuss how undigested food substances are removed from the body - discuss the absorption of digested food substances into the blood <p>NOTE: Functions of the liver should be mentioned</p> <ul style="list-style-type: none"> - discuss how the end-products of digestion are used in the body - discuss causes of indigestion. - discuss the effects of indigestion on the body. 	<p>What are the end products of digestion of protein and starch?</p> <p>State three functions of the liver.</p>

UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
UNIT 1 (CONT'D) HEAT ENERGY	<p>The pupil will be able to:</p> <p>4.1.3 demonstrate the effect of heat energy on substances.</p> <p>4.1.4 demonstrate the modes of heat transfer.</p>	<p>Effects of heat on substances</p> <p>Modes of heat transfer: Conduction, Convection and Radiation</p>	<p>Let pupils:</p> <ul style="list-style-type: none"> - review the change of state of matter from Upper Primary - melt some common substances e.g. candle wax, ice block - illustrate expansion of metals using a spherical iron or brass ball and ring <p>i. demonstrate conduction by putting one end of a piece of metal in fire and observe by holding the other end of the metal from time to time. Record and explain your observations</p> <p>ii. demonstrate convection by dropping crystals of potassium permanganate in warm water and observe movement of coloured column</p> <p>iii. demonstrate radiation by holding their hands close to a source of heat.</p> <p>- discuss the application of conduction, convection and radiation as used in the Thermos Flask</p> <p>NOTE: Heat from the sun (solar energy) is transmitted to the earth through radiation.</p>	<p>What are the important aspects of heat transfer?</p> <p>Explain how heat from the sun is transmitted to the earth.</p>

UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
UNIT 2 BASIC ELECTRONICS	The pupil will be able to: 4.2.1 investigate the behaviours of the Phase Shift Oscillator	Phase Shift Oscillator	Let pupils : i. connect three capacitors, three resistors and a transistor in phase shift oscillator circuit ii. connect an LED to the oscillator iii. investigate the behaviour of the LED. Project 1: Construct a phase shift oscillator and use it to produce various sounds (tone generator).	Explain the behaviour of the Phase Shift Oscillator

SECTION 5: INTERACTIONS OF MATTER

General Objectives: The pupil will

1. appreciate that interactions between and within matter helps humans to better understand the environment and their role in it
2. be aware of the uses of magnets
3. be aware of the influence of science and technology on the development of society.
4. recognise the importance of farm implements and machinery.
5. recognise vocations in Integrated Science.
6. develop skills in setting up and managing small businesses in Integrated Science.

UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
UNIT 1 MAGNETISM	<p>The pupil will be able to:</p> <p>5.1.1 demonstrate the magnetic field of force around a bar magnet</p> <p>5.1.2 demonstrate methods of making magnets.</p> <p>5.1.3 outline the uses of Compasses</p> <p>5.1.4 make a magnetic compass</p>	<p>Magnetic field and force</p> <p>Methods of making magnets; induction, stroking, use of electricity.</p> <p>Uses of magnetic compass</p> <p>Magnetic compass</p>	<p>Let pupils :</p> <ul style="list-style-type: none"> - review magnetic and non magnetic materials from Upper Primary syllabus - place a paper on top of a bar magnet and sprinkle iron filings on top of the paper. Tap the paper gently and record what happens. <p>NOTE: Discussion to include the poles of magnet.</p> <ul style="list-style-type: none"> - draw the magnetic fields of a bar magnet and discuss the characteristics of the magnetic lines of force. - perform activities to demonstrate methods of making magnets - brainstorm to bring out the uses of magnetic compass <p>Project:</p> <ul style="list-style-type: none"> - design and construct a magnetic compass 	<p>List four uses of magnetic compass</p>

UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
UNIT 2 TECHNOLOGY AND DEVELOPMENT	<p>The pupil will be able to:</p> <p>5.2.1 explain the meaning of 'technology'.</p> <p>5.2.2 explain the impact of technology on society</p> <p>5.2.3 analyse the role of technology in industrialisation</p>	<p>Meaning of technology, use of technology in Communications, Health, Agriculture, Recreation, Transportation.</p> <p>Impact of technology on society: Improved health, agriculture, education, transportation, communication, sanitation, energy sources (biodiesel).</p> <p>Role of technology in industrialisation:</p> <ul style="list-style-type: none"> - exploitation of natural resources - provision of machinery - provision of energy sources - manufacture of quality goods - transport of labour and goods - food irradiation - genetically modified foods 	<p>Let pupils:</p> <ul style="list-style-type: none"> - give examples of practical applications of science in daily life - brainstorm to explain the meaning of Technology - discuss how technology is used in various fields as listed in content. - discuss how technology has influenced the quality of life - discuss how technology has contributed to industrialisation: - discuss the effects of technology on traditional cultural practices, e.g. eating habits, health care delivery, farming practices, energy sources, sanitation, socialization, religious strength and practices. 	<p>Enumerate four ways by which technology has affected the quality of life.</p> <p>How is technology influencing traditional cultural practices?</p>

UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
UNIT 3 MACHINERY	<p>The pupil will be able to:</p> <p>5.3.1 identify some machinery and their uses</p> <p>5.3.2 describe general machinery maintenance schedule.</p> <p>5.3.3 outline the advantages and disadvantages of using machinery</p>	<p>Machinery and their uses Machinery for farm work, road construction, factory, house work, etc.</p> <p>Maintenance schedule of machinery: - changing oils - charging battery - oiling, greasing of exposed metal parts. - smoothening and polishing cut surfaces of discs. - tightening bolts and nuts - checking tyre pressure - filter renewal</p> <p>Advantages and disadvantages of using machinery</p>	<p>Let pupils :</p> <p>- identify and discuss some common types of machinery and their uses.</p> <p>- visit a commercial farm, plant pool, a factory or a road construction site to interview engineers on ways of maintaining machinery and the schedules they follow.</p> <p>- interview people and collect information on some advantages and disadvantages of using machinery. - discuss the advantages and disadvantages of using machinery.</p>	<p>Name three machinery and discuss their uses in: i. Home. ii. Factory iii. Farms</p> <p>Describe the general maintenance schedule of a known machine</p>

UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
UNIT 4 ENTREPRENEURSHIP	<p>The pupil will be able to:</p> <p>5.4.1 identify various types of SMEs in the locality</p> <p>5.4.2 describe and demonstrate the tasks/activities performed in some SMEs.</p> <p>5.4.3 differentiate between Agricultural Chains</p>	<p>Identification of Business/Job Titles: Blacksmith, Electrician, Palm wine Tapper, Florist, ICT Operator, Gold Smiths, Auto mechanics, Vegetable farmer, Chemical seller, Pito Brewer, Gari Processor, Soap making, Sachet Water Producer, Driver, Hair Dresser/ Barber, Fruit Juice Producer.</p> <p>Description of tasks/activities included in SMEs,</p> <p>Meaning of agricultural chains Types of agricultural chains</p> <ul style="list-style-type: none"> - Production Chains - Supply Chains - Processing Chains - Value Chains <p>Players in agricultural chains Roles of players in an agricultural chain Relationships between chain players Effects of relationship on chain players</p>	<p>Let pupils:</p> <ul style="list-style-type: none"> - brainstorm and list SMEs practised in their locality. - describe various SMEs in their locality - discuss the importance of the SMEs to the communities. <p>In groups, pupils to:</p> <ul style="list-style-type: none"> - visit some SMEs in the locality and identify and document tasks they perform in practising the occupations. <p>Teacher to invite a successful business person in the community to give a talk on the process of managing SMEs based on the content.</p> <ul style="list-style-type: none"> - identify and discuss the functions of a good business manager. <ul style="list-style-type: none"> - discuss ways of improving SMEs. <p>Teacher to provide storylines on Production Chains, Supply Chains, Processing Chains and Value Chains</p> <p>Pupils to:</p> <ul style="list-style-type: none"> - compare the case studies on the chains and bring out the differences between them in terms of <ul style="list-style-type: none"> o names of chains o purposes of chains o chain players o roles of chain players o relationship between chain players o effects of relationships on chain players 	<p>Describe three SMEs and state their importance in the community.</p> <p>State and describe three functions of a good business manager.</p> <p>List the players in the following agricultural chains</p> <ol style="list-style-type: none"> i. Maize production ii. Tom Brown Processing iii. Pito Brewing iv. Cabbage produced in Ajumako and consumed in a Hotel in Accra v. Pineapples grown in Ghana and exported to Europe.

UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
UNIT 4 (CONT'D) ENTREPRENEURS HIP	<p>The pupil will be able to:</p> <p>5.4.4 explain food safety and quality assurance issues in Agricultural Chains</p>	<p>Importance of Food safety and quality assurance in agricultural chains</p> <p>Agencies in food safety and quality assurance</p> <ul style="list-style-type: none"> - Food and Drugs Board - Ghana Standards Board 	<p>Let pupils:</p> <ul style="list-style-type: none"> - brainstorm and explain food safety and food quality assurance - discuss the importance of food safety and quality assurance in agricultural chains - list agencies in charge of food safety and quality assurance - discuss the roles of agencies in charge of food safety and quality assurance. - discuss how the roles of the agencies affect farmers and consumers of farm produce. 	<p>List two agencies involved in ensuring food safety and quality control.</p> <p>Discuss three roles performed by one agency responsible for food safety and quality assurance.</p>