

**SEMESTER ONE**

**GRADE: 10**

**PERIOD: I**

**TOPICS: INTRODUCTION TO BIOLOGY AND ITS BRANCHES;  
THE STUDY OF CELL AS THE BASIC UNIT OF LIFE;  
AND MOVEMENT OF SUBSTANCES ACROSS CELL MEMBRANE**

OUTCOMES	OBJECTIVES	CONTENTS	ACTIVITIES/ LAB WORKS	MATERIALS / RESOURCES	COMP ETENCIES/ ASSESSMENT
<p><b>Learners are able to:</b></p> <p>Acquire the fundamentals of laboratory skills in biology and the use of the microscope.</p> <p>Attain the concept that living things have specific characteristics that distinguish them from nonliving things and agree that all living things are made of cells</p>	<p>Upon completion of these topics, learners will:</p> <ol style="list-style-type: none"> <li>1. Define biology and discuss some of its branches</li> <li>2. Discover major contributors to the development of biology</li> <li>3. Compare the characteristics of living things and non-living things</li> <li>4. Relate the structures and composition of the cell in relations to their functions</li> <li>5. Compare the basic functions of tissues,</li> </ol>	<p><b>1. Definition of Biology</b> <b>- major Branches:</b> Zoology and Botany along with some other branches of Biology.</p> <p><b>2. Contributors:</b> Nationality and major contributions:  <ol style="list-style-type: none"> <li>a) Aristotle</li> <li>b) Lineaus</li> <li>c) Pasteur</li> <li>d) Koch</li> <li>e) Mendel,etc;</li> </ol> </p> <p><b>3. Characteristics that distinguish Living things from Non-living things:</b></p>	<p><b><u>Inclusive and differentiated learning</u></b> Mixed group presentation (gender, ability &amp; style)</p> <p><b>1. Class discussions:</b></p> <ol style="list-style-type: none"> <li>a. <b>using concept map, illustrate the branches of biology and other sub branches</b></li> <li>b. Stating the contributions of some scientists to the field of biology</li> <li>c. Describing the branches of biology and those specific ones that discuss STIs</li> </ol>	<p><b>A. Primary Text</b> Baffour Asante-Owusu, et al. <i>Senior High Biology</i> (Longman, 2009)</p> <p><b>B. Secondary Texts</b></p> <ul style="list-style-type: none"> <li>• Sue Hocking, <i>et al. OCR Biology</i> (OCR/Heinemann, 2008).</li> <li>• Doris Koto, et al., <i>Senior Secondary Guide – Biology</i> (Pearson, 2000)</li> </ul> <p>Senior Secondary Guide</p> <p><i>Senior secondary guide Biology</i> (star study guide series)</p>	<p><b>EXPECTED COMPETENCIES</b></p> <ul style="list-style-type: none"> <li>✓ Effective communication skills</li> <li>✓ Analytical and research skills</li> <li>✓ Research and problem solving skills</li> </ul> <p><b>ASSESSMENT STRATEGIES:</b> To be used to test for competencies, select relevant options.</p> <ol style="list-style-type: none"> <li>a. Quizzes</li> <li>b. Class works</li> <li>c. assignments, attendance</li> </ol>

	<p>organs and systems</p> <p>6. Demonstrate the use of the microscope in studying Biology</p> <p>7. Determine the difference among Prokaryotic, Eukaryotic, and Akaryotic cells</p> <p>8. Discover the difference between the plant and animal cells</p> <p>9. Examine the movement of substances into and out of the cell</p>	<p>nutrition, respiration, excretion, irritability, movement, growth and reproduction</p> <p><b>4. characteristics and examples of Euglena,</b> a boarder organism between animals and plants</p> <p><b>5. Biological tool</b> Light microscopes</p> <p><b>6. Cell:</b> a) Basic structures and functions of parts of a cell. b) Movement of substances into and out of the cell: osmosis, diffusion, facilitated diffusion, active transport, endocytosis (pinocytosis, phagocytosis), and exocytosis</p>	<p>(Microbiology, Parasitology, Virology, and Bacteriology).</p> <p>d. Distinguish the basic characteristics of living things including reproduction.</p> <p>2. <b>Homework:</b> Drawing cells (animal &amp; plant) and labeling their parts.</p> <p>3. <b>LAB:</b></p> <p>a. Learners will draw and label the light Microscope and outline the functions of each part. Learners will identify some laboratory materials and apparatus discuss their uses.</p> <p>b. Learners will use microscope to observe: a) onion skin; b) chick cells; and c) elodea plant cells.</p>	<p>Martin Barker &amp; David Darch 2<sup>nd</sup> edition, 2016</p> <p><b><u>C. Other Resources/Supplementa</u></b> <b><u>ry</u></b> <b><u>Readings</u></b> □Bob McDuell, <i>Senior High</i> <i>Integrated Science</i> (Pearson, 2009)</p> <p>Biological charts on branches of biology Compound light microscopes Onion bulbs Tooth picks Slides, prepared Droppers Razor blade Elodea plants Iodine solution</p>	<p>d. class participation</p> <p>e. Individual presentations,</p> <p>f. Lab works</p> <p>g. Test</p>
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**SEMESTER ONE**

**GRADE: 10**

**PERIOD: II**

**TOPIC: THE HIERACHY AND DIVERSITY OF LIVING THINGS AND UNICELLULAR ORGANISMS**

OUTCOMES	OBJECTIVES	CONTENTS	ACTIVITIES/ LAB WORKS	MATERIALS/ RESOURCES	COMP ETENCIES/ ASSESMENT
<p><b>Learners are able to:</b>                      Appreciate the systematic classification of organisms based on their characteristics.</p> <p>Explain the similarities and differences among the five major kingdoms of living things and develop the concept that life evolved from the simplest to the complex forms.</p>	<p>Upon completion of the topic, learners will:</p> <ol style="list-style-type: none"> <li>1. Outline the diversity of living things</li> <li>2. Discuss the basis of taxonomy (classification)</li> <li>3. Discuss the relationship of viruses to living and non-living things</li> <li>4. Listing the major characteristics of the kingdoms Monera (bacteria), Protista (protists), Fungi (fungi), Plantae (Plants) and Animalia (animals)</li> </ol>	<p><b>1. Classification and the importance of living things</b></p> <p><b>Classification of organisms</b></p> <p><b>2. into Kingdom, Phylum, Class, Order, Family, Genus and Species</b></p> <p><b>3. Unicellular organisms</b></p> <p>A)STIs-causing agents:                      Fungus,                      Bacteria (gonorrhoea, syphilis), Virus (HIV/AIDS),                      Protozoa (Trichomonas(Vaginalis))</p> <p>B. Sporozoa (plasmodium) causes, effects &amp; preventive methods</p> <p><b>Parasitic protozoa</b></p>	<p><b><u>Inclusive and differentiated learning</u></b></p> <p>Mixed group presentation (gender, ability &amp; style)</p> <ol style="list-style-type: none"> <li>1. Listing the general characteristics of each kingdom.</li> <li>2. <b>LAB</b> Drawing and labeling a representative organism of each of the five kingdoms.</li> <li>3. Drawing and labeling the structures of unicellular organisms;                             <ol style="list-style-type: none"> <li>a. Ameba</li> <li>b. Paramecium</li> <li>c. Euglena.</li> </ol> </li> <li>4. Observing</li> </ol>	<p><b><u>A. Primary Text</u></b>                      Baffour Asante-Owusu, et al. <i>Senior High Biology</i> (Longman, 2009)</p> <p><b><u>B. Secondary Texts</u></b>                      □Sue Hocking, et al. <i>OCR Biology</i> (OCR/Heinemann, 2008).  <i>Senior secondary guide Biology</i> (star study guide series) Martin Barker &amp; David Darch 2<sup>nd</sup> edition, 2016                      Doris Koto, et al., <i>Senior Secondary Guide – Biology</i> (Pearson, 2000)</p>	<p><b>EXPECTED COMPETENCIES</b></p> <ul style="list-style-type: none"> <li>✓ Effective communication skills</li> <li>✓ Analytical and research skills</li> <li>✓ Research and problem skills</li> <li>✓ Digital skills</li> <li>✓ Creativity and innovation skills</li> </ul> <p><b>ASSESSMENT STRATEGIES:</b>  <b>To be used to test for competencies, select relevant options.</b></p> <ol style="list-style-type: none"> <li>a. Quizzes</li> <li>b. Class works</li> <li>c. assignments, attendance</li> <li>d. class participation</li> <li>e. Individual presentations,</li> </ol>

	<p>5. Classify organisms into kingdom, phylum, class, order, family, genus and species</p> <p>7. Explain the basic characteristics of unicellular organisms</p> <p>8. Name unicellular organisms that are causative agents of diseases and the diseases they cause</p>	<p><b>(others)</b></p> <p>a) Entameba histolytica - Amebic dysentery (amebiasis)</p> <p>Giardia lamblia</p>	<p>unicellular organisms under a microscope by examining a drop of water containing protozoans.</p> <p>5. Drawing the life cycle of plasmodium.</p> <p>6. Listing and discussing causative agents of STIs and diseases they cause.</p> <p>7. Discussion of the effects and preventions of malaria and dysentery.</p>	<p>Senior Secondary Guide</p> <p><b><u>C. Other Resources/Supplementary Readings</u></b></p> <ul style="list-style-type: none"> <li>• Bob McDuell, <i>Senior High Integrated Science</i> (Pearson, 2009)</li> <li>• Specimens or drawings of various organisms, e.g. butterfly, cockroach, snail, earthworm, cat, man, etc.</li> <li>• Large beaker for setting up Hays infusion</li> <li>• Charts on kinds of Protozoans</li> <li>• Compound light microscopes</li> <li>• Empty slides</li> <li>• Prepared slides</li> <li>• Cover slips</li> <li>• Chemical (protoslo)</li> </ul>	<p>f. Lab works</p> <p>g. Test</p>
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**SEMESTER: ONE**

GRADE: 10

PERIOD: III

TOPIC: TISSUES AND MULTICELLULAR ANIMALS

<b>OUTCOMES</b>	<b>OBJECTIVES</b>	<b>CONTENT</b>	<b>ACTIVITIES/ LAB WORKS</b>	<b>MATERIALS/ RESOURCES</b>	<b>COMPETENCIES/ ASSESSMENT</b>
<p>Learners are able to develop the concept that tissues evolved from cells and organs from tissues and system from organs</p> <p>Learners are able to choose appropriate methods of preventing parasitic worm infections, pregnancy , STIs and substance (alcohol&amp;</p>	<p>Upon completion of this topic, students will be able to:</p> <ol style="list-style-type: none"> <li>Discuss the functions of the four types of tissues</li> <li>Explain the concept of organ as a combination of tissues</li> <li>Describe the characteristics of multicellular organisms</li> <li>Describe the general characteristics and morphological features of</li> </ol>	<p><b>1.Tissue and Organ system</b></p> <p><b>2.General characteristics</b></p> <ul style="list-style-type: none"> <li>. Sponges</li> <li>b. Hydra</li> </ul> <p>3. Worms:</p> <ul style="list-style-type: none"> <li>a) flat worms Planarian (free living)</li> <li>- blood &amp; liver flukes</li> <li>- tape worms</li> <li>b) Parasitic round worms</li> <li>- ascaris</li> <li>- hook worm</li> <li>- filarial worm</li> <li>- trichina worm</li> <li>c) Segmented worms</li> <li>- Earth worm and leeches</li> </ul> <p><b>4. Human reproduction</b></p> <ul style="list-style-type: none"> <li>a. structure and</li> </ul>	<p>Explanation of tissue in relation to organ and systems</p> <p><b>Assignment :</b> Drawing and labeling the body structure of a sponge and stating the functions of each</p> <ol style="list-style-type: none"> <li>Drawing the three different cells of a sponge and stating the function of each</li> <li>Drawing and labeling the parts of a hydra and stating their functions</li> </ol> <p>5. Explanation of the conditions for oral transmission to the host of any intestinal parasite.</p> <p>6. Outlining the effects, symptoms and methods of prevention of any intestinal parasite. (measures: washing hands after the use of latrine, before eating</p>	<p><b>A. Primary Text</b> Baffour Asante-Owusu, et al. <i>Senior High Biology</i> (Longman, 2009)</p> <p><b>B. Secondary Texts</b></p> <ul style="list-style-type: none"> <li>• Sue Hocking, et al. <i>OCR Biology</i> (OCR/Heinemann, 2008).</li> <li>• Doris Koto, et al., <i>Senior Secondary Guide – Biology</i>(Pearson, 2000) Senior Secondary Guide <ul style="list-style-type: none"> <li>• <i>Senior secondary guide Biology</i> (star study guide series)</li> </ul> </li> </ul> <p>Martin Barker &amp; David Darch 2<sup>nd</sup> edition, 2016</p> <p><b>C. Other Resources/Supplementary Readings</b></p> <ul style="list-style-type: none"> <li>• Bob McDuell, <i>Senior High Integrated Science</i></li> </ul>	<p><b>EXPECTED COMPETENCIES</b></p> <ul style="list-style-type: none"> <li>✓ Effective communication skills</li> <li>✓ Analytical and research skills</li> <li>✓ Research and problem skills</li> <li>✓ Organizational ability</li> <li>✓ Digital skills</li> <li>✓ Creativity and innovation skills</li> </ul> <p align="center"><b>ASSESSMENT STRATEGIES:</b> To be used to test for competencies, select relevant options.</p> <ol style="list-style-type: none"> <li>Quizzes</li> <li>Class works</li> <li>assignments, attendance</li> <li>class participation</li> </ol>

Drugs) abuse	<p>sponges and hydra</p> <p>5. Classify and structurally differentiate worms</p> <p>6. Explain parasitism among worms and the alternative hosts considering their life cycles</p> <p>7. Outline measures for preventing parasitic worm infections</p> <p>8. Differentiate between the leech and earth worm from a morphological point of view</p> <p>9. Compare the</p>	<p>functions of male and female reproductive organs(Naming the male and female reproductive organs Functions of these organs, Myths about reproduction)</p> <p>b. Human Life cycle: infancy, juvenile, adolescence, adult, senescence-old age (what influences sexual desires (hormones) and how can one control sexual desire)</p> <p>c. Menstruation</p> <p>✓ Menstruation and pregnancy</p> <p>✓ Menstrual hygiene</p> <p>c. <b>Pregnancy and STIs prevention</b> -Abstinence (Importance, Challenges/risky behavior</p>	<p>and eating well-cooked meat</p> <p>7. Dissecting an earth worm and identifying its external and internal features.</p> <p>Observing and drawing the external structures of:</p> <p>a. filarial worm b. tape worm c. hook worm d. round worm</p> <p><b>Individual presentations/ Mixed group presentation (gender, fast, middle and slow learners, )</b></p> <p>a. Use visual aids to demonstrate the natural family planning method. Mention the challenges of this method and why some girls cannot use it. Also mention that this method of prevention does not prevent STI and HIV.</p> <p>b. Encourage girls to consider double protection.</p>	<p>(Pearson, 2009)</p> <ul style="list-style-type: none"> <li>• charts on various types of tissues and organs</li> <li>• charts on various kinds of multicultural invertebrate animals including sponges, hydras,</li> <li>• charts on various kinds of worms <ul style="list-style-type: none"> <li>➤ flat worms,</li> <li>➤ segmented worms</li> <li>➤ ascaris,</li> <li>➤ tape worms</li> <li>➤ live earth worms</li> <li>➤ hook worm</li> <li>➤ filarial worm</li> <li>➤ trichina worm</li> </ul> </li> <li>• dissecting tray</li> <li>• dissecting set</li> <li>• gloves</li> <li>• beakers</li> <li>• water</li> </ul>	<p>e. Individual presentations,</p> <p>f. Lab works</p> <p>g. Test</p>
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	<p>structure and function of the human male and female reproductive systems</p> <p>10. Identify the various stages of the menstrual cycle and explain essence of contraceptive</p> <p>11. Recognize that substance abuse (alcohol and drugs) is harmful to life.</p>	<p>&amp; values)</p> <p>- <b>Contraceptives (Methods of contraceptives</b>&amp;Role of contraceptive (condom) in STI prevention)</p> <p>5. <b>Substance abuse</b></p> <ul style="list-style-type: none"> <li>✓ Names of substance disorder drugs and their classification</li> <li>✓ Route of entry into the body</li> <li>✓ Effect of substance disorder</li> <li>✓ Ways of preventing substance disorder</li> </ul>	<p><b>Drama:</b> A female refusing to have sex because it's her unsafe period of the menstrual cycle.</p> <p><b>Demonstrate</b> care for oneself during menstruation</p> <p><b>Case study</b> showing what influences sexual desires</p> <p><b>Discussion:</b> Hold class discussion on the effects of hormones on sexual desires</p> <p><b>Roll play</b> on resisting things that influence sexual desires</p> <p><b>Experience sharing</b> by people who succeeded from abstinence</p> <p><b>Professional talks or explanation:</b> Invite a health professional to speak about how contraceptives stop conception. Explain each method including strength and side effects.</p> <p><b>Experience sharing:</b> Considering former drug addict or one who has lived with a drug addict to share the influence of drugs on one's life.</p>		
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**SEMESTER TWO**

GRADE: 10

PERIODS: IV

TOPIC: ARTHROPOD AND BIOLOGICAL CONTROL OF PESTS

OUTCOMES	OBJECTIVES	CONTENT	ACTIVITIES/ LAB WORK	MATERIALS/ RESOURCES	COMP ETENCIES/ ASSESSMENT
<p>Learners are able to classify arthropods outline the various ways to control vectors and explain the economic importance of some arthropods.</p>	<p>Upon completion of this topic, learners will:</p> <ol style="list-style-type: none"> <li>1. Define and classify arthropods according to their structures and forms</li> <li>2. Explain the process of metamorphosis (complete &amp; incomplete) in arthropods;</li> <li>3. Discuss the role of vectors (cockroach, mosquito, house-fly,</li> </ol>	<ol style="list-style-type: none"> <li>1. <b>Arthropod: General characteristics &amp; classification with examples:</b> <ol style="list-style-type: none"> <li>a) study specimen: grasshopper/locust or cockroach, weevils and cotton stainers</li> <li>b) morphology</li> <li>c) respiration</li> <li>d) mouth parts, food and feeding</li> <li>e) life cycle:</li> </ol> </li> <li>2. <b>metamorphosis</b> (complete and incomplete)</li> <li>3. <b>Vectors:</b> Mosquitoes, teste fly, house fly, and rockroach. General characteristics, Mouth parts, feeding, life cycle and transmission of diseases.</li> <li>3. <b>Economic importance of social insects</b> <ol style="list-style-type: none"> <li>a. Honey bees</li> </ol> </li> </ol>	<p><b><u>Inclusive and differentiated learning</u></b></p> <p>Mixed group presentation (gender, fast, middle and slow learners, )</p> <ol style="list-style-type: none"> <li>1. <b>Field trip-</b> collection of different species of insect outdoor : butterfly, grasshopper, cockroach, weevils, cotton strainers and fly and observing their external body structures</li> <li>2. Discussing the economic importance of arthropods</li> </ol>	<p><b><u>A. Primary Text</u></b> Baffour Asante-Owusu, et al. <i>Senior High Biology</i> (Longman, 2009)</p> <p><b><u>B. Secondary Texts</u></b></p> <ul style="list-style-type: none"> <li>• Sue Hocking, et al. <i>OCR Biology</i> (OCR/Heinemann, 2008).</li> <li>• Doris Koto, et al., <i>Senior Secondary Guide – Biology</i> (Pearson, 2000)</li> </ul> <p>Senior Secondary Guide</p> <ul style="list-style-type: none"> <li>• <i>Senior secondary guide Biology</i> (star study guide series)</li> </ul> <p>Martin Barker &amp; David Darch 2<sup>nd</sup> edition, 2016</p> <p><b><u>C. Other Resources/Supplementary Readings</u></b></p> <ul style="list-style-type: none"> <li>• Bob McDuell, <i>Senior</i></li> </ul>	<p><b>EXPECTED COMPETENCIES:</b></p> <ul style="list-style-type: none"> <li>✓ Effective communication skills</li> <li>✓ Analytical and research skills</li> <li>✓ Research and problem skills</li> <li>✓ Organizational ability</li> <li>✓ Digital skills</li> <li>✓ Creativity and innovation skills</li> </ul> <p><b>ASSESSMENT STRATEGIES:</b> To be used to test for competencies, select relevant options.</p> <ol style="list-style-type: none"> <li>a. Quizzes</li> <li>b. Class works</li> <li>c. assignments, attendance</li> <li>d. class participation</li> </ol>



	<p>and tsetse fly)</p> <p>4. Explain the general characteristics of butterfly</p> <p>5. Elaborate on the economic importance of the honey bees and termites</p> <p>6. Discuss pests, their economic importance and control measures. Describe the features and economic importance of grasshoppers.</p>	<p>b. b. termites</p> <p><b>4. Pests</b></p> <ul style="list-style-type: none"> <li>- Economic importance</li> <li>- Chemical control</li> <li>- Biological control</li> </ul>	<p>3. Diagramming the life cycle of mosquitoes (anopheles) in relationship to the plasmodium (malaria)</p> <p>4. <b>Assignment</b> - Collecting mosquito larvae/wigglers and bringing to the class for observation.</p> <p>5. Listing methods of controlling the spread of malaria.</p> <p>6. Drawing and labeling the parts of each of the classes of arthropods, For instance: grasshopper, mosquitoes, millipede, crab, crayfish, spider, etc.</p> <p>7. Stating the economic importance of honey</p>	<p><i>High Integrated Science</i> (Pearson, 2009)</p> <ul style="list-style-type: none"> <li>• Charts on various kinds of arthropods and malaria cycle</li> <li>• Specimens: crab, crayfish, spiders, centipede, millipede, grasshoppers, butterflies cockroaches, weevils and cotton stainers</li> <li>• Insect collecting net</li> <li>• Dissecting set</li> <li>• Dissecting tray and gloves</li> </ul>	<p>e. Individual presentations,</p> <p>f. Lab works</p> <p>g. Test</p>
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			bees 8. Discussing honey bees and termites as social insects.		
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**SEMESTER: TWO**

**GRADE: 10**

**PERIOD: V**

**TOPIC: PLANT-LIKE ORGANISMS (ALGAE, FUNGI, MOSSES, FERNS) AND PHOTOSYNTHESIS**

**LEARNING OBJECTIVES**

1.

OUTCOMES	OBJECTIVES	CONTENT	ACTIVITIES/ LAB WORKS	MATERIALS RESOURCES	COMPETENCIES/ ASSESSMENT
<p>Learners are able to understand that algae are producers of atmospheric oxygen and serve as food for marine organisms.</p> <p>Learners are able to appreciate that mosses and ferns are non-flowering plants and understand that some fungi are disease causing agents while others are used as food</p>	<p>Upon completion of this topic, Learners will:</p> <p>1. Describe the general characteristics, structures and life cycles of algae, fungi, mosses and ferns</p> <p>2. Explain the economic importance of algae and fungi to human</p> <p>3. Describe the process of reproduction (sexual and asexual) in algae</p>	<p><b>1. Algae:</b></p> <p>a) General characteristics</p> <p>b) classification</p> <p>c) phytoplankton (floating microbe)</p> <p>d) green algae</p> <p>e) Spirogyra-reproduction (sexual and asexual)</p> <p>f) Economic importance of algae in food, medicine &amp; industry)</p> <p><b>2. Fungi:</b></p> <p>a) General characteristics</p> <p>b) classification</p> <p>c) nutrition-parasitic, saprophytic</p>	<p><b><u>Inclusive and differentiated learning</u></b></p> <p>Individual work/ Mixed group presentation (gender, fast, middle and slow learners, )</p> <p>1. Drawing and labeling the parts of a spirogyra</p> <p>2. Drawing and labeling the stages of sexual reproduction in spirogyra</p> <p>3. Examining and identifying a piece of molded bread under the microscope showing the hyphae</p>	<p><b><u>A. Primary Text</u></b> Baffour Asante-Owusu, et al. <i>Senior High Biology</i> (Longman, 2009)</p> <p><b><u>B. Secondary Texts</u></b></p> <ul style="list-style-type: none"> <li>• Sue Hocking, et al. <i>OCR Biology</i> (OCR/Heinemann, 2008).</li> <li>• Doris Koto, et al., <i>Senior Secondary Guide – Biology</i> (Pearson, 2000)</li> </ul> <p>Senior Secondary Guide</p> <ul style="list-style-type: none"> <li>• <i>Senior secondary guide Biology</i> (star study guide series)</li> </ul>	<p>EXPECTED</p> <p><b>COMPETENCIES:</b></p> <ul style="list-style-type: none"> <li>✓ Effective communication skills</li> <li>✓ Analytical and research skills</li> <li>✓ Research and problem skills</li> <li>✓ Organizational ability</li> <li>✓ Digital skills</li> <li>✓ Creativity and innovation skills</li> </ul> <p><b>ASSESSMENT STRATEGIES</b> to be used to test for competencies, select relevant options:</p> <ul style="list-style-type: none"> <li>a. Quizzes</li> <li>b. Class works</li> <li>c. assignments,</li> </ul>

	<p>4. Explain types of nutrition of fungi with terms such as <i>parasitic</i>, and <i>saprophytic</i>:</p> <p>5. List common fungal diseases of plants and human such as athlete foot, ringworm, blight, dishcloth, blight</p> <p>Explain the process of photosynthesis</p>	<p>d) Diseases that affect plants &amp; human; blight, smuts, rust, athlete's foot, yeast infection, ringworm and dishcloth.</p> <p><b>3. Economic importance</b> (food, medicine and industry)</p> <p><b>4. Reproduction</b> (sexual &amp; asexual)</p> <p><b>5. Mosses</b> (e.g. <i>Brachymerium</i> and <i>Funaria</i>) and Ferns (i.e. <i>Nephrolepis</i>, <i>Platycerium</i>)</p> <p>a) general characteristics</p> <p>b) reproduction: alternation of generations (sexual and asexual cycle)</p> <p>c) economic importance</p> <p><b>6. Photosynthesis</b></p> <p>a) Definition</p> <p>b) conditions of photosynthesis</p>	<p>of rhizopus,; drawing and labeling the parts.</p> <p>4. Illustrating the life cycle of rhizopus.</p> <p>5. Explaining the life cycle of a club fungus</p> <p>6. Collecting and studying a bracket fungus and identifying the annual rings</p> <p>7. Stating ways of preventing fungal infections</p> <p>8. Diagramming reproduction in fungus</p> <p>9. Drawing and labeling the sexual and asexual reproductive cycles of mosses, ferns</p> <p>10. growing two</p>	<p>Martin Barker &amp; David Darch 2<sup>nd</sup> edition, 2016</p> <p><b><u>C. Other Resources/Supplementary Readings</u></b></p> <ul style="list-style-type: none"> <li>• Bob McDuell, <i>Senior High Integrated Science</i> (Pearson, 2009)</li> <li>• Charts on algae &amp; fungi</li> <li>• Specimens (yeast, stale bread) club fungi, bracket fungi</li> <li>• Microscope</li> <li>• Plain slide &amp; prepared slide cover slips</li> <li>• Droppers</li> <li>• Beakers</li> <li>• Charts on the life cycles of mosses and ferns</li> <li>• Specimens of growing plants</li> <li>• Aluminum foil</li> <li>• Empty cans</li> <li>• Boiling water</li> <li>• White tile</li> <li>• Iodine solution</li> <li>• Dropper</li> <li>• Green leaf</li> </ul>	<p>attendance</p> <p>d. class participation</p> <p>e. Individual presentations,</p> <p>f. Lab works</p> <p>g. Test</p>
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		<p>c) leaf adaptation of photosynthesis light dependent reactions</p> <p>d) light independent reactions</p> <p>e) products of photosynthesis</p> <p>c) fate of photosynthetic products</p> <p>d) Macronutrients and micronutrients: their effects in photosynthesis</p>	<p>plants, one in sunlight and one in the shade to observe the effects of the presence or absence of light on plant growth</p> <p>Wrapping some leaves of a growing plant with aluminum foil and comparing it with other leaves of the same plants after four days.</p> <p>12. Testing a leaf for starch</p> <p>13. Testing to break down cell wall and stop the action of enzymes within a leaf</p> <p>14. Testing to extract chlorophyll</p> <p>15. Experimenting to demonstrate the need for chlorophyll in photosynthesis</p>	<ul style="list-style-type: none"> <li>• Ethanol</li> <li>• Variegated leaf</li> <li>• Test tube</li> <li>• Test tube holder</li> <li>• Test tube rack</li> <li>• Clamp and Clamp stand</li> <li>• Bench lamp</li> <li>• Filter funnel</li> <li>• Aquatic plant</li> </ul>	
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			16. Experimenting to demonstrate the need for light in photosynthesis		
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**SEMESTER: TWO**

GRADE: 10

PERIOD: VI

TOPIC: FLOWERING PLANTS

<b>OUTCOMES</b>	<b>OBJECTIVES</b>	<b>CONTENTS</b>	<b>ACTIVITIES/ LAB WORKS</b>	<b>MATERIALS/ RESOURCES</b>	<b>COMP ETENCIES/ ASSESSMENT</b>
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<p>Learning are able to accept that flowering plants are major food producers in the biosphere and are very important in the food chain.</p> <p>Learners are able to appreciate the concept of how water, food and minerals are transported in vascular plants.</p>	<p>Upon completion of this topic, learners will:</p> <ol style="list-style-type: none"> <li>1. Identify the characteristics of flowering plants and distinguish them from one another</li> <li>2. Classify flowering plants into <i>monocotyledonae</i>(monocots) and <i>dicotyledonae</i> (dicots)</li> <li>3. Distinguish the characteristics of monocots and dicots</li> <li>4. Describe the structures and functions of roots, stems, and leaves; and flowers of flowering plants.</li> <li>5. Explain sexual and asexual reproduction in flowering plants</li> <li>6. Determine the floral formulae of flowers such as flamboyant (<i>Delonix</i>), Pride of Barbados (<i>Caesalpinia</i>) and Rattle Box (<i>Crotalaria</i>)</li> <li>7. Discuss types of pollination and list agents of pollination</li> <li>8. Explain the process of zygote and embryo formation in flowering</li> </ol>	<p><b>1. Flowering plants:</b></p> <ol style="list-style-type: none"> <li>a) classification (monocots &amp; Discots)</li> <li>b) Success of flowering plants</li> </ol> <p><b>2. Functions of roots, stems, leaves and flowers</b></p> <p><b>3. Floral formulae of flowers:</b></p> <p>i.e. Flamboyant (Delonix), pride of Barbados (Caesalpinia) and rattle box (Crotalaria).</p> <p><b>3. Types of plants tissues</b></p> <p><b>4. Root system:</b></p> <ol style="list-style-type: none"> <li>a) types</li> <li>b) regions of root tip,</li> <li>c) functions and structures of root hairs</li> </ol> <p><b>5. Modified roots, stems and leaves</b></p> <p><b>6. Leaf</b></p>	<ol style="list-style-type: none"> <li>1. Drawing and labeling the parts of a complete flower and stating their functions</li> <li>2. Illustration of the types of vegetative propagation (cutting, grafting, etc)</li> <li>3. <b>LAB</b> Setting up an experiment to demonstrate the two types of germination - using corn seed (kernel) and bean seed..</li> <li>4. Examine the</li> </ol>	<p><b>A. Primary Text</b></p> <p>Baffour Asante-Owusu, et al. <i>Senior High Biology</i> (Longman, 2009)</p> <p><b>B. Secondary Texts</b></p> <ul style="list-style-type: none"> <li>• Sue Hocking, et al. <i>OCR Biology</i> (OCR/Heinemann, 2008).</li> <li>• Doris Koto, et al., <i>Senior Secondary Guide – Biology</i> (Pearson, 2000) Senior Secondary Guide</li> <li>• <i>Senior secondary guide Biology</i> (star study guide series) Martin Barker &amp; David Darch 2<sup>nd</sup> edition, 2016</li> </ul> <p><b>C. Other Resources/Suppleme</b></p>	<p><b>EXPECTED COMPETENCIES:</b></p> <ul style="list-style-type: none"> <li>• Effective communication skills</li> <li>• Analytical and research skills</li> <li>• Research and problem skills</li> <li>• Organizational ability</li> <li>• Digital skills</li> <li>• Creativity and innovation skills</li> </ul> <p><b>ASSESSMENT STRATEGIES to be used to test for competencies. Select relevant options:</b></p> <ol style="list-style-type: none"> <li>a. Quizzes</li> <li>b. Class works</li> <li>c. assignments, attendance</li> <li>d. class participation</li> <li>e. Individual presentations,</li> <li>f. Lab works</li> <li>g. Test</li> </ol>
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	<p>plants</p> <p>9. Describe the conditions for seed germination</p> <p>10. List the types of fruits and explain fruit and seed dispersal</p> <p>11. Describe plant hormones and their functions</p> <p>12. Explain transport system in plants</p> <p>13. Discuss the process of excretion in plants</p> <p>14. Describe the process of plant growth and development</p> <p>15. Explain the process of gaseous exchange in plant</p>	<p><b>classification and arrangement of stem</b></p> <p><b>7. Germination: types</b> (epigeal and hypogeal) - conditions</p>		<p><b><u>ntary</u></b></p> <p><b><u>Readings</u></b></p> <p>Bob McDuell, <i>Senior High Integrated Science</i></p>	
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	<p><b>8. Reproduction in flowering plants</b></p> <p><b>9. Kinds of fruits and dispersal of fruits and seeds – agents</b></p> <p><b>10. Tropisms and plant growth hormones</b></p> <p><b>11. Primary and secondary growth in plants</b></p> <p><b>12. Measurement of growth in plants</b></p> <p><b>13. Nastic and Tactic Movements in plants</b></p> <p><b>14. Transport system in vascular plants</b></p> <p><b>15. Excretion in plants</b></p> <p><b>16. Excretory product of plants:</b> water, carbon(IV) oxide, oxygen, Alkaloids, tannis, resins, acids, gums</p> <p><b>17. Movement of water and minerals through plants</b></p> <p><b>18. Movement of organic materials from leaves to roots</b></p> <p><b>19. Pressure flow hypothesis and cytoplasmic streaming of translocation</b></p> <p><b>20. Transpiration: advantages and disadvantages</b></p> <p><b>21. Environmental factors affecting transpiration</b></p>	<p>internal structure of leaf under the microscope</p> <p>5. Collecting as many fruits and seeds and classifying them into types.</p> <p>6. Drawing and labeling cross section of monocot and dicot stems and roots.</p> <p>7. Explaining the two types of pollination and listing agents of pollination</p> <p>8. Observing the process of transpiration through experiments</p> <p>9. <b>Field Trip</b> Collecting and</p>	<p>(Pearson, 2009) charts on plant tissues (ground vascular tissues and dermal tissues) Charts on the cross section of deoact stem and monocot stem Microscope and slides Specimens Whistle plant with roots, stem leaves &amp; flowers empty plastic jars/cans Cups Soil Dried seed Variety of fruits</p>	
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	<p><b>22. Physiological factors affecting the rise of water in xylem:</b> root pressure, transpiration, cohesion-tension mechanism, adhesion, water potential gradient</p> <p><b>23. Gaseous exchange</b></p> <p>a) concentration gradient</p> <p>b) structure and function of stomata</p> <p>c) structure and function of lenticels</p> <p><b>24. Explanation of metabolic equations</b></p> <p>a) <math>C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O + \text{Heat energy}</math></p> <p>b) <math>C_6H_{12}O_6 \rightarrow 2C_2H_5OH + 2CO_2 + \text{Heat}</math></p> <p><b>25. Types of respiration compared</b></p> <p>a) facultative aerobic</p> <p>b) facultative anaerobic</p>	<p>classifying different kinds of leaves</p> <p><b>Class work</b> Examining sections of stems and roots, showing different stages of primary and secondary growth.</p>		
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**SEMESTER: ONE**

**GRADE: 11**

**PERIOD: I**

**TOPIC : VIRUSES AND BACTERIA**

<b>OUTCOMES</b>	<b>OBJECTIVES</b>	<b>CONTENTS</b>	<b>ACTIVITIES/ LAB WORKS</b>	<b>MATERIALS/ RESOURCES</b>	<b>COMPETENCIES/ ASSESSMENT</b>
<p>Learners are able to recognize that viruses and bacteria are causative agents of diseases such as polio, mumps, measles, Ebola, some sexually transmitted infections (HIV/AIDS, Herpes) etc, while some bacteria are useful to human</p> <p>Learners are able to appreciate preventive measures to</p>	<p>Upon completion of these topics, learners will:</p> <ol style="list-style-type: none"> <li>1. List the characteristics of viruses</li> <li>2. Classify viruses based on nucleic acid (DNA &amp; RNA) and the organisms they attack</li> <li>3. Explain the life cycle of a virus</li> <li>4. List some viral diseases, modes of transmission and methods of prevention</li> <li>5. Describe</li> </ol>	<p><b>10. Virus:</b></p> <ol style="list-style-type: none"> <li>a) General characteristics</li> <li>a) definition</li> <li>b) size &amp; shape</li> <li>c) Composition</li> </ol> <p style="text-align: center;">Structure</p> <p><b>11. Classification:</b></p> <ol style="list-style-type: none"> <li>a) animal viruses</li> <li>b) plant viruses</li> </ol> <p><b>12. Common viral Diseases:</b> cold, flu, mumps, chicken pox, rabies, polio, HIV/ AIDS</p> <p><b>13. Life cycle of a virus</b></p> <p><b>14. Sexually transmitted Infections (STIs):</b> modes of</p>	<p><b><u>Inclusive and differentiated learning</u></b></p> <p>Individual work/ Mixed group presentation (gender, ability &amp; style)</p> <ol style="list-style-type: none"> <li>1. Listing and discussing viruses that cause diseases.</li> <li>2. Identifying and listing common viral diseases.</li> <li>3. Discussing STIs caused by viruses, modes of</li> <li>4. Transmission and prevention. Discussing the importance of HIV testing and support.</li> </ol>	<p><b><u>A. Primary Text</u></b></p> <p>Baffour Asante-Owusu, et al. <i>Senior High Biology</i> (Longman, 2009)</p> <ul style="list-style-type: none"> <li>• <i>Senior secondary guide Biology</i> (star study guide series)</li> </ul> <p>Martin Barker &amp; David Darch 2<sup>nd</sup> edition, 2016</p> <p><b><u>B. Secondary Texts</u></b></p> <ul style="list-style-type: none"> <li>• Sue Hocking, et al. <i>OCR Biology</i> (OCR/Heinemann, 2008).</li> <li>• Doris Koto, et al., <i>Senior Secondary Guide – Biology</i> (Pearson, 2000)</li> </ul> <p>Senior Secondary Guide</p>	<p><b>EXPECTED COMPETENCIES</b></p> <ul style="list-style-type: none"> <li>• Effective communication skills</li> <li>• Analytical and research skills</li> <li>• Research and problem skills</li> <li>• Organizational ability</li> <li>• Digital skills</li> <li>• Creativity and innovation skills</li> </ul> <p><b>ASSESSMENT STRATEGIES</b></p> <p>to be used to test for competencies, select relevant options.</p> <ol style="list-style-type: none"> <li>a. Quizzes</li> <li>b. Class works</li> <li>c. assignments, attendance</li> </ol>

<p>avoid risky sexual behavior</p>	<p>bacteria of various kinds and observe them under the microscopes</p> <p><b>6.</b> Classify bacteria, and draw and label a typical bacterial cell</p> <p><b>7.</b> List and describe some common bacterial diseases and symptoms</p> <p><b>8.</b> Outline preventive measures of bacterial diseases</p> <p><b>9.</b> Distinguish between <i>autotrophic</i> and <i>heterotropic</i> nutrition; and <i>aerobic</i>, <i>anaerobic</i> and</p>	<p>transmission and prevention</p> <p><b>15. Structure of bacteriophage</b></p>	<p>5. Diagramming the life cycle Of bactriophage.</p> <p>6. Group discussion on the causes and Preventive measure in controlling STIs.</p>	<p><b><u>C. Other Resources/Supplementary Readings</u></b></p> <ul style="list-style-type: none"> <li>• Bob McDuell, <i>Senior High Integrated Science</i> (Pearson, 2009)</li> <li>• Biological charts of the various types of viruses</li> <li>• Chart of HIV trend in Liberia</li> <li>• Prepared slides of bacteria</li> <li>• Charts for the shape and types of bacteria microscope</li> <li>• Microscope</li> <li>• Prepared slides of bacteria</li> <li>• Charts of shapes and types of bacteria</li> </ul>	<p>d. class participation</p> <p>e. Individual presentations,</p> <p>f. Lab works</p> <p>g. Test</p>
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	<i>facultative</i> respiration 11.Explain the economic importance of bacteria				
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**SEMESTER: ONE**

**GRADE: 11**

**PERIOD: II**

**TOPIC: NUTRITION AND FOOD PRESERVATION**

OUTCOMES	OBJECTIVES	CONTENTS	ACTIVITIES/ LAB WORKS	MATERIALS/ RESOURCES	COMPETENCIES/ ASSESSMENT
Learners able to realize that different types of food (nutrients) are required by organism for the production of energy to support life processes  Learners are able to realize the proper methods of preserving food to prevent	Upon completion of this topic, learners will be able to: 1. Explain the concept of nutrition and state why living things need nutrients 2. Outline and classify the types of nutrients found in food and its importance 3. Write the structural formulae of	<b>1.Nutrition - Definition and types:</b> a) Autotrophic nutrition b) Heterotrophic nutrition c) Holozoic nutrition d) Saprobiontic (sarprophytic) nutrition e) Parasitic nutrition f) Mutualistic nutrition  <b>2.Food and nutrients</b> (carbohydrates, lipids,	<b><u>Differentiated learning</u></b> Mixed group presentation (gender & ability )  1. Classifying the nutrients found in different types of food	<ul style="list-style-type: none"> <li>• <b><u>Primary Text</u></b>              Baffour Asante-Owusu, et al. <i>Senior High Biology</i> (Longman, 2009)</li> <li>• <b><u>Secondary Texts</u></b>              Sue Hocking, et al. <i>OCR Biology</i> (OCR/Heinemann, 2008).</li> </ul>	<b>EXPECTED COMPETENCIES</b> <ul style="list-style-type: none"> <li>• Effective communication skills</li> <li>• Analytical and research skills</li> <li>• Research and problem skills</li> <li>• Organizational ability</li> <li>• Digital skills</li> <li>• Creativity and</li> </ul>

<p>food poisoning (spoilage)</p>	<p>carbohydrates, proteins and lipids</p> <ol style="list-style-type: none"> <li>4. Demonstrate the presence of various nutrients found in food</li> <li>5. Determine the dental formula of a mammal (amount and arrangement of teeth)</li> <li>6. Explain the importance of dental care in humans</li> <li>7. Explain the concept of a balance diet</li> <li>8. Explain the concept of malnutrition</li> <li>9. Name and discuss various methods of preserving and storing food</li> <li>10. Preserve food using local resources</li> </ol> <p>Explain the biological basis for preserving and storing food</p>	<p>proteins, vitamins, etc.) and energy</p> <ol style="list-style-type: none"> <li>3. <b>Structure of carbohydrates, lipids and proteins</b></li> <li>4. <b>Teeth and dental formulae</b></li> <li>5. <b>Dental care</b></li> <li>6. <b>Balance diet</b></li> <li>7. <b>Malnutrition</b></li> <li>8. <b>Methods and importance of food preservation:</b> <ol style="list-style-type: none"> <li>a) drying</li> <li>b) salting</li> <li>c) smoking</li> <li>d) parboiling</li> <li>e) dehydration</li> <li>g) refrigeration</li> <li>h) frying</li> <li>i) use of oil</li> <li>j) incubation</li> <li>k) vitamin C</li> </ol> </li> </ol>	<ol style="list-style-type: none"> <li>2. Identifying structure of carbohydrate, proteins and lipids</li> </ol> <p><b>LAB</b> Testing for:</p> <ol style="list-style-type: none"> <li>(a) carbohydrate</li> <li>(b) reducing sugar (Benedict's test)</li> <li>(c) non-reducing sugar (e.g. sucrose)</li> <li>(d) starch (the iodine/potassium iodide test)</li> <li>(e) lipid-present (the emulsion test)</li> <li>(f) proteins (biuret test)</li> <li>g. Using preservative methods on samples of food and comparing them with other</li> </ol>	<ul style="list-style-type: none"> <li>• Doris Koto, et al., <i>Senior Secondary Guide – Biology</i> (Pearson, 2000)</li> <li>• <i>Senior secondary guide Biology</i> (star study guide series)</li> </ul> <p>Martin Barker &amp; David Darch 2<sup>nd</sup> edition, 2016</p> <p><b><u>C. Other Resources/Supplementary Readings</u></b></p> <ul style="list-style-type: none"> <li>• Bob McDuell, <i>Senior High Integrated Science</i> (Pearson, 2009)</li> <li>• Glucose solution</li> <li>• Benedict's solution</li> <li>• Fehling's solution</li> <li>• Test tubes</li> <li>• Test tube rack</li> <li>• Cassava</li> <li>• Potato □ Iodine</li> <li>• Potassium</li> <li>• Vitamin C powder</li> </ul>	<p>innovation skills</p> <p><b>ASSESSMENT STRATEGIES</b></p> <p>to be used to test for competencies. select relevant options:</p> <ol style="list-style-type: none"> <li>a. Quizzes</li> <li>b. Class works</li> <li>c. assignments, attendance</li> <li>d. class participation</li> <li>e. Individual presentations,</li> <li>f. Lab works</li> <li>g. Test</li> </ol>
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			<p>food stuffs that have not been Preserved</p>	<ul style="list-style-type: none"> <li>• Filter paper</li> <li>• Ethyl alcohol</li> <li>• Egg albumin</li> <li>• Milk</li> <li>• Copper (II) sulphate</li> <li>• Syringe</li> <li>• Droppers</li> <li>• Orange juice</li> <li>• Lemon juice</li> <li>• Grapefruit juice</li> <li>• Diclorophenolindophe nol (DCPIP) dye</li> <li>• Ascorbic acid</li> <li>• Pipette</li> <li>• Sodium hydroxide solution</li> <li>• Filter paper</li> <li>• Distill water</li> <li>• Groundnuts, fish, milk and pawpaw</li> <li>• Mortar and pestle</li> <li>• Specimens of various food stuffs</li> <li>• Salt</li> <li>• Incubator</li> <li>• Fire wood</li> <li>• Locally made dryer</li> <li>• Charcoal</li> <li>• Coal pot</li> </ul>	
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				<ul style="list-style-type: none"> <li>• Pot</li> <li>• Palm oil</li> <li>• vitamin C</li> </ul>	
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**SEMESTER ONE**

**GRADE: 11**

**PERIOD: III**

**TOPICS: SOIL, ENERGY AND ECOLOGY – PATTERNS IN NATURE**

<b>OUTCOMES</b>	<b>OBJECTIVES</b>	<b>CONTENTS</b>	<b>ACTIVITIES/ LAB WORKS</b>	<b>MATERIALS/ RESOURCES</b>	<b>COMP ETENCIES/ ASSESSMENT</b>
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<p>Learners are able to campaign for the proper disposal of non-biodegradable substances (plastics) into the soil and the maintenance of soil fertility for proper yield of food and cash crops</p> <p>Learners are able to appreciate the concept of ecosystem and the interdependence of organisms within ecosystems.</p>	<p>Upon completion of these topics, learners will:</p> <p><b>1.</b> Define and state the composition of soil</p> <p><b>2.</b> Distinguish between the different types of soil ( loamy, sandy and clay soil)</p> <p><b>3.</b> State the effects of erosion and the overuse of soil on soil fertility</p> <p><b>4.</b> Explain the processes of soil conservation, maintenance, and renewal of soil fertility</p> <p><b>5.</b> Explain the advantages and disadvantages of the slash and burn methods in farming</p> <p><b>6.</b> Characterize the reproductive isolating mechanisms of species</p>	<p><b>Soil:</b></p> <p>a. formation and composition</p> <p>b. types of soil</p> <p>c. fertility</p> <p>d. erosion: causes and prevention</p> <p>e. conservation</p> <p>f. maintenance</p> <p>g. renewal of soil fertility</p> <p>d) Weathering (a) Physical weathering (b) Chemical weathering'</p> <p><b>Liberia food and cash crops production</b></p> <p><b>Effects of non- biodegradable substances on soil fertility</b></p> <p><b>Isolation mechanisms of species</b></p> <p><b>Inter-specific interactions</b> (Biological associations)</p> <p>(a) mutualism (b) commensalism (c) predation (d) parasitism (e) competition</p> <p><b>Trophic levels:</b></p> <p>(a) autotrophs (producers) (b) heterotrophs (consumers) (c) Food chains and webs</p>	<p><b><u>Differentiated learning</u></b></p> <p>Mixed group presentation (gender &amp; ability )</p> <p>1. Explaining soil formation</p> <p>2. <b>Lab Work:</b></p> <p>b. Collecting, observing and classifying soil types Listing and discussing the composition of soil</p> <p>c. Demonstrating the presence of air in the soil (moisture content)</p> <p>d. food chains and food webs</p> <p>e. diagramming and Discussing – water, carbon, nitrogen, phosphorus and sulfur cycles.</p> <p>3. <b>Field Trip:</b></p>	<p><b><u>A. Primary Text</u></b> Baffour Asante-Owusu, et al. <i>Senior High Biology</i> (Longman, 2009)</p> <p><b><u>B. Secondary Texts</u></b></p> <ul style="list-style-type: none"> <li>Sue Hocking, et al. <i>OCR Biology</i> (OCR/Heinemann, 2008).</li> <li>Doris Koto, et al., <i>Senior Secondary Guide – Biology</i> (Pearson, 2000) Senior Secondary Guide</li> </ul> <p><i>Senior secondary guide Biology</i> (star study guide series) Martin Barker &amp; David Darch 2<sup>nd</sup> edition, 2016</p> <p><b><u>C. Other Resources/Supplementary Readings</u></b></p>	<p><b>EXPECTED COMPETENCIES</b></p> <ul style="list-style-type: none"> <li>Effective communication skills</li> <li>Analytical and research skills</li> <li>Research and problem skills</li> <li>Organizational ability</li> <li>Digital skills</li> <li>Creativity and innovation skills</li> </ul> <p><b>ASSESSMENT STRATEGIES</b> to be used to test for competencies. Select relevant options:</p> <ol style="list-style-type: none"> <li>Quizzes</li> <li>Class works</li> <li>assignments, attendance</li> <li>class participation</li> <li>Individual presentations,</li> <li>Lab works</li> <li>Test</li> </ol>
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	<p>7. Distinguish between habitat and niche Define and calculate (population growth, doubling time &amp; percentage growth rate, death &amp; birth rates and explain the concept of population diversity</p> <p>9. Describe the concept of ecological succession</p> <p>10. Describe the various types of inter-specific interactions among organisms</p> <p>11. Discuss the ecosystem (food chains, food webs, pyramids of numbers</p> <p>12. Define the productivity of an ecosystem and distinguish between gross primary productivity and net</p>	<p><b>Conservation of nature</b></p> <p>(a) soil conservation (b) forest conservation (c) wildlife conservation (d) oil conservation (e) mineral conservation</p> <p><b>8. Biocycles in nature</b></p> <p>(a) the water cycle (b) the carbon cycle (c) the nitrogen cycle (d) the phosphorus cycle (e) the sulfur cycle</p> <p><b>9. Organisms habitat and niche</b></p> <p><b>10. population:</b></p> <p>(a) population density (b) population growth rate (c) doubling time (d) percent growth rate (e) birth rate, death rate (f) immigration, emigration, density– dependent and density independent factors</p> <p><b>11. Ecological succession:</b> (a) primary and secondary successions (b) pioneer and climax communities</p>	<p>a. Observing and discussing the effects of erosion on soil fertility</p> <p>b. Digging in the school yard to observe non-biodegradable substances (plastic materials)</p> <p>c. Listing food and cash crops in Liberia and considering the type of soil for cultivation</p> <p>d. Discussing the various inter-specific interactions between species</p> <p>e. Taking field trips to visit ecosystems such as ponds and forest regions</p>	<ul style="list-style-type: none"> <li>• Bob McDuell, <i>Senior High Integrated Science</i> (Pearson, 2009)</li> <li>• Samples of different types of soil</li> <li>• Empty cups and jars</li> <li>• Plastic materials</li> <li>• Shovel</li> <li>• Charts of inter-specific interactions</li> <li>• Diagrams of trophic levels</li> <li>• Charts of biocycles</li> </ul>	
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	<p>primary productivity</p> <p><b>13.</b> Discuss energy flow through the trophic system, the water cycle, the carbon dioxide cycle, the nitrogen cycle, the phosphorus cycle and the sulfur cycle</p> <p><b>14.</b> Distinguish between immigration and emigration</p>				
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**SEMESTER: TWO**

**GRADE: 11**

**PERIOD: IV**

**TOPIC : CELL GROWTH AND REPRODUCTION (MITOSIS AND MEIOSIS)**

OUTCOMES	OBJECTIVES	CONTENTS	ACTIVITIES/ LAB WORKS	MATERIALS/ RESOURCES	COMP ETENCIES/
<p>Learners are able to accept that reproduction is a characteristic of living things and it begins with cell division</p> <p>Learners are able to understand the various roles and responsibilities in parenting, reproductive health and rights and how to avoid un planned pregnancies</p> <p>Learners are able to work together with peers to establish an environment</p>	<p>Upon completion of the topic, learners will:</p> <ol style="list-style-type: none"> <li>Describe the phases of the cell cycle</li> <li>List the events of mitosis and meiosis and diagram the phases</li> <li>Compare mitosis and meiosis and explain the importance of meiosis in sexual reproduction</li> <li>Distinguish between asexual and sexual reproduction</li> <li>List and explain the forms of asexual reproduction in plants and animals</li> <li>Discuss reproduction and</li> </ol>	<p><b>1. Cell growth &amp; reproduction:</b></p> <ol style="list-style-type: none"> <li>asexual reproduction <ul style="list-style-type: none"> <li>propagation</li> <li>Fission</li> <li>budding</li> </ul> </li> <li>Sexual reproduction <ul style="list-style-type: none"> <li>-cell cycle <ol style="list-style-type: none"> <li>interphase</li> <li>mitosis</li> <li>cytokinesis</li> </ol> </li> </ul> </li> <li>Meiosis <ul style="list-style-type: none"> <li>- sperm and egg formation</li> </ul> </li> </ol> <p><b>Responsibilities of parenting</b></p> <ul style="list-style-type: none"> <li>✓ What are the roles of each parent in child rearing</li> </ul> <p>Risk of teenage parenting</p> <p><b>Sexual Decisions and Impact on the Family</b></p> <ul style="list-style-type: none"> <li>✓ Making healthy decision on sexual issues</li> </ul>	<ol style="list-style-type: none"> <li>Drawing and labeling stages of mitosis and meiosis</li> <li>Comparing mitosis and meiosis</li> <li>Explaining sperm and egg formation</li> <li>Explaining terms such as gametes, diploid, haploid</li> </ol> <p><b>LAB</b></p> <ol style="list-style-type: none"> <li>Examining thin slices of onion root tip to study the stages of mitosis under the microscope</li> </ol> <p><b>Individual writing:</b> What kind of family you intend to have in</p>	<p><b>A. Primary Text</b> Baffour Asante-Owusu, et al. <i>Senior High Biology</i> (Longman, 2009)</p> <p><b>B. Secondary Texts</b></p> <ul style="list-style-type: none"> <li>Sue Hocking, et al. <i>OCR Biology</i> (OCR/Heinemann, 2008).</li> <li>Doris Koto, et al., <i>Senior Secondary Guide – Biology</i> (Pearson, 2000)</li> </ul> <p>Senior Secondary Guide</p> <p><b>C. Other Resources/Supplementary Readings</b></p> <ul style="list-style-type: none"> <li>□ Bob McDuell, <i>Senior High Integrated Science</i> (Pearson, 2009)</li> </ul> <p>Microscopes Slides Onion bulbs Scalpels</p>	<p><b>EXPECTED COMPETENCIES</b></p> <ul style="list-style-type: none"> <li>Effective communication skills</li> <li>Analytical and research skills</li> <li>Research and problem skills</li> <li>Organizational ability</li> <li>Digital skills</li> <li>Creativity and innovation skills</li> </ul> <p><b>ASSESSMENT STRATEGIES</b> to be used to test for competencies. Select relevant options:</p> <ol style="list-style-type: none"> <li>Quizzes</li> <li>Class works</li> <li>assignments, attendance</li> <li>class participation</li> <li>Individual presentations,</li> <li>Lab works</li> <li>Test</li> </ol>

<p>free of substance abuse</p>	<p>parenting in humans (sexuality)  7. Recognize sexual decisions and impact on the Family  Initiate advocacy on substance abuse and SBV</p>	<p>✓ Impact of these decisions on the family</p> <p>a) reproductive health and rights  b) b)infertility cycles of sexuality</p> <p><b>Consequences of sexual decision making</b>  Decision making about sex  Reproductive health and rights</p> <p><b>Advocacy</b>  Role of youth in stopping substance abuse  Role of the youth in stopping SBV</p>	<p>the next ten years?  Ask volunteers to share. Use issues raised to encourage students to wait until they are ready to have sex and make babies.</p> <p><b>Personal Experience sharing:</b> Invite a respected father to talk about the role of the father in parenting. Use this talk to emphasize the need for boys to take responsibility of their babies. Highlight the challenges of babies who grow up without their fathers and the long term effects this has on them.</p> <p><b>Role plays:</b>To prevent teenage parenting.</p> <ol style="list-style-type: none"> <li>1. A girl/boy effectively refusing to have sex</li> <li>2. A girl/boy discouraging another from</li> </ol>	<p>Charts of mitosis and meiosis  Methalene blue (chemical)  Razor blades  Dropper  Beakers  Posters and charts</p>	
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			<p>joining a group of peers who take alcohol to avoid risky situations against early sex</p> <p>3. Steps in using condom correctly. Do this several times to ensure the students understand the steps.</p> <p>Two girls sharing the challenges they have experienced with their family planning and how they have overcome them.</p> <p><b>Role play</b> showing young people refusing to have sex before completing high school</p> <p><b>Sharing experiences</b> on making sexual decisions (e.g. waiting to have sex when they are older with a person</p>		
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			<p>they love and have known for a long time, using contraceptives, condom, absenteeism, delay child bearing, etc.)</p> <p><b>Discussion:</b> sexual decisions and impact on individual and family.</p> <p><b>Skit</b> on negative and positive decision making about sex</p> <p><b>Role play</b> of parental influence in decision making (Negative and Positive)</p> <p><b>Role Play</b> of the importance of reproductive health rights and how they empower teenagers to make the right decisions about their sexuality.</p> <p><b>Draw posters, write poems, compose songs, prepare speeches, plan a</b></p>		
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			<p><b>peaceful demonstration, plan a radio interview...</b>          against drug abuse and School Based Violence.          Involve other young people in the school.          Fill the school with activities and drawings and writings against drug abuse and School Based Violence          Organize a hot line, where victims can call for help and advice.  <b>Involve local NGOs</b></p>		
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**SEMESTER: TWO**

**GRADE: 11**  
**PERIOD: V**



**TOPIC : NUCLEIC ACIDS, PROTEIN SYNTHESIS, HEREDITY, GENETICS, SEXUALITY AND EVOLUTION**

OUTCOMES	OBJECTIVES	CONTENTS	ACTIVITIES/ LAB WORKS	MATERIALS RESOURCES	COMP ETENCIES/ ASSESSMENT
<p>Learners are able to acquire the concept that DNA and RNA are the Principal transmitters of genetic characteristics, gene interaction, and genetic variation</p> <p>Learners are able to accept that traits are inherited from parents, through the DNA and that genetic disorders are inherited. Therefore, it is important to do medical examination</p>	<p>Upon completion of these topics, learners will:</p> <ol style="list-style-type: none"> <li>1. Explain the term nucleic acids and name the types of nucleic acids</li> <li>2. Describe the double helix model of DNA structure</li> <li>3. Outline the process of DNA replication and RNA transcription</li> <li>4. Explain the process of protein synthesis and give examples of</li> </ol>	<ol style="list-style-type: none"> <li>1. <b>The two types of nucleic acids and their structures</b> <ol style="list-style-type: none"> <li>a) DNA</li> <li>b) RNA</li> </ol> </li> <li>2. <b>Structures of nucleotides</b></li> <li>3. <b>Complementary based pairing</b></li> <li>4. <b>DNA replication and RNA transcription</b></li> <li>5. <b>Stages of protein synthesis</b></li> <li>6. <b>Types of RNA</b></li> <li>7. <b>The importance of protein synthesis</b></li> <li>8. <b>Heredity and genetics:</b> <ol style="list-style-type: none"> <li>a) principles of genetics</li> <li>b) Mendel’s experiment with garden peas;</li> <li>c) Genetic terms: phenotype, genotype, alleles, hybrid, homozygous, heterozygous, monohybrid, dihybrid, dominant and recessive genes</li> </ol> </li> <li>9. <b>Heredity Traits:</b> hemophilia,</li> </ol>	<p><b><u>Differentiated learning</u></b></p> <p>Mixed group presentation (gender &amp; ability )</p> <ol style="list-style-type: none"> <li>1. Using DNA model to demonstrate the process of DNA replication</li> <li>2. Using charts to explain the process of RNA transcription</li> <li>3. Using chart to demonstrate the process of protein synthesis</li> </ol>	<p><b><u>A. Primary Text</u></b> Baffour Asante-Owusu, et al. <i>Senior High Biology</i> (Longman, 2009)</p> <p><b><u>B. Secondary Texts</u></b></p> <ul style="list-style-type: none"> <li>• Sue Hocking, et al. <i>OCR Biology</i> (OCR/Heinemann, 2008).</li> <li>• Doris Koto, et al., <i>Senior Secondary Guide – Biology</i> (Pearson, 2000) Senior Secondary Guide</li> </ul> <p><b><u>C. Other Resources/Supplementary Readings</u></b></p> <ul style="list-style-type: none"> <li>• Bob McDuell, <i>Senior High Integrated Science</i></li> </ul>	<p><b>EXPECTED COMPETENCES</b></p> <ul style="list-style-type: none"> <li>• Effective communication skills</li> <li>• Analytical and research skills</li> <li>• Research and problem skills</li> <li>• Organizational ability</li> <li>• Digital skills</li> <li>• Creativity and innovation skills</li> </ul> <p><b>ASSESSMENT STRATEGIES</b> to be used to test for competencies, select relevant options.</p> <ol style="list-style-type: none"> <li>a. Quizzes</li> <li>b. Class works</li> <li>c. assignments, attendance</li> </ol>

<p>when selecting a partner.</p>	<p>5. the proteins synthesized by humans          Explain the meanings of heredity, genetics and sexuality</p> <p>6. Describe how trait are passed from parents to offspring</p> <p>7. Explain Mendel's contributions to the understanding of the principles of heredity</p> <p>8. Demonstrate genetic principles on Mendel's experiment with garden peas.</p> <p>9. Discuss linkage and sex-linked</p>	<p>mental disorder, sickle cell, color blindness, baldness, heavy ear lobes, etc.</p> <p>a) Indolence of environment on heredity</p> <p>b) Development of traits: Intelligence</p> <p><b>The ABO blood grouping and rhesus factor</b></p> <p><b>13. Evolution and natural selection (Darwin)</b></p> <p><b>14. Sexuality:</b> sex determination</p> <p><b>15. Variation:</b></p> <p>a)continuous variation</p> <p>c) discontinuous variations</p> <p><b>16. Sources of variation:</b></p> <p>a) crossing over</p> <p>b) independent assortment</p> <p>a)random fusion of gametes</p> <p><b>17.Causes of variation:</b></p> <p>a) genetic factors</p> <p>b) Environmental factors</p> <p><b>18. Consequence of variation–</b> natural selection</p> <p><b>19. Population genetics</b></p> <p><b>20. Convergent and Divergent of evolution</b></p>	<p>4. Describing Mendel's contributions to principles of heredity</p> <p>5. Describing Mendel's experiments and results</p> <p>6. Solving monohybrid and dihybrid problems using punnett square and stating the importance of the punnett square</p> <p>7. Discussing some genetic disorders and diseases.</p> <p>8. Outlining similarity. and differences among different species of vertebrates</p>	<p>(Pearson, 2009)</p> <ul style="list-style-type: none"> <li>• Integrated Science for SHS – (Pearson)             <ul style="list-style-type: none"> <li>▪DNA model</li> <li>▪ RNA model</li> <li>▪ Charts of DNA structure and replication</li> <li>▪ Charts of RNA structure and transcription</li> <li>▪ Charts of the process of protein synthesis</li> <li>▪ Garden peas</li> <li>▪ Biological charts showing genetically disorder individuals</li> </ul> </li> </ul> <p>Explain different stages of vertebrates Charts of evolution Charts of comparative anatomy of vertebrates Charts on developmental stages of vertebrates</p>	<p>d. class participation</p> <p>e. Individual presentations,</p> <p>f. Lab works</p> <p>g. Test</p>
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	<p>characters  Discuss: two theories of the mechanisms of evolution, factors affecting evolution and three sources of evolution with evidence</p>	<p><b>21. Evidence of evolution:</b>  EX; fossil records  <b>23. Theories of evolution</b>  a) Lamark's theory  b) Charles Darwin's theory</p>			
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**SEMESTER: TWO**

**GRADE: 11**

**PERIOD: VI**

**TOPIC: CHORDATA: FISHES, AMPHIBIANS AND REPTILES**

OUTCOMES	OBJECTIVES	CONTENTS	ACTIVITIES/ LAB WORKS	MATERIALS RESOURCES	COMP ETENCIES/ ASSESSMENT
<p>Learners are able to realize the economic importance of fishes, amphibians and reptiles and their nutritional values and differentiate between vertebrates and invertebrates</p>	<p>Upon completion of this topic, learners will:</p> <ol style="list-style-type: none"> <li>1. Explain the general characteristics of the phylum Chordata</li> <li>2. Classify the phylum chordata with its three major sub-phyla</li> <li>3. Describe the differences between vertebrates and invertebrates</li> <li>4. List the general characteristics of the fish and explain the differences among the three groups (jawless, cartilaginous and bony)</li> <li>5. Discuss the economic</li> </ol>	<p><b>1. Chordates:</b>            general characteristics: a) primitive chordates - amphioxus b) vertebrate:            i. Primitive fish            ii. Cartilaginous fish            iii. Bony fish            c) differences among the three groups            d) general characteristics of fish            e) Adaptation, locomotion, respiration and economics importance.  <b>2. Amphibians:</b>            general characteristics            a) External &amp; internal features of a frog,            b) metamorphosis  <b>3. Reptiles:</b>            a) general characteristics            b) external &amp; internal</p>	<p><b><u>differentiated learning</u></b></p> <p>Mixed group presentation (gender &amp; ability )</p> <p><b>LAB</b></p> <ol style="list-style-type: none"> <li>1. Identifying and describing the internal and external structures of a fish</li> <li>1. Collecting and dissecting fish and frog to study the digestive and circulatory systems</li> <li>2. Collecting and dissecting a lizard and studying the external features, digestive, circulatory and respiratory systems</li> <li>3. Drawing and labeling the amniotes</li> </ol>	<p><b><u>A. Primary Text</u></b>            Baffour Asante-Owusu, et al. <i>Senior High Biology</i> (Longman, 2009)</p> <p><b><u>B. Secondary Texts</u></b></p> <ul style="list-style-type: none"> <li>• Sue Hocking, et al. <i>OCR Biology</i> (OCR/Heinemann, 2008).</li> <li>• Doris Koto, et al., <i>Senior Secondary Guide – Biology</i> (Pearson, 2000)            Senior Secondary Guide</li> </ul> <p><b><u>C. Other Resources/Supplementary Readings</u></b></p> <ul style="list-style-type: none"> <li>• Bob McDuell, <i>Senior High Integrated Science</i> (Pearson, 2009)</li> <li>• Integrated Science for SHS – (Pearson)</li> <li>• Live frog, fish and lizard</li> <li>• Dissecting sets</li> <li>• Dissecting tray</li> </ul>	<p><b>EXPECTED COMPETENCIES</b></p> <ul style="list-style-type: none"> <li>• Effective communication skills</li> <li>• Analytical and research skills</li> <li>• Research and problem skills</li> <li>• Organizational ability</li> <li>• Digital skills</li> <li>• Creativity and innovation skills</li> </ul> <p><b>ASSESSMENT STRATEGIES to:</b> be used to test for competencies. Select relevant options.</p> <ol style="list-style-type: none"> <li>a. Quizzes</li> <li>b. Class works</li> <li>c. assignments, attendance</li> <li>d. class participation</li> <li>e. Individual presentations,</li> <li>f. Lab works</li> <li>g. Test</li> </ol>

	<p>importance of fishes</p> <p>6. List the general characteristics of amphibians</p> <p>7. Describe the external &amp; internal features of the amphibians using a frog</p> <p>8. Differentiate the structural differences between frog and toad</p> <p>Explain the success of reptiles on land as opposed to amphibians.</p>	<p>features of lizard</p> <p>c) internal fertilization and the amniotic egg</p>	<p>egg and studying the extraembryonic membranes.</p>	<ul style="list-style-type: none"> <li>• Biological charts of amphioxus, shark, fish, amphibians and reptiles</li> <li>• Gloves</li> <li>• Pins</li> <li>• Scissors</li> <li>• Razor blades</li> <li>• Water</li> </ul>	
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**SEMESTER: ONE**

**GRADE: 12**

**PERIOD: I**

**TOPIC: CHORDATA: BIRDS AND MAMMALS**

OUTCOMES	OBJECTIVES	CONTENTS	ACTIVITIES	MATERIALS RESOURCES	Competency/assessment
<p><b>Learners are able to:</b> Distinguish between mammals and describe the control mechanism of human body</p>	<p>Upon completion of this topic, learners will:</p> <ol style="list-style-type: none"> <li>Discuss the general characteristics of birds and mammals</li> <li>Relate the adaptations made by birds for flight</li> <li>Describe the external and internal features of birds</li> <li>Classify mammals on the basis of order, structure, and types of reproduction</li> <li>Outline the functions of each internal organs of</li> </ol>	<p><b>1. Birds:</b> a) general characteristics b) external and internal features c) types of birds (flight and non-flight) d) adaptation to flight e) types of feathers</p> <p><b>2. Mammals:</b> a) general characteristics - male and female reproductive systems b) orders of mammals c) features of each order d) structure of a typical mammalian molar tooth e) dentition and dental formulae</p>	<p><b>Inclusive and differentiated learning</b></p> <p><b>Class Discussion:</b> Listing and describing the f. general characteristics of birds g. internal and external features of birds</p> <p>Listing the general characteristics of mammals a) stating the structures and functions of the male and female reproductive systems b) Describing of the control mechanisms of the body temperature of aquatic, flying and primitive mammals.</p> <p><b>Assignment:</b></p>	<p><b>A. Primary Text</b> Baffour Asante-Owusu, et al. <i>Senior High Biology</i> (Longman, 2009)</p> <p><b>B. Secondary Texts</b></p> <ul style="list-style-type: none"> <li>Sue Hocking, et al. <i>OCR Biology</i> (OCR/Heinemann, 2008).</li> <li>Doris Koto, et al., <i>Senior Secondary Guide – Biology</i> (Pearson, 2000) Senior Secondary Guide</li> </ul> <p><b>C. Other Resources/Supplementary Readings</b></p> <ul style="list-style-type: none"> <li>Bob McDuell, <i>Senior High Integrated Science</i> (Pearson, 2009)</li> <li>Integrated Science for SHS – (Pearson)</li> <li>Charts of birds and mammals</li> <li>Live bird (chicken)</li> <li>Live animal (rat, cat, dog).</li> <li>Chicken eggs</li> </ul>	<p><b>EXPECTED COMPETENCIES</b></p> <ul style="list-style-type: none"> <li>Effective communication skills</li> <li>Analytical and research skills</li> <li>Research and problem skills</li> <li>Organizational ability</li> <li>Digital skills</li> <li>Creativity and innovation skills</li> </ul> <p><b>ASSESSMENT STRATEGIES</b> to be used to test for competencies. Select relevant options:</p> <ol style="list-style-type: none"> <li>Quizzes</li> <li>Class works</li> <li>assignments, attendance</li> <li>class participation</li> <li>Individual presentations,</li> <li>Lab works</li> <li>Test</li> </ol>

	<p>mammals</p> <p>Explain the control mechanisms of body temperature of aquatic, flying and primitive mammals</p>	<p><b>3. Control mechanisms of body temperature of aquatic, flying and primitive mammals</b></p>	<p>Describing features of each order</p> <p>a) Drawing and labeling a typical mammalian molar tooth</p> <p>b) Writing dental formulae of rabbit, dog and man</p> <p><b>LAB</b></p> <p>a. Dissecting a bird to observe the internal and external features.</p> <p>b. Drawing and labeling the three types of feather</p> <p>c. examining and drawing the contents of a real chicken egg</p>	<ul style="list-style-type: none"> <li>• Preserved specimen of birds and mammals</li> </ul>	
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**SEMESTER ONE**

**GRADE: 12**

**PERIOD: II**

**TOPIC : SKELETAL, MUSCULAR AND REPRODUCTIVE SYSTEMS**

OUTCOMES	OBJECTIVES	CONTENTS	ACTIVITIES	MATERIALS RESOURCES	COMPETENCES/ ASSESSMENT
<p><b>Learners are able to:</b> summarize the importance of bones and muscles in body movement and coordination</p> <p>Consider appropriate preventive measures to prevent STIs that destroys the reproductive and the skeletal systems</p> <p>Eloquently discuss the emotions that accompany adolescence sexual developments which will facilitate the way</p>	<p>Upon completion of these topics, learners will:</p> <ol style="list-style-type: none"> <li>List the regions of the human skeletal system</li> <li>State the functions of the human skeletal system</li> <li>Name and describe the locations of the various types of joints</li> <li>List and describe the functions of the three types of muscle tissues</li> <li>Describe the effects of sexually transmitted infections (STIs) and substance abuse on the skeletal and muscular systems</li> </ol> <p>Describe the body changes during</p>	<p><b>1. Division of the human body</b></p> <ol style="list-style-type: none"> <li>(head, neck, trunk and appendages)</li> <li>Body cavities</li> </ol> <p><b>2. Skeletal system:</b></p> <ol style="list-style-type: none"> <li>composition: bones, cartilage, ligaments and tendons</li> <li>Regions: <ol style="list-style-type: none"> <li>axial skeleton</li> <li>appendicular skeleton</li> </ol> </li> <li>Functions of the skeleton/bones</li> <li>Types of joints, functions and locations</li> </ol> <p><b>3. Muscular system:</b></p> <ol style="list-style-type: none"> <li>types and functions of muscle tissues</li> </ol> <p>4. Effects of sexually transmitted infections and substance abuse on the skeletal, muscular and reproductive systems</p> <p>5. Adolescence development</p> <p>6. Gamete formation:</p>	<ol style="list-style-type: none"> <li>Discussion of cell and tissue of the skeletal and muscular systems</li> <li>Drawing and labeling the skeletal and muscular systems</li> <li>Examining and studying bone cells under the microscope</li> <li>Listing the bones of the skeletal system</li> <li>Explaining types and functions of the muscle tissues</li> <li>Listing the effects of Sexually Transmitted Infections (STIs) and substances abuse on the human system and their methods of prevention</li> <li>Describing the stages of adolescence</li> <li>Demonstrating oogenesis and spermatogenesis by use</li> </ol>	<p><b>A. Primary Text</b></p> <p>Baffour Asante-Owusu, et al. <i>Senior High Biology</i> (Longman, 2009)</p> <p><b>B. Secondary Texts</b></p> <p>□ Sue Hocking, et al. <i>OCR Biology</i> (OCR/Heinemann, 2008).</p> <p>□ Doris Koto, et al., <i>Senior Secondary Guide – Biology</i> (Pearson, 2000)</p> <p>Senior Secondary Guide</p> <p><b>C. Other Resources/Supplementary Readings</b></p> <ul style="list-style-type: none"> <li>Bob McDuell, <i>Senior High Integrated Science</i> (Pearson, 2009)</li> </ul>	<p><b>EXPECTED COMPETENCIES</b></p> <ul style="list-style-type: none"> <li>Effective communication skills</li> <li>Analytical and research skills</li> <li>Research and problem skills</li> <li>Organizational ability</li> <li>Digital skills</li> <li>Creativity and innovation skills</li> </ul> <p><b>ASSESSMENT STRATEGIES</b></p> <p>to be used to test for competencies. Select relevant options:</p> <ol style="list-style-type: none"> <li>Quizzes</li> <li>Class works</li> <li>assignment</li> </ol>



<p>to abstinence or prevent of STIs and teenage pregnancy</p>	<p>adolescence development          Explain the functions of the male and female reproductive organs          Draw the male and female reproductive organs          Explain the process of gamete formation          Describe the structure and function of a sperm cell          Explain the menstrual cycle          Explain the reproductive health consequences of Gender Based Violence          Discuss the benefits of family planning and various methods used</p>	<p>i) oogenesis          j) spermatogenesis          7. Male and female reproductive organs          8. Sperm and egg          k) 9. Menstrual cycle          10. Fertilization and conception          l) sex determination          m) infertility          n) 11. Cycles of sexuality          12. Sexually transmitted infections (STIs):          o) -modes of transmission and methods of prevention          13. HIV/AIDS: - immune system, risky behaviors, care and support, stigma and discrimination and importance of testing          14. Gender Based Violence          p) 15. Family Planning          q)</p>	<p>of model and diagram          9. Describing the male and female reproductive organs and their functions          Drawing and labeling          11. the structure of sperm cell          12. Describing the stages of menstrual cycle          13. Explaining fertilization and development of the fetus          14. Stating causes of infertility          15. <b>Group presentation</b> on sexually transmitted diseases, with emphasis on HIV/AIDS          16. Explaining and discussing the reproductive health consequences of gender based violence          Describing the benefits of family planning</p>	<ul style="list-style-type: none"> <li>• Charts of the human skeletal, muscular and reproductive systems</li> <li>• Prepared slides of bone cells and cartilage cells</li> <li>• Chart of the human body regions and cavities</li> <li>• Models and charts of oogenesis and spermatogenesis</li> <li>• Charts of the male and female reproductive organs</li> <li>• Chart of the menstrual cycle</li> <li>• Chart showing stages of fetal development from the zygote (fertilized egg)             <ul style="list-style-type: none"> <li>• Chart of family planning methods</li> </ul> </li> </ul>	<p>nts, attendance          d. class participation          e. Individual presentations,          f. Lab works          g. Test</p>
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**SEMESTER: ONE**

**GRADE: 12**

**PERIOD: III**

**TOPICS: DIGESTIVE, CIRCULATORY AND LYMPHATIC SYSTEMS**

OUTCOMES	OBJECTIVES	CONTENTS	ACTIVITIES	MATERIALS RESOURCES	COMPETENCIES/ ASSESSMENT
<p>Discuss the role of the digestive system and outline the nutritional benefits of eating a balanced diet of locally available food.</p> <p>Appreciate the roles of the circulatory and the lymphatic systems in the process of transporting nutrients and the defense mechanism of the body respectively.</p>	<p>Upon completion of these topics, learners will:</p> <p>Define digestion, state the process and organs that are involved. State the functions of enzyme in the process of digestion</p> <p>Explain nutrition, the classes of food and their specific importance to the body</p> <p>List the components of blood and describe their functions and blood clotting process</p> <p>Discuss the heart, the blood and blood vessels.</p>	<p><b>9. Digestive system:</b></p> <p>a) nutrition – classes of food and their specific uses</p> <p><b>10. Alimentary canal:</b></p> <p>a) mouth (teeth &amp; tongue</p> <p>b) esophagus</p> <p>c) stomach</p> <p>d) intestines, exocrine glands (salivary and pancreatic glands)</p> <p>e) liver &amp; functions</p> <p><b>3.Circulatory system</b></p> <p>a) heart</p> <p>b) blood vessels</p> <p>c) blood cells and plasma</p> <p>b) types of circulations systematic and pulmonary</p> <p><b>4. Blood types and Rh Factor</b></p>	<p>1. Stating the functions of digestive enzymes</p> <p>2. Describing absorption through the villi and hepatic portal veins</p> <p>Listing and describing classes of food and their Importance</p> <p>Discussing the effects of malnutrition on growth and development, and on the immune system</p> <p>Describing the steps or processes of nutrition: digestion -absorption -assimilation</p> <p><b>LAB</b> Drawing and labeling the</p> <p>a. alimentary canal</p> <p>b. the human Heart</p> <p>c. Testing for carbohydrates, proteins and oils</p>	<p><b>A. Primary Text</b></p> <p>Baffour Asante-Owusu, et al. <i>Senior High Biology</i> (Longman, 2009)</p> <p><b>B. Secondary Texts</b></p> <ul style="list-style-type: none"> <li>Sue Hocking, et al. <i>OCR Biology</i> (OCR/Heinemann, 2008).</li> <li>Doris Koto, et al., <i>Senior Secondary Guide – Biology</i> (Pearson, 2000) Senior Secondary Guide</li> </ul> <p><b>C. Other Resources/Supplementary Readings</b></p> <ul style="list-style-type: none"> <li>Bob McDuell, <i>Senior High Integrated Science</i> (Pearson, 2009)</li> <li>Integrated Science for SHS – (Pearson)</li> <li>Charts of: <ul style="list-style-type: none"> <li>a)Circulatory system;</li> <li>d) Heart</li> </ul> </li> </ul>	<p><b>EXPECTED COMPETENCIES</b></p> <ul style="list-style-type: none"> <li>Effective communication skills</li> <li>Analytical and research skills</li> <li>Research and problem skills</li> <li>Organizational ability</li> <li>Digital skills</li> <li>Creativity and innovation skills</li> </ul> <p><b>ASSESSMENT STRATEGIES</b></p> <p>to be used to test for competencies. Select relevant options:</p> <ul style="list-style-type: none"> <li>a. Quizzes</li> <li>b. Class works</li> <li>c. assignments,</li> <li>d. attendance</li> <li>e. class participation</li> <li>f. Individual presentations,</li> <li>g. Lab works</li> <li>h. Test</li> </ul>

	<p>Discuss the lymphatic system and its functions and composition of lymph</p> <p>Describe the structure and functions of lymph nodes</p> <p><b>8.</b> Outline and give the function of other lymphoid organs (tonsils, spleen, thymus)</p>	<p><b>5. Effects of substance abuse on the circulatory system 6. Lymphatic system:</b></p> <p>a) lymph</p> <p>b) lymphatic vessels</p> <p>c) lymph node</p> <p>d) lymphocytes (T-cells and B-cells)</p>	<p>Stating the functions of the liver in digestion</p> <p>Discussing the effects of alcohol &amp; drugs on the organs of these systems</p> <p>Describing the composition of the blood and its functions</p> <p>Explaining the process of blood clotting</p> <p>Listing the various blood groups and the Rh factor</p> <p>Drawing and labeling the heart and liver</p> <p>Studying charts of the lymphatic system</p> <p>Drawing and labeling the lymphatic system</p>	<p>e) Blood vessels</p> <p>f) Digestive system</p> <p>g) Mouth, teeth, tongue</p> <p>h) Esophagus</p> <p>i) Stomach</p> <p>j) Intestine</p> <ul style="list-style-type: none"> <li>• Microscope</li> <li>• Slides</li> <li>• Prepared slides</li> <li>• Peeling needle</li> </ul> <p>Model and charts of the lymphatic system</p>	
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**SEMESTER: TWO**

**GRADE: 12**  
**PERIOD: IV**

**TOPICS : EXCRETORY, RESPIRATORY SYSTEMS AND GASEOUS EXCHANGE: THE PROCESS OF CELLULAR RESPIRATION (GLYCOLYSIS, PYRUVATE AND KREB CYCLE)**

OUTCOMES	OBJECTIVES	CONTENT	ACTIVITIES	MATERIALS/RESOURCES	COMPETENCIES/ASSESSMENT
<p>Take appropriate steps to prevent damage to the excretory and respiratory organs.</p> <p>Demonstrate comprehensive understanding of the excretory and respiratory systems.</p> <p>Realize that the energy released in gaseous exchange (respirations) is key to the survival of all living</p>	<p>Upon completion of these topics, learners will:</p> <ol style="list-style-type: none"> <li>Discuss the excretory system and functions of all associated organs.</li> <li>Explain the homeostatic role of the excretory system</li> <li>State the characteristics of the two types of respiration</li> <li>List the tissues and organs in the</li> </ol>	<p><b>1. Excretory system:</b> organs a) kidneys b) urinary bladder c) Urethra d) Skin, Liver, Lungs e) large intestine</p> <p><b>2. Respiratory system:</b> organs</p> <p><b>3. Kinds of respiration</b> a) internal &amp; external b) phases (inspiration and expiration)</p> <p><b>4. Artificial resuscitation</b></p> <p><b>5. Effects of substance abuse and STIs on the organs of the two systems</b></p> <p><b>6. Definition of cellular respiration</b> (aerobic and anaerobic)</p> <p><b>7. The formation of ATP</b>, a phosphorylated nucleotide</p>	<ol style="list-style-type: none"> <li>Explaining the process of excretion</li> <li>Explain the process of urination</li> <li>Describing the functions of tissues and organs in both external &amp; internal respiration</li> </ol> <p>Describing the lungs and the air passage ways</p> <p><b>LAB</b> Drawing and labeling the longitudinal section of the kidney</p> <p>Class Discussion: the role of the</p>	<p><b>A. Primary Text</b> Baffour Asante-Owusu, et al. <i>Senior High Biology</i> (Longman, 2009)</p> <p><b>B. Secondary Texts</b> <i>Senior secondary guide Biology</i> (star study guide series) Martin Barker &amp; David Darch 2<sup>nd</sup> edition, 2016</p> <ul style="list-style-type: none"> <li>Sue Hocking, et al. <i>OCR Biology</i> (OCR/Heinemann, 2008).</li> <li>Doris Koto, et al., <i>Senior Secondary Guide – Biology</i> (Pearson, 2000)</li> </ul> <p>Senior Secondary Guide 2016 edition,</p>	<p><b>EXPECTED COMPETENCIES</b></p> <ul style="list-style-type: none"> <li>✓ Effective communication skills</li> <li>✓ Analytical and research skills</li> <li>✓ Research and problem skills</li> <li>✓ Organizational ability</li> <li>✓ Digital skills</li> <li>✓ Creativity and innovation skills</li> </ul> <p><b>ASSESSMENT STRATEGIES</b> to be used to test for competencies, select relevant options:</p> <ol style="list-style-type: none"> <li>Quizzes</li> <li>Class works</li> <li>assignments,</li> <li>attendance</li> <li>class participation</li> <li>Individual</li> </ol>

organisms	<p>mechanism of breathing.</p> <p>7. Explain the effects of substance abuse and STIs on the two systems (excretory and respiratory)</p> <p>8. Discuss cellular respiration citing the major sequential stages making a metabolic pathway of numerous reactions (Glycolysis, link reaction, Krebs cycle and electron transport chain)</p>	<p><b>8. An overview of respiration:</b></p> <p>a) glycolysis</p> <p>b) link reaction</p> <p>c) Krebs cycle</p> <p>d) electron transport chain</p> <p><b>9. Coenzymes and respiration</b></p> <p><b>10. Nicotinamide adnine dinucleotide (NAD) and dehydrogenase enzymes</b></p> <p><b>11. Events of glycolysis</b></p> <p><b>12. Pyruvate and its fate</b></p> <p><b>13. Alcoholic fermentation</b> (anaerobic and aerobic respiration in yeast and fruits)</p> <p><b>14. Anaerobic respiration</b> in muscles and Oxygent debt</p> <p><b>15. Recations of the Krebs cycle</b> (tricarboxylic acid – TCA cycle/cirtic acid cycle):</p> <p>a) decarboxylation</p> <p>b) dehydrogenatio</p>	<p>diaphragm, intercostal muscles and ribs in respiration</p> <p>Video/pictures showing the organs affected by substance abuse and STIs</p> <p>Vigorous exercise exemplifying respiration</p> <p><b>LAB</b> Obtaining palm wine and placing it in a plastic gallon to observe alcoholic fermentation</p>	<p>M. Barker et D. Darch</p> <p><b><u>C. Other Resources/Supplementa</u></b></p> <p><b><u>ry</u></b></p> <p><b><u>Readings</u></b></p> <ul style="list-style-type: none"> <li>• Bob McDuell, <i>Senior High Integrated Science</i> (Pearson, 2009)</li> <li>• <b>Charts/poster</b> on kidneys, lungs, skin, and urinary organs</li> <li>• Palm wine</li> <li>• Grape fruits</li> <li>• Plastic gallons</li> <li>• Knife</li> <li>• Strainer</li> <li>• Large container (pan)</li> </ul> <p><b>Internet</b></p> <p><b>YouTube/video projector</b></p>	<p>presentations,</p> <p>g. Lab works</p> <p>h. Test</p>
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	<p>9. Distinguish between aerobic and anaerobic respiration</p> <p>10. Discuss anaerobic respiration in the muscle and yeast/fruits (alcoholic respiration)</p> <p>11. Discuss the significance of phosphorylation in glycolysis</p> <p>12. Identify the final products of glycolysis</p> <p>13. Outline the fate of pyruvate</p> <p>14. Contrast oxidation and reduction with</p>	<p>n</p> <p>c) oxidative phosphorylation</p> <p><b>16. Electron transport chain</b> (Etc) and ATP synthesis:</p> <p>a) flavoproteins</p> <p>b) quinones</p> <p>b) cytochromes</p>			
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	<p>regards to oxygen, hydrogen and electrons</p> <p>15. Distinguish between decarboxylation reactions and dehydrogenation reactions</p> <p>16. Analyze the four main events during glycolysis</p> <p>17. Interpret the summary equation for respiration (<math>C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O</math>)</p> <p>18. Identify the three types of electron carriers</p>				
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	<p>located in the inner membrane of the mitochondria (flavoproteins, quinones and cytochromes)</p> <p>19. Summarize the events in the Krebs cycle</p>				
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**SEMESTER: TWO**

**GRADE: 12**

**PERIOD: V**

**TOPICS : NERVOUS AND ENDOCRINE SYSTEMS (CONTROL AND CO-ORDINATION OF BODY ACTIVITIES)**

Upon the completion of these topics, learners will:

OUTCOMES	OBJECTIVES	CONTENTS	ACTIVITIES	MATERIALS/RESOURCES	COMPETENCIES/ASSESSMENT
<p>Outline the perfect coordination features in the control of body activities by both nervous and chemical control in the body.</p> <p>Work together to prevent: Gender based violence, rape, sexual abuse, STIs and intergenerational sex</p>	<ol style="list-style-type: none"> <li>1. Compare and contrast the operations of the nervous and endocrine systems</li> <li>2. Describe the structure and functions of the brain and a neuron</li> <li>3. Categorize the neurons of the nervous system</li> <li>4. Draw the nervous</li> </ol>	<p><b>1. The nervous system</b></p> <p>a) Composition: - central nervous system -Peripheral nervous system</p> <p><b>2. reflex action</b></p> <p><b>3. The nervous system</b> Spinal cord: (b) (a) structure and function sensory and motor Neurons (c) structure and types</p>	<ol style="list-style-type: none"> <li>1. Listing and describing parts of the nervous system</li> <li>2. Examining and explaining models of the brain and spinal cord</li> <li>4. Identifying various parts of the brain and spinal cord Drawing and labeling the parts of the brain and spinal cord</li> <li>5. Describing the peripheral nervous system</li> <li>6. Describing the</li> </ol>	<p><b>A. Primary Text</b> Baffour Asante-Owusu, et al. <i>Senior High Biology</i> (Longman, 2009)</p> <p><b>B. Secondary Texts</b> □Sue Hocking, et al. <i>OCR Biology</i> (OCR/Heinemann, 2008). Doris Koto, et al., <i>Senior Secondary Guide – Biology</i> (Pearson, 2000) Senior Secondary Guide</p> <ul style="list-style-type: none"> <li>• <i>Senior secondary guide Biology</i> (star study guide series)</li> </ul> <p>Martin Barker &amp; David Darch</p>	<p><b>EXPECTED COMPETENCIES</b></p> <ul style="list-style-type: none"> <li>• Effective communication skills</li> <li>• Analytical and research skills</li> <li>• Research and problem skills</li> <li>• Organizational ability</li> <li>• Digital skills</li> <li>• Creativity and innovation skills</li> </ul> <p><b>ASSESSMENT STRATEGIES</b> to be used to test for competencies. Select relevant options:</p> <ol style="list-style-type: none"> <li>a. Quizzes</li> <li>b. Class works</li> <li>c. assignments,</li> <li>d. attendance</li> </ol>

	<p>system and list the major parts</p> <p>5. Describe the structure and functions of the spinal cord</p> <p>6. Differentiate the various regions of the spinal cord in relations to their function</p> <p>7. Compare the central and peripheral nervous systems in relations to their function</p> <p>8. Differentiate between voluntary and involuntary</p>	<p>Of neurons</p> <p>(d) structure of the brain</p> <p><b>4. Generation and transmission of nerve impulses:</b></p> <p>(a) resting potential</p> <p>(b) action potential</p> <p>(c) refractory period</p> <p>(d) conduction of nerve impulses</p> <p>(e) role of the myelin Sheath</p> <p>(f) synapses and synaptic transmission</p> <p>(g) structure and function of synapse</p> <p><b>5. Voluntary and involuntary</b></p>	<p>structures and functions of the eye and ear</p> <p>7. Explaining reflex reaction</p> <p>8. Listing organs of the nervous system that STIs and substance abuse affect</p> <p>9. <b>CONTINUUM:</b> Drawing on posters, writing poems, composing songs, preparing speeches, planning a peaceful demonstration, planning a radio interview against drug abuse, GBV and Intergenerational sex among young people in the school.</p> <p>Organizing a hot line, where victims can call for help and advice. Involving local NGOs</p>	<p>2<sup>nd</sup> edition, 2016</p> <p><b><u>C. Other Resources/Supplementar</u></b></p> <p><b><u>y</u></b></p> <p><b><u>Readings</u></b></p> <ul style="list-style-type: none"> <li>• Bob McDuell, <i>Senior High Integrated Science</i> (Pearson, 2009)</li> <li>• Charts of nervous system, endocrine system, eye &amp; ear</li> <li>• Dissecting set</li> <li>• Dissecting tray</li> <li>• Microscope</li> <li>• Prepared slides</li> <li>• Model of brain, spinal cord, eye and ear</li> </ul> <p>Internet Cell Phone Poster Sheet Marker Video Projectors Recorder/radio</p>	<p>e. class participation</p> <p>f. Individual presentations,</p> <p>g. Lab works</p> <p>h. Test</p>
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	<p>actions</p> <p>9. Discuss the causes and effects of substance abuse on the nervous system</p> <p>10. Advocate for GBV, rape, sexual harassment, and intergenerational sex</p> <p>11. Explain the effects of some STIs on the nervous system</p> <p>12. Describe the structures and functions of the eye and ear</p> <p>13. Outline the functions of exocrine glands,</p>	<p>actions</p> <p><b>6.</b> Reflexes and reflex arc</p> <p><b>7.</b> Autonomic nervous system: functions and importance</p> <p><b>8.</b> Structure &amp; function of eye and ear</p> <p>9. GBV, Rape and Sexual harassment and Intergenerational sex</p> <p><b>6.</b> Effects of STIs on the organs of the nervous system</p> <p><b>7.</b> Substance abuse:</p> <p><b>9.</b> causes effects and prevention</p> <p><b>Endocrine system</b></p> <p>a) glands</p>	<p>10. Explaining the causes and corrections of vision defects</p> <p>11. Drawing, labeling and discussing, the skin as a sense organ</p> <p>12. Drawing and labeling a typical motor neuron</p> <p>13. Examining the model and chart of mammalian eye</p> <p>14. Drawing and labeling the whole eyeball to show its external and internal structures</p> <p>15. Examining model and charts of the mammalian ear and identifying the</p>		
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	<p>endocrine glands and hormones</p> <p>14. Explain the regulation of hormone secretion through negative feedback</p> <p>Describe the two basic mechanisms of hormones action</p>	<p>b) The role of the testes and ovaries as endocrine glands</p> <p>b)Hormone deficiency diseases</p>	<p>parts</p> <p>16. Drawing and labeling the ear to show its external and internal parts</p>		
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**SEMESTER: TWO**

**GRADE: 12**

**PERIOD: VI**

**TOPIC : HUMAN ECOLOGY, HEALTH, NATURAL RESOURCES AND POLLUTION**

**LEARNING OBJECTIVES**

<b>OUTCOMES</b>	<b>OBJECTIVES</b>	<b>CONTENTS</b>	<b>ACTIVITIES</b>	<b>MATERIALS/ RESOURCES</b>	<b>COMPETENCIES/ ASSESSMENT</b>
<p>Appreciate the importance of conservation of natural resources and the concept that natural resources contribute towards the wealth of a nation</p> <p>Realize that renewable natural resources are regenerated, unlike the non-renewable natural resources which can be exhausted if not used wisely.</p>	<p>Upon the completion of this topic, learners will be able to:</p> <ol style="list-style-type: none"> <li>1. Explain the concept of natural resources</li> <li>2. Distinguish between renewable and non-renewable natural resources</li> <li>3. Discuss the importance of natural resources</li> <li>4. Explain methods of conserving natural resources</li> <li>5. Explain ecosystem approach to natural resource management</li> </ol>	<ol style="list-style-type: none"> <li><b>1. Definition of natural resources</b></li> <li><b>2. Renewable and nonrenewable natural resources</b></li> <li><b>3. Definition and examples of flow renewable resources</b></li> <li><b>4. Conservation of natural resources</b></li> <li><b>5. Definition of pollution</b></li> <li><b>6. Causes of</b></li> </ol>	<ol style="list-style-type: none"> <li><b>1. Group Work (mixed group based on gender and ability)</b> on the importance of conservation or natural resources</li> <li><b>2. Field trips</b> - viewing sites of natural resources such as rain forests, gold mines, diamond mines, rivers, lakes, ocean/beach, coal mine, iron ore, rubber factory, petroleum refinery, etc.</li> <li><b>3. Field trips</b>-To observe:</li> </ol>	<p><b><u>A. Primary Text</u></b> Baffour Asante-Owusu, et al. <i>Senior High Biology</i> (Longman, 2009)</p> <p><b><u>B. Secondary Texts</u></b></p> <ul style="list-style-type: none"> <li>• Sue Hocking, et al. <i>OCR Biology</i> (OCR/Heinemann, 2008).</li> <li>• Doris Koto, et al., <i>Senior Secondary Guide Biology</i> (Pearson, 2000)</li> </ul> <p>Senior Secondary Guide <i>Senior secondary guide Biology</i> (star study guide</p>	<p><b>EXPECTED COMPETENCIES</b></p> <ul style="list-style-type: none"> <li>• Effective communication skills</li> <li>• Analytical and research skills</li> <li>• Research and problem skills</li> <li>• Organizational ability</li> <li>• Digital skills</li> <li>• Patriotism</li> <li>• Creativity and innovation skills</li> </ul> <p><b>ASSESSMENT STRATEGIES</b> to be used to test for competencies. Select relevant options:</p>

<p>Accept the concept that pollution is harmful to human, plant and animal lives.</p>	<p>6. Explain the term <i>pollution</i> and discuss the causes, effects and control methods of pollution</p> <p>7. Explain the importance of immunization as a means of preventing human diseases</p> <p>8. Explain the importance of personal health as well as community health</p> <p>9. State the dangers posed by drugs, alcoholic beverages and smoking</p> <p>10. Define and the term <i>sewage disposal</i> and discuss different methods of sewage disposal</p> <p>11. Identify economic uses of sewage</p> <p>12. Discuss sources of water, modes of contamination and methods of</p>	<p><b>pollution:</b></p> <p>a) air pollution b) water c) Land d) thermal e) noise</p> <p><b>7. Control of pollution</b></p> <p><b>8. vaccination and immunization</b></p> <p><b>9. Personal hygiene</b></p> <p><b>10. Drug abuse</b></p>	<p>a) solar radiation, b) tides c) Winds, etc.</p> <p>4. <b>Field trips to</b> Water sewage treatment plant</p> <p>5. Discussing different methods of sewage disposal</p>	<p>series) Martin Barker &amp; David Darch 2<sup>nd</sup> edition, 2016</p> <p><b><u>C. Other Resources/Supplementary</u></b></p> <p><b><u>Readings</u></b></p> <ul style="list-style-type: none"> <li>• Bob McDuell, <i>Senior High Integrated Science</i> (Pearson, 2009)</li> <li>• Charts of various kinds of natural resources</li> <li>• Samples of natural resources</li> <li>• Beaker</li> <li>• Contaminated water</li> <li>• Microscope</li> <li>• Slides</li> <li>• over slips</li> </ul>	<p>h. Quizzes i. Class works j. assignments, attendance k. class participation l. Individual presentations, m. Lab works Test</p>
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	<p>purification</p> <p>13. Discuss methods of refuse collection and disposal</p> <p>State the importance of first aid and be able to treat a numbers of conditions</p>				
<p>Realize that immunization prevents people against diseases.</p> <p>Accept the concept that drug abuse is harmful to the well-being of people.</p>	<p><b>11.</b></p>	<p><b>12. Community hygiene</b></p> <p><b>13. Sewage disposal:</b></p> <p>a) definitions of sewage and sewage disposal</p> <p>k) methods of sewage disposal</p> <p>l) economic uses of sewage</p> <p><b>14. Water:</b></p> <p>a) Sources</p> <p>b) mode of contamination/pollution</p> <p>c) methods of purification</p> <p><b>15. Refuse collection and disposal</b></p>	<p>7. Discussing uses of sewage</p> <p>8. <b>LAB</b>-Purifying water by boiling, chlorination and sand filtration (pumping water through sand filter to remove particles greater then 0.002mmdiameter).</p> <p>9. Testing water for contaminants</p> <p>10. Filtering contaminated water using clean cloth</p> <p>11. Practicing first aid exercises on partners</p>	<p>Pipette</p> <p>Methylene blue</p> <p>Thermometer</p> <p>Flask</p> <p>Stopper</p> <p>Alcohol</p> <p>Gauze mat</p> <p>Tripod</p> <p>Buncen burner</p> <p>Gas light</p> <p>Clean cloth</p> <p>Funnel</p> <p>Porcelain filter</p> <p>Soil</p> <p>Rocks</p> <p>Coal and coal pot</p> <p>Petroleum product (kerosene, fuel oil)</p> <p>Sand</p> <p>Wood</p>	

			<p>12. Observing nitrogen-fixing bacteria under microscope</p> <p>13. Estimating the alcohol content of various drinks</p>	<p>Chlorine Charts on water purification system Charts on sewage disposal Fertilizers</p>	
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