INTRODUCTION

The overall goal of the course of study in Biology provides learners with the opportunity to learn about variations in the structures and functions of organisms and provides an understanding of the effects of the environment on living things.

The General objectives for Grades 10 – 12 Biology:

1. **Explain the importance of biological knowledge in everyday living.**
2. **Develop an appreciation of nature and its significance in the survival of living things.**
3. **Acquire basic scientific and intellectual skills such as observation, classification and interpretation of data.**
4. **Develop the scientific attitude of problem solving and an acute sense of curiosity, creativity, innovation and critical thinking.**
5. **Comprehend the basic principles associated with the science of life including the impact of negative and positive issues.**

A learner-centered approach is emphasized in this curriculum. This is based on the firm belief that learning becomes more permanent, meaningful and exciting when learners themselves take ownership of the learning process. Instructors are therefore urged to contrive those classroom strategies that engage learners actively in the teaching and learning process.

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
Learners are able to: Acquire the fundamentals of laboratory skills in biology 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.	Upon completion of these topics, learners will: 1. Define biology and discuss some of its branches 2. Discover major contributors to the development of biology 3. Compare the characteristics of living things and non-living things 4. Relate the structures and composition of the cell in relations to their functions 5. Compare the basic functions of tissues, organs and systems 6. Demonstrate the use of the microscope in studying Biology 7. Determine the difference amongst Prokaryotic,	**1. Definition of Biology - Major Branches:** Zoology and Botany along with some other branches of Biology. 2. **Contributors:** Nationality and major contributions: a) Aristotle b) Linnaeus c) Pasteur d) Koch e) Mendel, etc. **3. Characteristics that distinguish Living things from Non-living things:** nutrition, respiration, excretion, irritability, movement, growth and reproduction **4. Characteristics and examples of Euglena**, an organism bordered	**Inclusive and differentiated learning** Mixed group presentation (gender, ability & style) **1. Class discussions:** a. Using concept map, illustrate the branches of biology and other sub branches **b.** Stating the contributions of some scientists to the field of biology **c.** Describing the branches of biology and those specific ones that relates to STIs (Microbiology, Parasitology, Virology, and Bacteriology). **d.** Distinguish the basic characteristics of living things including reproduction.	**A. Primary Text** Baffour Asante-Owusu, et al. *Senior High Biology* (Longman, 2009) **B. Secondary Texts** • Sue Hocking, *et al*. *OCR Biology* (OCR/Heinemann, 2008). • Doris Koto, et al., *Senior Secondary Guide – Biology* (Pearson, 2000) Senior Secondary Guide *Senior secondary guide Biology* (star study guide series) Martin Barker & David Darch 2nd edition, 2016 **C. Other Resources/Supplementary Readings**	**EXPECTED COMPETENCIES** • Effective communication skills • Analytical and research skills • Research and problem solving skills **ASSESSMENT STRATEGIES:** To be used to test for competencies, select relevant options. • Quizzes • Class works • assignments, attendance • class participation • Individual presentations, • Lab works • Test

	Eukaryotic, and Akaryotic cells 8. Discover the difference between the plant and animal cells 9. Examine the movement of substances into and out of the cell 10. Appreciate that all living organisms are made up of cells and that the cell is the building block of life	between animals and plants **5. Biological tool** Light microscopes **6. Cell and Cell Theory** 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	2. **Homework:** Drawing cells (animal & plant) and labeling their parts. 3. **LAB:** a. Learners will draw and label the light Microscope and outline the functions of each part. b. Learners will identify some laboratory materials and apparatus discuss their uses. c. Learners will use microscope to observe: a) onion epidermal cell; b) cheek cells;	Bob McDuell, *Senior High Integrated Science* (Pearson, 2009) Biological charts on branches of biology; Compound light microscopes; Onion bulbs; Tooth picks; prepared slides; Droppers; Razor blade; Iodine solution Links: www.dictionary.com www.khanacademy.com www.biomanbio.com www.biologyjunction.com www.rankred.com www.planeta42.com www.saps.org www.thoughtco.com	

SEMESTER ONE

GRADE: 10
PERIOD: II
TOPIC: THE HIERACHY AND DIVERSITY OF LIVING THINGS; UNICELLULAR ORGANISMS

OUTCOMES	OBJECTIVES	CONTENTS	ACTIVITIES/ LAB WORKS	MATERIALS/ RESOURCES	COMP ETENCIES/ ASSESSENT
Learners are able to: Appreciate the systematic classification of organisms based on their characteristics. Explain the similarities and differences among the five major kingdoms of living things Develop the concept that life evolved from the simplest to the complex forms.	Upon completion of the topic, learners will: 1. Outline the diversity of living things 2. Discuss the basis of taxonomy (classification) 3. Discuss the relationship of viruses bordering between living and non-living things 4. Listing the major characteristics of the kingdoms Monera (bacteria), Protista (protists), Fungi (fungi), Plantae (Plants) and Animalia (animals) 5. Classify organisms into kingdom, phylum, class, order, family, genus and species 6. Explain the basic characteristics of unicellular organisms	**1. Classification and the importance of living things** **2. Classification of organisms into** Kingdom, Phylum, Class, Order, Family, Genus and Species **3. Unicellular organisms** A)STIs-causing agents: Fungus, Bacteria (gonorrhea, syphilis), Virus (HIV/AIDS), Protozoa (Trichomonas(Vaginalis) B. Sporozoa (plasmodium) causes, effects & preventive methods **4. Parasitic protozoa and Diseases they cause (others)** a) Entameba	**Inclusive and differentiated learning** Mixed group presentation (gender, ability & style) 1. List the general characteristics of each kingdom. 2. **LAB** Draw and label one organism each belonging to each of the five kingdoms. 3. Draw and label the structures of unicellular organisms; a. Ameba b. Paramecium c. Euglena. 4. Observing unicellular organisms under a microscope by examining a drop of brackish/pond water containing protozoa. 5. Draw the life cycle of the plasmodium.	**A. Primary Text** Baffour Asante-Owusu, et al. *Senior High Biology* (Longman, 2009) **B. Secondary Texts** Sue Hocking, et al. *OCR Biology* (OCR/Heinemann, 2008). *Senior secondary guide Biology* (star study guide series) Martin Barker & David Darch 2nd edition, 2016 Doris Koto, et al., *Senior Secondary Guide – Biology* (Pearson, 2000) Senior Secondary Guide **C. Other Resources/Supplementary Readings** • Bob McDuell, *Senior High Integrated Science* (Pearson, 2009) • Specimens or diagrams of various organisms, e.g.	**EXPECTED COMPETENCIES** • Effective • communication skills • Analytical and research skills • Research and problem skills • Digital skills • Creativity and innovation skills **ASSESSMENT STRATEGIES:** **To** be used to test for competencies, select relevant options. • Quizzes • Class works • assignments, attendance • class participation • Individual presentations, • Lab works • Test

	7. Name unicellular organisms that are causative agents of diseases and the diseases they cause	histolytica - Amebic dysentery (amebiasis) b) Giardia lamblia – (giardiasis) c) Plasmodium falciparum- (malaria)	6. List and discuss causative agents of STIs and the diseases they cause. 7. Discussion of the effects and preventions of malaria and dysentery.	butterfly, cockroach, snail, earthworm, cat, man, etc. • • Charts on kinds of Protozoans • Compound light microscopes • Empty slides • Prepared slides • Cover slips Links: www.dictionary.com www.khanacademy.com www.biomanbio.com wwwogyjunction.com www.rankred.com www.planeta42.com www.saps.org www.thoughtco.com	

SEMESTER: ONE

GRADE: 10
PERIOD: III
TOPIC: MULTICELLULAR ORGANISMS AND REPRODUCTIVE STRUCTURES

OUTCOMES	OBJECTIVES	CONTENT	ACTIVITIES/ LAB WORKS	MATERIALS/ RESOURCES	COMPETENCIES/ ASSESSMENT
Learners are able to develop the concept that tissues are formed from cells, organs from tissues, and systems from organs Learners are able to choose appropriate methods of preventing parasitic worm infections, pregnancy , STIs and substance (alcohol& Drugs) abuse	Upon completion of this topic, students will be able to: 1. Discuss the functions of the four types of tissues 2. Explain the concept of organ as a combination of tissues and systems as a combination of organs 3. Describe the general characteristics of multicellular organisms 4. Describe the general characteristics and morphological features of sponges and hydra 5. Classify andstructurally differentiate worms	**1.Tissues, Organs, and Systems** **2.General characteristics**a. Sponges b. Hydra 3. Worms: **a)** flat worms Planarian (free living) - blood & liver flukes - tape worms **b)** Parasitic round worms - ascaris - hook worm - filarial worm - trichina worm **c)** Segmented worms - Earth worm and leeches 4. **Human reproductive structures** a. structure and functions of male and female reproductive organs(Naming the male	Explanation of tissues in relation to organs and systems **Assignment :** Draw and label the body structure of a sponge and stating the functions of each labelled parts a. Draw the three different cells of a sponge and stating the function of each b. Draw and label the parts of a hydra and state the functions of each labelled part 5. Explanation of the conditions for the oral transmission of intestinal parasites to their host. 6. Outlining the effects, symptoms and methods of prevention of any intestinal parasite. (measures: washing hands after the use of latrine, before eating and eating well-cooked meat) 7. Dissecting an earth worm and identifying its external and internal features.	**A. Primary Text** Baffour Asante-Owusu, et al. *Senior High Biology* (Longman, 2009) **B. Secondary Texts** • Sue Hocking, et al. *OCR Biology* (OCR/Heinemann, 2008). • Doris Koto, et al., *Senior Secondary Guide – Biology*(Pearson, 2000) Senior Secondary Guide • *Senior secondary guide Biology* (star study guide series) Martin Barker & David Darch 2nd edition, 2016 **C. Other Resources/Supplementary Readings** • Bob McDuell, *Senior High Integrated Science* (Pearson, 2009) • charts on various types of tissues, organs, and systems • charts on various kinds of multicultural invertebrates	**EXPECTED COMPETENCIES** • Effective communication skills • Analytical and research skills • Research and problem skills • Organizational ability • Digital skills • Creativity and innovation skills **ASSESSMENT STRATEGIES:** To be used to test for competencies, select relevant options. • Quizzes • Class works • assignments, attendance • class participation • Individual presentations, • Lab works • Test

	6. Explain parasitism among worms and the alternative hosts considering their life cycles 7. Outline measures for preventing parasitic worm infections 8. Differentiate between the leech and earth worm based on morphology 9. Compare the structures and functions of the human reproductive systems 10. Identify the various stages of the menstrual cycle and explain essence of contraceptive 11. Recognize that substance abuse (alcohol and drugs) is harmful to life.	and female reproductive organs Functions of these organs, Myths about reproduction) b. Human Life cycle: infancy, juvenile, adolescence, adult, senescence-old age (what influences sexual desires (hormones) and how can one control sexual desire) c. Menstruation ✓ Menstruation and pregnancy ✓ Menstrual hygiene c. **Pregnancy and STIs prevention** -Abstinence -Use of condoms (Importance, Challenges/risky behavior & values) - **Contraceptives (Methods** of contraceptives&Role of contraceptive (condom) in STI prevention) 5. **Substance abuse and Sexual desires**	8. Observe and drawthe external structures of: a. filarial worm b. tape worm c. hook worm d. round worm **Individual presentations/ Mixed group presentation (gender, fast, middle and slow learners,**) a. Use visual aids to demonstrate natural family planning method. i) Mention the challenges of this method and why some girls cannot use it. ii) mention that this method of prevention does not prevent STI and HIV. b. Encourage girls to consider double protection. **Drama:** A female refusing to have sex because it's her unsafe period of the menstrual cycle. **Demonstrate** care for oneself during menstruation **Case study** showing what influences sexual desires **Discussion**: Hold class discussion on the effects of hormones, drugs and substance abuse on sexual desires **Roll play** on resisting things that influence sexual desires	including sponges, hydras, etc… • charts/specimens of various kinds of worms • flat worms, • segmented worms • ascaris, • tape worms • earth worms • hook worm • filarial worm • trichina worm • dissecting tray • dissecting set • gloves • beakers • water • Petri dish Links: www.dictionary.com www.khanacademy.com www.biomanbio.comwww.biologyjunction.com www.rankred.com www.planeta42.com www.saps.org www.thoughtco.com	

		a) Definition of Drugs and Substance abuse **- Names of Drugs and Substances commonly abused** **- Classify drugs and Substances abused** **i) alcohol** **ii) narcotics** **iii) opiods etc…** - **Effects of drugs and substance abuse** - **Ways of preventing drugs and substance abuse**	**Experience sharing** by people who succeeded from abstinence **Professional talks or explanation:** Invite a health professional to speak about how contraceptives stop conception. Explain each method including strength and side effects. **Experience sharing:** Considering former drug addict or one who has lived with a drug addict to share the influence of drugs on one's life.		

SEMESTER TWO

GRADE: 10
PERIODS: IV
TOPIC: ARTHROPOD AND BIOLOGICAL CONTROL OF PESTS

OUTCOMES	OBJECTIVES	CONTENT	ACTIVITIES/ LAB WORK	MATERIALS/ RESOURCES	COMP ETENCIES/ ASSESSMENT
Learners are able to classify arthropods, outline the various ways to control pests, and explain the economic importance of some arthropods.	Upon completion of this topic, learners will: 1. Describe and classify arthropods according to their morphology 2. Explain the process of metamorphosis (complete & incomplete) and Ecdysis (molting) in arthropods; 3. Discuss the role of vectors (cockroach, mosquito, house-fly, and tsetse fly)	**1. Arthropod: General characteristics & classification** b) morphology and life processes i) respiration ii) feeding iii) mouth parts and body segments c) c) life cycle: **2. metamorphosis and Molting** (complete and incomplete) **3. Vectors:** (Mosquitoes**,** teste fly, house fly, and cockroach.) General characteristics: - Mouth parts, feeding, life cycle and transmission of diseases.	**Inclusive and differentiated learning** Mixed group presentation (gender, fast, middle and slow learners,) 1. **Field trip**- collection of different species of insect outdoor : butterfly, grasshopper, cockroach, weevils, cotton strainers and housefly and observing their external body structures a) study specimen: grasshopper/locust or cockroach, weevils and cotton stainers 2. Discussing the economic importance of arthropods 3. Diagramming the life cycle of mosquitoes (anopheles) in relationship to the plasmodium (malaria) 4. **Assignment** - Collecting mosquito larvae/wigglers and bringing to the lab for observation.	**A. Primary Text** Baffour Asante-Owusu, et al. *Senior High Biology* (Longman, 2009) **B. Secondary Texts** • Sue Hocking, et al. *OCR Biology* (OCR/Heinemann, 2008). • Doris Koto, et al., *Senior Secondary Guide – Biology* (Pearson, 2000) Senior Secondary Guide • *Senior secondary guide Biology* (star study guide series) Martin Barker & David Darch 2nd edition, 2016 **C. Other Resources/Supplementary Readings** • Bob McDuell, *Senior High Integrated Science* (Pearson, 2009)	EXPECTED COMPETENCIES: • Effective communication skills • Analytical and research skills • Research and problem skills • Organizational ability • Digital skills • Creativity and innovation skills **ASSESSMENT STRATEGIES:** **To** be used to test for competencies, select relevant options. • Quizzes • Class works • assignments, attendance • class participation • Individual presentations,

	4. Explain the general characteristics of butterfly 5. Elaborate on the economics importance of the honey bees and termites 6. Discuss pests, their economic importance and control measures. Describe the features and economic importance of grasshoppers.	4. Caste System in Social Insects 5. .**Economic importance of social insects** **a.** Honey bees **b.** . termites **6. Pests** - Economic importance - Chemical control - Biological control	5. Listing methods of controlling the spread of malaria. 6. Draw and label the parts of each of the classes of arthropods, For instance: grasshopper, mosquitoes, millipede, crab, crayfish, spider, etc. 7. Stating the economic importance of honey bees and terimites 8. Discussing honey bees and termites as social insects.	• Charts on various kinds of arthropods and malaria cycle • Specimens: crab, crayfish, spiders, centipede, millipede, grasshoppers, butterflies cockroaches, weevils and cotton stainers • Insect collecting net • Dissecting set • Dissecting tray and gloves • Hand lenses • Compound microscope Links: www.dictionary.com www.khanacademy.com www.biomanbio.com www.biologyjunction.com www.rankred.com www.planeta42.com www.saps.org www.thoughtco.com	• Lab works Test

SEMESTER: TWO

GRADE: 10
PERIOD: V
TOPIC: PLANT-LIKE ORGANISMS (ALGAE, MOSSES, FERNS) AND PHOTOSYNTHEISIS; FUNNGI
LEARNING OBJECTIVES

OUTCOMES	OBJECTIVES	CONTENT	ACTIVITIES/ LAB WORKS	MATERIALS RESOURCES	COMPETENCIES/ ASSESSMENT
Learners are able to understand that algae are producers of atmospheric oxygen and serve as food for organisms. Learners are able to appreciate that mosses and ferns are non-vascular plants Understand that some fungi are disease causing agents while others are used as food	Upon completion of this topic, Learners will: 1. Describe the general characteristics, structures and life cycles of algae, mosses ferns, and Fungi 2. Explain the economic importance of algae and	**1. Algae:** a) General characteristics b) classification c) phytoplankton (floating microbe) d) green algae e) Spirogyra-reproduction (sexual and asexual) f) Economic importance of algae in food, medicine & industry 1. **Mosses** (e.g. brachymerium and Funaria) a general characteristics b reproduction: alternation of generations	**Inclusive and differentiated learning** Individual work/ Mixed group presentation (gender, fast, middle and slow learners,) 1. Drawing and labeling the parts of a spirogyra 2. Drawing and labeling the stages of sexual reproduction in spirogyra 3. Observing and identifying a piece of molded bread under the microscope, drawing and labeling the parts of the hyphae of a rhizopus. 4. Illustrating the life cycle of rhizopus.	**A. Primary Text** Baffour Asante-Owusu, et al. *Senior High Biology* (Longman, 2009) **B. Secondary Texts** • Sue Hocking, et al. *OCR Biology* (OCR/Heinemann, 2008). • Doris Koto, et al., *Senior Secondary Guide – Biology* (Pearson, 2000) Senior Secondary Guide • *Senior secondary guide Biology* (star study guide series) Martin Barker & David Darch 2nd edition, 2016 **C. Other Resources/Supplementary**	EXPECTED **COMPETENCIES:** • Effective communication skills • Analytical and research skills • Research and problem skills • Organizational ability • Digital skills • Creativity and innovation skills **ASSESSMENT STRATEGIES to** be used to test for competencies, select relevant options: • Quizzes • Class works • assignments, attendance • class participation • Individual presentations,

Explain the processes of Photosynthesis in relation to how autotrophs make their food	fungi to human 3. Describe the process of reproduction in algae 4. Explain types of nutrition of fungi 5. Describe symbiotic relationship of Fungi in relation to *parasitism and saprophytism* 6. List common fungal diseases of plants and animals such as (athlete foot, ringworm	c economic importance 2. Ferns (i.e. Nephrolepis, Platycerium) a general characteristics b reproduction: alternation of generations c economic importance **4. Fungi:** a) General characteristics b) classification c) nutrition d) mode of life - parasitic, saprophytic e) Diseases that affect plants & human; blight, smuts, rust, athletes foot, yeast infection, ringworm and eczema (dishcloth.) f) Economic importance (food, medicine and industry) g) Reproduction (sexual & asexual) **5. Photosynthesis** a) Definition b) conditions of photosynthesis c) leaf adaptation to	5. Explaining the life cycle of a club fungus 6. Collecting and studying a bracket fungus and identifying the annual rings. 7. Stating ways of preventing fungal infections 8. Diagramming reproduction in fungus 9. Drawing and labeling the life cycles of mosses and ferns 10. Experimenting by growing two plants, one in sunlight and one in the shade to observe the effects sunlight on plant growth; 11. Wrapping some leaves of a growing plant with aluminum fold and comparing it with other leaves of the same plants after four days. 12. Testing a leaf for starch 13. Testing to break down cell wall and	**<u>Readings</u>** • Bob McDuell, *Senior High Integrated Science* (Pearson, 2009) • Charts on algae, mosses, ferns & fungi • Specimens (yeast, molded bread) club fungi, bracket fungi • Microscope • Plain slide & prepared slide, cover slips • Droppers • Beakers • Charts on the life cycles of algae, mosses, ferns,and fungi • Specimens of growing plants • Aluminum foil • Empty cans • Boiling water • White tile • Iodine solution • Dropper • Green leaf • Ethanol • Variegated leaf • Test tube • Test tube holder • Test tube rack • Clamp and Clamp stand • Bench lamp • Filter funnel • Aquatic plant Links:	• Lab works • Test

	dishcloth, blight 7. Explain the process of photosynthesis	photosynthesis(light dependent reactions light independent reactions) d products of photosynthesis e) fate of photosynthetic products f) Macronutrients and micronutrients: their effects in photosynthesis	stop the action of enzymes within a leaf 14. Testing to extract chlorophyll 15. Experimenting to demonstrate the need for chlorophyll in photosynthesis	www.dictionary.com www.khanacademy.com www.biomanbio.com www.biologyjunction.com www.rankred.com www.planeta42.com www.saps.org www.thoughtco.com	

GRADE: 10
PERIOD: VI
TOPIC: FLOWERING PLANTS

OUTCOMES	OBJECTIVES	CONTENTS	ACTIVITIES/ LAB WORKS	MATERIALS/ RESOURCES	COMP ETENCIES/ ASSESSMENT
Learning are able to accept that flowering plants are major food producers in the biosphere and are very important in the food chain. Learners are able to appreciate the concept of how water, food and minerals are transported in vascular plants.	Upon completion of this topic, learners will: 1. Identify the characteristics of flowering plants and distinguish them 2. Classify flowering plants into *monocotyledonae*(monocots) and *dicotyledonae* (dicots) 3. Distinguish the structural characteristics of monocots and dicots 4. Describe the structures and functions of roots, stems, and leaves; and flowers in flowering plants. 5. Explain sexual and asexual reproduction in flowering plants 6. Determine the floral formulae of flowers such as flamboyant (*Delonix),* Pride of Barbados (*Caesalpinia*) and Rattle Box (*Crotalaria)* 7. Discuss types of pollination and list agents of pollination 8. Explain the process of zygote and embryo	**1. Flowering plants:** a) classification (monocots & Dicots) b) Success of flowering plants **2. Functions of roots, stems, leaves and flowers** **3. Floral formulae of flowers:** i.e. Flamboyant (Delonix), pride of Barbados (Caesalpinia) and rattle box (Crotalaria). **3. Types of plants tissues** **4. Root system:** a) types b) regions of root tip, c) functions and structures of root hairs **5. Modified roots, stems and leaves** **-tubers,**	1. Drawing and labeling the parts of a complete flower and stating their functions 2. Illustration of the types of vegetative propagation (cutting, grafting, etc) 3. **LAB** Setting up an experiment to demonstrate the two types of germination - using corn seed (kernel) and bean seed.. 4. Examine the internal structure of leaf using the microscope 5. Collecting various fruits and seeds and classifying them into types.	**A. Primary Text** Baffour Asante-Owusu, et al. *Senior High Biology* (Longman, 2009) **B. Secondary Texts** • Sue Hocking, et al. *OCR Biology* (OCR/Heineman n, 2008). • Doris Koto, et al., *Senior Secondary Guide – Biology* (Pearson, 2000) Senior Secondary Guide • *Senior secondary guide Biology* (star study guide series)	**EXPECTED COMPETENCIES:** • Effective communication skills • Analytical and research skills • Research and problem skills • Organizational ability • Digital skills • Creativity and innovation skills **ASSESSMENT STRATEGIES to** be used to test for competencies. Select relevant options: • Quizzes • Class works • assignments, attendance • class participation • Individual presentations, • Lab works • Test

	formation in flowering plants 9. Describe the conditions necessary for seed germination 10. List the types of fruits and explain fruit and seed dispersal 11. Describe plant hormones and their functions 12. Explain transport system in plants 13. Discuss the process of excretion in plants 14. Describe the process of plant growth and development 15. Explain the process of gaseous exchange in plant	**-bulbs;** **- tendrils, runners** **6. Leaf classification and arrangement on stem** **7. Germination: types** (epigeal and hypogeal) - conditions necessary for germination	6. Drawing and labeling cross section of monocot and dicot stems and roots. 7. Explaining the types of pollination and listing agents of pollination 8. Observing the process of transpiration through experiments 9. **Field Trip** Collecting and classifying different kinds of leaves **Class work** Examining sections of stems and roots, showing different stages of primary and secondary growth. 5.	Martin Barker & David Darch 2nd edition, 2016 **C. Other Resources/Supplementary Readings** Bob McDuell, *Senior High Integrated Science* Links: www.dictionary.com www.khanacademy.com www.biomanbio.com www.biologyjunction.com www.rankred.com www.planeta42.com www.saps.org www.thoughtco.com	

	8. Reproduction in flowering plants **9. Kinds of fruits and dispersal of fruits and seeds** –(agents of dispersal) **10. Plant Hormones and Plant growth** **a) Primary and secondary growth in plants** **b) Measurement of growth in plants** **c) Nastic and Tactic Movements in plants** **11. Transport system in vascular plants** a) Movement of water and minerals through plants b) Movement of organic materials from leaves to roots **12 EXCRETION IN PLANTS** **a) Excretory product of plants:** water, carbon(IV) oxide, oxygen, Alkaloids, tannis, resins, acids, gums **13. Pressure flow hypothesis and cytoplasmic streaming of translocation** **14. Transpiration:** advantages and disadvantages		(Pearson, 2009) charts on plant tissues (ground vascular tissues and dermal tissues) Charts on the cross section of decoct stem and monocot stem Microscope and slides Specimens Whistle plant with roots, stem leaves & flowers empty plastic jars/cans Cups Soil Dried seed Variety of fruits		

	15. Environmental factors affecting transpiration **16. Physiological factors affecting the rise of water in xylem:** root pressure, transpiration, cohesion-tension mechanism, adhesion, water potential gradient **17. Gaseous exchange** a) concentration gradient b) structure and function of stomata c) structure and function of lenticels **18. Explanation of metabolic equations** d) $C_6H_{12}O_6 + 6O2 \rightarrow 6CO_2 + 6H_2O$ + Heat energy e) $C_6H_{12}O_6 \rightarrow 2C_2H_5OH + 2CO_2$ + Heat **19. Types of respiration compared** f) facultative aerobic g) facultative anaerobic				

SEMESTER: ONE

GRADE: 11
PERIOD: I
TOPIC : VIRUSES AND BACTERIA

OUTCOMES	OBJECTIVES	CONTENTS	ACTIVITIES/ LAB WORKS	MATERIALS/ RESOURCES	COMPETENCIES/ ASSESSMENT
Learners are able to recognize that viruses and bacteria are causative agents of diseases such as polio, mumps, measles, Ebola, tuberculosis, common cold, some sexually transmitted infections (HIV/AIDS, Herpes) syphilis, gonorrhea etc, while some bacteria are useful to human Learners are able to appreciate preventive measures to avoid risky sexual behavior Describe the structure of a bacteria cell as observed under a microscope Draw and label a typical bacteria cell	Upon completion of these topics, learners will: **1.** List the characteristics of viruses **2.** Classify viruses based on nucleic acid (DNA & RNA) **3.** Explain the life cycle of a virus **4.** List some viral diseases and organisms the attack, modes of transmission and methods of prevention **5.** Describe bacteria of various kinds **6.** Classify bacteria, **7.** List and describe some common bacterial diseases and symptoms **8.** Outline preventive measures of bacterial diseases	**1. Virus: Definition** a) General characteristics b) Composition of viral Structure **2. Classification:** DNA viruses RNA viruses **3. Common viral Diseases:** cold, flu mumps, chicken pox, rabies, polio, HIV/ AIDS **4. Life cycle of a virus** a) Lytic Cycle b) Lysogenic Cycle **5. Sexually transmitted Infections (STIs):** modes of transmission and prevention **6. Structure of bacteriophage**	**Inclusive and differentiated learning** Individual work/ Mixed group presentation (gender, ability & style) 1. Listing and discussing viruses and bacteria that cause diseases. 2. Identifying and listing common viral and bacterial diseases. 3. Discussing STIs caused by viruses and bacterial diseases 4. Mode of transmission and prevention. Discussing the importance of	**A. Primary Text** Baffour Asante-Owusu, et al. *Senior High Biology* (Longman, 2009) • *Senior secondary guide Biology* (star study guide series) Martin Barker & David Darch 2nd edition, 2016 **B. Secondary Texts** • Sue Hocking, et al. *OCR Biology* (OCR/Heinemann, 2008). • Doris Koto, et al., *Senior Secondary Guide – Biology* (Pearson, 2000) Senior Secondary Guide **C. Other Resources/Supplementary Readings** • Bob McDuell, *Senior High Integrated Science* (Pearson, 2009) • Biological charts of the various types of viruses	**EXPECTED COMPETENCIES** • Effective communication skills • Analytical and research skills • Research and problem skills • Organizational ability • Digital skills • Creativity and innovation skills **ASSESSMENT STRATEGIES to** be used to test for competencies, select relevant options. • Quizzes • Class works • assignments, attendance • class participation • Individual presentations, • Lab works • Test

	9. Distinguish between *autotrophic* and *heterotropic* nutrition; and *aerobic*, a*naerobic* and f*acultative* respiration 11.Explain the economic importance of bacteria	7. Bacteria a) definition b) General Characteristic c) Classification and shape d) Composition Structure **8.** Common bacterial Diseases: tuberculosis, tetanus, streptococcus **9.** Sexually transmitted Infections (STIs): a) modes of transmission and prevention	HIV testing and support. 5. Diagramming the life cycle Of bactriophage. 6. Group discussion on the causes and Preventive measure in controlling STIs.	• Chart of HIV trend in Liberia • Prepared slides of bacteria • Charts for the shape and types of bacteria microscope • Microscope • Prepared slides of bacteria • Charts of shapes and types of bacteria Links: www.dictionary.com www.khanacademy.com www.biomanbio.com biologyjunction.com www.rankred.com www.planeta42.com www.saps.org www.thoughtco.com	

SEMESTER: ONE

GRADE: 11
PERIOD: II
TOPIC: NUTRITION AND FOOD PRESERVATION

OUTCOMES	OBJECTIVES	CONTENTS	ACTIVITIES/ LAB WORKS	MATERIALS/ RESOURCES	COMPETENCIES/ ASSESSMENT
Learners are able to realize that different types of food contains nutrients that are required for the production of energy to support life processes Learners are able to apply the proper methods of preserving food to prevent food spoilage and ensure food security	Upon completion of this topic, learners will be able to: 1. Explain the process of nutrition and state why living things need nutrients 2. Outline and classify the types of nutrients found in food 3. Classify food into groups 4. Demonstrate the presence of various nutrients found in food 5. Explain the concept of a balance diet 6. Explain the concept of malnutrition 7. Determine the dental formula of a mammal (amount and arrangement of teeth) 8. Explain the importance of dental care in humans 9. Name and discuss various methods of preserving and storing food	**1.Nutrition - Definition and types:** a) Autotrophic nutrition b) Heterotrophic nutrition c) Holozoic nutrition **2.Food and nutrients** (carbohydrates, lipids, proteins, vitamins, mineral salts and water **3. Balance diet** **4. Malnutrition** **5. Teeth and dental formulae** **6. Dental care** **7. Food Poisoning and its Prevention** **8. Methods and importance of food preservation:** a) drying b)salting c) smoking d) parboiling	**Differentiated learning** Mixed group presentation (gender & ability) **1.** Classifying the nutrients found in different types of food **LAB** Testing for: A. carbohydrate (a) Reducing and non reducing sugar (Benedict's test) (e.g. sucrose) b) starch (the iodine/potassium iodide test) B. lipid-(the emulsion test) C. proteins (biuret test)	• **Primary Text** Baffour Asante-Owusu, et al. *Senior High Biology* (Longman, 2009) • **Secondary Texts** • Sue Hocking, et al. *OCR Biology* (OCR/Heinemann, 2008). • Doris Koto, et al., *Senior Secondary Guide – Biology* (Pearson, 2000) Senior Secondary Guide • *Senior secondary guide Biology* (star study guide series) Martin Barker & David Darch 2nd edition, 2016 **C. Other Resources/Supplementary Readings** • Bob McDuell, *Senior High Integrated Science* (Pearson, 2009) • Glucose solution • Benedict's solution • Fehling's solution • Test tubes • Test tube rack	**EXPECTED COMPETENCIES** • Effective communication skills • Analytical and research skills • Research and problem skills • Organizational ability • Digital skills • Creativity and innovation skills **ASSESSMENT STRATEGIES** to be used to test for competencies. select relevant options: • Quizzes • Class works • assignments, attendance • class participation • Individual presentations, • Lab works • Test

	10. Explain methods of preserving food using local resources 11. Explain other methods of food preservation in West Africa 12. Explain the biological basis for preserving and storing food	e) dehydration g)refrigeration h) frying i) use of oil j) heating	2. Using preservative methods on samples of food and comparing them with other food stuffs that have not been preserved	• Cassava • Potatoe • Iodine • Potassium • • Filter paper • Ethyl alcohol • Egg albumin • Milk • Copper (II) sulphate • Syringe • Droppers • Orange juice • Lemon juice • Grapefruit juice • Diclorophenolindophenol (DCPIP) dye • Ascorbic acid • Pipette • Sodium hydroxide solution • Filter paper • Distill water • Groundnuts, fish, milk and pawpaw • Mortar and pestle • Specimens of various food stuffs • Salt • Incubator • Fire wood • Locally made dryer • Charcoal • Coal pot • Pot • Palm oil	

				. . vitamin C Links: www.dictionary.com www.khanacademy.com www.biomanbio.com www.biologyjunction.com www.rankred.com www.planeta42.com www.saps.org www.thoughtco.com	

SEMESTER ONE

GRADE: 11
PERIOD: III
TOPICS: SOIL, ENERGY AND ECOLOGY – PATTERNS IN NATURE

OUTCOMES	OBJECTIVES	CONTENTS	ACTIVITIES/ LAB WORKS	MATERIALS/ RESOURCES	COMP ETENCIES/ ASSESSMENT
Learners are able to campaign for the proper disposal of non-biodegradable substances (plastics) into the environment and the maintenance of soil fertility for proper yield of food and cash crops Learners are able to appreciate the ecosystem and the interdependence of organisms within ecosystems. Distinguish the different types of soil (loamy, sandy, and clay soil)	Upon completion of these topics, learners will: **1.** Define Soil and state the composition of soil **2.** State the effects of erosion and the overuse of soil on soil fertility **3.** Explain the processes of soil conservation, maintenance, and renewal of soil fertility **4.** Explain the advantages and disadvantages of the slash and burn methods in farming **5.** Distinguish between habitat and niche	**1. Soil:** a. formation and composition b. types of soil c. soil fertility d. erosion: causes and prevention e. conservation f. maintenance g. renewal of soil fertility 2. Weathering (a) Physical weathering (b) Chemical weathering' **Liberia food and cash crops production** **Effects of non- biodegradable substances on soil fertility** **Isolation mechanisms of species** **Inter-specific interactions** (Biological associations) (a) mutualism (b) commensalism (c) predation (d)parasitism (e) competition **Trophic levels:** (a) producers (b) consumers	**Differentiated learning** Mixed group presentation (gender & ability) 1. Explaining of soil formation 2. **Lab Work**: a) Collecting, observing and classifying soil types b)Listing and discussing the composition of soil c) Demonstrating the presence of air in the soil (moisture content) d) food chains and food webs e)diagramming and discussing – water, carbon, nitrogen,	**A. Primary Text** Baffour Asante-Owusu, et al. *Senior High Biology* (Longman, 2009) **B. Secondary Texts** • Sue Hocking, et al. *OCR Biology* (OCR/Heinemann, 2008). • Doris Koto, et al., *Senior Secondary Guide – Biology*(Pearson, 2000) Senior Secondary Guide *Senior secondary guide Biology* (star study guide series) Martin Barker & David Darch 2nd edition, 2016 **C. Other Resources/Supplementary**	EXPECTED COMPETENCIES • Effective communication skills • Analytical and research skills • Research and problem skills • Organizational ability • Digital skills • Creativity and innovation skills **ASSESSMENT STRATEGIES** **to** be used to test for competencies. Select relevant options: • Quizzes • Class works • assignments, attendance • class participation • Individual presentations, • Lab works • Test

	6. Describe the concept of ecological succession 7. Define and calculate (population growth, doubling time & percentage growth rate, death & birth rates and explain the concept of population diversity) **8.** Describe inter-specific and intra-specific interactions among organisms **9.** Discuss the ecosystem (food chains, food webs, pyramids of numbers, pyramid of energy **10.** Define the productivity of an ecosystem and distinguish between gross primary productivity and net primary productivity **11.** Discuss energy flow through the trophic levels, the water cycle, the carbon dioxide cycle, the nitrogen cycle, the phosphorus cycle and the sulfur cycle	(c) decomposers (d) Food chains and webs **Conservation of nature** (c) soil conservation (b) forest conservation (c) wildlife conservation (d) oil conservation (e) mineral conservation **9. Biocycles in nature** (a) the water cycle (b) the carbon cycle (c) the nitrogen cycle (d) the phosphorus cycle (e) the sulfur cycle **10.Organisms habitat and niche** **11. population:** 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 **11.Ecological succession:** (a) primary and secondary successions (b) pioneer and climax communities	phosphorus and sulfur cycles. 3. **Field Trip:** **a.** Observing and discussing the effects of erosion on soil fertility **b.** Digging in the school yard/ dump sites to observe non-biodegradable substances (plastic and metallic materials) **c.** Listing food and cash crops in Liberia and considering the type of soil for cultivation **d.** Discussing the various inter-specific interactions between species **e.** Taking field trips to visit ecosystems such as ponds and forest regions	**Readings** • Bob McDuell, *Senior High Integrated Science* (Pearson, 2009) • Samples of different types of soil • Empty cups and jars • Plastic materials • Shovel • Charts of inter-specific interactions • Diagrams of trophic levels • Charts of biocycles Links: www.dictionary.com www.khanacademy.com www.biomanbio.com www.biologyjunction.com www.rankred.com www.planeta42.com www.saps.org • www.thoughtco.com •	

	12. Distinguish between immigration and emigration				

SEMESTER: TWO

GRADE: 11
PERIOD: IV
TOPIC : CELL GROWTH AND DIVISION (MITOSIS AND MEIOSIS); REPRODUCTION

OUTCOMES	OBJECTIVES	CONTENTS	ACTIVITIES/ LAB WORKS	MATERIALS/ RESOURCES	COMP ETENCIES/ ASSESSMENT
Learners are able to accept that reproduction is a characteristic of living things and it begins with cell division Learners are able to understand the various roles and responsibilities in parenting, reproductive health and rights and how to avoid un planned pregnancies Learners are able to work together with peers to establish an environment free of substance abuse	Upon completion of the topic, learners will: 1. Describe the stages of the cell cycle 2. List and diagram the phases of mitosis and meiosis 3. Distinguish mitosis and meiosis and explain the importance of meiosis in sexual reproduction 4. Distinguish between asexual and sexual reproduction 5. List and explain some forms of asexual reproduction in plants and animals 6. Discuss reproduction and parenting in humans (sexuality) 7. Recognize sexual decisions that has impact on the Family	**1. Cell growth & Division** a) Cell cycle b) Phases of Mitosis c) Meiosis Phases of Meiosis 2. **Reproduction** Types of Reproduction i) Asexual : fission, budding, vegetative propagation, cloning ii) Sexual :Conjugation, formation of male and female gametes (meiosis), fusion of gametes (fertilization) **Responsibilities of parenting** ✓ What are the roles of each parent in child rearing Risk of teenage parenting	1. Drawing and labeling stages of mitosis and meiosis 2. Distinguishing mitosis and meiosis 3. Explaining gametes formation 4. Explaining terms such as gametes, diploid, haploid **LAB** 5. Examining thin slices of onion root tip to study the stages of mitosis under the microscope **Individual writing**: What kind of family you intend to have in 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. **Personal Experience sharing:** 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.	**A. Primary Text** Baffour Asante-Owusu, et al. *Senior High Biology* (Longman, 2009) **B. Secondary Texts** • Sue Hocking, et al. *OCR Biology* (OCR/Heinemann, 2008). • Doris Koto, et al., *Senior Secondary Guide – Biology* (Pearson, 2000) Senior Secondary Guide **C. Other Resources/Supplementary Readings** Bob McDuell, *Senior High Integrated Science* (Pearson, 2009) Microscopes Slides Onion bulbs	**EXPECTED COMPETENCIES** • Effective communication skills • Analytical and research skills • Research and problem skills • Organizational ability • Digital skills • Creativity and innovation skills **ASSESSMENT STRATEGIES** **to** be used to test for competencies. Select relevant options: • Quizzes • Class works • assignments, attendance • class participation • Individual presentations, • Lab works • Test

	8. Initiate advocacy on substance abuse and SBV	**Sexual Decisions and Impact on the Family** ✓ Making healthy decision on sexual issues ✓ Impact of these decisions on the family a) reproductive health and rights b) b)infertility cycles of sexuality **Consequences of sexual decision making** Decision making about sex Reproductive health and rights **Advocacy** Role of youth in stopping substance abuse Role of the youth in stopping SBV	**Role plays:** To prevent teenage parenting. 1. A girl/boy effectively refusing to have sex 2. A girl/boy discouraging another from joining a group of peers who take alcohol to avoid risky situations against early sex 3. Steps in the correct use of condoms. Do this several times to ensure the students understand the steps. Two girls sharing the challenges they have experienced with their family planning and how they have overcome them. **Role play** showing young people refusing to have sex before completing high school **Sharing experiences** on making sexual decisions (e.g. waiting to have sex when they are older with a person they love and have known for a long time, using contraceptives, condom, absenteeism, delay child bearing, etc.) **Discussio**n: sexual decisions and impact on individual and family. **Skit** on negative and positive decision making about sex **Role play** of parental influence in decision making (Negative and Positive) **Role Play** of the importance of reproductive health rights and how they empower teenagers to make the right decisions about their sexuality.	Scalpels Charts of mitosis and meiosis Methylene blue (chemical) Razor blades Dropper Beakers Posters and charts Links: www.dictionary.com www.khanacademy.com www.biomanbio.com www.biologyjunction.com www.rankred.com www.planeta42.com www.saps.org www.thoughtco.com	

			Draw on posters, write poems, compose songs, prepare speeches, plan a peaceful demonstration, plan a radio interview… 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. **Involve local NGOs**		

SEMESTER: TWO

GRADE: 11
PERIOD: V
TOPIC : GENETICS (NUCLEIC ACIDS, PROTEIN SYNTHESIS, and HEREDITY), SEXUALITY AND EVOLUTION

OUTCOMES	OBJECTIVES	CONTENTS	ACTIVITIES/LAB WORKS	MATERIALS RESOURCES	COMPETENCIES/ ASSESSMENT
Learners are able to acquire the concept that DNA and RNA are the Principal transmitters of genetic characteristics, gene interaction, and genetic variation 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 when selecting a partner.	Upon completion of these topics, learners will: 1. Explain the term nucleic acids and name the types of nucleic acids 2. Describe the double helix model of DNA structure 3. Outline the process of DNA replication and RNA transcription 4. Explain the process of protein synthesis and give examples of the proteins synthesized in humans 5. Explain the meaning of genetics,	**1. The types of nucleic acids and their structures** a) DNA b) RNA **Types of RNA** **2. Structures of nucleotides and Complementary based pairing** **3. DNA replication and RNA transcription** **4. Stages of protein synthesis** **5. The importance of protein synthesis** **6. Genetics and Heredity :** a) principles of genetics b) Mendel's experiment with garden peas; c) Genetic terms: phenotype, genotype, alleles, hybrid, homozygous, heterozygous, monohybrid, dihybrid, genes (dominant and recessive) **7. Hereditary Traits:**	**Differentiated learning** Mixed group presentation (gender & ability) 1. Using DNA model to demonstrate the process of DNA replication 2. Using charts to explain the process of RNA transcription 3. Using chart to demonstrate the process of protein synthesis 4. Describing Mendel's contributions to	**A. Primary Text** Baffour Asante-Owusu, et al. *Senior High Biology* (Longman, 2009) **B. Secondary Texts** • Sue Hocking, et al. *OCR Biology* (OCR/Heinemann, 2008). • Doris Koto, et al., *Senior Secondary Guide – Biology* (Pearson, 2000) Senior Secondary Guide **C. Other Resources/Supplementary Readings** • Bob McDuell, *Senior High Integrated Science* (Pearson, 2009) • Integrated Science for SHS – (Pearson) ▪DNA model ▪ RNA model ▪ Charts of DNA ▪ ▪ structure and replication	**EXPECTED COMPETENCES** - • Effective communication skills • Analytical and research skills • Research and problem skills • Organizational ability • Digital skills • Creativity and innovation skills **ASSESSMENT STRATEGIES to** be used to test for competencies, select relevant options. • Quizzes • Class works • assignments, attendance • class participation • Individual presentations, • Lab works • Test

	heredity, and sexuality 6. Describe how trait are passed from parents to offspring 7. Explain Mendel's contributions to the understanding of the principles of heredity 8. Demonstrate genetic principles on Mendel's experiment with garden peas. 9. Discuss linkage and sex-linked characters 10. Discuss: Darwin's and Lamarck's theories of evolution, factors affecting evolution and three sources of evolution with evidence 11. List the various types of blood group, and state the type of blood needed for transfusion to	hemophilia, mental disorder, sickle cell, color blindness, baldness, ear lobes, etc. a) Influence of environment on heredity b) Development of traits: Intelligence **8. The ABO blood grouping and rhesus factor** **9. Evolution and natural selection (Darwin's Theory)** **10. Sexuality:** sex determination (X and Y chromosomes) **11. Variation**: a)continuous variation c) discontinuous variations **12. Sources of variation:** a) crossing over b) independent assortment a)random fusion of gametes **13. Causes of variation:** a) genetic factors b) Environmental factors **14. Consequence of variation**– natural selection **15. Population genetics** **16. Convergent and Divergent of evolution**	principles of heredity 5. Describing Mendel's experiments and results 6. Solving monohybrid and dihybrid problems using punnett square and stating the importance of the punnett square 7. Discussing some genetic disorders and diseases. 8. Outlining similarity. and differences among different species of vertebrates .	▪ Charts of RNA structure and transcription ▪ Charts of the process of protein synthesis ▪ Garden peas ▪ Biological charts showing genetically disorder individuals Explain different stages of vertebrates Charts of evolution Charts of comparative anatomy of vertebrates Charts on developmental stages of vertebrates Links: www.dictionary.com www.khanacademy.com www.biomanbio.com www.biologyjunction.com www.rankred.com www.planeta42.com www.saps.org www.thoughtco.com	

	specific blood groups	**17. Evidence of evolution:** EX; fossil records **18. Theories of evolution** a) Lamark's theory b) Charles Darwin's theory			

SEMESTER: TWO

GRADE: 11
PERIOD: VI
TOPIC: VERTEBRATES: (FISHES, AMPHIBIANS AND REPTILES)

OUTCOMES	OBJECTIVES	CONTENTS	ACTIVITIES/ LAB WORKS	MATERIALS RESOURCES	COMP ETENCIES/ ASSESSMENT
Learners are able to realize the economic importance of fishes, amphibians and reptiles appreciate their nutritional values and differentiate between vertebrates and invertebrates	Upon completion of this topic, learners will: 1. Explain the general characteristics of the phylum Chordata (Vertebrates) 2. Describe the differences between vertebrates and invertebrates 3. List the general characteristics of the fish and explain the differences among the three groups (jawless, cartilaginous and bony) 4. Discuss the economic importance of fishes 5. List the general characteristics of amphibians 6. Describe the external & internal features of the amphibians using a frog 7. Differentiate the structural differences between frog and toad	**1. Vertebrates:** general characteristics of Vertebrates: Fishes a) general characteristics of fishes i. Jawless fish ii. Cartilaginous fish iii. Bony fish b) differences amongst the three groups of fishes c) Adaptation, locomotion, respiration and economics importance. **2. Amphibians:** general characteristics a) External & internal features of a frog, b) Life cycle **3. Reptiles:** a) general characteristics	**<u>differentiated learning</u>** Mixed group presentation (gender & ability) **LAB** **1.** Identifying and describing the internal and external structures of a fish 1. Collecting and dissecting fish and frog to study the external and internal structures 2. Collecting and dissecting a lizard and studying the external and internal structures , 3. Drawing and labeling the amniotes egg and highlighting	**<u>A.</u> <u>Primary Text</u>** Baffour Asante-Owusu, et al. *Senior High Biology* (Longman, 2009) **<u>B.</u> <u>Secondary Texts</u>** • Sue Hocking, et al. *OCR Biology* (OCR/Heinemann, 2008). • Doris Koto, et al., *Senior Secondary Guide – Biology* (Pearson, 2000) Senior Secondary Guide **<u>C. Other Resources/Supplementary Readings</u>** • Bob McDuell, *Senior High Integrated Science* (Pearson, 2009) • Integrated Science for SHS – (Pearson) • Live frog, fish and lizard • Dissecting sets • Dissecting tray	**EXPECTED COMPETENCIES** • Effective communication skills • Analytical and research skills • Research and problem skills • Organizational ability • Digital skills • Creativity and innovation skills **ASSESSMENT STRATEGIES to:** be used to test for competencies. Select relevant options. • Quizzes • Class works • assignments, attendance • class participation • Individual presentations, • Lab works • Test

	8. List the general characteristics of reptiles 9. Describe the external and internal features of reptiles using a lizard 10. Explain the success of reptiles on land as opposed to amphibians.	b) external & internal features of lizard c) internal fertilization and the amniotic egg	the extraembryonic membranes.	• Biological charts of , shark, fish, various amphibians and reptiles • Gloves • Pins • Scissors • Razor blades • Water Links: www.dictionary.com www.khanacademy.com www.biomanbio.com www.biologyjunction.com www.rankred.com www.planeta42.com www.saps.org www.thoughtco.com	

SEMESTER: ONE

GRADE: 12
PERIOD: I
TOPIC: CHORDATA: AVES (BIRDS) AND MAMMALS

OUTCOMES	OBJECTIVES	CONTENTS	ACTIVITIES	MATERIALS RESOURCES	COMPETENCY/ ASSESSMENT
Learners are able to: Distinguish between mammals and birds; describe the control mechanism of human body	Upon completion of this topic, learners will: 1. Discuss the general characteristics of birds and mammals 2. Relate the adaptations of birds to flight 3. Describe the external and internal features of birds 4 Classify mammals on the basis of class, structure, and types of reproduction 5. Explain the control mechanisms of body temperature in mammals	**1. Birds:** a) general characteristics b) external and internal features (structural adaptation) c) c) types of birds (flight and flightless) d) adaptation to flight e) types of feathers **2. Mammals:** a) general characteristics - b) classes of mammals c) features of each class d) structure of a typical mammalian molar tooth e)dentition and dental formulae	**Inclusive and differentiated learning** **Class Discussion**: Listing and describing the general characteristics of birds; internal and external features of birds Listing the general characteristics of mammals b) Describing control mechanisms of the body temperature in mammals. **Assignment**: Describing features of each class of mammals a) Drawing and labeling a typical mammalian molar tooth b) Writing dental formulae of rabbit, dog and man **LAB** a. Dissecting a bird to observe the internal and external features.	**A. Primary Text** Baffour Asante-Owusu, et al. *Senior High Biology* (Longman, 2009) **B. Secondary Texts** • Sue Hocking, et al. *OCR Biology* (OCR/Heinemann, 2008). • Doris Koto, et al., *Senior Secondary Guide – Biology* (Pearson, 2000) Senior Secondary Guide **C. Other Resources/Supplementary Readings** • Bob McDuell, *Senior High Integrated Science* (Pearson, 2009) • Integrated Science for SHS – (Pearson) • Charts of birds and mammals • Live bird (chicken) • Live mammal (rat, cat, dog. • Chicken eggs • Preserved specimen of birds and mammals	**EXPECTED COMPETENCIES** • Effective communication skills • Analytical and research skills • Research and problem skills • Organizational ability • Digital skills • Creativity and innovation skills **ASSESSMENT STRATEGIES to** be used to test for competencies. Select relevant options: • Quizzes • Class works • assignments, attendance • class participation • Individual presentations, • Lab works • Test

		3. **Control mechanisms** of body temperature in mammals	b. Drawing and labeling the three types of feather c. examining and drawing the contents of a chicken egg	Links: www.dictionary.com www.khanacademy.com www.biomanbio.com www.biologyjunction.com www.rankred.com www.planeta42.com www.saps.org www.thoughtco.com	

SEMESTER ONE

GRADE: 12
PERIOD: II
TOPIC : SKELETAL, MUSCULAR AND REPRODUCTIVE SYSTEMS

OUTCOMES	OBJECTIVES	CONTENTS	ACTIVITIES	MATERIALS RESOURCES	COMPETENCIES/ ASSESSMENT
Learners are able to: summarize the importance of bones and muscles in the body for movement and coordination Consider appropriate preventive measures to prevent STIs that affects the reproductive and systems discuss the emotions that accompany adolescence sexual developments which will facilitate the way to abstinence or prevention of STIs and	Upon completion of these topics, learners will: 1. State the functions of the human skeletal system 2. List the regions of the human skeletal system 3. Name and describe the locations of the various types of joints 4. List and describe the functions of the three types of muscle tissues 5. Describe the effects of sexually transmitted infections (STIs) and substance abuse on the muscular systems 6. Describe the body changes during adolescence development 7. Explain the functions of the male and female reproductive organs	**1. Division of the human body** a) (head, neck, trunk and appendages) b) Body cavities **2. Skeletal system:** a)composition: bones, cartilage, ligaments and tendons b)Regions: i)axial skeleton ii)appendicular skeleton c) Functions of the skeleton/bones d) Types of joints, functions and locations **3.** Muscular system: a) types and functions of Muscles .4. Reproductive System a)Adolescence development b). Gamete formation: i)oogenesis ii)spermatogenesis 5. Male and female reproductive organs 6. Sperm and egg	1. Discussion of cells, tissues, and organs of the skeletal and muscular systems 2. Drawing and labeling the skeletal and muscular systems 3. Examining and studying bone cells under the microscope 4. Listing the bones of the skeletal system 5. Explaining types and functions of muscle 6. Listing the effects of Sexually Transmitted Infections (STIs) and substances abuse on the human system and their methods of prevention 7. Describing the stages of adolescence	**A. Primary Text** Baffour Asante-Owusu, et al. *Senior High Biology* (Longman, 2009) **B. Secondary Texts** Sue Hocking, et al. *OCR Biology* (OCR/Heinemann, 2008). Doris Koto, et al., *Senior Secondary Guide – Biology* (Pearson, 2000) Senior Secondary Guide **C. Other Resources/Supplementary Readings** • Bob McDuell, *Senior High Integrated Science* (Pearson, 2009) • Charts of the human skeletal, muscular and reproductive systems • Prepared slides of bone cells and cartilage cells • Chart of the human body regions and cavities	**EXPECTED COMPETENCIES** • Effective communication skills • Analytical and research skills • Research and problem skills • Organizational ability • Digital skills • Creativity and innovation skills **ASSESSMENT STRATEGIES to** be used to test for competencies. Select relevant options: • Quizzes • Class works • assignments, attendance • class participation • Individual presentations, • Lab works • Test

teenage pregnancy	8. Draw the male and female reproductive organs 9. Explain the process of gamete formation 10. Describe the structures and functions of a sperm cell 11. Explain the menstrual cycle 12. Explain the reproductive health consequences of Gender Based Violence 13. Discuss the benefits of family planning and various methods used	7. Menstrual cycle 8. Fertilization and conception i)sex determination ii)infertility 9.. Cycles of sexuality 10.. Sexually transmitted infections (STIs): -modes of transmission and methods of prevention 11.. HIV/AIDS: - immune system, risky behaviors, care and support, stigma and discrimination and importance of testing 12.. Gender Based Violence 13. Family Planning	8. Demonstrating oogenesis and spermatogenesis by use of models and diagrams 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. **Group presentation** 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	• Models and charts of oogenesis and spermatogenesis • Charts of the male and female reproductive organs • Chart of the menstrual cycle • Chart showing stages of fetal development from the zygote (fertilized egg) • Chart of family planning methods Links: www.dictionary.com www.khanacademy.com www.biomanbio.com www.biologyjunction.com www.rankred.com www.planeta42.com www.saps.org www.thoughtco.com	

SEMESTER: ONE

GRADE: 12
PERIOD: III
TOPICS: DIGESTIVE, CIRCULATORY AND LYMPHATIC SYSTEMS

OUTCOMES	OBJECTIVES	CONTENTS	ACTIVITIES	MATERIALS RESOURCES	COMPETENCIES/ ASSESSMENT
Discuss the role of the digestive system and outline the nutritional benefits of eating a balanced diet of locally available food. Appreciate the roles of the circulatory and the lymphatic systems in the process of transporting nutrients and the defense mechanism of the body respectively.	Upon completion of these topics, learners will: **1.** Define digestion, state the processes and list the organs that are involved. **2.** State the functions of enzyme in the process of digestion **3.** Explain nutrition, the classes of food and their specific importance to the body **4.** List the components of blood and describe their functions and the process of blood clotting **5.** Discuss the heart, the blood and blood vessels. **6.** Discuss the lymphatic system and its functions	**1. Digestive system:** a) nutrition – classes of food and their specific uses **2. Alimentary canal:** a) mouth b) esophagus c) stomach d) intestines, e) Accessory Organs exocrine glands (salivary and pancreatic glands, teeth and tongue) f) liver & functions **3.Circulatory system** a) heart b) blood vessels c) blood cells and plasma b) types of circulations (systematic and pulmonary) **4. Blood types and Rh Factor** **5. Effects of substance**	1. Stating the functions of digestive enzymes 2. Describing absorption through the villi and hepatic portal veins Listing and describing classes of food and their importance Discussing the effects of malnutrition on growth and development, and on the immune system Describing the steps or processes of nutrition: digestion -absorption -assimilation **LAB** Drawing and labeling the a. alimentary canal b. the human Heart c. Testing for carbohydrates, proteins and oils	**A. Primary Text** Baffour Asante-Owusu, et al. *Senior High Biology* (Longman, 2009) **B. Secondary Texts** • Sue Hocking, et al. *OCR Biology* (OCR/Heinemann, 2008). • Doris Koto, et al., *Senior Secondary Guide – Biology* (Pearson, 2000) Senior Secondary Guide **C. Other Resources/Supplementary Readings** • Bob McDuell, *Senior High Integrated Science* (Pearson, 2009) • Integrated Science for SHS – (Pearson) • Charts of: a)Circulatory system and Lymphatic System; b) Heart c) Blood vessels	**EXPECTED COMPETENCIES** • Effective communication skills • Analytical and research skills • Research and problem skills • Organizational ability • Digital skills • Creativity and innovation skills **ASSESSMENT STRATEGIES** **to** be used to test for competencies. Select relevant options: • Quizzes • Class works • assignments, • attendance • class participation • Individual presentations, • Lab works • Test

	and composition of lymph **7.** Describe the structure and functions of lymph nodes **8.** Outline and give the function of other lymphoid organs (tonsils, spleen, thymus)	**abuse on the circulatory system** **6. Lymphatic system:** a) lymph b) lymphatic vessels c) lymph node d) lymphocytes (T-cells and B-cells)	Stating the functions of the liver in digestion Discussing the effects of alcohol & drugs on the organs of these systems Describing the composition of the blood and its functions Explaining the process of blood clotting Listing the various blood groups and discuss the Rh factor Drawing and labeling the heart and liver Studying charts of the lymphatic system Drawing and labeling the lymphatic system	d) Digestive system e) Mouth, teeth, tongue f) Esophagus g) Stomach h) Intestine • Microscope • Slides • Prepared slides • Peeling needle Model and charts of the lymphatic system Links: www.dictionary.com www.khanacademy.com www.biomanbio.com www.biologyjunction.com www.rankred.com www.planeta42.com www.saps.org www.thoughtco.com	

SEMESTER: TWO

GRADE: 12
PERIOD: IV
TOPICS : EXCRETORY and RESPIRATORY SYSTEMS; CELLULAR RESPIRATION (GLYCOLYSIS AND KREB CYCLE)

OUTCOMES	OBJECTIVES	CONTENT	ACTIVITIES	MATERIALS/ RESOURCES	COMPETENCIES/ ASSESSMENT
Take appropriate steps to prevent damage to the excretory and respiratory organs. Demonstrate comprehensive understanding of the excretory and respiratory systems in relation to substance abuse. Realize that the energy released during gaseous exchange (respiration) is key to the survival of all living organisms	Upon completion of these topics, learners will: 1. Describe the excretory system and state the functions of all associated organs. 2. List the tissues and organs involved in the mechanism of breathing. 3. Explain homeostasis in relation to the excretory system 4. Explain the effects of substance abuse and STIs on the excretory and respiratory systems 5. State the characteristics of the types of respiration	**1. Excretory system:** organs a) kidneys b) urinary bladder c)Urethra d)Skin, Liver, Lungs e) large intestine **2. Respiratory system:** Organs a) lungs b) pharynx c) larynx d) alveoli e) bronchi f) bronchioles **3. Effects of substance abuse and STIs on the organs of the two systems .** **4. Respiration (Gaseous Exchange)** a) internal & external b) phases (inspiration and expiration)	1. Explaining the process of excretion 2. Explain the process of urination 3. Describing the functions of tissues and organs in both external & internal respiration Describing the lungs and the air passage ways **LAB** Drawing and labeling the longitudinal section of the kidney Class Discussion: the role of the diaphragm,	**A. Primary Text** Baffour Asante-Owusu, et al. *Senior High Biology* (Longman, 2009) **B. Secondary Texts** *Senior secondary guide Biology* (star study guide series) Martin Barker & David Darch 2nd edition, 2016 • Sue Hocking, et al. *OCR Biology* (OCR/Heinemann, 2008). • Doris Koto, et al., *Senior Secondary Guide – Biology* (Pearson, 2000) Senior Secondary Guide 2016 edition, M. Barker et D. Darch	**EXPECTED COMPETENCIES** • Effective communication skills • Analytical and research skills • Research and problem skills • Organizational ability • Digital skills • Creativity and innovation skills **ASSESSMENT STRATEGIES** **to** be used to test for competencies, select relevant options: • Quizzes • Class works • assignments, • attendance • class participation

	6. Distinguish between aerobic and anaerobic respiration 7. Discuss cellular respiration citing the major stages sequentially noting the main events (Glycolysis, Krebs cycle and electron transport chain) 8. Discuss anaerobic respiration in the muscle and its importance in fermentation using yeast/fruits for (alcohol production) 9. Discuss the significance of phosphorylation in glycolysis 10. Identify the final products of glycolysis 11. Outline the fate of pyruvate after Glycolysis 12. Distinguish oxidation and reduction with regards to oxygen, hydrogen and electrons 13. Distinguish between decarboxylation reactions and dehydrogenation reactions	**(Cellular Respiration)** **a) Aerobic respiration** **b) Anaerobic respiration** **c) Energy release** **7. The formation of ATP**, a phosphorylated nucleotide **8. An overview of respiration:** a) glycolysis b) link reaction c) Krebs cycle d) electron transport chain e) **9. Coenzymes and respiration** **10. Nicotinamide adnine dinucleotide (NAD) and dehydrogenase enzymes** **11. Pyruvate and its fate** **12. Alcoholic fermentation** (yeast and fruits) **13. Anaerobic respiration** in muscles and Oxygen debt **14. Reations of the Krebs cycle** (tricarboxylic acid – TCA cycle/cirtic acid cycle): a) decarboxylation b) dehydrogenation	intercostal muscles and ribs in respiration Video/pictures showing the organs affected by substance abuse and STIs Vigorous exercise exemplifying respiration **LAB** Obtaining palm wine and placing it in a plastic gallon to observe alcoholic fermentation **Demonstrate Artificial resuscitation**	**C. Other Resources/Supplementary Readings** • Bob McDuell, *Senior High Integrated Science* (Pearson, 2009) • **Charts/poster** on kidneys, lungs, skin, and urinary organs • Palm wine • Grape fruits • Plastic gallons • Knife • Strainer • Large container (pan) **Internet** **YouTube/video** **Projector** Links: www.dictionary.com www.khanacademy.com www.biomanbio.com www.biologyjunction.com www.rankred.com www.planeta42.com www.saps.org www.thoughtco.com	• Individual presentations, • Lab works • Test

	14. Interpret the balanced chemical equation for respiration ($C_6H_{12}O_6 + 6O_2 \dashrightarrow 6CO_2 + 6H_2O$) 15. Identify the three types of electron carriers located in the inner membrane of the mitochondria (flavoproteins, quinones and cytochromes)	c) oxidative phosphorylation **16. Electron transport chain** (Etc) and ATP synthesis: a) flavoproteins b) quinones b) cytochromes			

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
Outline features in the coordination and control of body activities by both Nervous and Endocrine systems in the body. . Work together to prevent: Gender based violence, rape, sexual abuse, STIs and intergenerational sex	1. Distinguish the functions of the nervous and endocrine systems 2. Describe the structure and functions of a nerve cell (neuron) and the brain 3. Classify the neurons of the nervous system 4. Draw the nervous system and list the major parts 5. Describe the structure and functions of the spinal cord 6. Differentiate the various regions of the spinal cord in relations to their function 7. Compare the central and	**1. The nervous system** a) Composition: - central nervous system -Peripheral nervous system **2. The nervous system** Spinal cord: a) Neurons structure and types of neurons b) function of sensory and motor Brain structure and function of parts of the brain **4. Generation and transmission of nerve impulses:**	1. Listing and describing parts of the nervous system 2. Examining and explaining models of the brain and spinal cord 4. Identifying various parts of the brain and spinal cord by drawing and labeling the parts of the brain and spinal cord 5. Describing the peripheral nervous system 6. Describing the structures and functions of the eye and ear 7. Explaining nervous actions	**A. Primary Text** Baffour Asante-Owusu, et al. *Senior High Biology* (Longman, 2009) **B. Secondary Texts** Sue Hocking, et al. *OCR Biology* (OCR/Heinemann, 2008). Doris Koto, et al., *Senior Secondary Guide – Biology* (Pearson, 2000) Senior Secondary Guide • *Senior secondary guide Biology* (star study guide series) Martin Barker & David Darch 2nd edition, 2016 **C. Other Resources/Supplementary Readings** • Bob McDuell, *Senior High Integrated Science* (Pearson, 2009)	**EXPECTED COMPETENCIES** • Effective communication skills • Analytical and research skills • Research and problem skills • Organizational ability • Digital skills • Creativity and innovation skills **ASSESSMENT STRATEGIES** **to** be used to test for competencies. Select relevant options: • Quizzes • Class works • assignments, • attendance • class participation • Individual presentations, • Lab works • Test

	peripheral nervous systems in relations to their 8. Differentiate between voluntary and involuntary actions 9. Discuss the causes and effects of substance abuse on the nervous system 10. Advocate for GBV, rape, sexual harassment, and intergenerational sex 11. Explain the effects of some STIs on the nervous system 12. Describe the structures and functions of the eye and ear 13. Distinguish and state the functions of exocrine glands and endocrine glands 14. Explain the regulation of	(a) resting potential (b) action potential (c) refractory period (d) conduction of nerve impulses (e) role of the myelin Sheath (f) synapses and synaptic transmission (g) structure and function of synapse **5**. Types of Nervous actions a) Voluntary and Involuntary Actions b) Reflex and reflex arc **6.** Autonomic nervous system: functions and importance **7.** Structure & function of eye and ear **8.** . GBV, Rape, Sexual harassment and	8. Listing organs of the nervous system that STIs and substance abuse affect 9. **CONTINUUM**: 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. Organizing a hot line, where victims can call for help and advice. Involving local NGOs 10. Explaining the causes and corrections of eye defects 11. Drawing, labeling and discussing, the skin as a sense organ 12. Drawing and labeling a typical motor neuron	• Charts of nervous system, endocrine system, eye & ear • Dissecting set • Dissecting tray • Microscope • Prepared slides • Model of brain, spinal cord, eye and ear Internet Cell Phone Poster Sheet Marker Video Projectors Recorder/radio Links: www.dictionary.com www.khanacademy.com www.biomanbio.com www.biologyjunction.com www.rankred.com www.planeta42.com www.saps.org www.thoughtco.com	

	hormone secretion through negative feedback Describe the two basic mechanisms of hormones action	Intergenerational sex (age difference/statutory age) 9. Effects of STIs on the organs of the nervous system 10. Substance abuse: causes, effects and prevention **9. Endocrine system** a) glands b) Hormones 12. The role of other organs as endocrine glands a)testes b) ovaries c) liver d)kidneys e)stomach Hormone deficiency diseases	13. Examining the model and chart of mammalian eye 14. Drawing and labeling the eye to show its external and internal structures 15. Examining model and charts of the mammalian ear and identifying the parts 16. Drawing and labeling the ear to show its external and internal features		

SEMESTER: TWO

GRADE: 12
PERIOD: VI
TOPIC : ECOLOGY (NATURAL RESOURCES AND POLLUTION) AND HEALTH
LEARNING OBJECTIVES

OUTCOMES	OBJECTIVES	CONTENTS	ACTIVITIES	MATERIALS/ RESOURCES	COMPETENCIES/ ASSESSMENT
Appreciate the importance of conservation of natural resources and the concept that natural resources contribute towards the wealth of a nation Realize that renewable natural resources are regenerated, unlike the non-renewable natural resources which can be exhausted if not used wisely. Accept the concept that pollution is harmful to the environment and organisms(Realize that immunization prevents people against diseases.	Upon the completion of this topic, learners will be able to: 1. Explain the concept of natural resources 2. Discuss the importance of natural resources 3. Distinguish between renewable and non-renewable natural resources 4. Explain methods of conserving natural resources 5. Explain preserving the ecosystem as an approach to natural resource management 6. Explain the term *pollution and* discuss the causes, effects and control methods of pollution 7. Explain the importance of	**1 .Definition of natural resources** a) Renewable Natural Resource) Nonrenewable Natural Resources **2. Definition and examples of the flow of renewable resources** **4.Conservation of natural resources** **5. Definition of pollution** **6. Causes of pollution:** a) air pollution b) water c) Land d) thermal e) noise **7. Control of pollution** **8. vaccination and immunization** **9. Personal hygiene**	1. **Group Work (mixed group based on gender and ability)**on the importance of conservation or natural resources 2. **Field trips** -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. 3. **Field trips**-To observe: a) solar radiation, b) tides c) Winds, etc. 4. **Field trips** to Water sewage treatment plant 5. Discussing different methods of sewage	**A. Primary Text** Baffour Asante-Owusu, et al. *Senior High Biology* (Longman, 2009) **B. Secondary Texts** • Sue Hocking, et al. *OCR Biology* (OCR/Heinemann, 2008). • Doris Koto, et al., *Senior Secondary Guide – Biology* (Pearson, 2000) Senior Secondary Guide *Senior secondary guide Biology* (star study guide series) Martin Barker & David Darch 2nd edition, 2016 **C. Other Resources/Supplementary Readings** • Bob McDuell, *Senior High Integrated Science* (Pearson, 2009) • Charts of various kinds of natural resources • Samples of natural resources • Beaker • Contaminated water • Microscope	**EXPECTED COMPETENCIES** • Effective communication skills • Analytical and research skills • Research and problem skills • Organizational ability • Digital skills • Patriotism • Creativity and innovation skills **ASSESSMENT STRATEGIES to** be used to test for competencies. Select relevant options: • Quizzes • Class works • assignments, attendance • class participation

Accept the concept that drug abuse is harmful to the well-being of people.	immunization as a means of preventing human diseases 8. Explain the importance of personal health as well as community health 9. State the dangers posed by drugs, alcoholic beverages and smoking 10. Define and the term *sewage disposal* and discuss methods of sewage disposal 11. Identify economic uses of sewage 12. Discuss sources of water, modes of contamination and methods of purification 13. Discuss methods of refuse collection and disposal State the importance of first aid and be able to treat a number of conditions	**10. Drug abuse** **11. Community hygiene** **12. Sewage and Sewage disposal:** a) definitions of sewage and sewage disposal i) methods of sewage disposal k) ii) economic uses of sewage **13. Water:** a) Sources b) mode of contamination/pollution c) methods of purification **14. Refuse collection and disposal**	disposal 7. Discussing uses of sewage 8. **LAB**-Purifying water by boiling, chlorination and sand filtration (pumping water through sand filter to remove particles greater then 0.002mmdiameter). 9. Testing water for contaminants 10. Filtering contaminated water using clean cloth 11. Practicing first aid exercises on partners 12. Observing nitrogen-fixing bacteria under microscope 13. Estimating the alcohol content of various drinks	• Slides • over slips Links: www.dictionary.com www.khanacademy.com www.biomanbio.com www.biologyjunction.com www.rankred.com www.planeta42.com www.saps.org www.thoughtco.com Pipette Methylene blue Thermometer Flask Stopper Alcohol Gauze mat Tripod Buncen burner Gas light Clean cloth Funnel Porcelain filter Soil Rocks Coal and coal pot Petroleum product (kerosene, fuel oil) Sand Wood Chlorine Charts on water purification system Charts on sewage disposal Fertilizers	• Individual presentations, • Lab works • Test