

Sing Yin Secondary School

Syllabus for Biology

September 2016– July 2017

Form Four

Introduction:

The learning targets of the curriculum are categorized into three domains:

- I. Knowledge and Understanding**
- II. Skills and Processes**
- III. Values and Attitudes**

Objectives:

Students should

- 1. acquire knowledge and develop an understanding of biological principles, concepts, terms and facts.**
- 2. apply biological knowledge in daily life and develop an understanding of current issues and developments in biology.**
- 3. make careful observations, ask relevant questions, identify problems and formulate hypotheses for investigations; plan and conduct scientific investigations individually or collaboratively.**
- 4. appreciate the hard work of frontier scientists and their contributions to developments in science and technology.**
- 5. be aware of the application of biological knowledge in society and its social, ethical, economic and environmental implications.**
- 6. recognize the responsibility for conserving environment and develop positive values and attitudes towards adopting a healthy lifestyle.**

Textbook:

Mastering Biology Bk 1A (Special edition), Bk 1B & Bk 2 (second edition), E1

Oxford

Revision for Chapter 1 to 4

Period : 2 cycles

Chapter 5: Food and humans

Period: 2 cycles

After the lessons, students should

- know the mode of nutrition of humans and its characteristics
- identify the sources and functions of different food substances
- be aware of the corresponding deficiency symptoms
- test for the presence of different food substances using appropriate food tests
- state the importance of a balanced diet
- be aware of the health problems resulting from improper diet

Chapter 6: Nutrition in humans

Period: 2 cycles

After the lessons, students should

- identify the main processes of human nutrition
- identify the alimentary canal and various glands in the human digestive system
- identify different parts of the alimentary canal
- state the functions of each type of tooth
- be able to describe the structure of a tooth

- know what is dentition and be able to identify the two sets of teeth in humans
- know the features of peristalsis along the alimentary canal
- be able to compare physical and chemical digestion
- identify the functions and characteristics of different digestive juices
- state the reactions involved in different parts of the alimentary canal
- know the adaptation of the small intestine for food absorption
- trace the route of absorption of various food substances
- know how are the absorbed food molecules assimilated inside cells
- state the roles of the liver
- state the role of egestion

Chapter 7: Gas exchange in humans

Period: 2 cycles

After the lessons, students should

- be able to recognize the main parts of human breathing system
- know how is incoming air kept clean, moist and warm in the respiratory tract
- learn how gas exchange takes place in the air sacs
- know the adaptive features of air sacs for gas exchange
- identify the adaptive features of red blood cells for carrying oxygen
- know how is oxygen and carbon dioxide transported
- be able to contrast the movements of rib cage and diaphragm during inhalation and exhalation
- know the difference between the composition of inhaled and exhaled air

Chapter 8: Transport in humans

Period: 3 cycles

After the lessons, students should

- know the purpose of having a transport system in humans
- know the constituents of human circulatory system
- identify the composition of the blood and the corresponding functions
- identify different types of blood vessels and the relationships between them
- identify the functions and adaptations of blood vessels
- know how blood pressure changes along the blood vessels
- identify different structures of the heart
- identify blood vessels related to the heart
- know how blood is circulated in the pulmonary and systemic circulation
- know how materials are exchanged between blood and body cells
- be able to describe the formation of tissue fluid
- identify constituents of the lymphatic system
- identify the functions of the lymphatic system

E1: Chapter 3: Regulation of gas content in blood

Period: 2 cycles

After the lessons, students should

- aware of the importance of regulating gas content in blood
- know how the respiratory centre brings about the basic rhythm of breathing
- know what happens at different times of the cardiac cycle

- know how exercise affects the rate and depth of breathing and cardiac output

Chapter 9: Nutrition and gas exchange in plants

Period: 2 cycles

After the lessons, students should

- know the adaptive features of roots for water and mineral absorption
- be able to describe the absorption of water and minerals in roots
- know where and how does gas exchange take place in plants
- know how leaves are adapted for gas exchange
- identify factors affecting gas exchange in plants

Chapter 10: Transpiration, transport and support in plants

Period: 2 cycles

After the lessons, students should

- be able to describe transpiration pull
- be able to state the importance of transpiration to plants
- identify factors affecting the rate of transpiration
- know what xylem and phloem are composed of
- know how flowering plants transport water, minerals and organic nutrients
- know how are young stem and non-woody parts of dicotyledonous plant supported
- know how a woody plant support itself

Chapter 11: Cell cycle and division

Period: 2 cycles

After the lessons, students should

- be able to describe the structure of a chromosome
- be able to contrast diploid and haploid cells
- know that cell cycle consists of cell growth and mitotic cell division
- identify every stages of mitotic cell division
- state the significance of mitotic cell division
- identify every stages of meiotic cell division
- state the significance of meiotic cell division
- be able to compare mitotic and meiotic cell divisions

Chapter 12: Reproduction in flowering plants

Period: 2 cycles

After the lessons, students should

- be able to define binary fission
- contrast asexual and sexual reproduction
- identify food storage organs involved in vegetative propagation
- identify structures and functions of various parts of a flower
- list out the adaptive features of insect-pollinated and wind-pollinated flowers
- be able to describe fertilization in flowers
- be able to list out the advantages and disadvantages of asexual and sexual reproduction in flowering plants

Chapter 13: Reproduction in humans

Period: 3 cycles

After the lessons, students should

- identify the structures and functions of male and female reproductive systems
- identify the structures and functions of sperm and ova
- realize events that happen during the human menstrual cycle
- be able to define ejaculation
- be able to describe the process of fertilization
- contrast identical and fraternal twins
- know what happens to the zygote before implantation
- know the functions of amnion and placenta
- be able to outline the main stages of the birth process
- know the advantages of breast-feeding
- understand the biological basis of various contraceptive methods

E1: Chapter 4: Hormonal control of reproductive cycle

After the lessons, students should

- know how follicle stimulating hormone, luteinizing hormone, oestrogen and progesterone interact to bring about changes in the menstrual cycle
- know the significance of hormonal control of the menstrual cycle
- know how hormones are used as contraceptives
- be aware of how hormones are used in the treatment of infertility

Period: 2 cycles

Total time allocation: 26 cycles

END

Signature of Teacher in charged: _____

Checked by: _____

Sing Yin Secondary School

Syllabus for Biology

September 2016– July 2017

Form Five

Introduction:

The learning targets of the curriculum are categorized into three domains:

- I. Knowledge and Understanding**
- II. Skills and Processes**
- III. Values and Attitudes**

Objectives:

Students should

- 1. acquire knowledge and develop an understanding of biological principles, concepts, terms and facts.**
- 2. apply biological knowledge in daily life and develop an understanding of current issues and developments in biology.**
- 3. make careful observations, ask relevant questions, identify problems and formulate hypotheses for investigations; plan and conduct scientific investigations individually or collaboratively.**
- 4. appreciate the hard work of frontier scientists and their contributions to developments in science and technology.**
- 5. be aware of the application of biological knowledge in society and its social, ethical, economic and environmental implications.**
- 6. recognize the responsibility for conserving environment and develop positive values and attitudes towards adopting a healthy lifestyle.**

Textbook: Mastering Biology Bk2 & Bk 3 (second edition)

Oxford

Chapter 14: Growth and Development

Period: 2 cycles

After the lessons, students should

- know what are growth and development and how do they occur
- be able to outline the major processes in seed germination
- identify the locations of growth in plants
- know what happens to cells in different regions of the root and shoot tips during growth and development
- state the advantages and disadvantages of the parameters for measuring growth
- identify the stages of growth in annual plants and humans
- be aware of the faster growth rate of girls than boys during early adolescence

Chapter 15: Detecting the environment

Period: 2 cycles

After the lessons, students should

- be able to classify irritability, stimulus, receptor, response, effector and coordination
- identify functions of various parts of the human eye
- identify the causes and ways of correction of short sight, long sight and colour blindness
- identify the responses of shoots and roots to light
- identify where auxins are produced and their effects
- know how auxins cause phototropism in shoots and roots
- identify functions of various parts of the human ear
- be able to describe how we hear

Chapter 16: Coordination in humans

Period: 2 cycles

After the lessons, students should

- be able to identify different parts constituting the human nervous system
- compare different types of neurones
- know how nerve impulses transmitted across a synapse
- know the significance of synapses
- know the main parts of the brain and cerebral cortex and their corresponding functions
- identify the structure and functions of the spinal cord
- be able to trace the reflex arc
- know the significance of reflex actions
- know the characteristics of reflex actions and voluntary actions
- know how the nervous system brings about voluntary actions
- contrast reflex and voluntary actions
- know how are hormones transported to all parts of body
- know the general function of hormones
- contrast hormonal and nervous coordination

Chapter 17: Movement in humans

Period: 1.5 cycles

After the lessons, students should

- know the general plan of human skeleton
- know the functions of human skeleton
- identify various structures and functions of a movable joint
- contrast hinge joints and ball-and-socket joints
- know what are skeleton muscles made up of and how are they attached to bones
- know how is muscle contraction initiated
- be able to identify opposing muscles
- know how muscles and bones work together to bring about movement

Chapter 18: Homeostasis

Period: 1.5 cycle

After the lessons, students should

- know the major parameters of the internal environment of our body and their importance
- identify the roles of nervous and endocrine systems in homeostasis
- know how homeostasis is brought about
- know how blood glucose level is regulated and why is this important

E1:Chapter 1: Regulation of water content (osmoregulation)

After the lessons, students should know the importance of regulating water content

Period: 2 cycles

- To identify the major organ involved in osmoregulation
- To realize the importance of osmoregulation
- To identify the major parts of the urinary system and their functions
- To know the structure of a nephron
- To know how ultrafiltration takes place in a nephron
- To compare the composition of the glomerular filtrate and plasma

- To know how substances in the glomerular filtrate are reabsorbed into the blood along kidney tubules
- To know the role of antidiuretic hormone and the kidneys in regulating water content by negative feedback mechanism
- To know how kidneys regulate water content after taking in excess salts
- To know the role of kidneys in excretion
- To know the function of a dialysis machine
- To know the composition of the dialysis fluid and its importance in the functioning of the dialysis machine

E1: Chapter 2: Regulation of body temperature (thermoregulation)

After the lessons, students should know the importance of regulating water content

Period :1.5 cycle

- To state the importance of regulating body temperature
- To know the major ways of transferring heat between body and the environment
- To state the structures of the skin and their functions
- To know how various structures of the skin responds under cold and hot conditions
- To identify the roles of hormones and muscles in body temperature regulation
- To state the behavioural mechanisms that help regulating body temperature under cold and hot conditions
- To know how the hypothalamus detects changes in external and internal temperature
- To know what happens when the thermoregulatory centre detects a skin or blood temperature change

Chapter 21: Photosynthesis

After the lessons, students should

Period: 2 cycles

- know where photosynthesis occurs in plant cells and its significance
- be aware of the need of destarching a plant before conducting experiments
- know the requirements for photosynthesis
- know the adaptive features of a leaf to photosynthesis
- know the adaptive features of a chloroplast to photosynthesis
- identify the major steps of photochemical reactions
- identify the major steps of the Calvin cycle
- know the relationship between photochemical reactions and the Calvin cycle
- know the fate of photosynthetic products
- know the effect of light intensity and carbon dioxide concentration on the rate of photosynthesis

Chapter 22: Respiration

After the lessons, students should

Period: 2 cycles

- be able to compare and contrast burning and respiration
- know the role of ATP in cellular metabolism
- identify the two types of respiration
- be able to identify structures of a mitochondrion and state how it is adapted to respiration
- know what happens during different stages of aerobic respiration
- know how anaerobic respiration occur in skeletal muscles and yeast
- identify the cause of muscle fatigue
- be able to compare aerobic and anaerobic respiration
- state the applications of anaerobic respiration
- contrast the processes of respiration and photosynthesis

Chapter 19: Biodiversity

Period: 1 cycle

After the lessons, students should

- understand what is biodiversity
- know how organisms are classified and named
- know the characteristics of the six kingdoms
- contrast archaebacteria and bacteria
- know how plants and animals are classified
- be aware of the continual changing of the classification system
- know what the modern classification system is based on
- know the use of a dichotomous key

Chapter 20: Ecosystems

Period: 3.5 cycles

After the lessons, students should

- be aware of the levels of organization in ecology
- be aware of the self-supporting, stable and dynamic nature of an ecosystem
- know the major types of ecosystems in Hong Kong
- identify the living and non-living components of an ecosystem and how they will affect the ecosystem
- be aware of the different ways organisms may adopt to interact with each other in an ecosystem
- know how primary succession takes place
- contrast primary and secondary succession
- be able to define a food chain and a food web
- know the roles of producers and consumers in the energy flow of an ecosystem
- know how energy flows and how is it lost within an ecosystem
- distinguish between a pyramid of numbers and a pyramid of biomass
- be aware of the importance of cycling of materials in an ecosystem
- know how carbon and nitrogen is cycled in an ecosystem
- be aware of the impacts of human activities on our ecosystems
- know how to conserve the ecosystems
- identify the uses of quadrats, line transects and belt transects

Chapter 23: Personal Health

Period: 1 cycle

After the lessons, students should

- know the biological meaning of disease and health
- be aware of the deficiency symptoms of food substances
- be aware of the problems of intaking an excess of food substances
- know the health benefits of exercise
- be aware of the effects of insufficient sleep, smoking, alcohol and drug abuse on health

Chapter 24: Infectious diseases

Period: 1 cycle

After the lessons, students should

- identify the major difference between infectious and non-infectious diseases
- know some diseases caused by pathogens

- know how infectious diseases are transmitted and how to reduce these diseases
- know how antibiotics kill or inhibit bacterial growth
- know the consequences of indiscriminate use of antibiotics
- know what is sulpha drugs and their functions
- know how does 'cocktail therapy' work

Chapter 25: Non-infectious diseases and disease prevention

Period: 1 cycle

After the lessons, students should

- know some examples of non-infectious diseases, their risk factors and how to prevent them
- know how immunization programmes contribute to disease prevention
- state some activities that community health involves

Chapter 26: Body defence mechanisms

Period: 2 cycles

After the lessons, students should

- be able to give examples of physical and chemical barriers
- know how blood clotting provides body defence
- know what is phagocytosis
- know what happens in an inflammatory response
- know how antibodies act against pathogens
- identify the principles of humoral immune response and cell-mediated immune response
- be able to compare B cells and T cells
- be able to distinguish between primary and secondary responses
- know the biological principle behind vaccination
- distinguish between active and passive immunity

Total time allocation: 26 cycles

END

Signature of Teacher in charged: _____

Checked by: _____

Sing Yin Secondary School

Syllabus for Biology

September 2016– July 2017

Form Six

Introduction:

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- I. Knowledge and Understanding**
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Objectives:

Students should

- 1. acquire knowledge and develop an understanding of biological principles, concepts, terms and facts.**
- 2. apply biological knowledge in daily life and develop an understanding of current issues and developments in biology.**
- 3. make careful observations, ask relevant questions, identify problems and formulate hypotheses for investigations; plan and conduct scientific investigations individually or collaboratively.**
- 4. appreciate the hard work of frontier scientists and their contributions to developments in science and technology.**
- 5. be aware of the application of biological knowledge in society and its social, ethical, economic and environmental implications.**
- 6. recognize the responsibility for conserving environment and develop positive values and attitudes towards adopting a healthy lifestyle.**

Textbook: Mastering Biology Bk E4 & Bk 4

Oxford

Chapter 27: Basic genetics

Period: 3 cycles

After the lessons, students should

- know the meaning of genetics
- know the structural relationship between a chromosome, DNA and a gene
- compare the composition of DNA and that of RNA
- identify the constituents of a nucleic acid
- know how genes determine an organism's body characteristics
- know why DNA is suited to its function as a genetic material
- know what is monohybrid inheritance
- be able to state the Law of Segregation
- know the ways to determine the genotype of an organism with a dominant character
- know what is dihybrid inheritance
- be able to state the Law of Independent Assortment
- know the ways to determine the genotype of an organism with two dominant characters
- know how blood groups and sex are determined in humans
- know what are sex-linked genes
- contrast continuous and discontinuous variations
- know why phenotypic and genotypic variations occur
- know what is mutation

Chapter 28: Molecular genetics

Period: 1 cycle

After the lessons, students should

- be able to state the features of the genetic code
- identify the two main stages in protein synthesis
- know the fate of the proteins synthesized
- distinguish between gene mutation and chromosome mutation
- distinguish between spontaneous mutations and induced mutations
- be able to give examples of mutagens

Chapter 29: Applied genetics

Period: 1.5 cycles

After the lessons, students should

- know the major steps and applications of recombinant DNA technology
- know the major steps, basic principle and applications of DNA fingerprinting
- know the goals, contribution and limitations of the Human Genome Project

E4:Chapter 1: Traditional and modern biotechnology

Period: 2.5 cycles

- To give examples of traditional and modern biotechnology
- To be able to define biotechnology, genetic engineering and cloning
- To know the use of restriction enzymes, DNA ligases, DNA polymerases, DNA probes and vectors in genetic engineering
- To know the basic principles of gel electrophoresis, recombinant DNA technology, polymerase chain reaction and DNA fingerprinting
- To know the applications of recombinant DNA technology, polymerase chain reaction and DNA fingerprinting
- To know the benefits and possible hazards of genetic engineering
- To know the major steps and applications of plant and animal cloning
- To state some advantages and disadvantages of plant and animal cloning

E4:Chapter 2: Biotechnology in medicine and agriculture

Period: 1 cycle

- To be able to distinguish between germ line and somatic gene therapy
- To know the potential benefits and hazards of gene therapy
- To give examples of applications of stem cells in medical treatment
- To know the uses of transgenic plants and animals in scientific research and agriculture
- To give examples of desirable traits built into transgenic plants and animals

E4: Chapter 3: Bioethics

Period: 0.5 cycle

- To be aware of bioethics
- To be able to list some issues related to the production of GM food, cloning, the Human Genome Project (HGP), gene therapy and stem cell therapy

Chapter 30: Evolution I

Period: 1 cycle

After the lessons, students should

- know how life originated
- know what is evolution
- understand how fossil record can provide evidence for evolution
- know the limitations of using fossil record as evidence for evolution

Chapter 31: Evolution II

Period: 1.5 cycles

After the lessons, students should

- know how evolution happens
- state the significance of variations within a species
- state the two main principles of Lamarck's theory
- know what is speciation
- know the isolation mechanisms that lead to the formation of new species

Total time allocation: 12 cycles

END

Signature of Teacher in charged: _____

Checked by: _____