

Law Ting Pong Secondary School
S4 Biology
Course Outline

Section	Week	Learning objectives (Students should be able to...)	Assessment
Ch2 Cells 2.1 Studying cells using microscopes	2	<ul style="list-style-type: none"> • Understand the technological development of microscopes • State the cell theory and use microscopes to examine cell details • Know the types of microscopes commonly used today • Calculate the total magnification of a compound microscope • Differentiate between observations at low-power and high-power magnifications 	Formative assessment: <ul style="list-style-type: none"> • Present the functions of sub-cellular structures of different cell types • Draw a table to contrast different cell types Summative assessment: Test
2.2 The basic structure of a cell		<ul style="list-style-type: none"> • Describe the functions of different sub-cellular structures in cells • Differentiate between animal cells and plant cells 	
2.3 Levels of body organization		<ul style="list-style-type: none"> • Understand how cells are organized in multicellular organisms 	
2.4 Prokaryotic and eukaryotic cells		<ul style="list-style-type: none"> • Differentiate between prokaryotic cells and eukaryotic cells 	
Ch3 Movement of substances across cell membrane 3.1 Cell membrane	3-5	<ul style="list-style-type: none"> • Recognize the structure of cell membrane and how it is related to its properties and functions 	Formative assessment: <ul style="list-style-type: none"> • Draw a model to represent the structure of cell membrane • Use a table to illustrate different transport mechanisms
3.2 Movement of substances		<ul style="list-style-type: none"> • Account for the movement of substances across membrane 	

Section	Week	Learning objectives (Students should be able to...)	Assessment
across membranes		using the concepts of diffusion, osmosis and active transport <ul style="list-style-type: none"> • Compare respective states of cells in solutions of different water potentials • Compare different processes of substance movement across cell membrane 	Summative assessment: Test
Ch4 Enzymes and Metabolism	6-8	<ul style="list-style-type: none"> • Identify catabolism, anabolism and metabolism 	Formative assessment: <ul style="list-style-type: none"> • Draw a mind map to describe the functions and properties of enzymes • Write a report to investigate the action of amylase / catalase • Write a report to investigate the effect of temperature / pH on enzyme activity Summative assessment: Test
4.1 Metabolism			
4.2 The role of enzymes in metabolism		<ul style="list-style-type: none"> • State the role of enzymes in metabolism 	
4.3 Actions and properties of enzymes		<ul style="list-style-type: none"> • Understand how enzymes work • Understand why enzyme actions are specific • Know the properties of enzymes 	
4.4 Factors affecting the rate of enzymatic reactions		<ul style="list-style-type: none"> • Understand how temperature, pH and inhibitors affect the rate of enzymatic reactions 	
4.5 Applications of enzymes	<ul style="list-style-type: none"> • Know the applications of enzymes 		
Ch5 Food and humans	9	<ul style="list-style-type: none"> • Know the modes of nutrition 	Formative assessment: <ul style="list-style-type: none"> • Present on the analysis of food substances in different meals Summative assessment: Test
5.1 Modes of nutrition			
5.2 The food requirements of humans		<ul style="list-style-type: none"> • Identify the functions and food sources of different food substances • Identify the inorganic and organic chemical constituents of organisms 	

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		<ul style="list-style-type: none"> • Be aware of the corresponding deficiency diseases 	
5.3 Food tests		<ul style="list-style-type: none"> • Test for the presence of different food substances using appropriate food tests 	
5.4 Balanced diet		<ul style="list-style-type: none"> • Understand what a balanced diet is • Understand the factors that affect our dietary requirements • Be aware of the health problems resulting from an improper diet 	
Ch6 Nutrition in humans	10-13	<ul style="list-style-type: none"> • Identify the main processes of nutrition in humans • Identify different parts of the digestive system 	Formative assessment: <ul style="list-style-type: none"> • Annotate a diagram of human digestive system • Annotate a diagram of human tooth • Draw a flowchart to illustrate the digestion of food substances along the alimentary canal • Draw a diagram to show the absorption of different food substances Summative assessment: Test
6.1 The human digestive system			
6.2 Ingestion		<ul style="list-style-type: none"> • State the functions of different types of teeth • Know what dentition is and be able to identify the two sets of teeth in humans • Be able to describe the structure of a tooth 	
6.3 Digestion		<ul style="list-style-type: none"> • Be able to compare physical and chemical digestion • Understand the importance of peristalsis • Identify the actions of different digestive juices 	
6.4 Absorption		<ul style="list-style-type: none"> • Know the adaptation of the small intestine for food absorption • Trace the route of absorption of various food substances 	
6.5 Assimilation of the absorbed food	<ul style="list-style-type: none"> • Know how absorbed food molecules are transported to other parts of the body • Know the fates of the absorbed food 		

Section	Week	Learning objectives (Students should be able to...)	Assessment
		<ul style="list-style-type: none"> • State the roles of the liver 	
6.6 Egestion		<ul style="list-style-type: none"> • Understand what egestion is • To distinguish between egestion and excretion 	
Ch7 Gas exchange in humans	14-15	<ul style="list-style-type: none"> • Recognize the main parts of the human breathing system • Describe how incoming air is kept clean, moist and warm in the respiratory tract 	Formative assessment: <ul style="list-style-type: none"> • Annotate a diagram of human respiratory system • Draw a flowchart to show the pathway of airflow into the lungs • Write an essay on adaptive features of air sacs and red blood cells • Draw a flowchart to show the mechanism of inhalation and exhalation Summative assessment: Test
7.1 The human breathing system		<ul style="list-style-type: none"> • Describe how gas exchange takes place in the air sacs • Explain the adaptive features of air sacs for gas exchange • Contrast the differences between the composition of inhaled and exhaled air 	
7.2 Gas exchange in the air sacs		<ul style="list-style-type: none"> • Explain identify the adaptive features of red blood cells for carrying oxygen • Describe how oxygen and carbon dioxide are transported 	
7.3 Transport of respiratory gases		<ul style="list-style-type: none"> • Describe how ventilation is brought about 	
7.4 Ventilation			Mid-year summative assessment: Ch2 – 7
Ch8 Transport in humans	19-23	<ul style="list-style-type: none"> • Recognise the main parts of human transport system • Identify the different components of the human circulatory system 	Formative assessment: <ul style="list-style-type: none"> • Annotate a diagram of human heart • Draw a table to compare and contrast different types of blood vessels • Write an essay to show how continuous
8.1 The human transport system		<ul style="list-style-type: none"> • Identify the composition of blood and the corresponding functions 	
8.2 Blood			

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8.3 Blood vessels		<ul style="list-style-type: none"> • Identify the differences between arteries and veins • Describe what capillaries are and their function • Explain how blood pressure changes along blood vessels 	<p>blood flow can be maintained</p> <ul style="list-style-type: none"> • Draw a diagram to illustrate how tissue fluid is formed and its return to the circulatory system <p>Summative assessment: Test</p>
8.4 The heart		<ul style="list-style-type: none"> • Identify different structures of the heart • Identify blood vessels related to the heart 	
8.5 Blood circulation		<ul style="list-style-type: none"> • Outline how blood is circulated in the pulmonary and systemic circulation 	
8.6 Exchange of materials between blood and body cells		<ul style="list-style-type: none"> • Describe how materials are exchanged between blood and body cells • Explain how capillaries are adapted to their function • Describe the formation of tissue fluid 	
8.7 Lymphatic system		<ul style="list-style-type: none"> • Identify the different components of the lymphatic system • Describe how lymph moves inside lymph vessels • Give the functions of the lymphatic system 	
Ch9 Nutrition and gas exchange in plants	26	<ul style="list-style-type: none"> • Describe how plants obtain food • Understand why plants are important • Describe the importance of minerals to plants 	<p>Formative assessment:</p> <ul style="list-style-type: none"> • Annotate a diagram of leaf • Group discussion: Release of different gases by a plant throughout a day <p>Summative assessment: Test</p>
9.1 Nutrition in plants		<ul style="list-style-type: none"> • Illustrate gas exchange takes place in plants • Explain how leaves are adapted to gas exchange 	
9.2 Gas exchange in plants			
Ch10 Transpiration,	27-29	<ul style="list-style-type: none"> • Describe what transpiration is and where it takes place 	Formative assessment:

Section	Week	Learning objectives (Students should be able to...)	Assessment
transport and support in plants 10.1 Transpiration in plants		<ul style="list-style-type: none"> • Outline how transpiration takes place through stomata • Explain how transpiration pull is created • Understand why transpiration is important • Describe the features of leaves to prevent excessive water loss • Explain factors affecting the rate of transpiration 	<ul style="list-style-type: none"> • Draw a diagram to illustrate transpiration • Write a report on the investigation of the effect of different factors on transpiration rate • Draw a mind map to show the adaptive features of different structures of a plant for efficient transport • Group discussion: Why support in plant is important? <p>Summative assessment: Test</p>
10.2 Absorption of water and minerals in plants		<ul style="list-style-type: none"> • Explain the adaptive features of roots for absorption • Describe how water and minerals are absorbed by roots 	
10.3 Transport in plants		<ul style="list-style-type: none"> • Describe where and how transport takes place in flowering plants • Explain the adaptive features of xylem vessels for transport of water and minerals • Explain the adaptive features of phloem for transport of organic nutrients 	
10.4 Support in plants		<ul style="list-style-type: none"> • Explain how plants are supported 	
Ch11 Cell cycle and division 11.1 Chromosomes	32-33	<ul style="list-style-type: none"> • Describe the structure of a chromosome • Contrast diploid and haploid cells 	<p>Formative assessment:</p> <ul style="list-style-type: none"> • Draw a flowchart to illustrate the processes of cell division • Draw a table to contrast different types of cell division <p>Summative assessment: Test</p>
11.2 The cell cycle and mitotic cell division		<ul style="list-style-type: none"> • State that cell cycle consists of interphase and mitotic cell division • Identify different stages of mitotic cell division • State the importance of mitotic cell division 	
11.3 Meiotic cell division		<ul style="list-style-type: none"> • Identify different stages of meiotic cell division 	

Section	Week	Learning objectives (Students should be able to...)	Assessment
11.4 Comparison between mitotic and meiotic cell divisions		<ul style="list-style-type: none"> • Explain the importance of meiotic cell division • Compare and contrast mitotic and meiotic cell divisions 	
Ch12 Reproduction in flowering plants 12.1 Types of reproduction	34-35	<ul style="list-style-type: none"> • Contrast asexual and sexual reproduction 	Formative assessment: <ul style="list-style-type: none"> • Draw a flowchart to describe the process of vegetative propagation • Annotate a diagram of flower • Draw a flowchart to describe the process of sexual reproduction of flowering plants • Draw a table contrast the pros and cons of different modes of reproduction Summative assessment: Test
12.2 Asexual reproduction		<ul style="list-style-type: none"> • Describe what binary fission is • Describe the process of vegetative propagation • To identify storage organs involved in vegetative propagation 	
12.3 Sexual reproduction in flowering plants		<ul style="list-style-type: none"> • Identify structures and functions of various parts of a flower • State the characteristics of insect-pollinated and wind-pollinated flowers • Describe the process of fertilization in flowers • Explain the significance of seed and fruit dispersal 	
12.4 Significance of asexual and sexual reproduction		<ul style="list-style-type: none"> • Give the advantages and disadvantages of asexual and sexual reproduction in flowering plants 	
Ch13 Reproduction in humans 13.1 Human reproductive systems	36-38	<ul style="list-style-type: none"> • Identify the structures and functions of male and female reproductive systems 	Formative assessment: <ul style="list-style-type: none"> • Annotate a diagram of male and female reproductive system • Draw a table to contrast the different types of gametes
13.2 Human gametes		<ul style="list-style-type: none"> • Contrast the differences between sperms and ova 	

Section	Week	Learning objectives (Students should be able to...)	Assessment
		<ul style="list-style-type: none"> Describe the secondary sexual characteristics in boys and girls 	<ul style="list-style-type: none"> Draw a flowchart to illustrate the process of human reproduction Debate breast-feeding vs. bottle feeding for nursing infant Debate on the use of different contraceptive methods <p>Summative assessment: Test</p>
13.3 Ovulation and menstrual cycle		<ul style="list-style-type: none"> State what ovulation is Describe events that happen during the human menstrual cycle 	
13.4 Fertilization		<ul style="list-style-type: none"> Outline how sperms are transferred from a male into a female body Describe the process of fertilization 	
13.5 Development of the embryo and foetus		<ul style="list-style-type: none"> State the events leading to implantation State the functions of amnion and placenta Describe how identical twins and fraternal twins are formed 	
13.6 The birth process		<ul style="list-style-type: none"> Outline the main stages of labour 	
13.7 Parental care		<ul style="list-style-type: none"> State the importance of parental care to humans Give the advantages of breast-feeding 	
13.8 Birth control		<ul style="list-style-type: none"> Explain the biological basis and reliability of various contraceptive methods 	
Ch14 Growth and development	39-40	<ul style="list-style-type: none"> State what growth and development are and how they occur 	
14.1 Concepts of growth and development		<ul style="list-style-type: none"> State what growth and development are and how they occur 	
14.2 Growth and development in plants		<ul style="list-style-type: none"> Identify the structure of a seed Explain the conditions for seed germination Describe what happens when a seed germinates 	

Section	Week	Learning objectives (Students should be able to...)	Assessment
		<ul style="list-style-type: none"> Identify primary and secondary growth Describe what happens to cells in different regions of the root and shoot tips during growth and development 	Summative assessment: Test Final examination: Ch2 – 14
14.3 Measurement of growth		<ul style="list-style-type: none"> State the advantages and disadvantages of the parameters for measuring growth 	
14.4 Growth curves		<ul style="list-style-type: none"> Identify the stages of growth in annual plants and humans 	

Assessment

CA marks = Test \times 80% + Assignment \times 20%

Year grade = CA \times 60% + SA \times 40%

Mark ranges

Performance Level	Marks
5*	>85
5	76-85
4	61-75
3	46-60
2	30-45
1	<30

23.5 Treatment of infectious diseases		<ul style="list-style-type: none"> • Describe how antibiotics kill or inhibit bacterial growth • Explain the consequences of indiscriminate use of antibiotics • Explain how to slow down the development of antibiotic resistance in bacteria • State what sulpha drugs are and their functions 	
24.1 Non-infectious diseases		<ul style="list-style-type: none"> • Give some examples of non-infectious diseases, their treatment, risk factors and ways of prevention 	
24.2 Prevention of diseases		<ul style="list-style-type: none"> • Explain how immunization programmes contribute to disease prevention • Explain how healthy lifestyles contribute to disease prevention • Describe how to promote community health 	
Ch25 Body Defence Mechanism	34		<p>Formative assessment:</p> <ul style="list-style-type: none"> • Write a story to narrate how a virus / bacterium enter the human and its fate <p>Summative assessment: Test</p>
25.1 Non-specific defence mechanisms		<ul style="list-style-type: none"> • State the characteristics of non-specific defence mechanisms • Describe the first line of defence and give examples of physical and chemical barriers • Describe how blood clotting provides body defence • Describe how phagocytosis provides body defence • Explain what happens in an inflammatory response 	
25.2 Specific defence mechanisms		<ul style="list-style-type: none"> • Recognize the actions of B cells and T cells in immune response • Describe how antibodies act against pathogens or their toxins • Distinguish between primary and secondary responses • Explain the principle of vaccination • Distinguish between active and passive immunity 	
Ch26 Basic genetics	35-36	<ul style="list-style-type: none"> • Compare the composition of DNA and that of RNA 	Formative assessment:

26.1 DNA — carrier of genetic information		<ul style="list-style-type: none"> • Describe the Watson-Crick model of DNA • Describe the structural relationship between a chromosome, DNA and a gene • Explain how genes determine an organism's body characteristics • Explain why DNA is suited to its function as a genetic material 	<ul style="list-style-type: none"> • Write a report on the discovery of DNA • Draw genetic diagrams to illustrate inheritance of different characteristics • Presentation: Human variations
26.2 Mendel's Laws of inheritance		<ul style="list-style-type: none"> • Describe what monohybrid and dihybrid inheritance are • State the Law of Segregation and the Law of Independent Assortment • Explain how to determine the genotype of an organism with a dominant character 	Summative assessment: Test
26.3 Inheritance in humans		<ul style="list-style-type: none"> • Explain how blood groups and sex are determined in humans • Describe what sex-linked genes are 	
26.4 Variations in organisms		<ul style="list-style-type: none"> • Contrast continuous and discontinuous variations • Explain why variations occur • Describe how genetic variations are brought about 	
Ch27 Molecular genetics	37	<ul style="list-style-type: none"> • State the features of the genetic code • Identify the two main stages of protein synthesis • Identify the characteristics of transcription and translation 	
27.1 From DNA to proteins		<ul style="list-style-type: none"> • Distinguish between gene mutations and chromosome mutations • Distinguish between spontaneous mutations and induced mutations • Give examples of mutagens 	<ul style="list-style-type: none"> • Draw a flowchart to illustrate the process of gene expression • Project: Mutation
27.2 Mutations			Summative assessment: Test

Ch28 Biotechnology 28.1 Recombinant DNA technology	38	<ul style="list-style-type: none"> Outline the major steps and applications of recombinant DNA technology 	
28.2 DNA fingerprinting		<ul style="list-style-type: none"> Outline the major steps, basic principle and applications of DNA fingerprinting 	
28.3 Human Genome Project		<ul style="list-style-type: none"> State the goals, benefits and limitations of the Human Genome Project Appreciate the joint efforts of scientists in international genomics projects 	
Ch29&30 Evolution 29.1 The origin of life	39-40	<ul style="list-style-type: none"> State how life originated 	Formative assessment: <ul style="list-style-type: none"> Presentation: Origin of life Write an essay on natural selection Summative assessment: Test Final Examination: Ch2 – 29
29.2 Evolution		<ul style="list-style-type: none"> Describe how the diversified life forms on earth today were formed Explain how fossils provide evidence for evolution Give the limitations of using fossil records as evidence for evolution Give other evidence that supports the theory of evolution 	
30.1 Mechanism of evolution		<ul style="list-style-type: none"> Describe how evolution takes place Distinguish between Lamarck’s theory and Darwin’s theory Give some examples of natural selection in action Explain how insecticide-resistant insect pests and antibiotic-resistant bacteria develop 	
30.2 Speciation		<ul style="list-style-type: none"> Describe what speciation is Explain how speciation occurs 	

Assessment

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Mark ranges

Performance Level	Marks
5*	>85
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S5 Biology
Course Outline

Section	Week	Learning objectives (Students should be able to...)	Assessment
Ch14 Growth and development 14.1 Concepts of growth and development	2-3	<ul style="list-style-type: none"> • State what growth and development are and how they occur 	Formative assessment: <ul style="list-style-type: none"> • Debate on the use of different methods to measure growth • Annotate a diagram of a root • Draw a mind map to illustrate the conditions for seed germination Summative assessment: Test
14.2 Growth and development in plants		<ul style="list-style-type: none"> • Identify the structure of a seed • Explain the conditions for seed germination • Describe what happens when a seed germinates • Identify primary and secondary growth • Describe what happens to cells in different regions of the root and shoot tips during growth and development 	
14.3 Measurement of growth		<ul style="list-style-type: none"> • State the advantages and disadvantages of the parameters for measuring growth 	
14.4 Growth curves		<ul style="list-style-type: none"> • Identify the stages of growth in annual plants and humans 	
Ch15 Detecting the environment 15.1 Detecting changes in the environment	4-6	<ul style="list-style-type: none"> • State what irritability is • Describe how a response is produced upon detecting a stimulus 	Formative assessment: <ul style="list-style-type: none"> • Annotate a diagram of human eye • Draw a diagram to show how the sensation of vision is generated • Draw ray diagrams to illustrate short sight
15.2 Detecting light by the		<ul style="list-style-type: none"> • Identify functions of various parts of the human eye 	

Section	Week	Learning objectives (Students should be able to...)	Assessment	
eye		<ul style="list-style-type: none"> • Explain how vision is generated • Differentiate between rod and cone cells • Explain how the eye controls the amount of light entering it • Describe what eye accommodation is • Explain how the eye focuses on near and distant objects • Give the causes and corrections of short sight, long sight and colour blindness 	and long sight and how they are corrected <ul style="list-style-type: none"> • Annotate a diagram of ear • Draw a flowchart to show how sensation of hearing is generated • Report on the scientific investigations of phototropism in history of biology 	
15.3 Detecting sound by the ear		<ul style="list-style-type: none"> • Identify functions of various parts of the human ear • Explain how hearing is generated 	Summative assessment: Test	
15.4 Detecting light by plants		<ul style="list-style-type: none"> • Identify the responses of shoots and roots to light • Identify where auxins are produced and their effects • Explain how auxins cause phototropic responses in plants 		
Ch16 Coordination in humans 16.1 The human nervous system		<ul style="list-style-type: none"> • Identify different parts of the human nervous system • Differentiate between different types of neurones 		
16.2 Transmission of nerve impulses between neurones	7-9	<ul style="list-style-type: none"> • Describe how nerve impulses are transmitted across a synapse • Give the significance of synapses 	Formative assessment: <ul style="list-style-type: none"> • Annotate a diagram of neurone • Draw a table to contrast different types of neurones • Annotate a diagram of human brain • Draw flowcharts to show how different responses can be produced • Draw a table to contrast voluntary and involuntary actions 	
16.3 The central nervous system		<ul style="list-style-type: none"> • Identify main parts of the brain and their functions • Identify the structure and functions of the spinal cord 		
16.4 Reflex action and voluntary action		<ul style="list-style-type: none"> • Trace the reflex arc • Explain the significance of reflex actions 		Summative assessment: Test

Section	Week	Learning objectives (Students should be able to...)	Assessment
16.5 Differences between reflex actions and voluntary actions		<ul style="list-style-type: none"> • Explain how the nervous system brings about voluntary actions • Contrast reflex and voluntary actions 	
16.6 The human endocrine system		<ul style="list-style-type: none"> • State how hormones are transported to all parts of the body • Describe the general function of hormones 	
16.7 Comparison between hormonal coordination and nervous coordination		<ul style="list-style-type: none"> • Contrast hormonal and nervous coordination 	
Ch18 Homeostasis			
18.1 The concept of homeostasis	10	<ul style="list-style-type: none"> • To know what homeostasis is • To know the major parameters of the internal environment of our body and the importance of keeping them stable 	Formative assessment: <ul style="list-style-type: none"> • Draw a flowchart to illustrate the regulation of blood glucose level Summative assessment: Test
18.2 Mechanism of homeostasis		<ul style="list-style-type: none"> • Explain how homeostasis is brought about • Explain how blood glucose level is regulated and why this is important 	
Ch17 Movement in humans	12-13	<ul style="list-style-type: none"> • Describe what the human skeleton is made up of • Outline the general plan of the human skeleton • State the functions of the human skeleton 	Formative assessment: <ul style="list-style-type: none"> • Annotate a diagram of human skeleton • Make a video to show how movement can be brought about by musculo-skeletal system
17.1 The human skeleton		<ul style="list-style-type: none"> • Identify functions of various parts of a movable joint • Differentiate between hinge joints and ball-and-socket joints 	
17.2 Joints		<ul style="list-style-type: none"> • State what skeletal muscles are made up of and how they are 	
17.3 Muscles			

Section	Week	Learning objectives (Students should be able to...)	Assessment
		attached to bones	Summative assessment: Test
17.4 Movement of the body		<ul style="list-style-type: none"> Identify opposing muscles Explain how muscles and bones work together to bring about movement 	
17.5 Initiation of muscle contraction		<ul style="list-style-type: none"> Describe how muscle contraction is initiated 	
Ch19 Biodiversity	14-15	<ul style="list-style-type: none"> Explain what biodiversity is 	Formative assessment: <ul style="list-style-type: none"> Present the characteristics of organisms in different kingdoms
19.1 Diversity of life forms		<ul style="list-style-type: none"> Describe how organisms are classified and named 	
19.2 Classification		<ul style="list-style-type: none"> Describe the modern classification of organisms 	Summative assessment: Test
19.3 Development of the classification system		<ul style="list-style-type: none"> State the characteristics of the six kingdoms Contrast archaeobacteria and bacteria Describe how plants and animals are classified 	Mid-year summative assessment: Ch2 – 19
19.4 The six kingdoms		<ul style="list-style-type: none"> Use a dichotomous key for classification 	
19.5 Dichotomous keys			
Ch20 Ecosystems	19-24	<ul style="list-style-type: none"> Be aware of the levels of organization in ecological studies Be aware of the self-supporting, stable and dynamic nature of an ecosystem Identify the major types of ecosystems in Hong Kong 	Formative assessment: <ul style="list-style-type: none"> Present on different types of ecosystems in Hong Kong Draw a mind map to show the different modes of interactions among organisms in a community
20.1 Basic concepts of ecology		<ul style="list-style-type: none"> Identify the abiotic factors in an ecosystem 	
20.2 Abiotic factors of an ecosystem			

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20.3 Biotic community of an ecosystem		<ul style="list-style-type: none"> • Differentiate between the habitat and niche of an organism • State what species diversity and dominant species are • Explain the modes of interactions among organisms in a community • Differentiate between primary succession and secondary succession 	<ul style="list-style-type: none"> • Draw a flowchart to illustrate primary succession • Draw pyramid of biomass / numbers for different food chains • Draw diagrams to illustrate carbon and nitrogen cycles <p>Summative assessment: Test</p>
20.4 Energy flow in an ecosystem		<ul style="list-style-type: none"> • Explain how energy flows within an ecosystem • Define a food chain and a food web • Explain the roles of producers and consumers in the energy flow of an ecosystem • Explain how energy is lost from one trophic level to another • Distinguish between pyramid of numbers and pyramid of biomass 	
20.5 Material cycling in an ecosystem		<ul style="list-style-type: none"> • Outline how carbon and nitrogen are cycled in an ecosystem • Describe the roles of producers, consumers and decomposers in energy flow and material cycling 	
20.6 Conservation of ecosystems		<ul style="list-style-type: none"> • Be aware of the impact of human activities on ecosystems • Explain how to conserve ecosystems 	
20.7 Ecological study		<ul style="list-style-type: none"> • Apply the use of quadrats, line transects and belt transects in an ecological study • Measure abiotic factors in an ecological study 	
Ch21 Photosynthesis	26-27	<ul style="list-style-type: none"> • Describe what photosynthesis is 	Formative assessment:

Section	Week	Learning objectives (Students should be able to...)	Assessment
21.1 The basic concepts of photosynthesis			<ul style="list-style-type: none"> • Presentation: How leaf is adapted for photosynthesis? • Draw diagram to show the steps of biochemical reactions in photosynthesis • Write a report to investigate effect of different factors on the rate of photosynthesis Summative assessment: Test
21.2 The site of photosynthesis		<ul style="list-style-type: none"> • Explain the adaptive features of a leaf for photosynthesis • Explain the adaptive features of a chloroplast for photosynthesis 	
21.3 The requirements for photosynthesis		<ul style="list-style-type: none"> • Be aware of the need of destarching a plant before conducting experiments • State the requirements for photosynthesis 	
21.4 The process of photosynthesis		<ul style="list-style-type: none"> • Outline the major steps of photochemical reactions • Outline the major steps of the Calvin cycle • Explain the relationship between photochemical reactions and the Calvin cycle 	
21.5 Factors affecting the rate of photosynthesis		<ul style="list-style-type: none"> • Explain the effect of light intensity and carbon dioxide concentration on the rate of photosynthesis 	
21.6 The fate of photosynthetic products		<ul style="list-style-type: none"> • Describe the fate of photosynthetic products 	
21.7 The significance of photosynthesis		<ul style="list-style-type: none"> • State the significance of photosynthesis 	
Ch22 Respiration	28-29		Formative assessment: <ul style="list-style-type: none"> • Draw diagram to show the biochemical reactions of aerobic respiration • Draw a table to contrast aerobic and
22.1 The basic concepts of respiration		<ul style="list-style-type: none"> • Describe what respiration is • State the role of ATP in cellular metabolism • Identify the two types of respiration 	
22.2 The site of respiration		<ul style="list-style-type: none"> • State where respiration takes place in a cell 	

Section	Week	Learning objectives (Students should be able to...)	Assessment
22.3 Aerobic respiration		<ul style="list-style-type: none"> Outline the major steps of aerobic respiration 	anaerobic respiration <ul style="list-style-type: none"> Draw a table to contrast photosynthesis and respiration Summative assessment: Test
22.4 Anaerobic respiration		<ul style="list-style-type: none"> Outline how anaerobic respiration occurs in yeast and skeletal muscles Explain the importance of anaerobic respiration Describe what oxygen debt is State the applications of anaerobic respiration 	
22.5 Comparison of aerobic and anaerobic respiration		<ul style="list-style-type: none"> Contrast between aerobic and anaerobic respiration 	
22.6 Relationship between respiration and photosynthesis		<ul style="list-style-type: none"> Contrast between respiration and photosynthesis 	
Ch 23 & 24 Personal Health & Diseases	32-33	<ul style="list-style-type: none"> Recognize the meaning of health 	Formative assessment: <ul style="list-style-type: none"> Prestation: Common infectious diseases Design a poster, leaflet or web page to advise how to reduce the chances of developing one form of cancer Summative assessment: Test
23.1 The meaning of health		<ul style="list-style-type: none"> Recognize the meaning of a disease Identify the major difference between infectious and non-infectious diseases 	
23.2 Types of diseases		<ul style="list-style-type: none"> State what pathogens are and how they cause diseases 	
23.3 Causes of infectious diseases		<ul style="list-style-type: none"> Explain how infectious diseases are transmitted and the preventive measures to reduce the spread of these diseases 	
23.4 Transmission of infectious diseases and preventive measures			

Section	Week	Learning objectives (Students should be able to...)	Assessment
23.5 Treatment of infectious diseases		<ul style="list-style-type: none"> • Describe how antibiotics kill or inhibit bacterial growth • Explain the consequences of indiscriminate use of antibiotics • Explain how to slow down the development of antibiotic resistance in bacteria • State what sulpha drugs are and their functions 	
24.1 Non-infectious diseases		<ul style="list-style-type: none"> • Give some examples of non-infectious diseases, their treatment, risk factors and ways of prevention 	
24.2 Prevention of diseases		<ul style="list-style-type: none"> • Explain how immunization programmes contribute to disease prevention • Explain how healthy lifestyles contribute to disease prevention • Describe how to promote community health 	
Ch25 Body Defence Mechanism 25.1 Non-specific defence mechanisms	34	<ul style="list-style-type: none"> • State the characteristics of non-specific defence mechanisms • Describe the first line of defence and give examples of physical and chemical barriers • Describe how blood clotting provides body defence • Describe how phagocytosis provides body defence • Explain what happens in an inflammatory response 	Formative assessment: <ul style="list-style-type: none"> • Write a story to narrate how a virus / bacterium enter the human and its fate Summative assessment: Test
25.2 Specific defence mechanisms		<ul style="list-style-type: none"> • Recognize the actions of B cells and T cells in immune response • Describe how antibodies act against pathogens or their toxins • Distinguish between primary and secondary responses • Explain the principle of vaccination • Distinguish between active and passive immunity 	

Section	Week	Learning objectives (Students should be able to...)	Assessment
Ch26 Basic genetics 26.1 DNA — carrier of genetic information	35-36	<ul style="list-style-type: none"> • Compare the composition of DNA and that of RNA • Describe the Watson-Crick model of DNA • Describe the structural relationship between a chromosome, DNA and a gene • Explain how genes determine an organism's body characteristics • Explain why DNA is suited to its function as a genetic material 	Formative assessment: <ul style="list-style-type: none"> • Write a report on the discovery of DNA • Draw genetic diagrams to illustrate inheritance of different characteristics • Presentation: Human variations Summative assessment: Test
26.2 Mendel's Laws of inheritance		<ul style="list-style-type: none"> • Describe what monohybrid and dihybrid inheritance are • State the Law of Segregation and the Law of Independent Assortment • Explain how to determine the genotype of an organism with a dominant character 	
26.3 Inheritance in humans		<ul style="list-style-type: none"> • Explain how blood groups and sex are determined in humans • Describe what sex-linked genes are 	
26.4 Variations in organisms		<ul style="list-style-type: none"> • Contrast continuous and discontinuous variations • Explain why variations occur • Describe how genetic variations are brought about 	
Ch27 Molecular genetics 27.1 From DNA to proteins	37	<ul style="list-style-type: none"> • State the features of the genetic code • Identify the two main stages of protein synthesis • Identify the characteristics of transcription and translation 	Formative assessment: <ul style="list-style-type: none"> • Draw a flowchart to illustrate the process of gene expression • Project: Mutation
27.2 Mutations		<ul style="list-style-type: none"> • Distinguish between gene mutations and chromosome mutations 	

Section	Week	Learning objectives (Students should be able to...)	Assessment
		<ul style="list-style-type: none"> • Distinguish between spontaneous mutations and induced mutations • Give examples of mutagens 	Summative assessment: Test
Ch28 Biotechnology 28.1 Recombinant DNA technology	38	<ul style="list-style-type: none"> • Outline the major steps and applications of recombinant DNA technology 	
28.2 DNA fingerprinting		<ul style="list-style-type: none"> • Outline the major steps, basic principle and applications of DNA fingerprinting 	
28.3 Human Genome Project		<ul style="list-style-type: none"> • State the goals, benefits and limitations of the Human Genome Project • Appreciate the joint efforts of scientists in international genomics projects 	
Ch29&30 Evolution 29.1 The origin of life	39-40	<ul style="list-style-type: none"> • State how life originated 	Formative assessment: <ul style="list-style-type: none"> • Presentation: Origin of life • Write an essay on natural selection Summative assessment: Test Final Examination: Ch2 – 29
29.2 Evolution		<ul style="list-style-type: none"> • Describe how the diversified life forms on earth today were formed • Explain how fossils provide evidence for evolution • Give the limitations of using fossil records as evidence for evolution • Give other evidence that supports the theory of evolution 	
30.1 Mechanism of evolution		<ul style="list-style-type: none"> • Describe how evolution takes place • Distinguish between Lamarck's theory and Darwin's theory 	

Section	Week	Learning objectives (Students should be able to...)	Assessment
		<ul style="list-style-type: none"> • Give some examples of natural selection in action • Explain how insecticide-resistant insect pests and antibiotic-resistant bacteria develop 	
30.2 Speciation		<ul style="list-style-type: none"> • Describe what speciation is • Explain how speciation occurs 	

Assessment

$$CA = \text{Test} \times 80\% + \text{Assignment} \times 20\%$$

$$\text{Year grade} = CA \times 60\% + SA \times 40\%$$

Mark ranges

Performance Level	Marks
5*	>85
5	76-85
4	61-75
3	46-60
2	30-45
1	<30

Law Ting Pong Secondary School
S6 Biology
Course Outline

Section	Week	Learning objectives (Students should be able to...)	Assessment
E1 Ch1 Regulation of Water Content 1.1 Importance of osmoregulation	2	<ul style="list-style-type: none"> • Realise the importance of osmoregulation • Identify the major organs involved in osmoregulation 	Formative assessment: <ul style="list-style-type: none"> • Annotate a diagram of nephron • Draw a diagram to illustrate the formation of urine • Draw a flowchart to show how water potential of blood is regulated Summative assessment: Test
1.2 The general plan of the urinary system		<ul style="list-style-type: none"> • Identify the major parts of the urinary system and their functions 	
1.3 Structure of the kidney		<ul style="list-style-type: none"> • Identify the structures of a nephron 	
1.4 Formation of urine		<ul style="list-style-type: none"> • Explain how ultrafiltration takes place in a nephron • Explain the adaptive features of the proximal convoluted tubule for reabsorption • Describe how substances in the glomerular filtrate are reabsorbed into the blood 	
1.5 The role of kidneys		<ul style="list-style-type: none"> • Describe the actions of ADH in keeping the water potential of the blood stable • Explain the role of kidneys in excretion 	
1.6 The dialysis machine		<ul style="list-style-type: none"> • Describe what happens if a person's kidneys do not function properly 	

Section	Week	Learning objectives (Students should be able to...)	Assessment
		<ul style="list-style-type: none"> • Explain how the dialysis machine helps clean the blood 	
E1 Ch2 Regulation of body temperature 2.1 Importance of body temperature regulation	3	<ul style="list-style-type: none"> • State the importance of keeping body temperature stable • Identify the major ways of heat exchange between the body and the environment 	Formative assessment: <ul style="list-style-type: none"> • Annotate a diagram of skin • Draw a flowchart to illustrate the regulation of body temperature Summative assessment: Test
2.2 The control centre of body temperature		<ul style="list-style-type: none"> • Describe the role of the hypothalamus in detecting changes in internal and external temperatures • Explain the actions of the thermoregulatory centre when there are changes in skin or blood temperature 	
2.3 Mechanisms of body temperature regulation		<ul style="list-style-type: none"> • Describe the roles of various structures of the skin in body temperature regulation • Explain the changes of the body under cold and hot conditions 	
2.4 Heatstroke and hypothermia		<ul style="list-style-type: none"> • Describe what heatstroke and hypothermia are 	
E1 Ch3 Regulation of gas content in blood 3.1 Importance of regulating gas content in blood	4	<ul style="list-style-type: none"> • Be aware of the importance of regulating gas content in blood 	Formative assessment: <ul style="list-style-type: none"> • Presentation: Physiological responses during vigorous exercise and their significance Summative assessment: Test
3.2 Control of breathing		<ul style="list-style-type: none"> • Explain how the respiratory centre brings about the basic rhythm of breathing • Explain the effects of carbon dioxide content in blood on the rate and depth of breathing 	

Section	Week	Learning objectives (Students should be able to...)	Assessment
3.3 Control of heart beat		<ul style="list-style-type: none"> • Explain how the heart beat is initiated • Describe what happens at different times in a cardiac cycle • Calculate heart rate, stroke volume and cardiac output • Explain how cardiac output is controlled 	
3.4 Effect of exercise on breathing and heart beat		<ul style="list-style-type: none"> • Explain how exercise affects the rate and depth of breathing and cardiac output • Be aware of the significance of changes in rate and depth of breathing and the cardiac output 	
E1 Ch4 Hormonal control of reproductive cycle	5	<ul style="list-style-type: none"> • State the major hormones involved in the menstrual cycle and their functions • Explain how follicle stimulating hormone, luteinising hormone, oestrogen and progesterone interact to bring about changes in the menstrual cycle 	Formative assessment: <ul style="list-style-type: none"> • Draw diagrams to show the variations of different hormones during a menstrual cycle • Group discussion: Reasons and significance of variations of different hormones during a menstrual cycle
4.1 Interaction of hormones in the menstrual cycle		<ul style="list-style-type: none"> • Explain how hormones are used as contraceptives 	
4.2 Use of hormones as contraceptives		<ul style="list-style-type: none"> • Explain how synthetic hormones are used in the treatment of infertility 	
4.3 Use of hormones in the treatment of infertility			Summative assessment: Test
E2 Ch1 Human impact on the environment	6	<ul style="list-style-type: none"> • Describe the impact of rapid human population growth on the environment and possible ways to reduce the impact 	Formative assessment: <ul style="list-style-type: none"> • Project: Identify areas in Hong Kong in which air pollution is most serious, based on the available information from the Environmental Protection Department, and
1.1 Impact of rapid human population growth on the environment			

Section	Week	Learning objectives (Students should be able to...)	Assessment
1.2 Natural resources		<ul style="list-style-type: none"> • Differentiate between renewable and non-renewable resources 	<p>discuss the possible cause</p> <ul style="list-style-type: none"> • Group discussion: Causes and effects of different global issues <p>Summative assessment: Test</p>
1.3 The environmental impact of malpractices in fisheries		<ul style="list-style-type: none"> • Describe the environmental impact of malpractices in fisheries 	
1.4 The environmental impact of malpractices in agriculture		<ul style="list-style-type: none"> • Describe the environmental impact of malpractices in agriculture • Explain bioaccumulation and biomagnification of pesticides in organisms • Explain the causes of eutrophication 	
1.5 The environmental impact of industrialization and urbanization		<ul style="list-style-type: none"> • Describe the environmental impact of land clearance and reclamation • State the sources of air pollution and water pollution, and their effects on human health 	
1.6 Global environmental issues		<ul style="list-style-type: none"> • Explain the causes and consequences of global warming, acid rain and algal bloom 	
E2 Ch2 Conservation		7	
2.1 Sustainable development	<ul style="list-style-type: none"> • State the measures taken to promote sustainable fisheries and agriculture in Hong Kong 		
2.2 Management of resources	<ul style="list-style-type: none"> • Identify the 4 Rs in environmental protection • State the measures taken to control air pollution and water pollution in Hong Kong 		
2.3 Pollution control			

Section	Week	Learning objectives (Students should be able to...)	Assessment
		<ul style="list-style-type: none"> Identify the roles of microorganisms in sewage treatment State the measures taken to manage solid waste in Hong Kong 	conservation <ul style="list-style-type: none"> Write an essay on conservation of ecological systems in Hong Kong Summative assessment: Test Final Examination
2.4 The need for conservation		<ul style="list-style-type: none"> Realise the need for conservation Realise the importance of preserving biodiversity 	
2.5 Conservation of species		<ul style="list-style-type: none"> Give what endangered species are State the measures for protecting endangered species 	
2.6 Conservation of habitats		<ul style="list-style-type: none"> Identify some conservation areas in Hong Kong Be aware of some ecological restoration projects and habitat creation projects in Hong Kong 	
2.7 Roles of individuals in conservation		<ul style="list-style-type: none"> Describe what individuals can do in conservation 	

Assessment

CA = Test × 80% + Assignment × 20%

Year grade = CA × 40% + SA × 60%

Mark ranges

Performance Level	Marks
5*	>85
5	76-85
4	61-75
3	46-60
2	30-45
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