Combined Science (Biology) Curriculum Plan (2009-2012)

Form	Compulsory / Elective Part	Topics	Practical Activities / Scientific Investigations	Learning & Teaching Activities / Learning & Teaching Resources
S4	I. Cells and Molecules of Life	*Ia Molecules of life*	Performing tests for the presence of biomolecules in living tissues	Making a fluid mosaic model of cell membrane 3D Animation: Osmosis on Cell Membrane
		Ib Cellular organisation	Observation with a light microscope Preparation of temporary mounts Examination of prokaryotic and eukaryotic cells Biological drawing (White blood cell & Hydrilla)	
		Ic Movement of substances across membrane	Demonstration of osmosis using dialysis tubing Study of osmosis in living plant tissue **Investigative Lab : Cell Designer**	
		Ie Cellular energetics *Metabolism: catabolism and anabolism* *Enzymes and enzymatic reaction*	Demonstration of the breaking-down action of enzymes Investigation of the effect of temperature / pH / inhibitors on enzyme activity **Investigative Lab : An Investigation with Catalase** Investigation of protease activities in different fruit juices Design an investigation of the effectiveness of different biological washing powders	**NHB : The effect of temperature on catalase activity (R1)**
	III. Organisms and Environment	*IIIb Essential life processes in animals*	Detection of food substances by food tests Investigation of food substances present in common foodstuffs **Investigative Lab : Vitamin C-A strong antioxidant** Dissection of rat to examine the mammalian alimentary canal and its associated glands Design an investigation of the action of digestive enzymes Investigation of the effect of bile salts on oil Examination of the mammalian breathing system / the pig lungs **Investigative lab : Fish Breathing**	Calculations of nutrients requirements NHB : Vitamin Deficiency Examination of a human torso

	III. Organisms and Environment	*IIIb Essential life processes in animals*	Examination of a blood smear / transverse sections of an artery and a vein / capillary flow in a fish tail fin Dissection and examination of a pig heart	
		IIIa Essential life processes in plants	Investigation of the effect of light intensity on gas exchange in plants using a data logger Demonstration of the occurrence of transpiration Measurement of the rate of transpiration using a bubble potometer Design an investigation of the effects of environmental factors on the rate of transpiration Examination of the vascular tissues of a young dicotyledonous plant Investigation of the plant tissue responsible for water transport	**NHB : The relationship between stomatal distribution and the habitats in flowering plants (R1)** Computer Simulation : Design an Investigation of the Effects of Environmental Factors on the Rate of Transpiration Video : Vascular Tissue of Plant
S5	I. Cells and Molecules of Life	*Id Cell cycle and division*	Examination of meiotic cell division **SBA 1: Amount of antioxidants from different tea samples**	**NHB : The relative time spent in each stage of the cell cycle (R1)** Animation : Cell Cycle and Mitotic Cell Cycle Video : Investigation of Relative Time Spent in Each Stage of Cell Cycle
		IIIc Reproduction, growth and development	Examination of different stages of foetal development	Foetal models **PBL : Infertility (R3)** **STSE : Contraception (R2)**
		IIId Coordination and response	Examination of a human eye model Investigation of the phototrophic responses of shoots and roots Examination of a human ear / brain model Electrical Stimulation of a Frog's Leg	NHB : Irritability in Plant **PBL : Bean Sprouts (R3)**
		IIIe Homeostasis		NHB : Insulin Discovery
	II. Genetics and Evolution	IIc Biodiversity and evolution Diversity of life forms Classification of organisms	**SBA 2: Amount of catalase in plant specimen** Using a key to identify organisms from a local Habitat Constructing a dichotomous key for leaves	
	III. Organisms and Environment	IIIf Ecosystems	Ecology study of a local habitat	**NHB : Predator-prey relationship (R1)** **STSE : Action Blue Sky (R2)**

S6	IV. Health and Diseases II. Genetics and Evolution	IVa Personal health IVb Diseases IIa Basic genetics IIb Molecular genetics IIc Biodiversity and evolution Origin of life Evolution	Ethanol effect on *Artemia* heart rate **SBA 3: Determine the water potential of plant cells** Observation of maize cobs with grains of different colours Observation and analysis of continuous variation in humans/ discontinuous variation in humans Separation of DNA fragments using gel electrophoresis **SBA 4: Compare the rate of transpiration in two plants**	PBL : Food Poisoning Detective **STSE : Infectious Diseases (R2)** **PBL : Tetanus (R3)** **NHB : Mendelian Genetics (R1)** **NHB : Uncover the structure of DNA (R1)** **PBL : DNA Fingerprinting (R3)** **STSE : Human Genome Project (R2)**

Remarks:

1. *Topics in italics and blue are foundation topics.*
2. EDB resources:

(R1) Curriculum Resources for Infusing Ideas about Nature and History of Biology and Scientific Inquiry into the Learning and Teaching of Senior Secondary Biology Curriculum (NHB)

(R2) Curriculum Resources for Infusing Science-Technology-Society-Environment Connections into the Learning and Teaching of the Senior Secondary Biology Curriculum (STSE)

(R3) Learning and Teaching Resources for Senior Secondary Biology Curriculum: Problem-based Learning (PBL)

(R4) Investigative Lab