

Manitoba

Education, Citizenship and Youth

SENIOR 3 BIOLOGY 30S

Student Specific Learning Outcomes

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Cluster 0: Biology Skills and Attitudes

Demonstrating Understanding

S3B-0-U1 Use appropriate strategies and skills to develop an understanding of biological concepts.

Examples: using concept maps, sort-and predict frames, concept frames...

S3B-0-U2 Demonstrate an in-depth understanding of biological concepts.

Examples: use accurate scientific vocabulary, explain concept to someone else, make generalizations, compare/contrast, identify patterns, apply knowledge to new situations/contexts, draw inferences, create analogies, creative presentations...

Personal Perspectives/Reflection

S3B-0-P1 Demonstrate confidence in their ability to carry out investigations.

S3B-0-P2 Demonstrate a willingness to reflect on their own wellness.

S3B-0-P3 Appreciate the impact of personal lifestyle choices on general health and make decisions that support a healthy lifestyle.

S3B-0-P4 Demonstrate an understanding of and respect for a diversity of cultural perspectives and approaches to maintaining health and treating illness.

Examples: Asian approaches to health and wellness based on concepts of balance; Indigenous peoples traditional medicines, concepts of healing; homeopathy...

Scientific Inquiry

S3B-0-S1 State a testable hypothesis or prediction based on background knowledge or on observed events.

S3B-0-S2 Plan an experiment to answer a specific scientific question.

Include: materials, Independent, dependent and controlled variables, methods, safety considerations.

S3B-0-S3 Demonstrate work habits that ensure personal safety, the safety of others, and consideration of the environment.

Examples: application of WHMIS, proper disposal of chemical or biological specimens...

S3B-0-S4 Select and use scientific equipment appropriately and safely.

Examples: microscopes, dissection equipment, prepared slides...

S3B-0-S5 Demonstrate sensitivity towards, and respect for, living and non-living tissues, specimens and organisms utilized for biological research.

S3B-0-S6 Record, organize and display data and observations using an appropriate format.

Include: biological drawings.

S3B-0-S7 Evaluate the relevance, reliability, and adequacy of data and data collection methods.

Include: discrepancies in data, sources of error.

S3B-0-S8 Analyze data or observations in order to draw a conclusion that explains the results of the experiment and identifies implications of these results.

Decision-Making

S3B-0-D1 Identify and explore a current issue.

Examples: clarify what the issue is, identify different viewpoints and/or stakeholders, research existing data/information.

S3B-0-D2 Evaluate implications of possible alternatives or positions related to an issue.

Examples: positive and negative consequences of a decision, strengths and weaknesses of a position...

S3B-0-D3 Recognize that decisions reflect values and consider their own values and those of others when making a decision.

S3B-0-D4 Recommend an alternative or identify a position and provide justification.

S3B-0-D5 Propose a course of action related to an issue.

S3B-0-D6 Evaluate the process used by themselves or others to arrive at a decision.

Information Management and Communication

S3B-0-I1 Synthesize information obtained from a variety of sources.

Include: print and electronic sources, resource people, different types of writing.

S3B-0-I2 Evaluate information obtained to determine its usefulness for information needs.

Examples: scientific accuracy, reliability, currency, relevance, balance of perspectives, bias...

S3B-0-I3 Quote from or refer to sources as required and reference sources according to accepted practice.

S3B-0-I4 Communicate information in a variety of forms appropriate to the audience, purpose and context.

Group Work

S3B-0-G1 Collaborate with others to achieve group goals and responsibilities.

S3B-0-G2 Elicit, clarify and respond to questions, ideas, and diverse points of view in discussions.

S3B-0-G3 Evaluate individual and group processes used.

Working in Science

S3B-0-W1 Demonstrate a continuing, more informed interest in biology and biology-related careers and issues.

S3B-0-W2 Appreciate the contributions of Canadian scientists and institutions, past and present, to the field of human biology

Unit 1: Wellness and Homeostasis

Personal Wellness

S3B-1-01 Increase awareness of personal wellness as well as personal and family health history.

S3B-1-02 Develop a personal wellness plan.

S3B-1-03 Recognize how individual wellness choices affect others.

Examples: community, family, fetus...

Introduction to Homeostasis

S3B-1-04 Describe how the body attempts to maintain an internal balance called homeostasis, recognizing that the conditions in which life processes can occur are limited.

Include: thermoregulation (maintenance of body temperature), osmoregulation (water balance), waste management.

S3B-1-05 Explain the principle of negative feedback and identify how the body stabilizes systems against excessive change.

Include: role of receptors, effectors

Cells and Homeostasis

S3B-1-06 Identify life processes that individual cells, as well as complex organisms, need to manage.

Include: obtain food, convert energy, eliminate wastes, reproduce, grow and repair, transport substances.

S3B-1-07 Explain how cell membranes regulate movement of materials into and out of cells and recognize the importance of this regulation in managing life processes and maintaining homeostasis.

Include: passive transport, active transport, and endo/exocytosis.

S3B-1-08 Identify factors that influence movement of substances across a membrane, recognizing that movement of these substances is important for the internal balance of the cell.

Examples: size of molecule, concentration gradient, temperature, polarity of molecules, surface area...

S3B-1-09 Explain the role of energy in maintaining an internal balance in the cell.

Include: role of ATP in metabolism.

Unit 2: Digestion and Nutrition

Digestion

S3B-2-01 Identify major structures and functions of the human digestive system from a diagram, model or specimen.

Include: tongue, teeth, salivary glands, epiglottis, esophagus, pharynx, sphincters, stomach, small intestine, large intestine, rectum, anus, appendix, liver, gall bladder, pancreas, uvula.

Introduction to Mechanical and Chemical Digestion

S3B-2-02 Describe the processes of mechanical digestion that take place at various sites along the alimentary canal.

Include: chewing in the mouth, peristalsis along the tract, muscle contractions in the stomach, emulsification by bile in the small intestine.

S3B-2-03 Identify functions of secretions along the digestive tract.

Include: to lubricate, to protect.

S3B-2-04 Identify sites of chemical digestion along the alimentary canal as well as the type of nutrient being digested.

Include: starch in the mouth; proteins in the stomach; carbohydrates, lipids and proteins in the small intestine.

Enzymes and Chemical Digestion

S3B-2-05 Explain the role of enzymes in the chemical digestion of nutrients and identify factors that influence their action.

Examples: pH, temperature, coenzymes, inhibitors...

Absorption

S3B-2-06 Describe the processes of absorption that take place at various sites along the alimentary canal.

Include: uptake of nutrients by villi in the small intestine, uptake of water in large intestine.

The Liver

S3B-2-07 Describe the homeostatic role of the liver with respect to the regulation of nutrient levels in the blood and nutrient storage.

Include: carbohydrate metabolism.

Nutrition

S3B-2-08 Describe the functions of the six basic types of nutrients: carbohydrates, lipids, proteins, vitamins, minerals and water.

Include: ATP production, construction and repair, regulating.

S3B-2-09 Identify dietary sources for each of the six basic types of nutrients.

Wellness

S3B-2-10 Evaluate personal food intake and related food decisions.

Examples: % daily values of nutrients, portion size, nutrient labels, balance between lifestyle and consumption...

S3B-2-11 Investigate and describe conditions/disorders that affect the digestive process.

Decision-Making

S3B-2-12 Use the decision-making process to investigate an issue related to digestion and nutrition.

Examples: dietary disorders, diabetes, media influence on body image, fad diets, specialized diets ...

Unit 3: Transportation and Respiration

Introduction

S3B-3-01 Design and execute an experiment to investigate an aspect of the transportation or respiratory system.

Examples: the effect of exercise on heart and/or respiratory rate, the effect of adrenalin on blood pressure, carbon dioxide production as an indicator of metabolism...

S3B-3-02 Identify the materials transported between cells and capillaries.
Include: carbon dioxide, oxygen, hormones, nutrients, nitrogenous wastes.

Blood Components

S3B-3-03 Compare the characteristics of blood components in terms of appearance, origin, numbers, relative size and function in the body.

Include: plasma, erythrocytes (red blood cell), leukocytes (white blood cell) and platelets.

S3B-3-04 Use a microscope to identify blood components.
Include: erythrocytes, leukocytes, platelets.

S3B-3-08 Compare the structure and function of blood vessels.

Example: diameter, elasticity, muscle layers, valves, what they transport ...

Blood Groups

S3B-3-05 Compare and contrast the characteristics of different blood groups.
Include: ABO, Rh factor.

S3B-3-06 Predict the physiological consequences of blood transfusions involving different blood groups.

S3B-3-07 Describe the blood donation process and investigate related issues.

Example: compatible blood groups, screening procedure, frequency of donation, use of donated blood products, blood-borne diseases...

Heart Function and Control

S3B-3-09 Describe the cardiac cycle.
Include: systole, diastole.

S3B-3-10 Describe, in general terms, the nervous and chemical control of heartbeat.

Blood Pressure

S3B-3-11 Explain the meaning of blood pressure readings and identify the normal range.

Include: given as a ratio of systolic over diastolic.

S3B-3-12 Identify factors which affect blood pressure and describe their effects.

Examples: age, exercise, stress, caffeine, nicotine, shock betablockers, diuretics, effects: low blood pressure, high blood pressure, increased heart rate...

S3B-3-13 Explain how transport systems help to maintain homeostasis in the body.

Include: transport nutrients, oxygen, carbon dioxide, wastes, and hormones; help maintain fluid balance; regulate body temperature; and assist in the defense of the body against invading organisms.

Respiration

S3B-3-14 Distinguish between cellular respiration, internal respiration, and external respiration.

S3B-3-15 Identify major structures and function of the human respiratory systems from a diagram, model or specimen.

Include: lungs, pleura, nasal cavity, epiglottis, bronchi & bronchioles, alveoli, diaphragm, interpleural fluid, pharynx, larynx, trachea, uvula, ribs and intercostals muscles, pulmonary capillaries.

S3B-3-16 Describe how breathing is controlled to help maintain homeostasis in the human body.

Include: chemoreceptors, medulla oblongata.

Wellness

S3B-3-17 Investigate and describe factors/disorders associated with transportation and/or respiration in the human body.

Examples: asthma, arteriosclerosis, effects of various factors on fetal well-being (alcohol, smoking, drugs, infertility diseases),

S3B-3-18 Identify personal lifestyle choices that contribute to cardio-vascular and respiratory wellness.

Examples: exercise, smoking...

Unit 4: Excretion and Waste Management

General

S3B-4-01 Identify the primary metabolic wastes produced in the cell and the human body and the source of each.

Include: Carbon dioxide, water, nitrogenous compounds, mineral salts.

S3B-4-02 Describe the roles of the major excretory structures in eliminating wastes and helping the body maintain homeostasis.

Include: kidneys, lungs, skin, intestine, liver.

Urinary

S3B-4-03 Identify structures of the human urinary system from a diagram, model or specimen and describe the function of each.

Include: kidneys, renal cortex, renal medulla, renal pelvis, renal arteries and veins, ureters, urinary bladder, urethra, urinary sphincters.

S3B-4-04 Explain the processes of filtration, reabsorption, and secretion in the nephron.

S3B-4-05 Describe the feedback mechanisms associated with water and salt balance and their role in the maintenance of homeostasis in the human body.

Include: antidiuretic hormone (ADH) and aldosterone.

S3B-4-06 Describe what types of information can be gained through urinalysis.

Examples: performance enhancing drugs, diabetes, recreational drugs, pregnancy, infections, kidney failure or damage,...

Wellness

S3B-4-07 Investigate and describe issues related to kidney failure and treatment options available.

Include: organ transplant, personal lifestyle, dialysis.

S3B-4-08 Appreciate the importance of a healthy excretory system and describe how it can be influenced by personal lifestyle.

Examples: maintaining fluid level, choice of drinks, protective sports gear (protecting kidneys)...

Unit 5: Protection and Control

General

S3B-5-01 Identify ways in which the body protects itself from accident or injury.

Examples: the senses, the skeletal and muscular systems, instinct, reflexes, fight or flight response...

Immune System

S3B-5-02 Describe physical and chemical barriers that protect the body from foreign agents.

Examples: skin, melatonin, mucous membranes, cilia, pH (stomach, vagina), tears, sneezing, coughing, lymphatic filtering (tonsils, adenoids)...

S3B-5-03 Describe the body's response to allergens, vaccines, viruses/bacteria.

Include: inflammatory response, immune response.

S3B-5-04 Explain the role of the lymphatic system in protecting the human body.

Include: lymph vessels, lymph nodes, lymph.

S3B-5-05 Describe examples that illustrate the critical role of the immune system in maintaining personal and societal health and investigate related issues.

Examples: introduction of new diseases to a population, epidemics, organ transplant and rejection...

Nervous System

S3B-5-06 Describe the major organization and function of the nervous system.

Include: central nervous system and peripheral nervous system (autonomic and somatic).

S3B-5-07 Identify the functional regions of the brain on a diagram.

Examples: general anatomy such as cerebellum, specific regions responsible for speech and other functions, left-brain/right-brain concept...

S3B-5-08 Identify possible implications of concussions on brain function.

Examples: multiple concussions in sport, second impact syndrome...

S3B-5-09 Explain how a nerve impulse travels a particular pathway using chemical and electrical signals.

Include: synapse.

S3B-5-10 Compare the general roles of nervous and the hormonal controls, recognizing that the nervous and endocrine systems interact to maintain homeostasis in the body. Include: communication, speed, duration, target pathway, action.

Wellness

S3B-5-11 Describe how personal lifestyle and environmental factors can influence protection and/or control systems.

Examples: impact of drugs, neurotoxins, anabolic steroids, mercury, cadmium, lead, hormones, sleep, diet, use of safety equipment...

S3B-5-12 Investigate and describe conditions/disorders that affect protection and/or control in the human body.

S3B-6-04 Use the decision-making process to investigate the role of public health and government regulations in protecting public health.

Examples: immunization policies, mandatory spraying for mosquito control, travel bans and advisories, mandatory helmet wear...

Unit 6 – Wellness and Homeostatic Changes

S3B-6-01 Analyze examples of how different body systems work together to maintain homeostasis under various conditions.

Examples: cold weather, organ transplant

S3B-6-02 Recognize that aging is a progressive failure of the body's homeostatic responses and describe some changes that take place in different body systems as we age.

Examples: less blood and oxygen delivered to muscles and other tissues due to decreased efficiency of heart and lungs, lower calorie requirement due to decreased metabolic rate, increased susceptibility to autoimmune diseases due to fall in number of T cells and decreased activity of B cells...

S3B-6-03 Compare legal and medical definitions of death and identify social issues related to the process of dying.

Examples: euthanasia, advanced directive, choice of treatments, organ donation, availability of palliative care...

S3B-6-04 Describe how technology has allowed us to control our wellness and the ethical dilemmas that use of technology can create.

Examples: reproductive technologies, surgery, anesthetic, pharmaceuticals...