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ABSTRACT

The major program components of the Biology 30 curriculum are outlined in this document. These key elements include: (1) process skills; (2) psychomotor skills; (3) attitudes; and (4) concepts (subject matter). Each of the components has been assigned an emphasis rating (expressed in a percentage) and a priority rating (designated by a ranking of high, medium, or low). (ML)

DIPLOMA EXAMINATION

CURRICULUM SPECIFICATIONS
for
BIOLOGY 30

Alberta
EDUCATION
April 1986

BIOLOGY 30 CURRICULUM SPECIFICATIONS

A. Program Elements

The Biology program is based on four elements: process skills, psychomotor skills, attitudes, and concepts (subject matter). The percentage emphasis of each component for instruction in Biology 30 is listed in the table below. Even though each component is listed separately, instruction should integrate process skills, psychomotor skills and attitudes with the development of concepts. Not all these elements have equal emphasis at each course level. Hence, development of these components should take place as the concepts are presented.

Content	Emphasis
Process Skills	20%
Psychomotor Skills	5%
Attitudes	15%
Concepts (Subject Matter)	60%

B. Priority Weightings

The following code is used in the specifications to indicate curriculum and instruction priority.

A = high priority
B = medium priority
C = low priority

BIOLOGY 30 CURRICULUM SPECIFICATIONS

PROGRAM COMPONENTS

A. PROCESS SKILLS — 20%

PRIORITY RATING		EMPHASIS IN PER CENT
A	1. Questioning 1.1 Formulating and expressing relevant questions 1.2 Defining problem statements 1.3 Recognizing limitations to scientific investigation of given questions and problems	20%
A	2. Proposing Ideas 2.1 Formulating hypotheses 2.2 Stating predictions	
A	3. Designing Experiments 3.1 Defining operationally 3.2 Identifying and controlling variables 3.3 Determining procedures 3.4 Evaluating experimental designs and suggesting modifications	
B	4. Gathering Data 4.1 Observing accurately 4.2 Measuring accurately 4.3 Recording data clearly and completely 4.4 Estimating quantities and measures	

PROGRAM COMPONENTS Cont.

PRIORITY RATING		EMPHASIS IN PER CENT
B	5. Processing Data 5.1 Organizing and presenting data 5.2 Determining patterns and trends in data 5.3 Determining experimental error both for original data and for values derived from these data	Cont.
A	6. Interpreting Data 6.1 Identifying limits to interpretations 6.2 Generating appropriate explanations, theories and/or models 6.3 Generating ideas for extending knowledge related to the area of investigation	

B. PSYCHOMOTOR SKILLS — 5%

PRIORITY RATING		EMPHASIS IN PER CENT
Equal priority	Develop and calibrate tools and instruments	5%
	Develop and manipulate various tools, instruments, apparatus, and materials proficiently	
	Carry out various accepted procedures and techniques, for example, laboratory work, field work, and preparations	
	Develop and follow safe practices and procedures	

C. ATTITUDES — 15%

Equal priority	Awareness - Develop an awareness of the biological factors related to issues of current interest	15%
	Appreciation - Develop an appreciation of the interdependence of human organ systems and their functioning in a homeostatic relationship	

D. CONCEPTS (SUBJECT MATTER) 60%

PRIORITY RATING	CONCEPT		EMPHASIS IN PER CENT
B	Cellular processes are fundamental to life	1. Animal cells exhibit complex structure and function. a. Membranes b. Cytoplasm and nucleoplasm c. Organelles	
A		2. Substances necessary for life are transported by physical and chemical processes. a. Diffusion and osmosis b. Active transport c. Endocytosis and exocytosis	7%
A	Homeostatic mechanisms regulate the body and its systems.	1. Negative feedback.	
		2. Enzyme action regulates cell metabolism.	
		3. Competitive inhibitors interfere with enzyme activity.	3%
		4. Acids, bases and buffers.	
A	Humans must take in and process the required nutrients for absorption.	1. Basic organic and inorganic substances provide requirements for cell maintenance and growth. a. Identify the importance of carbohydrates, proteins, lipids, nucleic acids, vitamins, minerals and water. b. Identify the general structural and functional differences between carbohydrates, lipids and proteins.	13%

PROGRAM COMPONENTS Cont.

PRIORITY RATING	CONCEPT		EMPHASIS IN PER CENT
		c. Carbohydrates, lipids and proteins can be identified in the lab. i. Carbohydrates (Benedict's solution and iodine) ii. Lipids (Sudan IV and Translucence) iii. Proteins (Biuret solution)	
B		d. The anatomy of the digestive system consists of the mouth, esophagus, stomach, small intestine, large intestine and anus.	
		e. Accessory structures which assist in the process of digestion are salivary glands, liver, gall bladder and the pancreas.	Cont.
A	Cont.	f. Digestion includes the physical and chemical breakdown of ingested macromolecules, preparing them for absorption. i. Oral (Salivary Amylase) ii. Gastic (Pepsin, HCl) iii. Intestinal (Carbohydrases, Bile, Lipase, Bicarbonate ion)	
		g. The release of digestive enzymes is under: i. Mechanical control (Peristalsis) ii. Hormonal control (Gastrin, Secretin) iii. Nervous control	
B		h. Nutrients are absorbed into the circulatory system.	
		i. The large intestine absorbs water and vitamins, stores, then ejects undigested materials.	

PROGRAM COMPONENTS Cont.

PRIORITY RATING	CONCEPT		EMPHASIS IN PER CENT
	Cont.	j. Malfunctions of the digestive system can result in ulcers or gall stones. k. Foreign substances may be absorbed and retained by body tissue.	
B	Body fluids distribute essential nutrients to and carry wastes away from tissues.	1. The heart and its major blood vessels are structured to facilitate circulation.	11%
		2. Blood circulation occurs in a closed system consisting of arteries, arterioles, capillaries, venules and veins.	
A		3. Homeostatic controls maintain cardiac output and blood pressure. a. Capillary fluid exchange b. The medulla oblongata processes information from: i. Stretch receptors ii. Carbon dioxide c. Heart tissue is self-stimulating.	
A		4. Blood is the primary circulating body tissue fluid. a. Cellular components have specific functions. i. Erythrocytes transport gases. ii. Leukocytes control foreign invading bodies through antibody production and phagocytosis. iii. Platelets initiate blood clotting.	

PROGRAM COMPONENTS Cont.

PRIORITY RATING	CONCEPT		EMPHASIS IN PER CENT
	Cont.	b. Noncellular components include plasma proteins, inorganic molecules, nutrients, and waste molecules. c. Specific proteins determine blood types. i. A, B, O factors ii. Rh factor d. Oxygen concentration regulates red blood cell production.	Cont.
A		5. Malfunctions in the circulatory system may result in heart attacks and strokes.	
B		6. Lymph is a secondary circulating body fluid. a. Lymph system b. Lymph function	
B	Breathing precedes gas exchange and transport.	1. The anatomy of the respiratory system includes the: a. Trachea b. Bronchi c. Bronchioles d. Alveoli	6%
B		2. Mechanics of breathing include inhalation and exhalation.	
B		3. Gas exchange occurs between the environment, blood, and body tissues.	

PROGRAM COMPONENTS Cont.

PRIORITY RATING	CONCEPT		EMPHASIS IN PER CENT
A	Cont.	4. Hemoglobin and blood plasma are necessary for gas transport. a. Oxygen is transported as part of the oxy-hemoglobin molecule. b. Carbon dioxide is transported as part of the bicarbonate ion, as part of carbaminohemoglobin, and as a molecule dissolved in plasma.	Cont.
B		5. Breathing rate is controlled by respiratory centers in the medulla.	
A		6. Smoking can adversely affect the respiratory system and may result in: a. Lung cancer b. Emphysema	
C	Energy is released by the oxidation of organic compounds.	1. Cellular respiration involves three basic concepts. a. Hydrogen and its electron move from weak to progressively stronger electron acceptors. b. The transfer of hydrogen and its electron releases energy which can be used to form high energy bonds. c. Some energy is stored as ATP.	4%
B		2. Anaerobic respiration in muscle cells: a. Takes place in the absence of oxygen b. Results in the accumulation of lactic acid c. Produces low amounts of ATP	

PROGRAM COMPONENTS Cont.

PRIORITY RATING	CONCEPT		EMPHASIS IN PER CENT
B	Cont.	3. Aerobic respiration: a. Utilizes oxygen as a final electron acceptor b. Results in carbon dioxide and water as end products c. Produces high amounts or ATP	
A		4. ATP released during cellular respiration is utilized for several metabolic processes including: a. Synthesis b. Movement and muscle contraction c. Heat production d. Active transport	
A	The kidney provides homeostatic control over body fluids.	1. The excretory system removes metabolic wastes from the blood. a. Urea, formed in the liver, is a major nitrogenous waste product in the blood. b. The excretory system involves the kidney, ureter, urinary bladder, and urethra. c. Urine formation involves the glomerulus, Bowman's capsule, proximal and distal convoluted tubules, loop of Henle, and collecting duct.	8%
A		2. Body fluid balance is maintained by hormones and ions. a. Body fluid is regulated by aldosterone. b. Osmotic pressure of body fluids is regulated by antidiuretic hormone.	
A		3. Dialysis may replace kidney function.	

PRIORITY RATING	CONCEPT		EMPHASIS IN PER CENT
A	Regulation of internal environment requires co-ordination between the nervous and hormonal systems.	1. Endocrine secretions regulate and maintain body functions. a. Major endocrine glands include the pituitary, pancreas, adrenal and thyroid. b. Blood sugar regulation is influenced by insulin, adrenalin, thyroxin and glucagon. c. Hormone levels are regulated by negative feedback. d. Dwarfism is caused by a deficiency in human growth hormone.	16%
A		2. Nervous control involves reception, transmission, interpretation, and response. a. Stimuli in the environment must first be detected by sensory receptors. i. Eye. A. The cornea, iris, pupil, lens, and retina are involved in image formation. B. Light activates rods and cones. C. The optic nerve transmits images from the retina to the brain. D. Far- and near-sightedness and astigmatism are common disorders of the eye.	

PROGRAM COMPONENTS 'ont.

PRIO-RITY RATING	CONCEPT		EMPHASIS IN PER CENT
	Cont.	ii. Ear. A. The eardrum, ossicles, round and oval windows, cochlear fluid, and the organ of corti are involved in sound transmission. B. The auditory nerve transmits impulses from the cochlea to the brain. C. The eustachian tube maintains equal pressure on both sides of the eardrum. D. The semicircular canals detect body position and motion. iii. Chemoreceptors detect taste and odor. iv. Receptors in the skin detect pressure and temperature.	
A		b. Neural transmission relays information throughout an organism. i. Structure of a neutron. ii. Electrical activity of a nerve impulse. A. Threshold levels B. "All or none" response C. Refractory period iii. Chemical transmission between neurons involves excitatory and inhibitory substances. A. Acetylcholine B. Noradrenaline C. Acetylcholinesterase	

PROGRAM COMPONENTS Cont.

PRIORITY RATING	CONCEPT		EMPHASIS IN PER CENT
B	Cont.	c. The central nervous system interprets information and co-ordinates response. i. The cerebrum, hypothalamus, cerebellum, and medulla oblongata are major regions of the brain. ii. The spinal cord transmits information to and from the brain. iii. The reflex arc involves peripheral nerves and the spinal cord.	
B		d. The autonomic nervous system involves both sympathetic and parasympathetic nerves.	
B	Voluntary movement and body support are the result of skeletal muscles and the skeletons to which they are attached.	1. The skeleton provides for muscle attachment, protection, of internal organs and locomotion. a. Ligaments b. Tendons c. Joints	4%
B		2. Skeletal muscles have a unique structure. a. Fibers and fibrils. b. Actin and myosin.	
B		3. Muscle contraction is stimulated by nerve action.	
		4. Muscle contraction requires calcium, creatine phosphate, and ATP.	
		5. Inflammation of the joints may result in arthritis.	

PROGRAM COMPONENTS Cont.

PRIORITY RATING	CONCEPT		EMPHASIS IN PER CENT
B	Humans are capable of reproducing.	1. Reproduction systems: a. The male reproductive system involves the penis, scrotum, testicles, vas deferens, urethra, prostate gland, Cowper's gland, and the seminal vesicle. b. The female reproductive system involves the vagina, uterus, cervix, fallopian tubes, and ovaries.	
A		2. The development and functioning of the reproductive system is under the control of hormones. a. Gonadotropic hormones regulate the production of sex hormones. i. Follicle stimulating hormone ii. Lutenizing hormone iii. Intersticial cell stimulating hormone (male precursor) b. Testosterone functions in developing primary and secondary sex characteristics. c. Estrogen and progesterone function in: i. Developing primary and secondary sex characteristics ii. Menstrual cycle	8%
A		3. Pregnancy and child birth: a. Fertilization and implantation b. Pregnancy is maintained through a hormonal balance c. Embryonic and fetal development involves a placenta, the amnion, chorion, and the umbilical cord d. Oxytocin and relaxin are involved in the birth process	