

Biology: Concepts & Applications

INSTRUCTOR:	Gerald Haase	OFFICE HOURS:	Wednesdays, 1-3pm
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TELEPHONE:	867.668.8831	DATES:	January 5 – April 17, 2015

** Biology Tutoring may also be available on: Mondays @ 2:30 – 4 pm when there are no labs.

COURSE DESCRIPTION

Biology: Concepts and Applications (Diploma Level) covers the principles of many aspects of biology similar to those described by the ABE Articulation, Provincial Level, of British Columbia, with an emphasis on human biology. Biology 060 with appropriate marks will allow students to enter a first-year college or university biology course, or a Licensed Practical Nursing Program.

PREREQUISITES

A minimum of sixty-five percent (65%) in Grade 11 biology, or Yukon College Biology 050, or permission of the instructor. English 050 is required as a co-requisite.

LEARNING OUTCOMES

At the completion of this course, the student will:

- Understand and be able to communicate the basic concepts of human anatomy, covering similar material to that of Yukon Biology 12.
- Have the prerequisites, knowledge, and skills to enter science programs, especially those related to biological sciences such as a health programs or Renewable Resources.
- Be able to enter, with confidence, a first-year biology course.
- Have an appreciation of biology within the course context as well as related concepts, such as First Nations traditional knowledge and global biological issues.

COURSE FORMAT

1. There are approximately thirty-five scheduled 1 ½ -hour sessions generally consisting of:
 - review / topic introduction
 - viewing a videotape
 - lecture / discussion

2. The laboratories consist of:
 - two three-hour sessions for Labs 1 & 2 via computer-assisted labs
 - one histology (tissue types) lab in the Biology Lab Room 2805
 - Labs 3 - 7 will be held on consecutive afternoons during the week of March 31 – April 4, 2014. There will be no classes this week.

COURSE REQUIREMENTS

ASSESSMENTS

Attendance:

It is the student's responsibility to attend all classes.

The following is an excerpt from the Yukon College Academic Regulations and Procedures (January 2000) manual from section 4.01—**Attendance**:

“Students in all program areas are expected to attend classes. However, attendance requirements may vary from program to program. Special permission from the Dean or Chair is required if a student is enrolled in another course and the timetables for the two courses overlap. Attendance requirements are noted below.

Individual instructors shall inform students of the attendance requirements for their course at the beginning of the semester.

- Admission to a lecture or laboratory may be refused by the instructor due to lateness or misconduct. Students who do not attend classes or submit assignments as required may be refused admission to further classes.
- Attendance at practicum activities and work placement activities (in Co-op programs) is required. Students shall notify the placement agency as well as the instructor whenever practicum/work attendance is not possible.
- Attendance for sponsored students will be reported to the sponsoring agency as required.

Electronic Devices

In order to be successful in classes and minimize distractions for others, cell phones, iPods and other electronic devices must be turned off while students are in class. In an emergency situation, the instructor may give a student permission to use a cell phone or pager.

Appropriate Language

In all areas of the college environment, students are responsible to show respect for others, swearing, or language that is discriminatory or derogatory in relation to race, sex, ethnic background, religious beliefs, age and physical condition is not appropriate.

Assignments:

1. After most of the **23 chapters**, an assignment is handed in (typewritten or word processed). It is the student's responsibility to be informed about expectations by reading the Student Manual.
2. After each of the **7 laboratories**, a lab assignment is handed in. **The lab part of the course must be passed to pass the course. It is the student's responsibility to be informed about expectations by reading the Course Outline and the Student Manual.**
3. Each student is required to complete a research **presentation**. The presentation format is open; for example, students may choose to do a research paper, an oral presentation, or a visual presentation. The topics chosen must be approved by the instructor.

Examinations:

There are two examinations covering the contents as follows:

1. **Midterm Exam** - chapters 1-8, 23-26
2. **Final Exam** - All chapters covered in this course. The lecture part of the course (assignments and exams) must be passed to pass the course. It is the student's responsibility to be informed about all aspects of the exams and student assessment by reading the course outline.

EVALUATION

A final grade for the course will be assigned on the following basis:

- Assignments 20%
- Labs 20%
- Presentation 5%
- Midterm Exam 25%
- Final Exam 30%

Total: 100 %

Yukon College uses a letter grade system and calculates weighted grade point averages (GPA) on a 4.0 scale. Following are equivalents of the letter grades:

LETTER GRADE	PERCENTAGE EQUIVALENT	GRADE POINT
A+	95 – 100	4.0
A	86 – 94	4.0
A-	80 – 85	3.7
B+	75 – 79	3.5
B	70 – 74	3.0
B-	65 – 69	2.7
C+	62 – 64	2.5
C	58 – 61	2.0
C-	55 – 57	1.7
D	50 – 54	1.0
F	under 50	0.0

Rewrites

A rewrite for a failing grade on an examination (less than 50%) may be permitted at the instructor's discretion. These examinations will be written no earlier than two weeks after the date of the original examination. The mark will be recorded whether it is higher or lower than the original. However, a maximum mark of 65% will be awarded.

"No Shows"

A student who misses an examination will receive a mark of zero for that examination but may be permitted a rewrite. Exceptions may be made if a student receives prior permission from the instructor, or faces an emergency. Some form of documentation of the emergency may be required.

Note: The passing mark for this course is 50%.

REQUIRED TEXTBOOKS AND MATERIALS

Required Textbooks: Mader, Sylvia (2010). Inquiry into Life (13th ed) or the 14th edition

Required Additional Materials:

1. Yukon College Laboratory Manual (adapted from North Island College; included in the student package).
2. One videotape / DVD for each chapter
3. Laboratory materials as required (dissection kits available in biology lab).

PLAGIARISM

Plagiarism is a serious academic offence. Plagiarism occurs when students present the words of someone else as their own. Plagiarism can be the deliberate use of a whole piece of another person's writing, but more frequently it occurs when students fail to acknowledge and document sources from which they have taken material. Whenever the words, research or ideas of others are directly quoted or paraphrased, they must be documented according to an accepted manuscript style (e.g., APA, CSE, MLA, etc.)

Resubmitting a paper which has previously received credit is also considered plagiarism. Students who plagiarize material for assignments will receive a mark of zero (F) on the assignment and may fail the course. Plagiarism may also result in dismissal from a program of study or the College.

ACADEMIC ACCOMODATION

Reasonable accommodations are available for students requiring an academic accommodation to fully participate in this class. These accommodations are available for students with a documented disability, chronic condition or any other grounds specified in section 8.0 of the Yukon College Academic Regulations (available on the Yukon College website). It is the student's responsibility to seek these accommodations. If a student requires an academic accommodation, he/she should contact the Learning Assistance Centre (LAC) at (867) 668-8785 or lassist@yukoncollege.yk.ca.

Specific Learning Outcomes:

Methods and Concepts

Specific Learning Outcomes: It is expected that students will be able to:

- a. describe the hierarchy of organization, from atoms and molecules through cells to the biosphere
- b. describe the characteristics of living organisms which distinguish them from non-living things
- c. make detailed observations about the natural world
- d. formulate scientific questions and distinguish them from other types of questions
- e. formulate hypotheses
- f. critique experimental results and write scientific reports
- g. discuss the effects of science and technology on society

Atoms and Molecules /The Cell /Diffusion

Specific Learning Outcomes: It is expected that students will be able to:

- a. explain how the distribution of electrons in an atom or an ion determines the number and kinds of chemical bonds that can be formed
- b. list the various types of chemical bonds and the circumstances under which each forms
- c. describe the essential chemistry and characteristics of water
- d. compare characteristics of acids, bases, and salts
- e. explain how small organic molecules are assembled into macromolecules by condensation, and how the reverse process is accompanied by hydrolysis
- f. identify the general structure of a monosaccharide, fatty acid, amino acid, and nucleic acid
- g. demonstrate an understanding of cell theory
- h. identify and describe the function of major cell components and relate structure to function
- i. distinguish between eukaryotic and prokaryotic cells
- j. describe the essential role of DNA
- k. define diffusion and relate its importance to biological processes
- l. differentiate between passive and active transport

Energy-Acquiring and Energy-Releasing Pathways

Specific Learning Outcomes: It is expected that students will be able to:

- a. describe the pathways by which energy enters organisms and passes to other organisms and back into the environment
- b. outline the steps of light-dependent and light-independent reactions, including reactants and products of each phase
- c. differentiate between aerobic respiration and anaerobic respiration
- d. explain the processes involved in the three stages of aerobic respiration
- e. know the raw materials and products of the processes of glycolysis, fermentation, the Krebs cycle, and electron transfer phosphorylation.

Meiosis

Specific Learning Outcomes: It is expected that students will be able to:

- a. compare mitosis and meiosis in terms of chromosome duplication and cell divisions
- b. describe the various phases of meiosis in terms of chromosome action and cytoskeletal elements
- c. explain what actually happens when fertilization occurs
- d. define various genetic terms including, but not limited to: gene, allele, dominance, homozygous, heterozygous, genotype, phenotype, karyotype

From DNA to Proteins

Specific Learning Outcomes: It is expected that students will be able to:

- a. relate the structure of nucleic acids to nucleotides and describe the components of nucleotides
- b. describe how DNA is replicated
- c. explain how the structure and behaviour of the three types of RNA determine the structure of polypeptide chains
- d. describe the nature of mutations and their role in genetic variation
- e. describe several ways and levels of gene activation and inactivation
- f. explain how operon controls regulate gene expression in prokaryotes
- g. differentiate recombinant DNA technology from genetic engineering
- h. describe how DNA can be cleaved, spliced, cloned and sequenced
- i. explain Mendel's Laws and how they relate to expected inheritance of traits
- j. differentiate between, and give examples of incomplete dominance and codominance
- k. explain and give examples of sex-linked inheritance

Animal Structure and Function

Specific Learning Outcomes: It is expected that students will be able to:

- a. list and describe various levels of organization (cells, tissues, organs, organ systems)
- b. describe characteristics of various tissue types, and provide examples
- c. describe sensory and motor neurons and interneurons in terms of structure and function
- d. explain how action potentials are propagated in neurons
- e. define chemical synapse and explain how neurotransmitters function
- f. outline the organization of the nervous system into central and peripheral, autonomic and somatic, and sympathetic and parasympathetic systems
- g. relate how specific sensory receptors relay signals from stimuli via the nervous system
- h. state the location and function of endocrine glands in the human body
- i. explain how the hypothalamus and pituitary gland work together to secrete hormones and regulate other endocrine glands
- j. list the functions of skin, and identify four cell types in vertebrate skin
- k. describe how ligaments, tendons, muscles and bones work together to move the human body
- l. describe the functions of smooth muscle and cardiac muscle
- m. explain how muscles contract, indicating the role of calcium, ATP and stimulus input

- n. relate the functions of the circulatory system and the lymphatic system
- o. describe cellular and plasma components of blood
- p. describe the path of blood flow in humans, indicating the significance of the pulmonary and systemic circuits, passage through various chambers of the heart, and movement through specific arteries, capillaries and veins to accommodate all organs and tissues of the body
- q. describe typical external barriers to invading organisms
- r. describe the processes involved in the nonspecific inflammatory response
- s. distinguish between antibody-mediated and cell-mediated defense patterns
- t. explain the mechanisms of immunological specificity and memory
- u. explain the basis for immunization
- v. compare the mechanisms used in various invertebrate & vertebrate systems
- w. explain the relation of the human respiratory system to the circulatory and nervous systems, and to cellular respiration
- x. list some diseases of the human respiratory system, and describe characteristics of these diseases
- y. compare incomplete and complete digestive systems, and relate how organisms ingest, digest and absorb nutrients from food
- z. list the structures and functions of various organs and regions of the human digestive system
- aa. list typical human nutritional requirements
- bb. explain how the chemical composition of extracellular fluid is maintained in mammals
- cc. list the components, and describe the function of the components, of the mammalian urinary system
- dd. describe the processes of urine formation and excretion
- ee. explain how heat gain and loss occurs, and how ectotherms, endotherms, and heterotherms maintain steady body temperatures
- ff. compare and contrast asexual and sexual reproduction in terms of processes, advantages and disadvantages
- gg. describe early embryonic development and distinguish between oogenesis, spermatogenesis, fertilization, cleavage, gastrulation, and organ development
- hh. list the structures, and describe the functions, of the human male and female reproductive systems
- ii. outline the principal events of prenatal development
- jj. explain the significance of cell differentiation and morphogenesis in the development of an organism

Topic Outline:

Methods and Concepts

- Levels of Biological Organization
- Diversity
- Responding to Change
- Scientific Method

Atoms and Molecules

- Atomic Theory
- Bonding
- Inorganic and Organic Molecules
- Fluid Mosaic Model of Membranes

The Cell

- Cell Theory
- Organelles
- Plant and Animal Cells
- Cell Cycles and Division

Diffusion

- Permeability, Diffusion
- Osmosis, Dialysis
- Passive/Active Transport

Energy-Acquiring / Energy-Releasing Pathways

- Chlorophyll
- Leaf Structure
- Photosynthesis (Light and "Dark" Reactions)
- Cellular Respiration
- Aerobic and Anaerobic Reactions

Meiosis

- Asexual vs. sexual reproduction
- Fertilization in plants and animals and the significance of meiosis

From DNA to Proteins

- structure and function of DNA
- replication/transcription/translation leading to protein synthesis
- gene control in prokaryotic and eukaryotic cells
- recombinant DNA and genetic engineering
- Mendel's Laws and inheritance

Protection, Support and Movement

- functions
- layers
- specialized structures

- monitoring the environment
- keeping cool
- secretions and excretions
- care
- locomotion
- skeletons and muscles
- development and structure of bone
- connections and joints
- fractures and diseases
- types of muscle tissue; structure
- nerves and muscles
- development and exercise
- oxygen and muscles

The Heart and Circulation

- circulatory systems
- anatomy of the four-chambered heart
- blood flow through the heart and circulatory system
- malfunctions
- exercise and the heart
- hearts in other vertebrates
- open and closed systems
- vessel structures in closed systems
- BP; hypotension and hypertension
- cholesterol
- blood
- blood clotting

Immunity

- the body's immune system
- responses of the lymphatic system
- leukocytes
- penetration by foreign organisms
- antibodies
- B and T lymphocytes
- malfunctions and deficiencies
- body temperature
- A.I.D.S.

Respiration

- plant respiration
- ways of getting oxygen
- respiration in mammals
- iron in respiration
- inhaling and exhaling
- role of medulla in breathing rate
- conditions affecting the respiratory system
- resuscitation, high altitudes

Digestion and Human Nutrition

- ingestion, digestion, and absorption

- the role of the mouth, stomach, small intestine, pancreas, liver, gall bladder colon
- the role of various enzymes in digestion
- nutrients, calories and diets
- vitamins and minerals

Excretion

- removal of wastes
- invertebrates
- human excretory system
- maintenance of homeostasis
- structures of the urinary system
- kidney form and function
- disorders of the urinary system

Neural Control and the Senses

- the neuron
- organization of neurons
- transmission of impulses
- interactions of neurons
- autonomic nervous system
- and parasympathetic systems
- control of the autonomic nervous system
- feedback
- anatomy of the brain and spinal cord
- forebrain, hindbrain
- brain research
- disorders and drugs
- more than five senses
- functions
- sensory receptors and centres
- somatic receptors
- skin receptors
- chemoreceptors
- internal receptors
- light
- anatomy of the eye
- vision and vision disorders
- sight in other animals
- the auditory centre
- structure of the ear
- deafness

The Endocrine Glands

- hormones
- importance of receptors
- the endocrine system
- endocrine glands
- pineal gland
- the thyroid
- islets of the pancreas

- the pituitary

Reproduction and Development

- male reproductive structures
- sperm production and pathways
- sterility and impotence
- female reproductive tract
- development, anatomy and function
- homologous structures
- human sexual response
- menstrual cycle and ovulation
- unfertilized ovum
- fertilized ovum
- post-fertilization events
- pregnancy and birth
- birth control techniques
- sexually transmitted diseases (see A.I.D.S. under Immunity)
- development of the embryo
- embryonic stages
- gestation
- aging