Biology 30 Course Outline
J.A. Williams High School
2018 - 2019

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Welcome to Biology 30! To support the development of scientific literacy, a science program must provide learning experiences that address critical aspects of science and its application. There are four major foundations these provide a general direction for the program and identify the major components of its structure.

Foundation 1

Attitudes — *Students will be encouraged to* develop attitudes that support the responsible acquisition and application of scientific and technological knowledge to the mutual benefit of self, society and the environment.

Foundation 2

Knowledge — *Students will* construct knowledge and understandings of concepts in life science, physical science and Earth and space science, and apply these understandings to interpret, integrate and extend their knowledge.

Foundation 3

Science, Technology and Society (STS) — *Students will* develop an understanding of the nature of science and technology, the relationships between science and technology, and the social and environmental contexts of science and technology.

Foundation 4

Skills — *Students will* develop the skills required for scientific and technological inquiry, for solving problems, for communicating scientific ideas and results, for working collaboratively and for making informed decisions.

Prerequisites for this course include Biology 20.

Course Overview

Assessment

Each unit will consist of notes, homework, assignments, quizzes and exams. The final mark for each term will be calculated based on the student's achievement of each of the learner outcomes. All assessments (formative and summative) throughout the term will be given a percentage mark and achievement level. Only tests, labs, the final exam, and major projects will be summative. Daily work and small quizzes will be formative.

Students are responsible for completing **ALL** work and missed work. Late assignments are to be handed in upon the student's return to class. All daily work, minor assignments, homework and formative assessments receive **NO** weighted marks. It is imperative that students complete all assignments and homework as they provide the base of knowledge required for success on the summative major assignments and exams. These types of assignments will receive a weighted mark that will become part

of their report card mark. If a student chooses to **NOT** complete the formative assignments for whatever reason, contact will be made with their parents and further necessary controls will be established.

If a student is excusably absent from a summative exam or quiz, the exam will be written on the first day of return unless other arrangements have been made with me **PRIOR** to the scheduled exam.

Students will be provided with 3 "Zero Days" throughout the semester which are an opportunity to complete a missed summative assessment or improve a previous mark. This assessment will then be graded and replace the students previous mark. The particular summative assessment desired to be redone or completed on the designated zero day will be at the discretion of the teacher.

To be successful in a high school academic course, students must be reviewing on a weekly if not nightly basis. Please be sure to come and ask questions at **ANY TIME** if you are unsure of any concepts. I will answer any questions I can in class but I am also available outside of class anytime for further review as long as students approach me to set up a time. It is difficult to catch up once you get behind so please be a responsible student.

Mark Distribution

70%	Class Work (Assignments, Quizzes, Labs, Chapter/Unit Tests)
30%	Diploma Exam

Course Evaluation

Unit A		**24.5%**
a)	Assignments, Labs, Quizzes	7.35%
b)	Unit Exam	17.15%
Unit B		**19.5%**
a)	Assignments, Labs, Quizzes	5.85%
b)	Unit Exam	13.65%
Unit C		**36.5%**
a)	Assignments, Labs, Quizzes	10.95%
b)	Unit Exam	25.55%
Unit D		**19.5%**
a)	Assignments, Labs, Quizzes	5.85%
b)	Unit Exam	13.65%

Diploma Exam is scheduled as follows: **Monday, January 28, 2019**

For your Diploma Exam you have 6 hours (9:00 am - 3:00 pm)

Students should be reviewing almost daily as this is an academic course with large amounts of material to understand.

Additional review time is available outside of scheduled class time by request or after school.

Timeline (approximate)

The major themes addressed in Biology 30 are *change, diversity, equilibrium* and *systems.* These four themes are interwoven throughout the following four units:

<u>Unit A:</u> Nervous and Endocrine Systems **September 4 – September 28***
Chapters 13-15
Time Allocation: 25% of course

Students will:
1. explain how the nervous system controls physiological processes
2. explain how the endocrine system contributes to homeostasis.

<u>Unit B</u>: Reproduction and Development **October 1 - October 26***
Chapter 16
Time Allocation: 20% of course

Students will:
1. explain how survival of the human species is ensured through reproduction
2. explain how human reproduction is regulated by chemical control systems
3. explain how cell differentiation and development in the human organism are regulated by a combination of genetic, endocrine and environmental factors.

<u>Unit C:</u> Cell Division, Genetics and Molecular Biology **October 29 - December 12***
Chapters 17-20
Time Allocation: 40% of course

Students will:
1. describe the processes of mitosis and meiosis
2. explain the basic rules and processes associated with the transmission of genetic characteristics
3. explain classical genetics at the molecular level.

<u>Unit D:</u> Population and Community Dynamics **December 13 - January 17***
Chapters 21-23
Time Allocation: 15% of course

Students will:
1. describe a community as a composite of populations in which individuals contribute to a gene pool that can change over time
2. explain the interaction of individuals in a population with one another and with members of other populations
3. explain, in quantitative terms, the change in populations over time.

Rest of June: Review for Diploma Exam, Practice/Review

*Dates are flexible and subject to change based on student need.

Expectations

All students are expected to be respectful of both myself and other students in the classroom. This is a high school academic course and any disruptions or disrespect will not be tolerated. Respect in my classroom includes the following:

Positive Attitude towards Learning:

- Being ON TIME and PREPARED to learn.
- You will have daily work and you will need to keep up with it. Students with missing assignments will have to spend lunch hours with me. If you are absent, make arrangements with me.
- If you are aware of a day that you will be absent, for personal or school-related reasons, please inform me PRIOR to the absence and I will provide you with the work for that day. Students are still responsible for all work missed on such days.
- All students are in my classroom to LEARN and need to do so in an environment free of constant disruption. Collaboration with other students is encouraged however this work must be on task and not a distraction to other students.
- Cheating will NOT be tolerated. Any plagiarized or copied assignment will not be accepted and the student will be required to redo the assignment, including the person who allowed the copying to take place.
- Come see me at lunch or make an appointment if there is anything you need help with.
- Electronic devices such as cell phones and ipods are typically not allowed to be used in the classroom. If any cell phones or ipods (without special permission) are seen, they will be confiscated until the end of class.
- **Always do your best!**

Respect:

- Please do not interrupt when I am speaking
- Students are expected to be courteous and polite. Put downs and sarcasm will not be tolerated. If students cannot respect either myself or others and their behaviour becomes an issue, students will be asked to leave my classroom and we will arrange another time to make up for missed work.
- Class does not end until I dismiss you.

Safety:

- No food or beverages other than water in my classroom are allowed for safety purposes. During labs, no food or drinks are permitted.
- Follow classroom instructions carefully.
- Follow lab safety procedures and wear protective equipment at all times.
- Ask to leave the room so I am aware of your location at all times.
- When in doubt, ASK!

Required Materials

Textbook: Biology Alberta 20-30 (Nelson, 2007)

You must bring a binder, pen, textbook and pencil to every class regardless of what the activity or topic. Some units will require the use of a calculator, and one is required for your final exam.

Outcomes for Biology 30

Unit A: Nervous and Endocrine Systems

General Outcome 1: explain how the nervous system control physiological processes.

- Describe the general structure and function of a neuron and myelin sheath, explaining the formation and transmission of an action potential, including all-or-none response and intensity of response; the transmission of a signal across a synapse; and the main chemical transmitters involved, ie., norepinephrine, acetylcholine and cholinesterase
- Identify the principle structures of the central and peripheral nervous systems and explain their functions in regulating the voluntary (somatic) and involuntary(autonomic) systems of the human organism; i.e., cerebral hemispheres and lobes, cerebellum, pons, medulla oblongata, hypothalamus, spinal cord, sympathetic and parasympathetic nervous system, and the sensory-somatic nervous system.
- Describe the organization of neurons into nerves and the composition and function of reflex arcs.
- Describe the structure and function of the parts of the human ear, including the pinna, auditory canal, tympanum, ossicles, cochlea, organ of Corti, auditory nerve, semicircular canals and Eustachian tube.
- Explain other ways that humans sense their environment and their special orientation in it; (olfactory, proprioceptors, taste, skin receptors)

General Outcome 2: explain how the endocrine system contributes to homeostasis

- Identify the principal endocrine glands of humans; (the hypothalamus/pituitary complex, thyroid, parathyroid, adrenal glands, and islet cells of the pancreas
- Describe the function of the hormone (ACTH)/cortisol, glucagon/insulin, hGH, ADH, epinephrine, aldosterone, and describe how they maintain homeostasis through feedback
- Explain the metabolic roles hormones may play in homeostasis; i.e., thyroxine in metabolism, insulin, glucagon and cortisol in blood sugar regulation; hGH in growth; ADH in water regulation; aldosterone in sodium ion regulation
- Explain how the endocrine system allows humans to sense their internal environment and respond appropriately
- Explain how the endocrine system allows humans to sense their internal environment and respond appropriately
- Compare the endocrine and nervous control system and explain how they act together
- Describe, using an example the physiological consequences of hormone imbalances; i.e. diabetes mellitus

Unit B: Reproduction and Development

General Outcome 1: explain how the survival of the human species is ensured through reproduction

- Identify structures and describe their functions, of the female and male reproductive system:

o Ovaries	o Vagina	o Sertoli cells	o Prostate gland
o Fallopian tubes	o Testes	o Epididymides,	o Ejaculatory duct
o Uterus	o Seminiferous tubules	o Vas deferentia	o Urethra
o Endometrium		o Cowpers glands	o penis
o Cervix	o Interstitial cells	o Seminal vesicles	

- distinguish sperm and egg from supporting structures: seminiferous tubules, interstitial cells, sertoli cells, follicle, corpus luteum
- describe chromosomal and hormonal influence on formation of gonads
- explain how STI's can interfere with fertility and reproduction

General Outcome 2: explain how human reproduction is regulated by chemical control systems

- Describe the role of these hormones in the regulation of secondary sexual characteristics and role in male reproductive system and female menstrual cycle:
  - GnRH
  - LH
  - FSH
  - Estrogen
  - Progesterone
  - Testosterone
- Stages of menstrual cycle
- Identify follicle/corpus luteum within the ovary (in a diagram)

General Outcome 3: explain how cell differentiation and development in the human organism are regulated by a combination of genetic, endocrine, and environmental factors

- Trace the process of fertilization, implantation, and extra embryonic membrane formation followed by embryonic and fetal development, parturition, and lactation.
- Describe the control mechanism in the above events:
  - Progesterone
  - LH
  - hCG
  - prostaglandins
  - oxytocin
  - prolactin
- describe development of main physiological events that occur in the development of organ systems in each trimester (zygote, blastocyst, gastrulation, general morphogenesis)
- identify major tissue and organs that arise from ectoderm, mesoderm, and endoderm in the embryo
- Describe the influence of environmental factors on embryonic and fetal development. (teratogens)
- Describe physiological or mechanical basis of different reproductive technologies

<u>Unit C: Cell Division, Genetics, and Molecular Biology</u>

General Outcome 1: Describe the processes of mitosis and meiosis

- Define/explain significance of chromosome number in somatic and sex cells
  - Haploidy, diploidy and polyploidy
- Explain events of the cell cycle
- Describe the process of meiosis (spermatogensis and oogenesis) and the necessity for the reduction of chromosome number
- Compare the process of mitosis and meiosis
- Describe the process of crossing over and nondisjunction, evaluate their significance to organism inheritance and development
- Describe the diversity of reproductive strategies by comparing the alternation of generations
- Compare the formation of fraternal (dizygotic) and identical (monozygotic) offspring in a single birthing event

General Outcome 2: explain the basic rules and processes associated with the transmission of genetic characteristics

- Describe the evidence for dominance, segregation and the independent assortment of genes on different chromosomes
- Compare ratios and probabilities of genotypes and phenotypes for dominant and recessive, multiple, incompletely dominant, and codominant alleles
- Explain the influence of gene linkage and crossing over on variability
- Explain the relationship between variability and the number of genes controlling a trait (how many genes control a trait)
- Compare the pattern of inheritance produced by genes on the sex chromosomes , as investigated by Morgan
- Interpret patterns of inheritance of traits and predict the probability of inheritance of traits illustrated in monohybrid, dihybrid and sex linked inheritance, using pedigrees and punnett squares
- Draw and interpret pedigree charts from single and multiple-allele inheritance patterns
- Analyze crossover data for a single pair of chromosomes to create a chromosome map showing gene arrangement and relative distance

General Outcome 3: explain classical genetics at the molecular level

- Summarize historical events that led to the discovery of the structure of DNA, including the work of Franklin and Watson and Crick
- Describe how genetic information is contained in the sequence of bases in DNA molecules in chromosomes and how the DNA molecules replicate themselves
- Describe in general, how genetic information is transcribed into sequences of bases in RNA molecules and is finally translated into sequences of amino acids in proteins
- Explain, in general how restriction enzymes cut DNA molecules into smaller fragments and how ligases reassemble them
- Explain how cells may be transformed by inserting new DNA sequences into their genomes
- Explain how random change (mutation) in the sequence of bases results in abnormalities or provides a source of genetic variability
- Explain how base sequences in nucleic acids contained in the nucleus, mitochondrion and chloroplast give evidence for the relationships among organisms of different species

<u>Unit D: Population and Community Dynamics</u>

General Outcome 1: describe a community as a composite of populations in which individuals contribute to a gene pool that can change over time.

- Describe the Hardy-Weinberg principle and explain its significance in population gene-pool stability and non-equilibrium values
- Describe the factors that cause the diversity in the gene pool to change; i.e., natural selection, genetic drift, gene flow, nonrandom mating (sexual selection), bottleneck effect, founder effect, migration, mutation.
- Apply the Hardy-Weinberg principle to determine allele and genotype frequencies
- Describe the molecular basis of gene-pool change and the significance of these changes over time; i.e., mutations and natural selection

General Outcome 2- explain the interaction of individuals in a population with one another and with members of other populations.

- Describe the basis of species interactions and symbiotic relationships and describe the influence of these interactions on population changes; i.e.,
    - Predator prey and producer consumer relationships
    - Symbiotic relationships
    - Interspecific and intraspecific competition
- Explain the role of defense mechanisms in predation and competition (mimicry, protective coloration, toxins, behavior)
- Explain how mixtures of populations that define communities may change over time or remain as a climax community; i.e., primary succession, secondary succession.

General Outcome 3: explain, in quantitative terms, the change in populations over time

- Describe and explain, factors that influence population growth;
    - Mortality, natality, immigration, emigration
- Describe the growth of populations in terms of the mathematical relationship among carrying capacity, biotic potential, environmental resistance and the number of individuals in the population
    - Growth rate
    - Per capita growth rate
    - Population density
- Explain the different population growth patterns;
    - Logistic growth pattern (S-shaped curve) and exponential growth pattern (J-shaped curve)
    - Open and closed populations
    - Describe the characteristics and reproductive strategies of r-selected and K-selected organism