BIOR4S : Grade 12 Biology Course Outline-

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Overview

The Grade 12 Biology course is a general Science course structured into four major units and five underlying themes that reflect what students are expected to know, do and learn in this course. It emphasizes:

- The Nature of Science and Technology
- Science, Technology, Society, and the Environment
- Scientific and Technological Skills and Attitudes
- Essential Science Knowledge, such as: life science, physical science, as well as Earth and space science
- Unifying Concepts Between Scientific Disciplines

Students are to become scientifically literate problem solvers, data managers, and life-long learners in today's changing and technology-oriented society. Lab work, investigation, reflection and application are important aspects of this course and in science as a whole.

Objectives

By the end of this course, students should have a working knowledge in the following content areas, as outlined in the Manitoba Grade 12 Biology Curriculum:

Part 1: Genetics

Unit 1 - Understanding Biological Inheritance

- Outline Mendel's principles of inheritance, stating their importance to the understanding of heredity. Terms: principles of segregation, dominance, independent assortment.
- Explain what is meant by the terms heterozygous and homozygous.
- Distinguish between genotype and phenotype and use these terms appropriately when discussing the outcomes of genetic crosses.
- Use Punnett squares to solve a variety of autosomal inheritance problems and justify the results by using appropriate terminology. Terms: monohybrid cross, dihybrid cross, testcross, P generation, F1 generation, F2 generation, phenotypic ratio, genotypic ratio, dominant alleles, recessive alleles, purebred, hybrid, carrier.
- Describe examples and solve problems involving the inheritance of phenotypic traits that do not follow a dominant-recessive pattern. Terms: co-dominance, incomplete dominance, multiple alleles, lethal genes...
- Explain the basis for sex determination in humans. Terms: XX and XY

- Describe examples and solve problems involving sex-linked genes. Terms: red-green colour-blindness, hemophilia, Duchenne muscular dystrophy...
- Use pedigree charts to illustrate the inheritance of genetically determined traits in a family tree and to determine the probability of certain offspring having particular traits. Include: symbols and notation used.
- Discuss ethical issues that may arise as a result of genetic testing for inherited conditions or disorders.
- Discuss the role of meiosis and sexual reproduction in producing genetic variability in offspring. Terms: crossing-over, randomness
- Explain how chromosome mutations may arise during meiosis. Term: non-disjunction
- Identify monosomy and trisomy chromosome mutations from karyotypes. Terms: Down syndrome, Turner syndrome, Klinefelter syndrome...

Unit 2 – Mechanisms of Inheritance

- Outline significant scientific contributions/discoveries that lead to our understanding of the structure and function of the DNA molecule. Terms: timeline, individual contributions, multidisciplinary collaboration, competitive environment...
- Describe the structure of a DNA nucleotide. Terms: deoxyribose sugar, phosphate group, nitrogenous bases
- Describe the structure of a DNA molecule. Terms: double helix, nucleotides, base-pairing, gene
- Describe the process of DNA replication. Terms: template, semi-conservative replication, role of enzymes
- Compare DNA and RNA in terms of their structure, use and location in the cell.
- Outline the steps involved in protein synthesis. Terms: mRNA, codon, amino acid, transcription, tRNA, anticodon, ribosome, translation
- Relate the consequences of gene mutation to the final protein product. Examples: point mutation in sickle cell anemia, frameshift mutation in B- thalessemia...
- Discuss implications of gene mutation to genetic variation. Terms: source of new alleles.
- Investigate an issue related to the application of gene technology in bioresources.
- Investigate an issue related to the application of gene technology in humans. Ideas: understanding the technology/processes involved, ethical and legal implications, a variety of perspectives, personal, societal/global implications.

Part 2 - Biodiversity

Unit 3 - Evolutionary Theory and Biodiversity

- Define the term evolution, explaining how evolution has lead to biodiversity by altering populations and not individuals. Terms: gene pool, genome

- Describe and explain the process of discovery that led Darwin to formulate his theory of evolution by natural selection. Ideas: the voyage of the Beagle, his observations of South American fossils, the impact of the Galapagos Islands on his thinking. the work of other scientists.
- Outline the main points of Darwin's theory of evolution by natural selection. Terms: overproduction, competition, variation, adaptation, natural selection, speciation.
- Demonstrate, through examples, what the term "fittest" means in the phrase "survival of the fittest".
- Explain how natural selection leads to changes in populations. Examples: Industrial melanism, antibiotic resistant bacteria, pesticide resistant insects...
- Describe how disruptive, stabilizing and directional natural selection act on variation.
- Distinguish between natural selection and artificial selection.
- Outline how scientists determine if a gene pool has changed, according to the criteria for genetic equilibrium. Terms: large population, random mating, no gene flow, no mutation, no natural selection.
- Discuss how genetic variation in a gene pool can be altered. Examples: natural selection, gene flow, genetic drift, non-random mating, mutation ...
- Describe how populations can become reproductively isolated. Examples: geographic isolation, niche differentiation, altered behaviour, altered physiology...
- With the use of examples, differentiate between convergent evolution and divergent evolution (adaptive radiation).
- Distinguish between the two models for the pace of evolutionary change: punctuated equilibrium and gradualism

Unit 4 - Organizing Biodiversity

- Define the concept of biodiversity in terms of ecosystem, species and genetic diversity.
- Explain why it is difficult to determine a definition of species. Examples: hybrids such as mules, phenotypic variations in a species, non- interbreeding sub-populations...
- Describe the dynamic nature of classification.
- Describe types of evidence used to classify organisms and determine evolutionary relationships. Examples: fossil record, DNA analysis, biochemistry, embryology, morphology...
- Compare the characteristics of the domains. Terms: Archaea (Archaebacteria), Bacteria (Eubacteria), Eukarya.
- Compare the characteristics of the kingdoms in the Eukarya domain. Terms: cell structure, major mode of nutrition, cell number, motility.
- Investigate an evolutionary trend in a group of organisms. Examples: hominid evolution, vascularization in plants, animal adaptations for life on land...

Unit 5 - Conservation of Biodiversity

- Discuss a variety of reasons for maintaining biodiversity. Ideas: maintaining a diverse gene pool, economic value, sustainability of an ecosystem.
- Describe strategies used to conserve biodiversity. Examples: habitat preservation, wildlife corridors, species preservation programs, public education
- Select and use appropriate tools or procedures to determine and monitor biodiversity in an area. Examples: field guides, dichotomous keys, quadrats, transects, mark and recapture...
- Investigate an issue related to the conservation of biodiversity. Examples: heritage seeds, water quality in Lake Winnipeg, land use designations, hydroelectric development...

COURSE EXPECTATIONS:

- Come to class on time and be prepared to learn
- 10 absences (excused & unexcused) = Credit Suspension/Credit Loss
- 4 lates = 1 absence
- Do your work – in class & at home
- Ask for help when you need it – in class, at lunch, during spares, or before school
- Be respectful to others in the class and be responsible

PLEASE PUT YOUR HAT, CELL PHONE, OR OTHER ELECTRONIC ENTERTAINMENT DEVICE IN YOUR LOCKER, OTHERWISE YOU WILL BE ASKED TO LEAVE OR THEY WILL BE CONFISCATED.

NO FOOD OR DRINKS ALLOWED IN THE CLASSROOM.

Materials

Students are expected to come to class on time and prepared. This includes having your **textbook**, a **pen**, **pencil**, **ruler**, **calculator**, **paper**, **binder**, etc. with you for **EACH CLASS**. Various texts, worksheets, technology applications and resources will also be used.

Laboratory Behaviour

We will be doing labs whenever possible in this course, and it is expected that all students behave in an acceptable manner when labs are being conducted. It is important for students to build good laboratory practices and observe the safety rules outlined. Lab instructions must be followed and lab equipment must be used properly, to ensure the safety of the whole class. Inappropriate behaviour or failure to follow instructions will result in a mark of zero on the lab.

Evaluation

Students will be graded based on their fulfillment of the stated objectives. Assignments, in-class work, homework, individual and group projects, weekly quizzes, labs and tests are some of the methods that will be used to evaluate this.

Mark Breakdown:

Per Term:	Assignments/Labs	30.0%
	Homework Checks	5.0%
	Quizzes	15.0%
	Tests	50.0%
Overall:	Course Work	70.0%
	Final Exam	30.0%
		100.0%

All marks are recorded and available on Engrade (www.engrade.com). Students **MUST** register their accounts, and can check their own marks there.

Extra Help:

I am available throughout the day and before school. It is important that students keep up, and continually review the material, as the tests and assignments are cumulative.

If you would like to make an appointment to receive extra help, we can discuss a time that works for both of us or send me an email. You may email any questions you may have at: **mhegel@wsd1.org**

Missed Unit Tests, Assignments, Projects, Labs, Quizzes

- **Unexcused Absences:** If you miss a unit test, assignment, project, lab, or quiz due to an unexcused absence you will receive a mark of zero.
- **Excused Absences:** If you miss a unit test due to an excused absence you must write it on the next day you are back at school (normally outside of class time).
- If you miss an assignment or project due to an excused absence you must get the instructions from the teacher, or hand in the assignment/project, on the next day you are back at school.
- If you miss a lab or quiz due to an **excused absence** you need to see the teacher to make arrangements for make up or alternate plans.

Lates: If you miss a quiz because you are late you will receive a mark of zero.

IT IS YOUR RESPONSIBILITY TO REMEMBER THESE REQUIREMENTS AND TAKE APPROPRIATE ACTIONS.

Missed Notes, Homework, & Assignments

It is **your responsibility** to find out what you missed and to get any notes, assignments, homework, etc. that you missed.