LOCALLY DEVELOPED COURSE OUTLINE

Biology (AP)35-3

Submitted By:

Red Deer Catholic Regional Division No. 39

Submitted On:

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Course Basic Information

Outline Number	Hours	Start Date	End Date	Development Type	Proposal Type	Grades
35-3	75.00	09/01/2016	08/31/2020	Acquired	Reauthorization	G11 G12

Course Description

The Biology AP® 35 Course provides students access to introductory post-secondary content. Students can earn advanced credit or advanced standing at thousands of colleges and universities on the basis of their AP® achievements.

Biology 30 is a co-requisite to AP® Biology 35.

Course Prerequisites

Sequence Introduction (formerly: Philosophy)

This locally developed course, provides additional opportunities for students to develop and refine the learner competencies outlined in the Alberta Education's Inspiring Education

The Advanced Placement® (AP)Biology locally developed course advances learning outcomes beyond those found in Biology 30.

The purpose of the course is to provide further opportunities for students to deepen their understanding of biological principles and further develop their laboratory skills. Through an inquiry model, students will develop and refine hypothesis, test and collect evidence and draw conclusions or make predictions about natural phenomena. Students will develop and apply scientific practices throughout the course in both the classroom and laboratory settings. Students will be presented with inquiries that will require them to engage the world critically and analytically.

Throughout the course illustrative examples will be presented to students connecting what is being studied with the world that surrounds them. Through this process, students will be challenged to create their own illustrative examples of various biological principles. Students will be encouraged to interrogate and evaluate previous illustrative examples to determine if they are still accurate and relevant using reasoning and the presentation of evidence.

Student Need (formerly: Rationale)

The Biology AP® course provides students access to introductory post-secondary content. Students can earn advanced credit or advanced standing at thousands of colleges and universities on the basis of their AP® achievements.

The Biology AP® course is designed to be the equivalent of a two-semester college introductory level biology course usually taken by biology majors during their first year. After showing themselves to be qualified on the AP® Exam, some students, are permitted to undertake upper-level courses in biology or to register for courses in which biology is a pre-requisite in some post-secondary institutions. Other students may have satisfied a basic requirement for a laboratory-science course and will be able to undertake other courses at the post-secondary level to pursue their majors.

Our society is experiencing significant growth in biological advances and biotechnology. Students enrolled in Biology AP® will gain exposure to these content areas and applications.

In keeping with the values defined within Alberta Education's Ministerial Order on Student Learning, the intent of this course is to respond to the needs of the Learner to reach their individual learning potential to become "Engaged Thinkers and Ethical Citizens with an Entrepreneurial Spirit, who contribute to a strong and prosperous economy and society."

Scope and Sequence (formerly: Learner Outcomes)

The Biology AP course is designed to be an extension of the existing Biology 30 course. The two courses taken as one linear stream are intended to encompass material equivalent to a general biology course taken during the first year of post-secondary education. The general outcomes of this course would parallel those present in a post-secondary biology environment and include:

• attaining a depth of understanding in fundamental biological concepts

• developing a scientific awareness of how the understanding of biological concepts affects decision making and society as a whole

• developing the abilities to think clearly and express ideas, orally and in writing, with clarity and logic

• developing proper laboratory techniques through extensive laboratory work

The following learner outcomes and assessment standards are from the Advance Placement (AP®) Biology curriculum. AP has acknowledged that the learning outcomes from the AP Biology courses have been written in the LDC to reflect the competencies in support of Alberta Education's Inspiring Education. The following statement is included to ensure that the AP copyright is honoured in this document.

Guiding Questions (formerly: General Outcomes

1 Explore, examine evidence and draw conclusions regarding how the process of evolution drives the diversity and unity of life.

2 Investigate and connect how biological systems utilize free energy and molecular building blocks to grow, to reproduce, and maintain dynamic homeostasis.

3 Explore, examine evidence and draw conclusions regarding how living systems store, retrieve, transmit, and respond to information essential to life processes.

4 Investigate and connect ideas with regard to how biological systems interact and how these systems and their interactions possess complex properties.

Learning Outcomes (formerly: Specific Outcomes)

1 Explore, examine evidence and draw conclusions regarding how the process of evolution drives the diversity and unity of life.	**35-3**
1.1 Evaluate and refine evidence based on data from many scientific disciplines that support biological evolution	X
1.2 Pose scientific questions that correctly identify essential properties of shared, core life processes that provide insights into the history of life on Earth	X
1.3 Describe specific examples of conserved core biological processes and features shard by all domains or within one domain of life, and how these shared, conserved core processes and features support the concept of common ancestry for all organisms	X
1.4 Justify the scientific claim that organisms share many conserved core processes and features that evolved and are widely distributed among organisms today	X
1.5 Pose scientific questions about a group of organisms whose relatedness is described by a phylogenetic tree	X
1.6 Evaluate evidence provided by a data set in conjunction with phylogenetic tree or a simple cladogram to determine evolutionary and speciation	X
1.7 Create a phylogenetic tree or simple cladogram that correctly represents evolutionary history and speciation from a provided data set	X
1.8 Describe a scientific hypothesis about the origin of life on Earth	X
1.9 Evaluate scientific questions based on hypotheses about the origin of life on Earth	X
1.10 Describe the reasons for revisions of scientific hypotheses of the origin of life on Earth	X
1.11 Evaluate scientific hypotheses about the origin of life on Earth	X

1.12 Evaluate the accuracy and legitimacy of data to answer scientific questions about the origin of life on Earth	X
1.13 Justify the selection of geological, physical, and chemical data that reveal early Earth conditions	X

2 Investigate and connect how biological systems utilize free energy and molecular building blocks to grow, to reproduce, and maintain dynamic homeostasis.	**35-3**
2.1 Connect the concept of cell communication to the functioning of the immune system	X
2.2 Connect concepts in and across domains to show that timing and coordination of specific events are necessary for normal development in an organism and that these events are regulated by multiple mechanisms	X
2.3 Use a graph or diagram to analyze situations or solve problems (quantitatively or qualitatively) that involve timing and coordination of events necessary for normal development in an organism	X
2.4 Justify scientific claims with scientific evidence to show that timing and coordination of several events are necessary for normal development in an organism and that these events are regulated by multiple mechanisms	X
2.5 Describe the role of programmed cell death in development and differentiation, the reuse of molecules, and the maintenance of dynamic homeostasis	X
2.6 Design a plan for collecting data to support the scientific claim that the timing and coordination of physiological events involve regulation	X
2.7 Justify scientific claims with evidence to show how timing and coordination of physiological events involve regulation	X
2.8 Connect concepts that describe mechanism that regulate the timing and coordination of physiological events	X
2.9 Analyze data to support the claim that responses to information and communication of information affect natural selection	X

2.10 Justify scientific claims, using evidence, to describe how timing and coordination of behavioural events in organisms are regulated by several mechanisms	X
2.11 Connect concepts in and across domain(s) to predict how environmental factors affect responses to information and change behaviour	X

3 Explore, examine evidence and draw conclusions regarding how living systems store, retrieve, transmit, and respond to information essential to life processes.	**35-3**
3.1 Justify the selection of data from historical investigations that support the claim that DNA is the source of heritable information	X
3.2 Make predictions about natural phenomena occurring during the cell cycle	X
3.3 Describe the connection between the regulation of gene expression and observed differences between different kinds of organisms and between individuals in a population	X
3.4 Explain how the regulation of gene expression is essential for the processes and structures that support efficient cell function	X
3.5 Use representations to describe how gene regulation influences cell products and functions	X
3.6 Explain how signal pathways mediate gene expression, including how this process can affect protein production	X
3.7 Use representations to describe mechanisms of the regulation of gene expression	X
3.8 Compare and contrast processes by which genetic variation is produced and maintained in organisms from multiple domains	X
3.9 Construct an explanation of how viruses introduce genetic variation in host organisms	X
3.10 Use representations and appropriate models to describe how viral replication introduces genetic variation in the viral population	X
3.11 Describe basic chemical processes for cell communication shared across evolutionary lines of descent	X

3.12 Generate scientific questions involving cell communication as it relates to the process of evolution	X
3.13 Use representation(s) and appropriate models to describe features of a cell signaling pathway	X
3.14 Construct explanations of cell communication through cell-to-cell	X
3.15 Create representation(s) that depict how cell-to-cell communication occurs by direct contact or from a distance through chemical signaling	X
3.16 Describe a model that expresses the key elements of signal transduction pathways by which a signal is converted to a cellular response	X
3.17 Justify claims based on scientific evidence that changes in signal transduction pathways can alter cellular response	X
3.18 Describe a model that expresses key elements to show how change in signal transduction can alter cellular response	X
3.19 Construct an explanation of how certain drugs affect signal reception and, consequently, signal transduction pathways	X
3.20 Analyze data that indicate how organisms exchange information in response to internal changes and external cues, and which can change behaviour	X
3.21 Create a representation that describes how organisms exchange information in response to internal changes and external cues, and which can result in changes in behaviour	X
3.22 Describe how organisms exchange information in response to internal changes or environmental cues	X

4 Investigate and connect ideas with regard to how biological systems interact and how these systems and their interactions possess complex properties.	**35-3**
4.1 Refine representations to illustrate how interactions between external stimuli and gene expression result in specialization of cells, tissues and organs	X
4.2 Construct explanations based on evidence of how variation in molecular units provides cells with a wider range of functions.	X

4.3 Predict the effects of a change in an environmental factor on the genotypic expression of the phenotype	X
4.4 Use evidence to justify a claim that a variety of phenotypic responses to a single environmental facto can result from different genotypes within the population	X
4.5 Refine representations to illustrate how interactions between external stimuli and gene expression result in specialization of cells, tissues and organs	X
4.6 Construct explanations based on evidence of how variation in molecular units provides cells with a wider range of functions.	X
4.7 Predict the effects of a change in an environmental factor on the genotypic expression of the phenotype	X
4.8 Use evidence to justify a claim that a variety of phenotypic responses to a single environmental facto can result from different genotypes within the population	X

Facilities or Equipment

Facility

Standard high school biology lab facilities are sufficient for this course.

Facilities:

Equipment

standard high school biology equipment is sufficient for this course.

Learning and Teaching Resources

AP Biology 35 is designed to be the equivalent of a general first year post-secondary course. Many current post-secondary introductory biology textbooks provide suitable resources. Appropriate student resources (any recent edition) include the following:

• Reece, J. B., Urry, L. A., Cain M. L., Wasserman, S. A., Minorsky, P. V., & Jackson Campbell Biology. 10th ed. San Francisco: Pearson, Benjamin Cummings, 2014.

• Freeman, S., Quillin, K., & Allison, L. Biological Science. 5th ed. San Francisco: Pe Benjamin Cummings, 2014.

• Mader, S. S., Windelspecht, M., Biology. 12th ed. New York: McGraw-Hill Higher Education, 2015.

• Brooker, R., Widmaier, E., Graham, L., Stiling P., Biology. New York: McGraw-Hill Education, 2014.

• www.masteringbiology.com

• AP® Biology Investigative Labs: an inquiry based approach

Sensitive or Controversial Content

Sensitive or controversial issues that may arise from course content will be dealt with in accordance with the Controversial Issues section of the Guide to Education and RDCRS #39 Administrative Procedures.
Administrative Procedure 103 - Safe and Caring Learning Environments for Students will be referred to should sensitive content arise.

Issue Management Strategy

Health and Safety

External resources such as guest speakers must be approved by school administration and may be subject to independent contract.

All Off-site activities are organized according to Red Deer Catholic Regional Schools Administrative Procedure 342 – Field Trips and Other Curricular Activities
Red Deer Catholic Regional Schools Occupational Health and Safety guideline document for the school is to be referred to for the applicable work areas within the school.

Red Deer Catholic Regional Schools Occupational Health and Safety Administrative Procedure 103 sets out responsibilities for safe working conditions.

As with all science courses, teachers should refer to Safety in the Science Classroom from Alberta Education (particularly Chapter 5 – Biological Hazards, and chapter 7 – chemical hazards) to inform their practice regarding the health and safety of themselves and their students.

Risk Management Strategy

Statement of Overlap with Existing Programs

This course is a reauthorization and previously has been found by Alberta Education not to have any significant overlap with existing provincially developed courses.

Student Assessment

Assessment practices for this course should invite student participation in articulating learning targets and setting criteria for success, in providing evidence of understanding and in developing appropriate grading practices. Assessment and grading practices should also reflect the context of particular student, school and classroom learning needs.

Teachers will set specific criteria and grading practices, with students, as they assess student learning based on the learning outcomes from the course. These criteria form the basis for assessing, grading and reporting student progress. Communicating student progress is an ongoing conversation between the teacher, the student and the parent, throughout the course, with the goal of improving student learning.

The validity of assessment will be enhanced if evidence of student achievement, related to the general and specific outcomes, is gathered over time, and through communication with students as they build understanding, revise misunderstandings and refine approaches to learning. Careful observation of students as they engage in learning tasks and critical examination of the work they produce allows teachers to build out a multi-dimensional picture of student learning.

Valid grading reflects a student's achievement towards the learning outcomes. The reporting of behavior, effort, attendance, neatness, group contribution, initiative etc. is reported separately (Webber, Aitken, Lupart, & Scott, 2009, Guskey, 2006, Reeves, 2004).

To be credible and defensible, assessment information that is used in grading a body of evidence, samples student performance, and is related to specified outcomes, based on professional judgment rather than being based on a calculated mean (average).

Assessment and grading practices should take into consideration the helical nature of

learning - the recursive and increasingly complex skills and knowledge required of students as they demonstrate what they know and can do in relation to each of the specific and general outcomes. As the complexity of learning outcomes increases within each level of the course (15-25-25), evidence of a more comprehensive understanding is required.

Where a specific learner outcome spans all levels (15-25-35), students are expected to show an increasing level of sophistication and refinement of skills in demonstrating the outcome. Overall, general and specific outcomes can be achieved and assessed concurrently rather than sequentially.

Teachers should adhere to the following assessment standards when determining appropriate assessment and grading practices for this Locally Developed Course.

Assessment practices should reflect the following principles:

• Assessment of student performance is explicitly tied to the learning outcomes of the course

• Students are involved in understanding and articulating learning targets and criteria of success

• Students have opportunities to receive feedback in non-graded and formative learning activities and assignments before submitting assignments or engaging in activities for summative evaluation

• Assessments are purposefully designed in ways that motivate and challenge students, and are respectful of student diversity

• Students are provided choice in how they demonstrate learning

• Assessment data is gathered from a broad range of assessment activities and includes information from student work products and performances, from teacher observations of student learning processes, and from student reflections/student-provided evidence of success

• Assigned grades emphasize the most recent and most consistent evidence of student learning

• Assessment of Citizenship, Personal Development and Character is considered within all learning programs as included within the Calgary Board of Education Board of Trustees' Governance Policies.

References

Guskey, T. R. (May, 2006). Making high school grades meaningful. Phi Delta Kappa International,

87(9), pp. 670-675. Retrieved from http://www.jstor.org/stable/20442125

Reeves, D.B. (Dec 2004). The case against zeros. Phi Delta Kappan 86 (4). Retrieved from

http://schools.esu13.org/bannercounty/Documents/caseagainstzero.pdf

Webber, C.F., Aitken, N. Lupart, J. & Scott, S. (2009). The Alberta student assessment study final

report. Edmonton, Canada:

Course Approval Implementation and Evaluation