

Secondary Biology 2 Endorsement Specs

Purpose

This endorsement, when attached to a current Secondary Education License, verifies that the individual has the skills and knowledge necessary to teach students in an advanced secondary life science classroom and is required to teach Advanced Biology (AP, CE, and IB) and some high school life science elective courses. Those with this endorsement can also teach all the courses a Biology 1 endorsed educator can teach. NOTE: Advanced biology (AP, CE, and IB) courses may also include additional requirements in order to be approved by the university or college board to teach.

Endorsement Prerequisites

To be eligible for this endorsement, candidates must meet the following prerequisites:

- Have a Secondary Education License
- Have the Secondary Science Core Endorsement
- Have the Secondary Biology 1 Endorsement

Endorsement Requirement Areas

The Science Core Endorsement has the following 2 requirement areas:

1. Advanced Data Analysis Content Knowledge
2. Advanced Life Science Knowledge

Endorsement Type

A professional endorsement will be awarded when all of the requirement areas have been met. An associate endorsement will be awarded if the applicant holds a professional Biology 1 endorsement **OR** has completed at least 1 of the 2 requirement areas.

Requirement Area Options

The different options available to complete each of the requirement areas are described below. Quick links to the requirement area competencies are linked in parentheses.

Requirement Area 1: Advanced Data Analysis Content Knowledge ([B2.1](#))

Complete one of the following options to show evidence of competency in this Requirement Area

University Courses

- Any 3+ credit university course (passed with a grade of C or higher) in Statistics (e.g., General Statistics, Applied Statistics, Probability and Statistics, Statistics for Scientists)

College Major (Meets Requirement Areas 1-2 for this endorsement)

- College Major in Biology, Biology Education, or a Biology Variation (e.g., Microbiology, Ecology, Wildlife Biology, Physiology, Genetics, Evolutionary Biology)
- Other College Majors may be approved for this endorsement with approval of USBE Science Specialist based on a transcript review

Requirement Area 2: Advanced Life Science Content Knowledge ([B2.2](#))

Complete one of the following options to show evidence of competency in this Requirement Area



University Courses

- Complete **TWO** 3+ credit university courses (passed with a grade of C or higher) in Advanced/Applied Biology in addition to the courses taken to meet Chemistry 1 Endorsement requirements (if applicable). *At least one of these courses MUST include a 1.0 Credit Lab experience or be worth 4.0 Credits.* Examples of course could include: Cell Biology or Microbiology, Anatomy and/or Physiology, Biotechnology, Wildlife Biology, or an additional course focused in advanced Zoology/Botany.

College Major (Meets Requirement Areas 1-2 for this endorsement)

- College Major in Biology, Biology Education, or a Biology Variation (e.g., Microbiology, Ecology, Wildlife Biology, Physiology, Genetics, Evolutionary Biology)
- Other College Majors may be approved for this endorsement with approval of USBE Science Specialist based on a transcript review

Requirement Area Competencies

The Secondary Biology 2 competencies are organized into 1 section:

- 1. Biology 2 Core Ideas** – This endorsement is required to teach Advanced Biology (AP, CE, and IB) and high school life science elective courses. These competencies and requirements go above that of the core ideas found in the SEEd Biology Standards.

B2.1 Advanced Data Analysis

B2.2 Advanced Life Science Content Knowledge

Each of the requirement area competencies are described below. Quick links to each requirement area options are provided in the parentheses.

Requirement Area 1 - Advanced Data Analysis Content Knowledge ([Options](#))

B2.1: Advanced Data Analysis

B2.1.A: Representing and Describing Data

- B2.1.A.a Construct a graph, plot, or chart (X,Y; Log Y; Bar; Histogram; Line, Dual Y; Box and Whisker; Pie) showing correct: a) Orientation, b) Labeling, c) Units, d) Scaling, e) Plotting, f) Type, g) Trend line
- B2.1.A.b Describe data from a table or graph, including: a) Identifying specific data points, b) Describing trends and/or patterns in the data, c) Describing relationships between variables

B2.1.B: Statistical Tests and Data Analysis

- B2.1.B.a Perform mathematical calculations, including: a) Mathematical equations, b) Means, c) rates, d) ratios, e) percentages.
- B2.1.B.b Use confidence intervals and/or error bars (both determined using standard errors) to determine whether sample means are statistically different.
- B2.1.B.c Perform chi-square hypothesis testing
- B2.1.B.d Use data to evaluate a hypothesis (or prediction), including a) Rejecting or failing to reject the null hypothesis, b) Supporting or refuting the alternative hypothesis.

Requirement Area 2 - Advanced Life Science Content Knowledge ([Options](#))

B2.2: Advanced Life Science Content Knowledge

B2.2.A: Molecules to Organisms

- B2.2.A.a Properties of water that result from its polarity and hydrogen bonding affect its



biological function.

- B2.2.A.b Structure (composition and properties) and function (processes and mechanisms) of macromolecules required by living organisms
- B2.2.A.c Mechanisms by which genetic information is copied for transmission between generations and mechanisms by which genetic information flows from DNA to RNA to protein.
- B2.2.A.d How the binding of transcription factors to promoter regions affects gene expression and/or the phenotype of the organism.
- B2.2.A.e Connection between the regulation of gene expression and phenotypic differences in cells and organisms.
- B2.2.A.f Structure and function of subcellular components and organelles and how they contribute to cell function including a) how they capture, store, and use energy, b) exchange molecules within the cell and with the cell's environment
- B2.2.A.g Structure of biological membranes and how they influence selective permeability including a) mechanisms that organisms use to maintain solute and water balance, b) mechanisms that organisms use to transport large molecules across the plasma membrane, c) how the structure of a molecule affects its ability to pass through the plasma membrane.
- B2.2.A.h Properties and Role of Enzymes in life function
- B2.2.A.i Role of Energy in living organisms including: a) photosynthetic processes, b) using energy stored in biological macromolecules
- B2.2.A.j Ways that cells can communicate with one another and sense/respond their environment including feedback mechanisms to maintain homeostasis
- B2.2.A.k Regulation and checkpoints in the Cell cycle

B2.2.B: Heredity

- B2.2.B.a How the process of meiosis generates genetic diversity.
- B2.2.B.b Deviations from Mendel's model of the inheritance of traits.
- B2.2.B.c How the same genotype can result in multiple phenotypes under different environmental conditions.
- B2.2.B.d Types of interactions that regulate gene expression and how the location of regulatory sequences relates to their function
- B2.2.B.e How alterations in DNA sequences contribute to variation that can be subject to natural selection.
- B2.2.B.f The use of genetic engineering techniques in analyzing or manipulating DNA.

