IDAHO SCIENCE END-OF-COURSE (EOC)
BIOLOGY CONTENT STANDARDS

Standard 1: Nature of Science

Goals:	Objective 1	Objective 2	Objective 3	Objective 4	Objective 5	Objective 6	Objective 7
Goal 1.1: Understand Systems, Order, and Organization	9-10.B.1.1.1 Explain the scientific meaning of system, order, and organization. (648.01a) **Skill Statements:** • Recognize the terms system, order, and organization in relation to biological science. • Recognize order and organization within biological science systems. **Content Limits:** Systems, order, and organization must be limited to plant and animal cell systems, body systems (i.e., respiratory, circulatory, and digestive), ecological systems and cycles, and classification systems.	9-10.B.1.1.2 Apply the concepts of order and organization to a given system. (648.01a) **Skill Statements:** • Identify examples of scientific systems and methods of organization. • Explain the interactions and the order of components within a complete system. • Categorize the parts of a specific system and explain how they are dependent on one another. • Predict what will happen to a system if one part/component is removed or malfunctions within a system. **Content Limits:** Systems are limited to plant and animal cell systems, body systems (i.e., respiratory, circulatory, and digestive), ecological systems and cycles, and classification systems.					
Goal 1.2: Understand Concepts and Processes of Evidence, Models, and Explanations	9-10.B.1.2.1 Use observations and data as evidence on which to base scientific explanations. (648.02a) **Skill Statements:** • Determine which data best support a specific scientific explanation. • Select the most reasonable scientific explanation for an observation or a set of data. **Content Limits:** Sources of data can include narrative descriptions, and quantitative and qualitative observations; data displays can include graphs, data tables, and diagrams related to biological science.	9-10.B.1.2.2 Develop models to explain concepts or systems. (648.02b) ***Assessed in the classroom, not on the biology EOC assessment.***	9-10.B.1.2.3 Develop scientific explanations based on knowledge, logic and analysis. (648.02c) ***Assessed in the classroom, not on the biology EOC assessment.***				

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Goals:	Objective 1	Objective 2	Objective 3	Objective 4	Objective 5	Objective 6	Objective 7
Goal 1.3: Understand Constancy, Change, and Measurement	9-10.B.1.3.1 Measure changes that can occur in and among systems. (648.03b) **Skill Statements:** • Measure changes over time in a system using an appropriate tool. • Identify and/or describe a measurable change or changes that occur within a system or between two systems over time. **Content Limits:** Systems are limited to plant and animal cell systems, body systems (i.e., respiratory, circulatory, and digestive), ecological systems and cycles, and classification systems. System changes may include temperature, pH, concentration changes, reaction rate changes, and population and ecosystem changes. Tools used for measurement may include a thermometer, pH tester (paper and probe), and microscope.	9-10.B.1.3.2 Analyze changes that can occur in and among systems. (648.03b) **Skill Statements:** • Analyze the changes that occur in systems using models, flow charts, food webs/chains, diagrams, graphs, and/or data tables. • Evaluate how internal and/or external changes can affect the function of a system. **Content Limits:** Systems are limited to plant and animal cell systems, body systems (i.e., respiratory, circulatory, and digestive), ecological systems and cycles, and classification systems. System changes may include temperature, pH, concentration changes, reaction rate changes, and population and ecosystem changes.	9-10.B.1.3.3 Measure and calculate using the metric system. (648.03c) **Skill Statements:** • Identify the units of measure for length, mass, volume, and temperature within the metric system. • Use the appropriate tool when measuring using the metric system. • Convert between units within the metric system. • Perform metric-based calculations related to biology. **Content Limits:** Measure and calculate using single-step metric conversions. Suitable units may include grams, meters, liters, and degrees Celsius. Prefixes include milli-, centi-, and kilo-. Tools used for measurement include balance, graduated cylinder, metric ruler, beaker, flask, test tube, pH tester (paper and probe), thermometer, and stopwatch. Items requiring conversions from customary to metric units should always include the appropriate conversion factors.				
Goal 1.4: Understand the Theory that Evolution is a Process that Relates to the Gradual Changes in the Universe and of Equilibrium as a Physical State	Reference to 7.S.3.2.1 No objectives in Biology.						
Goal 1.5: Understand Concepts of Form and Function	No objectives in Biology.						

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Goals:	Objective 1	Objective 2	Objective 3	Objective 4	Objective 5	Objective 6	Objective 7
Goal 1.6: Understand Scientific Inquiry and Develop Critical Thinking Skills	9-10.B.1.6.1 Identify questions and concepts that guide scientific investigations. (649.01a) **Skill Statements:** • Evaluate a set of questions to determine which ones are scientifically valid for investigation. • Identify questions related to the Biology Content Standards that can be tested using scientific inquiry. **Content Limits:** Questions and/or concepts that can be tested using the scientific method should be related to the Biology Content Standards.	9-10.B.1.6.2 Utilize the components of scientific problem solving to design, conduct, and communicate results of investigations. (649.01b) ***Assessed in the classroom, not on the biology EOC assessment.***	9-10.B.1.6.3 Use appropriate technology and mathematics to make investigations. (649.01c) **Skill Statements:** • Examine a set of tools and technologies to determine which should be used to investigate a given situation. • Apply mathematics to interpret scientific data. • Students will be able to identify or use suitable forms of technology for measurement and mathematics needed to conduct an experiment or solve a problem related to a biological investigation. **Content Limits:** Suitable technologies include computer and basic computer software, calculator, thermometer, balance, pH tester (paper and probe), and light microscope. Suitable mathematics calculations may include single-step metric conversions, and calculations involving cell volume to surface area ratios, proportion of offspring exhibiting a specific phenotype, enzyme reaction rates, O_2/CO_2 production, pH levels, etc. Formulas will be provided within the test items as necessary.	9-10.B.1.6.4 Formulate scientific explanations and models using logic and evidence. (649.01d) ***Assessed in the classroom, not on the biology EOC assessment.***	9-10.B.1.6.5 Analyze alternative explanations and models. (649.01e) **Skill Statements:** • Compare two or more possible explanations for a set of data. • Analyze two or more explanations/models for a biological science concept and describe which model best fits the concept. • Analyze the relevance and validity of past explanations/models as compared to current explanations/models. • Develop a possible alternative model to explain a set of data and be able to defend the model scientifically. **Content Limits:** Models and explanations should be based on the Biology Content Standards.	9-10.B.1.6.6 Communicate and defend a scientific argument. (649.01f) ***Assessed in the classroom, not on the biology EOC assessment.***	9-10.B.1.6.7 Explain the differences among observations, hypotheses, and theories. (649.01g) **Skill Statements:** • Compare two or more of the following three terms: observation, hypothesis, and theory. • Compare the purpose/function of observations, hypotheses, and theories in science. • Identify examples of observations, hypotheses, and theories. **Content Limits:** The scientific observations, hypotheses, and theories should be limited to topics covered in the Biology Content Standards.
Goal 1.7: Understand That Interpersonal Relationships Are Important in Scientific Endeavors	No objectives in Biology.						
Goal 1.8: Understand Technical Communication	9-10.B.1.8.1 Analyze technical writing, graphs, charts, and diagrams. (658.02a) **Skill Statements:** • Analyze and/or interpret scientific data presented within technical writing, graphs, charts, and diagrams. • Compare different data displays and determine which best presents data of a specific type. **Content Limits:** Derive meaning from technical writing, graphs, charts, and diagrams based on biology content. Technical writing can be in the form of a list of procedures or instructions.						

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Standard 2: Physical Science

No goals or objectives in Biology.

Standard 3: Biology

Goals:	Objective 1	Objective 2	Objective 3	Objective 4	Objective 5	Objective 6	Objective 7
Goal 3.1: Understand the Theory of Biological Evolution	9-10.B.3.1.1 Use the theory of evolution to explain how species change over time. (652.01a) **Skill Statements:** • Discuss the evidence that convinced Darwin that species could change over time. • Describe how natural selection can change a population. • Identify and/or evaluate specific examples of natural selection and artificial selection. • Use current scientific evidences to explain that organisms evolve. • Describe factors that influence speciation. • Relate current organisms to past organisms based on provided evidence. **Content Limits:** Demonstrate understanding of the roles that genetic variability, natural/artificial selection, biodiversity, and other environmental factors play in how species change over time. Evidence of evolution may include the fossil record, changes in body forms and/or function (e.g., Darwin's finches), homologous structures, genetic inheritance, and mutations. Factors that influence speciation will only include geographic isolation.	9-10.B.3.1.2 Explain how evolution is the consequence of interactions among the potential of a species to increase its numbers, genetic variability, a finite supply of resources, and the selection by the environment of those offspring better able to survive and reproduce. (652.01a) **Skill Statements:** • Predict what happens to a population when the following conditions change: carrying capacity, limiting factors, genetic variability, and/or environment. **Content Limits:** Demonstrate an understanding of the following concepts: mutation, genetic variability, differential reproduction, limiting factors, carrying capacity, and biological fitness.					

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Goals:	Objective 1	Objective 2	Objective 3	Objective 4	Objective 5	Objective 6	Objective 7
Goal 3.2: Understand the Relationship between Matter and Energy in Living Systems	9-10.B.3.2.1 Explain how matter tends toward more disorganized states (entropy). (653.01a) **Skill Statements:** • Identify examples of entropy. • Identify various levels of entropy in provided examples to determine which one has the most or least entropy. **Content Limits:** Explain that there is a tendency for living systems to become more disorganized over time. Living systems must come from the Biology Content Standards.	9-10.B.3.2.2 Explain how organisms use the continuous input of energy and matter to maintain their chemical and physical organization. (653.01b) **Skill Statements:** • List and/or describe the different types of energy for biological systems. • Identify the source(s) of energy for a given biological system. • Use energy and number/biomass pyramids to describe the relationship between energy and matter in maintaining life. • Analyze how matter (e.g., biomass, nutrients, water, solutes, and gasses) and energy are used to maintain homeostasis in biological systems. **Content Limits:** Types of energy are limited to solar and chemical. Systems are limited to plant and animal cell systems, body systems (i.e., respiratory, circulatory, and digestive), ecological systems and cycles, and classification systems.	9-10.B.3.2.3 Show how the energy for life is primarily derived from the sun through photosynthesis. (653.01c) **Skill Statements:** • Identify the chemical equation for photosynthesis (reactants and products). • Explain how solar energy is converted into chemical energy through photosynthesis. **Content Limits:** Students will be able to identify and interpret the photosynthetic reaction including the products and reactants of the light-dependent reactions and Calvin cycle (light-independent reactions). Students should know the molecules used to capture light energy (chlorophyll). Students will not be tested on photosystems, chemiosmosis, or the electron transport chain.	9-10.B.3.2.4 Describe cellular respiration and the synthesis of macromolecules. (653.01d) **Skill Statements:** • Identify the chemical equation of cellular respiration (reactants and products). • Describe how chemical (food) energy is converted into ATP through cellular respiration. • Explain how oxygen and glucose are used in cellular respiration. • Distinguish between the products of aerobic and anaerobic respiration. • Explain that both plants and animals perform cellular respiration. • Identify the reactants and products of glycolysis, Krebs cycle (citric acid cycle), and electron transport chain (not specific numbers). • Identify major types of biological macromolecules. • Explain how ATP from cellular respiration is used as an energy source for the production of macromolecules (carbohydrates, proteins, lipids, nucleic acids). **Content Limits:** Students will *not* be tested on chemiosmosis or oxidative phosphorylation.	9-10.B.3.2.5 Show how matter cycles and energy flows through the different levels of organization of living systems (cells, organs, organisms, communities) and their environment. (653.01h) **Skill Statements:** • Explain how matter cycles through a biogeochemical cycle. • Examine the flow of matter and/or energy through a living system. **Content Limits:** Suitable topics include food chains/webs and biogeochemical cycles such as water, carbon, and/or oxygen. Living systems include a cell, an individual organism, a food web, and ecosystems.		

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Goals:	Objective 1	Objective 2	Objective 3	Objective 4	Objective 5	Objective 6	Objective 7
Goal 3.3: Understand the Cell is the Basis of Form and Function for All Living Things	9-10.B.3.3.1 Identify the particular structures that underlie the cellular functions. (651.01a) **Skill Statements:** • Identify organelles and other cellular structures within plant and animal cells. **Content Limits:** Organelles and cellular structures include chloroplasts, mitochondria, nucleus, cell membrane, cell wall, ribosomes, lysosomes, Golgi body, endoplasmic reticulum, cytoplasm, cytoskeleton, vacuoles (in both plants and animals), flagella, and cilia. Cell structures may also include specific structures of membranes, including components of the phospholipid bilayer (phospholipids and protein channels for transport of substances).	9-10.B.3.3.2 Explain cell functions involving chemical reactions. (651.01b) **Skill Statements:** • Describe the functions of each of the organelles and other structures of a plant and an animal cell. • Explain the roles of enzymes and ATP in cells. **Content Limits:** Organelles and cellular structures include chloroplasts, mitochondria, nucleus, cell membrane, cell wall, ribosomes, lysosomes, Golgi body, endoplasmic reticulum, cytoplasm, cytoskeleton, vacuoles (in both plants and animals), flagella, and cilia. Specific functions of the membrane include transport through the membrane (diffusion, osmosis, and active transport).	9-10.B.3.3.3 Explain how cells use DNA to store and use information for cell functions. (651.01c) **Skill Statements:** • Describe the structure of DNA. • Describe the process of DNA replication through base-pairing. • Compare and contrast the structures and roles of DNA and RNA within a cell. • Describe the process of protein synthesis, including transcription and translation. • Compare the steps of mitosis. • Explain the role of mitosis in the cell cycle. • Compare the steps of meiosis. • Compare and contrast mitosis and meiosis. • Summarize how the process of meiosis produces genetic variability. • Explain the difference between dominant and recessive alleles. • Compute the genotypic and phenotypic ratios from monohybrid Punnett square crosses. • Explain the role of X and Y chromosomes in gender determination. **Content Limits:** Summarize DNA replication, mitosis, and meiosis. Concepts assessed may include DNA and nucleotide structure, base-pairing, transcription and translation (RNA, ribosomes), cell cycle and mitosis, meiosis and gamete formation. Assessable terms include the following: Punnett squares, monohybrid crosses, dominant and recessive genes, homozygous, heterozygous, genotype, phenotype, and X and Y chromosomes.	9-10.B.3.3.4 Explain how selective expression of genes can produce specialized cells from a single cell. (651.01e) **Skill Statements:** • Understand that cells differentiate into different cell types or tissues. **Content Limits:** Explain how a single cell differentiates to produce all cells of the body containing the same DNA, which is expressed differently.			

Standard 4: Earth and Space Systems

No goals or objectives in Biology.

Standard 5: Personal and Social Perspectives; Technology

Goals:	Objective 1	Objective 2	Objective 3	Objective 4	Objective 5	Objective 6	Objective 7
Goal 5.1: Understand Common Environmental Quality Issues, Both Natural and Human Induced	9-10.B.5.1.1 Analyze environmental issues such as water and air quality, hazardous waste, forest health, and agricultural production. (656.01a) **Skill Statements:** • Describe how environmental issues impact Earth's systems. • Evaluate the causes and effects of current environmental issues and develop possible solutions. • Analyze national and local environmental issues. • Examine the environmental impact of humans on natural resources. **Content Limits:** Environmental issues may include water and air quality, depletion of natural resources, industrial pollution, transport and disposal of hazardous waste, and global climate change.						
Goal 5.2: Understand the Relationship between Science and Technology	9-10.B.5.2.1 Explain how science advances technology. (655.01a) **Skill Statements:** • Give examples of scientific discoveries that have led to technological advances. • Describe how scientific discoveries have impacted technology. **Content Limits:** Technologies may include medicine, radiology (X-ray), cloning, genetic engineering, and stem cell applications.	9-10.B.5.2.2 Explain how technology advances science. (655.01a) **Skill Statements:** • Identify and/or describe how technology advances biological sciences. **Content Limits:** Technologies include microscope, computer, measurement tools, or other technologies that have advanced biological sciences.	9-10.B.5.2.3 Explain how science and technology are pursued for different purposes. (656.01b) **Skill Statements:** • Explain why humans pursue science. • Explain why humans pursue technology. • Explain how science and technology are pursued for different purposes. **Content Limits:** Science is the process that increases and informs our knowledge of the natural world. Technology is the tool we use to advance our scientific knowledge and alter the quality of life.				

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Goals:	Objective 1	Objective 2	Objective 3	Objective 4	Objective 5	Objective 6	Objective 7
Goal 5.3: Understand the Importance of Natural Resources and the Need to Manage and Conserve Them	9-10.B.5.3.1 Describe the difference between renewable and nonrenewable resources. (656.03a) **Skill Statements:** • Describe the terms renewable and nonrenewable. • Classify example resources as renewable or nonrenewable. • Evaluate the advantages and disadvantages of using renewable and nonrenewable resources. **Content Limits:** Renewable and nonrenewable resources may include water, solar, wind, biomass, and fossil fuels (coal, oil, and natural gas).						