Student Review Sheet

Biology Semester A Examination

Test Description
Length: 2 hours
Points: 70 SR (~85%), 2 BCRs (~15%)

<table>
<thead>
<tr>
<th>Unit</th>
<th>Approximate Number of Selected Response Items</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biology Skills &amp; Processes</td>
<td>15</td>
</tr>
<tr>
<td>Ecology</td>
<td>16</td>
</tr>
<tr>
<td>Chemistry of Life</td>
<td>7</td>
</tr>
<tr>
<td>Cells In Living Things</td>
<td>14</td>
</tr>
<tr>
<td>Energetics</td>
<td>8</td>
</tr>
<tr>
<td>Nucleic Acids &amp; Protein Synthesis</td>
<td>10</td>
</tr>
<tr>
<td><strong>Totals</strong></td>
<td><strong>70</strong></td>
</tr>
</tbody>
</table>

The vocabulary terms and objectives are grouped into units for your convenience. Some items may occur in multiple units during the semester. The vocabulary includes terms that students may encounter when reading examination items. (H) indicates items found on the Biology Honors examination but not on the Biology I examination.

Some Vocabulary for the Exam:

**Biology Skills & Processes**
- conclusion
- control
- data
- dependent variable
- experiment
- hypothesis
- independent variable
- petri dish (H)
- rate
- variable
- Venn diagram
- conclusion
- control
- data
- dependent variable
- experiment
- hypothesis
- independent variable
- petri dish (H)
- rate
- variable
- Venn diagram

**Ecology**
- abiotic
- absorption (H)
- aquatic
- bacteria
- biomass
- biomass pyramid
- nitrogen cycle
- omnivore
- parasite
- predator
- prey
- producer

**Chemistry of Life**
- acid
- carbohydrate
- dietary fiber
- electrical charge
- energy
- inorganic
- lipid
- mineral
- monomer
- organic
- pH
- protein
- vitamin

**Other**
- biosphere
- carbon cycle
- carnivore
- carnivorous (H)
- commensalism
- decomposition
- diversity
- ecosystem
- food chain
- food web
- fungi
- herbivore
- host
- insecticide
- mutualism
- parasite
- predator
- prey
- producer
- pyramid
- sediment
- species
- succession
- terrestrial
- trophic level

Montgomery County Public Schools
Student Review Sheet

**Cells In Living Things**
- anaphase
- asexual reproduction
- binary fission
- budding
- cell
- cell membrane
- cellulose
- cell wall
- chloroplast
- cytoplasm
- diffusion
- eukaryotic
- excrete
- flagellum
- homeostasis
- metaphase
- mitochondrion
- mitosis
- molecular transport (H)
- nucleus
- oar (H)
- organelle
- osmosis
- permeable (H)
- photosynthesis
- prokaryotic
- prophase
- reproduction
- ribosome
- telophase
- excrete
- flagellum
- homeostasis
- metaphase
- mitochondrion
- mitosis
- molecular transport (H)
- nucleus
- oar (H)
- organelle
- osmosis
- permeable (H)
- photosynthesis
- prokaryotic
- prophase
- reproduction
- ribosome
- telophase
- Energetics
- aerobic respiration
- anaerobic respiration
- ATP
- catalase
- chemosynthesis
- dehydration synthesis
- digestion
- enzyme
- photosynthesis
- respiration
- DNA
- double helix
- gene
- glucose
- glycine
- histidine
- leucine
- mRNA
- nucleic acid
- nucleotide
- phosphate
- protein synthesis
- replication (H)
- rRNA
- sugar
- threonine
- transcription (H)
- translation (H)
- tRNA
- Nucleic Acids & Protein Synthesis
- amino acid
- arginine
- base
- chromosome
- codon
- glucose
- glycine
- histidine
- leucine
- mRNA
- nucleic acid
- nucleotide
- phosphate
- protein synthesis
- replication (H)
- rRNA
- sugar
- threonine
- transcription (H)
- translation (H)
- tRNA

Upon successful completion of the first semester the student should be able to:

**Biology Skills and Processes**
- interpret graphs and diagrams.
- identify trends revealed by data.
- analyze data to form conclusions.
- defend the need for verifiable data.
- identify the control in an experiment.
- read and interpret a technical passage.
- identify the hypothesis of an experiment.
- identify meaningful, answerable, scientific questions.
- identify appropriate methods for conducting an investigation.
- use ratio and proportion in appropriate situations to solve problems.
- distinguish between a dependent variable and an independent variable.
- describe similarities and differences when explaining concepts and/or principles.
- identify the appropriate instruments and materials needed to conduct an experiment.
- recognize safe laboratory procedures.
- organize data using appropriate techniques.
Student Review Sheet

Ecology
- interpret a food web.
- interpret an energy pyramid.
- describe the flow of energy through a food web.
- distinguish between a food web and a food chain.
- distinguish between producers and consumers.
- distinguish among carnivores, herbivores, and omnivores.
- distinguish among commensalism, mutualism, and parasitism.
- identify the role of bacteria in the nitrogen cycle.
- describe the impact of human activities on the nitrogen cycle.
- describe the impact of human activities on the carbon cycle.
- state the roles of photosynthesis and respiration in the carbon cycle.
- identify the changes that occur during ecological succession.
- identify actions that can help preserve the biosphere.

Chemistry of Life
- describe the chemical properties of water.
- identify the source of dietary fiber in animals.
- identify the general role of minerals in cell processes.
- identify the building blocks of proteins and nucleic acids.
- state the ranges of pH associated with acids, bases, and neutral solutions.

Cells In Living Things
- compare plant and animal cells.
- state the function of a flagellum.
- state the functions of chloroplasts, mitochondria, and ribosomes.
- identify the roles of a membrane in osmosis, homeostasis, and excretion.
- describe components of the cell membrane.
- predict the flow of water across a membrane based on the cell’s environment.
- describe the role of the nucleus in mitosis.
- distinguish between prokaryotes and eukaryotes.
- identify the relationship between DNA and genetic information.
- identify the changes in quantities of DNA that occur during mitosis. (H)
- describe asexual reproduction.
- distinguish between binary fission and budding.
- identify the role of feedback in maintaining cellular homeostasis.
- identify the effect of environmental factors on the metabolic activity of cells and organisms.

Energetics
- identify the properties of enzymes.
- determine the effect of temperature on enzyme activity.
- distinguish between photosynthesis and chemosynthesis.
- identify the basic reactants and products of photosynthesis.
- compare aerobic respiration and anaerobic respiration.
- identify the basic reactants and products of aerobic respiration.
Student Review Sheet

**Nucleic Acids and Protein Synthesis**
- identify the steps of protein synthesis.
- identify the relationships among DNA, mRNA, and tRNA.
- use a codon table to determine the order of amino acids encoded by a DNA sequence.
- distinguish among replication, transcription, and translation. (H)
- describe the shape of DNA and RNA molecules.
- identify the three main components of a nucleotide.
- describe how the structure of DNA determines the function of DNA.
- identify the importance of replication to genetic continuity.
- identify the mRNA sequence resulting from a DNA sequence.

BCRs were put on the exam review sheets to encourage appropriate student collaboration and review of concepts in preparation for the entire exam (not just the BCRs). Teachers should **not** address these BCRs during the course of their instruction nor should they assist in preparing students for the BCRs during exam review. Students are able to collaborate and use other resources to review and solidify concepts. Students should be prepared to answer any of the following BCRs. Teachers will select TWO from the list below on the day of the exam:

**BCR: HOW SWEET IT IS**

Diet drink Brand X claims to be sugar-free. You want to determine if Brand X contains sugar. There is a chemical that turns orange when added to a sugar solution. The chemical remains clear when added to a sugar-free solution.

Write a hypothesis to answer the question, “Does Brand X contain sugar?” Outline a well designed procedure to test your hypothesis. Include in your response:

- the hypothesis.
- the dependent and independent variables.
- a control.
- a well designed procedure.
- data that should be collected to answer the question.

**BCR: TROPICAL STORM’S EFFECTS ON SALT WATER MARSHES**

Large tropical storms can have dramatic effects on coastal, estuarine, and terrestrial ecosystems. The combination of high winds and intense precipitation deposits a large amount of leaves, branches, and mud as well as pollutants into the streams killing some of the living organisms in the water. The increase of dead leaves and branches mix with dead organisms, creating detritus.

Salt marshes serve as filters to remove sediments and toxins from the water. Marsh plants break down many pollutants into less harmful forms and minimize the toxic effects of pollutants. Excessive pollutants can overburden the cleansing capabilities of marshes.

Explain the effect of the tropical storm on the salt marsh ecosystem. Include: the roles each organism plays in the food web, tropic levels of a given organism, and the effects of the tropical storm on living things.
**BCR: CELL STRUCTURES**

All living things are composed of cells. Cell structures are specialized depending on the different functions of the cells. This is true of the structures found in both plant and animal cells.

Compare and contrast animal and plant cell structures. In your response, include:

- A comparison of structures in the plant and animal cells
- The role of chloroplasts in plant cells and mitochondria in animal cells
- How the cell structure relates to the different cell functions in the plant and animal cells.

**BCR: RELATIONSHIPS AMONG ORGANISMS**

**FOOD WEB DIAGRAM**

![Food Web Diagram]

Explain how an increase or decrease in the number of beetles would affect the other organisms in the web. Include in your answer

- the trophic levels of the corn, beetle, and snake
- the relationships among other organisms in the food web
- specific ways the ecosystem could be affected by a change in the number of beetles

**BCR (Both Exams): THE STRUCTURE OF DNA**

DNA is composed of building blocks. The building blocks are arranged in such a way that DNA can be copied accurately when cells reproduce. Maintaining the structure of DNA through repeated cell divisions is important to the survival of an individual and to a species.

Describe how DNA is copied. Include in your response:

- The building blocks of DNA
- The shape of the molecule
- How the arrangement of the building blocks prevents mistakes in copying
BCR (H): THE IMPORTANCE OF NITROGEN

Crops do not grow well without nutrients. Over-farming depletes nutrients from the soil. One of those nutrients is nitrate. Nitrate is a form of nitrogen that plants use to make proteins and nucleic acids.

Legumes are plants that have root structures containing bacteria. Those bacteria make and release nitrates into the soil. Some farmers have noticed that planting and growing legumes helps their crops grow.

Design an experiment that would address the problem of nitrate depletion. Make sure to include the components of a Well Designed Investigation in your response.

BCR (H): THE TROUBLE WITH CO2

Scientists believe that an increase in carbon dioxide, CO₂, in the atmosphere is causing a gradual increase of the Earth’s temperature, a process known as global warming. They are concerned that one human activity, cutting down trees without replacing them, is contributing to global warming.

Describe how the amount of CO₂ in the atmosphere can change. Include in your response:
- the names of the two cellular processes involved in the carbon cycle
- how carbon can be cycled between the environment and living organisms
- how human activities impact the carbon cycle

BCR (H): MIXOTROPH ALGAE

*Karlodinium veneficum* is a special type of algae called a mixotroph. It is capable of acting as both an autotroph and a heterotroph. It hunts and kills smaller, autotrophic algae and can obtain energy by eating them. It is also able to use the chloroplasts of its prey and make its own food.

Describe the difference in function between the chloroplast and the mitochondria in *Karlodinium veneficum*.

Be sure to include:
- The names of the processes completed by the mitochondria and chloroplast
- The reactants and products of the chemical reactions completed by mitochondria and chloroplasts
**BCR(H): THE LOSS OF BAY GRASSES**

The blue crab is an important animal in the Chesapeake Bay. It provides food for many organisms, including humans. Although the crab has a hard shell for protection, it has to lose this shell so that it can grow, a process called molting. One way that crabs try to survive during this molting process is to hide in bay grasses when they molt.

In recent years, bay grasses have been disappearing. This may be the result of changes in the amount of light reaching the bay grasses. The water is becoming more cloudy, preventing light from getting to the plants. Some reasons for this are the erosion of land from construction and agricultural practices. Also, the runoff of nutrients from the excessive use of fertilizers, runoff from livestock operations, and the dumping of materials from sewage treatment facilities contribute to this problem.

Explain how the loss of bay grasses might affect the organisms in the food web. In your response, be sure to include:

- the trophic levels of the bay grass, blue crab, and weakfish
- the role or roles of each organism in the food web
- how a decrease in bay grasses might affect other organisms in the food web

The following information will be provided in the test book for students to use during their exam:

- Science Rubric for BCRs