Introduction to the Biology Keystone Exam

Today's Agenda

- Learn about the Biology Keystone Exam
- Look at sample questions
- Review Reading and Interpreting Data and Graphs
  - You don't need to know anything about the topic to be successful with these questions
- Open-ended Practice Question
  - Brainstorm
  - Write
  - Peer edit
  - Turn in for teacher comments

Who will participate in the Keystone Exams?

- Beginning in 2012-2013 the Algebra I, Literature, and Biology Keystone Exams will replace the 11th grade Pennsylvania System of School Assessment (PSSA) tests in mathematics, reading, and science for purposes of satisfying No Child Left Behind (NCLB)/Adequate Yearly Progress (AYP) requirements.
- Therefore, all students in grade 11 must participate in the Algebra I, Literature, and Biology Keystone Exams. Additionally, students in any grade who are enrolled in a Keystone related course should participate.

How long is the Keystone exam?

- There is no time limit for a student to complete a Keystone Exam.
- Each Keystone Exam should take the typical student 2 to 3 hours to complete.
- There are two modules on each test, and each module (or Test Session) of the Keystone Exam should take 1 to 1.5 hours to complete.
- Each module will be administered on a separate day

How will you take the Keystone Exam?

- All Keystones will be administered with paper and pencil

What will the Keystone test be like?

- The Keystone Exams will include
  - multiple-choice questions
    - Inference questions
    - Data analysis questions
    - Vocabulary questions
    - Relationship questions (show relationships between structures)
  - constructed-response or open-ended questions

- Approximately 60% to 75% of the total score will be from multiple-choice questions and 25% to 40% of the total score will be from constructed-response questions.

Data Analysis – multiple choice

The chart below shows relationships between genes, the environment, and coloration of tomato plants.

Inherited Gene	Environmental Condition	Final Appearance
A	Light	Green
B	Light	White
A	Dark	White
B	Dark	White

Which statement best explains the final appearance of these tomato plants?

(1) The expression of gene *A* is not affected by light.
(2) The expression of gene *B* varies with the presence of light.
(3) The expression of gene *A* varies with the environment.
(4) Gene *B* is expressed only in darkness.

Data Analysis – constructed response

A student squeezed a clothespin as many times as possible in a 30-second time period. The student repeated this procedure nine more times in quick succession. The data obtained are in the chart below.

Trial	Number of Squeezes in 30 Seconds
1	32
2	29
3	28
4	27
5	26
6	25
7	23
8	21
9	19
10	17

State one hypothesis that this data would support concerning the relationship between number of trials and number of squeezes in 30 seconds. [

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Example Question

Anchor Descriptor		Eligible Content		Enhanced Standard
BIO.A.1.1	Explain the characteristics common to all organisms.	**BIO.A.1.1.1**	Describe the characteristics of life shared by all prokaryotic and eukaryotic organisms.	**3.1.B.A1** **3.1.B.C2** **4.1.3.A** **4.1.4.A**

Sample Exam Question

Standard BIO.A.1.1.1

Which characteristic is shared by **all** prokaryotes and eukaryotes?

A. ability to store hereditary information

B. use of organelles to control cell processes

C. use of cellular respiration for energy release

D. ability to move in response to environmental stimuli

Example Question

Anchor Descriptor		Eligible Content		Enhanced Standard
BIO.A.1.2	Describe relationships between structure and function at biological levels of organization.	**BIO.A.1.2.1**	Compare cellular structures and their functions in prokaryotic and eukaryotic cells.	**3.1.B.A1** **3.1.B.A5** **3.1.B.C2** **4.1.4.A**

Sample Exam Question

Standard BIO.A.1.2.1

Living organisms can be classified as prokaryotes or eukaryotes. Which two structures are common to both prokaryotic and eukaryotic cells?

A. cell wall and nucleus

B. cell wall and chloroplast

C. plasma membrane and nucleus

D. plasma membrane and cytoplasm

Example Question

MODULE A—CELLS AND CELL PROCESSES

ASSESSMENT ANCHOR BIO.A.1 Basic Biological Principles *(continued)*				
Anchor Descriptor		**Eligible Content**		**Enhanced Standard**
BIO.A.1.2	Describe relationships between structure and function at biological levels of organization.	**BIO.A.1.2.1**	Compare cellular structures and their functions in prokaryotic and eukaryotic cells.	**3.1.B.A1** **3.1.B.A5** **3.1.B.C2** **4.1.4.A**

Sample Exam Question

Standard BIO.A.1.2.1

- Aligned constructed response example on next slide

Constructed response sample
Parts A and B

Prokaryotic cells are generally much smaller than eukaryotic cells.

Part A: Identify a structural difference between prokaryotic cells and eukaryotic cells that is directly related to their difference in size.

Part B: Based on the structural difference, explain why prokaryotic cells can be much smaller than eukaryotic cells.

Constructed Response Sample
Part C

Standard BIO.A.1.1

Continued. Please refer to the previous page for task explanation.

Part C: Describe one similarity between prokaryotic cells and eukaryotic cells that is independent of size.

Example Question

ASSESSMENT ANCHOR
BIO.A.1 Basic Biological Principles *(continued)*

Anchor Descriptor		Eligible Content		Enhanced Standard
BIO.A.1.2	Describe relationships between structure and function at biological levels of organization.	**BIO.A.1.2.2**	Describe and interpret relationships between structure and function at various levels of biological organization (i.e., organelles, cells, tissues, organs, organ systems, and multicellular organisms).	**3.1.B.A5** **3.1.B.A6** **3.1.B.A1**

Sample Exam Question

Standard BIO.A.1.2.2

Alveoli are microscopic air sacs in the lungs of mammals. Which statement **best** describes how the structure of the alveoli allows the lungs to function properly?

A. They increase the amount of energy transferred from the lungs to the blood.

B. They increase the flexibility of the lungs as they expand during inhalation.

C. They increase the volume of the lungs, allowing more oxygen to be inhaled.

D. They increase the surface area of the lungs, allowing efficient gas exchange.

Example Question

ASSESSMENT ANCHOR
BIO.A.2 The Chemical Basis for Life

Anchor Descriptor		Eligible Content		Enhanced Standard
BIO.A.2.1	Describe how the unique properties of water support life on Earth.	**BIO.A.2.1.1**	Describe the unique properties of water and how these properties support life on Earth (e.g., freezing point, high specific heat, cohesion).	**3.1.B.A8** **3.1.B.A5** **4.2.5.C**

Sample Exam Question

Which statement **best** describes an effect of the low density of frozen water in a lake?

A. When water freezes, it contracts, decreasing the water level in a lake.

B. Water in a lake freezes from the bottom up, killing most aquatic organisms.

C. When water in a lake freezes, it floats, providing insulation for organisms below.

D. Water removes thermal energy from the land around a lake, causing the lake to freeze.

Example Question

ASSESSMENT ANCHOR
BIO.A.2 The Chemical Basis for Life *(continued)*

Anchor Descriptor		Eligible Content		Enhanced Standard
BIO.A.2.2	Describe and interpret relationships between structure and function at various levels of biochemical organization (i.e., atoms, molecules, and macromolecules).	**BIO.A.2.2.1**	Explain how carbon is uniquely suited to form biological macromolecules.	**3.1.B.A7** **3.2.C.A2**
		BIO.A.2.2.2	Describe how biological macromolecules form from monomers.	**3.1.B.A7** **3.1.B.A8** **3.1.B.A2** **3.1.C.A2**

Which statement correctly describes how carbon's ability to form four bonds makes it uniquely suited to form macromolecules?

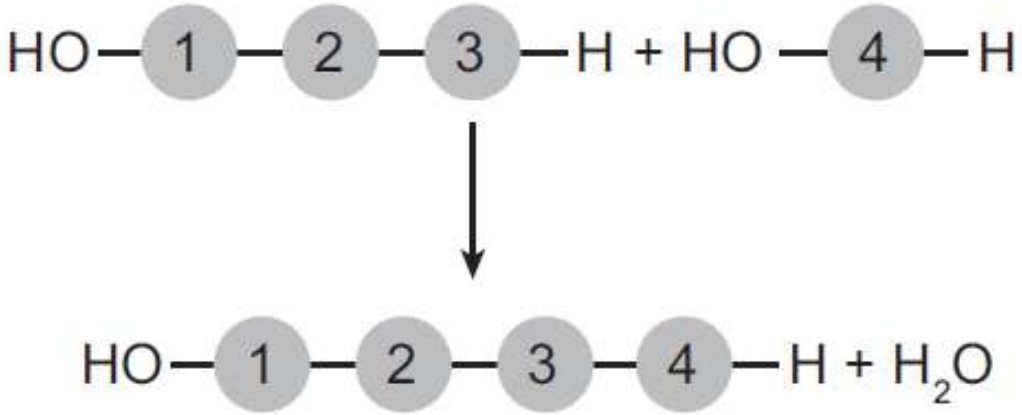
A. It forms short, simple carbon chains.

B. It forms large, complex, diverse molecules.

C. It forms covalent bonds with other carbon atoms.

D. It forms covalent bonds that can exist in a single plane.

Chemical Reaction



The diagram shows a reaction that forms a polymer from two monomers. What is this type of reaction called?

A. glycolysis

B. hydrolysis

C. photosynthesis

D. dehydration synthesis

ASSESSMENT ANCHOR BIO.A.2 The Chemical Basis for Life *(continued)*				
Anchor Descriptor		**Eligible Content**		**Enhanced Standard**
BIO.A.2.2	Describe and interpret relationships between structure and function at various levels of biochemical organization (i.e., atoms, molecules, and macromolecules).	**BIO.A.2.2.3**	Compare the structure and function of carbohydrates, lipids, proteins, and nucleic acids in organisms.	**3.1.B.A7** **3.1.B.A2** **3.1.C.A2** **3.1.C.A7**

Carbohydrates and proteins are two types of macromolecules. Which functional characteristic of proteins distinguishes them from carbohydrates?

A. large amount of stored information

B. ability to catalyze biochemical reactions

C. efficient storage of usable chemical energy

D. tendency to make cell membranes hydrophobic

ASSESSMENT ANCHOR BIO.A.2 The Chemical Basis for Life *(continued)*				
Anchor Descriptor		**Eligible Content**		**Enhanced Standard**
BIO.A.2.2	Describe and interpret relationships between structure and function at various levels of biochemical organization (i.e., atoms, molecules, and macromolecules).	**BIO.A.2.2.3**	Compare the structure and function of carbohydrates, lipids, proteins, and nucleic acids in organisms.	**3.1.B.A7** **3.1.B.A2** **3.1.C.A2** **3.1.C.A7**

Sample Exam Question

Standard BIO.A.2.2.3

Proteins are a major part of every living cell and have many different functions within each cell. Carbohydrates also perform numerous roles in living things.

Part A: Describe the general composition of a protein molecule.

Part B: Describe how the structures of proteins differ from the structures of carbohydrates.

Previous Question Continued

Part C: Describe how the functions of proteins differ from the functions of carbohydrates.

BIO.A.2 The Chemical Basis for Life *(continued)*

Anchor Descriptor		Eligible Content		Enhanced Standard
BIO.A.2.3	Explain how enzymes regulate biochemical reactions within a cell.	**BIO.A.2.3.1**	Describe the role of an enzyme as a catalyst in regulating a specific biochemical reaction.	**3.1.B.A2** **3.1.B.A7**
		Standard BIO.A.2.3.1	Substance A is converted to substance B in a metabolic reaction. Which statement **best** describes the role of an enzyme during this reaction? A. It adjusts the pH of the reaction medium. B. It provides energy to carry out the reaction. C. It dissolves substance A in the reaction medium. D. It speeds up the reaction without being consumed.	**3.1.B.A2** **3.1.B.A7**

BIO.A.2 The Chemical Basis for Life *(continued)*			
Anchor Descriptor		**Eligible Content**	**Enhanced Standard**
BIO.A.2.3	Explain how enzymes regulate biochemical reactions within a cell.	**BIO.A.2.3.1** Describe the role of an enzyme as a catalyst in regulating a specific biochemical reaction.	**3.1.B.A2** **3.1.B.A7**
		BIO.A.2.3.2 Explain how factors such as pH, temperature, and concentration levels can affect enzyme function.	**3.1.B.A2** **3.1.B.A7**

Standard BIO.A.2.3.2

A scientist observes that, when the pH of the environment surrounding an enzyme is changed, the rate the enzyme catalyzes a reaction greatly decreases. Which statement **best** describes how a change in pH can affect an enzyme?

A. A pH change can cause the enzyme to change its shape.

B. A pH change can remove energy necessary to activate an enzyme.

C. A pH change can add new molecules to the structure of the enzyme.

D. A pH change can cause an enzyme to react with a different substrate.

ASSESSMENT ANCHOR
BIO.A.3 Bioenergetics

Anchor Descriptor		Eligible Content		Enhanced Standard
BIO.A.3.1	Identify and describe the cell structures involved in processing energy.	**BIO.A.3.1.1**	Describe the fundamental roles of plastids (e.g., chloroplasts) and mitochondria in energy transformations.	**3.1.B.A2** **3.1.B.A5** **3.1.C.A1**

Standard BIO.A.3.1.1

Using a microscope, a student observes a small, green organelle in a plant cell. Which energy transformation **most likely** occurs first within the observed organelle?

A. ATP to light

B. light to chemical

C. heat to electrical

D. chemical to chemical

ASSESSMENT ANCHOR BIO.A.3 Bioenergetics *(continued)*				
Anchor Descriptor		**Eligible Content**		**Enhanced Standard**
BIO.A.3.2	Identify and describe how organisms obtain and transform energy for their life processes.	**BIO.A.3.2.1**	Compare the basic transformation of energy during photosynthesis and cellular respiration.	**3.1.B.A2** **3.1.B.A5** **3.1.C.A1** **4.1.10.C**

Standard BIO.A.3.2.1

Photosynthesis and cellular respiration are two major processes of carbon cycling in living organisms. Which statement correctly describes one similarity between photosynthesis and cellular respiration?

A. Both occur in animal and plant cells.

B. Both include reactions that transform energy.

C. Both convert light energy into chemical energy.

D. Both synthesize organic molecules as end products.

ASSESSMENT ANCHOR
BIO.A.3 Bioenergetics *(continued)*

Anchor Descriptor		Eligible Content	
BIO.A.3.2	Identify and describe how organisms obtain and transform energy for their life processes.	**BIO.A.3.2.2**	Describe the role of ATP in biochemical reactions.

Sample Exam Question

Standard BIO.A.3.2.2

A protein in a cell membrane changed its shape to move sodium and potassium ions against their concentration gradients. Which molecule was **most likely** used by the protein as an energy source?

A. ATP

B. ADP

C. catalase

D. amylase

ASSESSMENT ANCHOR
BIO.A.4 Homeostasis and Transport

Anchor Descriptor		Eligible Content	
BIO.A.4.1	Identify and describe the cell structures involved in transport of materials into, out of, and throughout a cell.	**BIO.A.4.1.1**	Describe how the structure of the plasma membrane allows it to function as a regulatory structure and/or protective barrier for a cell.

Carbon dioxide and oxygen are molecules that can move freely across a plasma membrane. What determines the direction that carbon dioxide and oxygen molecules move?

A. orientation of cholesterol in the plasma membrane

B. concentration gradient across the plasma membrane

C. configuration of phospholipids in the plasma membrane

D. location of receptors on the surface of the plasma membrane

ASSESSMENT ANCHOR BIO.A.4 Homeostasis and Transport *(continued)*	
Anchor Descriptor	**Eligible Content**
BIO.A.4.1 Identify and describe the cell structures involved in transport of materials into, out of, and throughout a cell.	**BIO.A.4.1.2** Compare the mechanisms that transport materials across the plasma membrane (i.e., passive transport—diffusion, osmosis, facilitated diffusion; and active transport—pumps, endocytosis, exocytosis).

- Sample Question on next slide

A sodium-potassium pump within a cell membrane requires energy to move sodium and potassium ions into or out of a cell. The movement of glucose into or out of a cell does not require energy. Which statement **best** describes the movement of these materials across a cell membrane?

A. Sodium and potassium ions move by active transport, and glucose moves by osmosis.

B. Sodium and potassium ions move by active transport, and glucose moves by facilitated diffusion.

C. Sodium and potassium ions move by facilitated diffusion, and glucose moves by osmosis.

D. Sodium and potassium ions move by facilitated diffusion, and glucose moves by active transport.

ASSESSMENT ANCHOR
BIO.A.4 Homeostasis and Transport *(continued)*

Anchor Descriptor		Eligible Content	
BIO.A.4.1	Identify and describe the cell structures involved in transport of materials into, out of, and throughout a cell.	**BIO.A.4.1.2**	Compare the mechanisms that transport materials across the plasma membrane (i.e., passive transport—diffusion, osmosis, facilitated diffusion; and active transport—pumps, endocytosis, exocytosis).

Some animals can produce a potassium ion concentration inside their cells that is twenty times greater than that of their environment. This ion concentration gradient is maintained by the plasma membrane.

Part A: Identify the process in the cell membrane that produces this difference in concentration.

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Part B: Explain the process that occurs as the cell produces the ion concentration gradient.

_____

_____

Part C: Compare the process of potassium ion transport to another mechanism that moves material across the plasma membrane.

ASSESSMENT ANCHOR
BIO.A.4 Homeostasis and Transport *(continued)*

Anchor Descriptor		Eligible Content	
BIO.A.4.1	Identify and describe the cell structures involved in transport of materials into, out of, and throughout a cell.	**BIO.A.4.1.3**	Describe how membrane-bound cellular organelles (e.g., endoplasmic reticulum, Golgi apparatus) facilitate the transport of materials within a cell.

Standard BIO.A.4.1.3

The rough endoplasmic reticulum and Golgi apparatus work together in eukaryotic cells. What is one way that the rough endoplasmic reticulum assists the Golgi apparatus?

A. It assembles nucleic acids from monomers.

B. It breaks down old, damaged macromolecules.

C. It packages new protein molecules into vesicles.

D. It determines which protein molecules to synthesize.

ASSESSMENT ANCHOR
BIO.A.4 Homeostasis and Transport *(continued)*

Anchor Descriptor		Eligible Content	
BIO.A.4.2	Explain mechanisms that permit organisms to maintain biological balance between their internal and external environments.	**BIO.A.4.2.1**	Explain how organisms maintain homeostasis (e.g., thermoregulation, water regulation, oxygen regulation).

Standard BIO.A.4.2.1

Which example is an activity that a fish **most likely** uses to maintain homeostasis within its body?

A. using camouflage to avoid predators

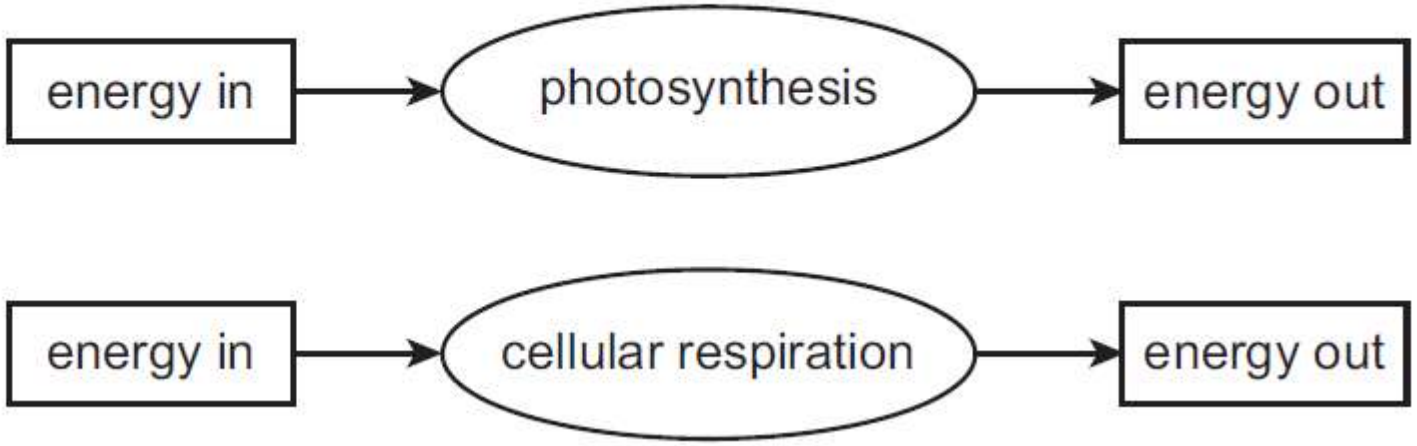
B. feeding at night to regulate body temperature

C. moving to deeper water to regulate metabolic wastes

D. exchanging gases through its gills to regulate oxygen levels

ASSESSMENT ANCHOR BIO.A.3 Bioenergetics *(continued)*			
Anchor Descriptor		**Eligible Content**	
BIO.A.3.2	Identify and describe how organisms obtain and transform energy for their life processes.	**BIO.A.3.2.1**	Compare the basic transformation of energy during photosynthesis and cellular respiration.

Use the diagrams below to answer the question.



Part A: Complete the chart below by describing energy transformations involved in each process.

Process	Energy Transformations
photosynthesis	
cellular respiration	

Continued. Please refer to the previous page for task explanation.

Part B: Describe how energy transformations involved in photosynthesis are related to energy transformations involved in cellular respiration.

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What's Happening Tomorrow?

- Review key vocabulary terms you will see in the Keystone
- Practice Keystone Exam
- Correct and discuss Keystone Exam
  - Answer key posted on Mrs. Fortenbaugh's Moodle
- 3-2-1 Exit Ticket