



Biology Keystone Test Information

A. Each Multiple Choice is 1 point and has 4 choices

B. Constructed Response (open ended) 0-3 points.

GENERAL DESCRIPTION OF 3-POINT SCORING GUIDELINES FOR BIOLOGY

3 POINTS

- The response demonstrates a *thorough* understanding of the scientific content, concepts, and/or procedures required by the task(s).
- The response provides a clear, complete, and correct response as required by the task(s). The response may contain a minor blemish or omission in work or explanation that does not detract from demonstrating a *thorough* understanding.

2 POINTS

- The response demonstrates a *partial* understanding of the scientific content, concepts, and/or procedures required by the task(s).
- The response is somewhat correct with *partial* understanding of the required scientific content, concepts, and/or procedures demonstrated and/or explained. The response may contain some work that is incomplete or unclear.

1 POINT

- The response demonstrates a *minimal* understanding of the scientific content, concepts, and/or procedures required by the task(s).
- The response is somewhat correct with *minimal* understanding of the required scientific content, concepts, and/or procedures demonstrated and/or explained. The response may contain some work that is incomplete or unclear.

0 POINTS

- The response provides *insufficient* evidence to demonstrate any understanding of the scientific content, concepts, and/or procedures required by the task(s).
- The response may show only information copied or rephrased from the question or *insufficient* correct information to receive a score of 1.

Module a

Cells and Cells Processes

Basic Biological Principles –

Chemical Basis of Life –

Bioenergetics –

Homeostasis & Transport –

Module B

Continuity and Unity of Life

Cell Growth & Reproduction –

Genetics –

Theory of Evolution –

Ecology –

Practice keystone exam questions

I. Basic Biological Principles –

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

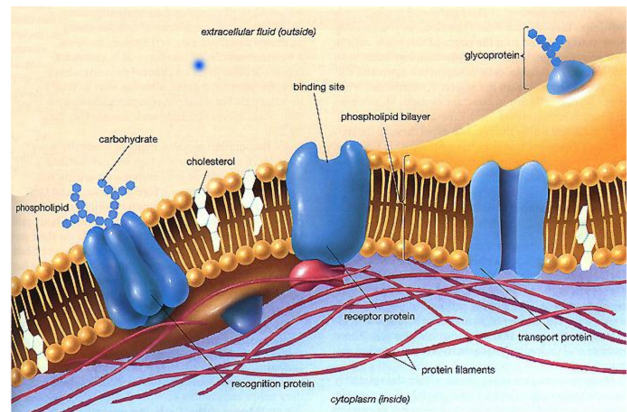
2. Living organisms can be classified as prokaryotes or eukaryotes. Which two structures are common to both prokaryotic and eukaryotic cells?

- A. cell wall and nucleus
- B. cell wall and chloroplast
- C. plasma membrane and nucleus
- D. plasma membrane and cytoplasm

3. Which component of this membrane contains a hydrophobic region and acts as the primary barrier to **most** foreign substances?

- A. protein
- B. cholesterol
- C. carbohydrate chain
- D. phospholipid bilayer

Cell Membrane

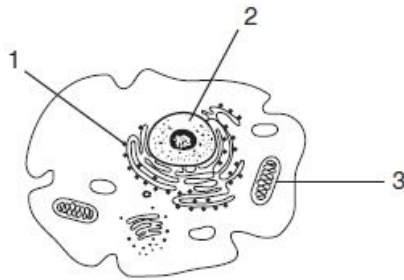


4. Two students were testing the amount of fertilizer that would best promote the growth of strawberries in a garden. Which of the following could be an unavoidable source of experimental error?

- A length of the study
- B variation in the strawberry plants
- C the cost of watering the plants
- D fertilization during the study

CONSTRUCTED RESPONSE

In a cell, a variety of structures perform specific functions and interact to maintain homeostasis. The diagram below represents a typical cell with three cell structures labeled 1, 2, and 3.



1. Select one cell structure labeled in the diagram and write its number in the space below. Explain how the cell structure you selected helps maintain homeostasis in a cell. In your answer, be sure to:

- **identify the cell structure you selected [1]**
- **state one function of this cell structure [1]**
- **identify one substance that is often associated with the cell structure you selected and state how that substance is associated with the cell structure [1]**
- **identify one other cell structure and explain how it interacts with the cell structure you selected to maintain homeostasis in the cell [1]**

Cell structure number: _____

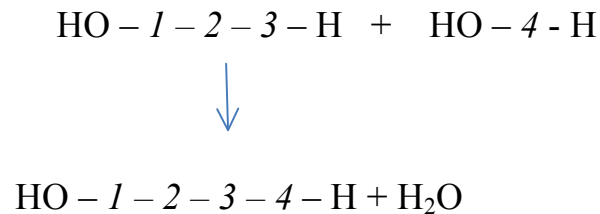
II. Chemical Basis of Life –

1. 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.

2. Use the diagram below to answer the question.

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

3. There are many different enzymes located in the cytoplasm of a single cell. How is a specific enzyme able to catalyze a specific reaction?

- A Different enzymes are synthesized in specific areas of the cytoplasm.
- B Most enzymes can catalyze many different reactions.
- C An enzyme binds to a specific substrate (reactant) for the reaction catalyzed.
- D Enzymes are transported to

4. Which molecule in plant cells first captures the radiant energy from sunlight?

- A glucose
- B carbon dioxide
- C chlorophyll
- D adenosine triphosphate

CONSTRUCTED RESPONSE

1. The table below lists enzymes that function in different locations in the human body, and the temperature and pH ranges of these locations.

Enzyme	Location	Temperature (°C)	pH
ptyalin	mouth	36.7–37.0	6.5–7.0
pepsin	stomach	37.3–37.6	1.0–3.0
trypsin	small intestine	37.3–37.6	7.5–9.0

Different enzymes are secreted in each of the three locations. Ptyalin digests carbohydrates. Pepsin and trypsin both digest proteins. Discuss the activity of these enzymes. In your answer, be sure to:

- state how the activity of pepsin will most likely change after it moves with the food from the stomach to the small intestine [1]
- support your answer using data from the table [1]
- state how a fever of 40°C would most likely affect the activity of these enzymes and support your answer [1]
- identify the characteristic of enzymes that prevents ptyalin and trypsin from digesting the same type of food [1]

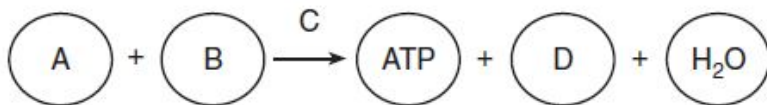
III. Bioenergetics –

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

l A biological process that occurs in both plants and animals is shown below.

2.



Which row in the chart below identifies the lettered substances in this process?

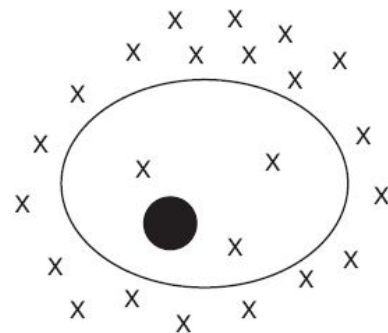
Row	A	B	C	D
(1)	O ₂	CO ₂	glucose	enzymes
(2)	glucose	O ₂	enzymes	CO ₂
(3)	enzymes	O ₂	CO ₂	glucose
(4)	glucose	CO ₂	enzymes	O ₂

- A. Row 1
- B. Row 2
- C. Row 3
- D. Row 4

1

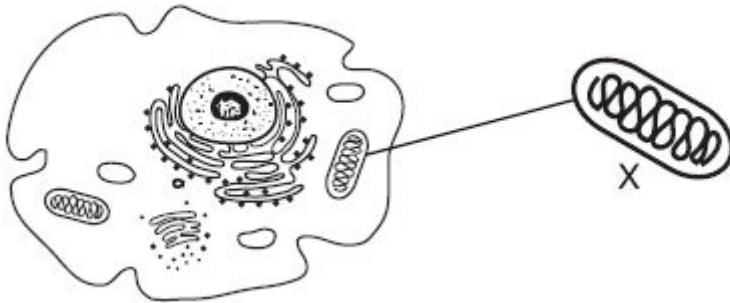
3. A process that would result in the movement of these molecules out of the cell requires the use of

- A. DNA
- B. ATP
- C. antigens
- D. antibodies



CONSTRUCTED RESPONSE

The diagram below represents a cell found in some complex organisms. The enlarged section represents an organelle, labeled found in this cell.



Describe the function of organelle X and explain how it is important to the survival of the cell. In your answer, be sure to:

- identify organelle X [1]
- state the process that this organelle performs [1]
- identify the *two* raw materials that are needed for this process to occur [1]
- identify *one* molecule produced by this organelle and explain why it is important to the organism [2]

IV. Homeostasis & Transport –

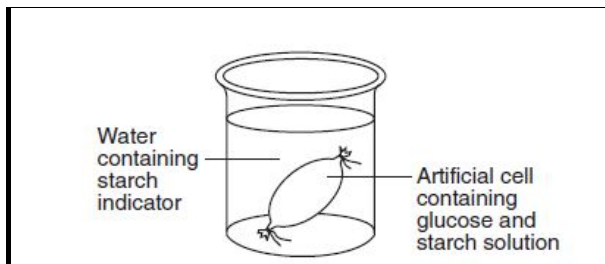
1. The cell membrane of the red blood cell will allow water, oxygen, carbon dioxide, and glucose to pass through. Because other substances are blocked from entering, this membrane is called

- A perforated.
- B semi-permeable.
- C non-conductive.
- D permeable.

2. There are many different enzymes located in the cytoplasm of a single cell. How is a specific enzyme able to catalyze a specific reaction?

- A Different enzymes are synthesized in specific areas of the cytoplasm.
- B Most enzymes can catalyze many different reactions.
- C An enzyme binds to a specific substrate (reactant) for the reaction catalyzed.
- D Enzymes are transported to

ANSWER BOTH QUESTIONS BASED ON THIS DIAGRAM (3 AND 4)



3. After two hours, the color of the liquid in the beaker did not change. This shows that

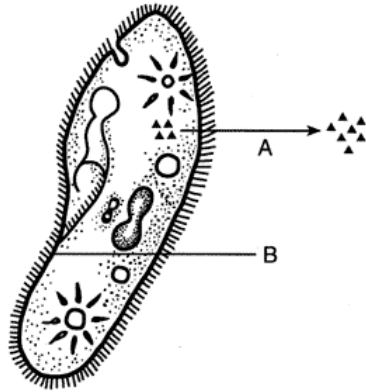
- A. glucose moved from the artificial cell into the beaker
- B. starch did not pass out of the artificial cell
- C. starch was digested to glucose in the artificial cell
- D. glucose molecules combined to produce starch in the artificial cell

4. This laboratory setup would most likely be used to demonstrate

- A. carbohydrate synthesis
- B. active transport
- C. osmosis
- D. dehydration

CONSTRUCTED RESPONSE

Base your answers to questions 55 and 56 on the diagram below, which represents a unicellular organism in a watery environment. The ▲s represent molecules of a specific substance.



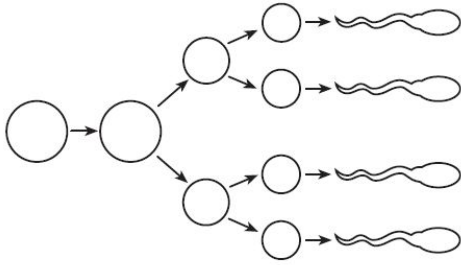
Arrow A represents active transport. State *two* ways that active transport is different from diffusion. [2]

1. _____

2. _____

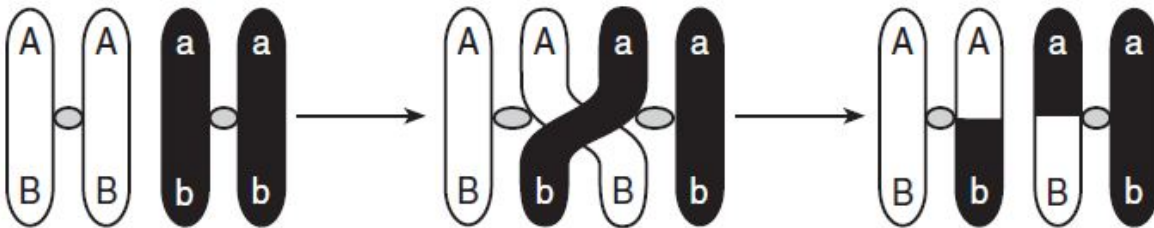
V. Cell Growth & Reproduction

1. Which statement concerning the reproductive cells in the diagram below is correct?



- A. The cells are produced by mitosis and contain all the genetic information of the father.
- B. If one of these cells fertilizes an egg, the offspring will be identical to the father.
- C. Each of these cells contains only half the genetic information necessary for the formation of an offspring.
- D. An egg fertilized by one of these cells will develop into a female with the same characteristics as the mother.

2. The diagram below shows a process that affects chromosomes during meiosis.



This process can be used to explain

- A why some offspring are genetically identical to their parents
- B the process of differentiation in offspring
- C why some offspring physically resemble their parents
- D the origin of new combinations of traits in offspring

3. Which of the following *best* describes meiosis?

- A It is carried out in all tissues that require cell replacement.
- B It occurs only in cells in the reproductive structures of the organism.
- C It happens in all tissues except the brain and spinal cord.
- D It is the first stage of mitosis.

CONSTRUCTED RESPONSE

Compare asexual reproduction to sexual reproduction. In your comparison, be sure to include:

- which type of reproduction results in offspring that are usually genetically identical to the previous generation and explain why this occurs [2]
- *one* other way these methods of reproduction differ [1]

VI. Genetics –

1. The endoplasmic reticulum is a network of membranes within the cell, and it is often classified as rough or smooth, depending on whether there are ribosomes on its surface. Which statement best describes the role of rough endoplasmic reticulum in the cell?

- A. It stores all proteins for later use.
- B. It provides an attachment site for larger organelles.
- C. It aids in the production of membrane and secretory proteins.
- D. It stores amino acids required for the production of all proteins

2. A genetic mutation resulted in a change in the sequence of amino acids of a protein, but the function of the protein was not changed. Which statement best describes the genetic mutation?

- A. It was a silent mutation that caused a change in the DNA of the organism.
- B. It was a silent mutation that caused a change in the phenotype of the organism.
- C. It was a nonsense mutation that caused a change in the DNA of the organism.
- D. It was a nonsense mutation that caused a change in the phenotype of the organism

3. Genetic engineering has led to genetically modified plants that resist insect pests and bacterial and fungal infections. Which outcome would most likely be a reason why some scientists recommend caution in planting genetically modified plants?

- A. unplanned ecosystem interactions
- B. reduced pesticide and herbicide use
- C. improved agricultural yield and profit
- D. increased genetic variation and diversity

4. In certain breeds of dogs, deafness is due to a recessive allele (d) of a particular gene, and normal hearing is due to its dominant allele (D). What percentage of the offspring of a normal heterozygous (Dd) dog and a deaf dog (dd) would be expected to have normal hearing?

- A 0%
- B 25%
- C 50%
- D 100%

CONSTRUCTED RESPONSE

In DNA, a sequence of three bases is a code for the placement of a certain amino acid in a protein chain. The table below shows some amino acids with their abbreviations and DNA codes.

Amino Acid	Abbreviation	DNA Code
Phenylalanine	Phe	AAA, AAG
Tryptophan	Try	ACC
Serine	Ser	AGA, AGG, AGT, AGC, TCA, TCG
Valine	Val	CAA, CAG, CAT, CAC
Proline	Pro	GGA, GGG, GGT, GGC
Glutamine	Glu	GTT, GTC
Threonine	Thr	TGA, TGG, TGT, TGC
Asparagine	Asp	TTA, TTG

Which amino acid chain would be produced by the DNA base sequence below?

C-A-A-G-T-T-A-A-A-T-T-A-T-T-G-T-G-A

- (1) Val — Glu — Phe — Asp — Thr — Asp
- (2) Val — Pro — Phe — Asp — Asp — Thr
- (3) Val — Glu — Phe — Asp — Asp — Thr
- (4) Val — Glu — Phe — Thr — Asp — Asp

Describe how a protein would be changed if a base sequence mutates from GGA to TGA. [1]

Identify one environmental factor that could cause a base sequence in DNA to be changed to a different base sequence. [1]

VII. Theory of Evolution –

1. A mutation occurs in the genes that code for coat color in deer. Which change will most likely result from this mutation?

- A. a change in the selection pressures acting on coat color
- B. a change in the coat-color genes of deer predator species
- C. an increase in coat-color diversity in the population
- D. an increase in the number of genes for coat color in the population

2. Scientists found that, over a period of 200 years, a mountain pond was transformed into a meadow. During that time, several communities of organisms were replaced by different communities. Which of these *best* explains why new communities were able to replace older communities?

- A The original species became extinct.
- B Species in the older community died from old age.
- C The abiotic characteristics of the habitat changed.
- D Diseases that killed the older organisms disappeared.

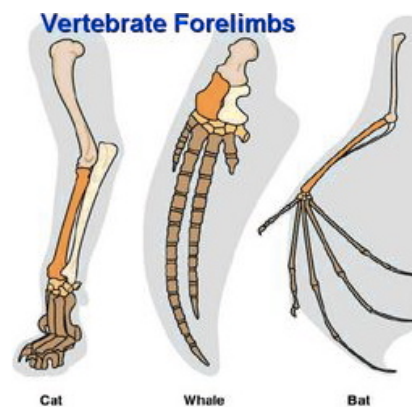
3. A population of termites initially consists of darkly colored and brightly colored members. After several generations, the termite population consists almost entirely of darkly colored members because the brightly colored termites are easier for a predatory species of insectivores to locate. This situation is an example of

- A the evolution of a new species.
- B natural selection.
- C artificial selection.
- D adaptive radiation.

Use the illustrations below to answer the question
MAMMALIAN FOREARMS

4. The skeletons of mammalian forelimbs represent variations of a structure that was present in their common ancestor. What has most likely caused the variation in forelimbs?

- A. changes in muscle structure
- B. changes in the genetic codes
- C. trait formation due to behaviors
- D. development of vestigial structures



CONSTRUCTED RESPONSE

A hawk has a genetic trait that gives it much better eyesight than other hawks of the same species in the same area. Explain how this could lead to evolutionary change within this species of hawk over a long period of time. In your answer, be sure to include an explanation of:

- competition within the hawk population [1]
- survival of various individuals in the population [1]
- how the frequency of the better-eyesight trait would be expected to change over time within the population [1]
- what would most likely happen to the hawks having the better-eyesight trait if they also had unusually weak wing muscles [1]

VIII. Ecology –

1. Beak structures differ between individuals of one species of bird. These differences most likely indicate

- A. the presence of a variety of food sources
- B. a reduced rate of reproduction
- C. a large supply of one kind of food
- D. an abundance of predators

2. Two interactions between organisms are shown in the table below. X and Y do not represent the same organisms in the two interactions.

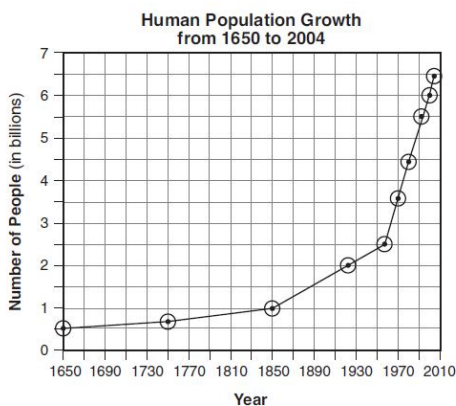
	Organism X	Organism Y
Interaction 1	predator	prey
Interaction 2	parasite	host

Which statement best describes the relationship between organism X and organism Y in each interaction?

- A. Organism X is positively affected by the relationship and organism Y is negatively affected.
- B. Organism X is negatively affected by the relationship and organism Y is positively affected.
- C. Both organisms are positively affected by the relationship.
- D. Both organisms are negatively affected by the relationship.

3. Use the graph below to answer the question.

The trend shown on the graph would most likely result in



- A. a decreased demand for deforestation
- B. an increase in available freshwater
- C. a decrease in air pollution
- D. an increased demand for land use

CONSTRUCTED RESPONSE

1. Each of the environmental problems listed below has had an impact on ecosystems.

**increased ultraviolet radiation
global warming**

Select one of these problems and write it in the space below. Explain how this problem has affected an ecosystem. In your answer, be sure to:

- **identify one specific cause of the environmental problem [1]**
- **identify one organism that has been affected by the problem and state one way that organism has been affected [1]**
- **state one action that can be taken to lessen the impact of this problem on the environment [1]**

Problem: _____

ANSWERS TO MULTIPLE CHOICE

Basic Biological Principles

1. A
2. D
3. D
4. D

Chemical Basis of Life

1. C
2. D
3. C
4. C

Bioenergetics

1. D
2. B
3. B

Homeostasis & Transport

1. B
2. C
3. B
4. C

Cell Growth & Reproduction –

1. C
2. D
3. B

Genetics –

1. C
2. A
3. A
4. C

Theory of Evolution –

1. A
2. C
3. B
4. B

Ecology

1. A
2. A
3. D