



Indiana Department of Education  
SUPPORTING STUDENT SUCCESS

*ISTEP+: Biology I*

End-of-Course Assessment

Released Items and Scoring Notes

## Introduction

Indiana students enrolled in Biology I participated in the *ISTEP+: Biology I Graduation Examination* End-of-Course Assessment (ECA) during the 2010-2011 test administration windows. The Biology I ECA consists of two item types which contribute to a student's scale score: multiple-choice and constructed-response. It is important to keep in mind that a significant portion of a student's score is calculated from the multiple-choice items on the assessment, which are not addressed within this document.

This document consists of open-ended items from the Spring 2011 administration and includes:

- Sample released open-ended questions
- Rubrics used by trained evaluators to score student responses
- Sample papers used by trained evaluators to distinguish between rubric score point values
- Annotations describing the rationale for scoring student responses

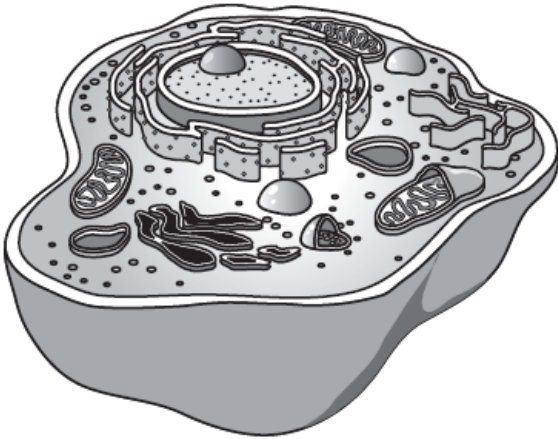
The purpose of this guide is to provide additional Biology I ECA sample items and to model the types of items that are scored using rubrics.

**Reporting Category 1: Molecules and Cells**

**Question 1**

Below is a diagram of the structures found in a typical animal cell.

**Cell**



List the names of any three structures shown in the diagram.

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Describe the function of each of the structures listed above.

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## Question 1

### Key Elements

- Cell membrane
- Endoplasmic reticulum
- Ribosomes
- Golgi body
- Mitochondrion
- Nucleus
- Nucleolus
- Lysosomes
- Smooth endoplasmic reticulum (ER)
- Rough endoplasmic reticulum (ER)
- Nuclear membrane
- Cytoplasm
- Vacuole/vesicle
- Cytoskeleton
- Cristae

### AND

- The cell membrane separates the cell from its environment.
- Ribosomes are the site of protein assembly.
- Golgi bodies process and package molecules.
- Mitochondria produce ATP.
- The nucleus stores DNA.
- The nucleolus is the site of rRNA synthesis and assembly of ribosomal subunits.
- Lysosomes carry out cellular digestion.
- Smooth ER synthesizes lipids, metabolizes carbohydrates.
- Rough ER produces secretory proteins, membrane proteins.
- Nuclear membrane encloses the nucleus.
- Cytoplasm holds structures in place.
- Vacuole is for storage, intracellular digestion and waste removal.
- Cytoskeleton helps maintain cell shape.
- Cristae increase the surface area inside the mitochondria.

**RUBRIC:**

<b>3 points</b>	<b>Six key elements</b>
<b>2 points</b>	<b>Four or five key elements</b>
<b>1 point</b>	<b>Three key elements</b>
<b>0 points</b>	<b>Other</b>

**Question 1, Sample A – 3 points**

Nucleus, mitochondria, and ribosomes.

The nucleus is used to store the DNA that is used in the production of proteins. The mitochondria is the powerhouse of the cell; its used for making energy for the cell. the cell's ribosomes are use in protein synthesis..

*Notes: The student lists three structures and describes the function of each of the three (six key elements).*

*Please note that student responses are scored for science content only, not for accurate spelling, grammar, or punctuation.*

**Question 1, Sample B – 2 points**

nucleus, cell membrane, ribosome

The nucleus of a cell is equivalent to a control center, it controls everything that happens in a cell. The cell membrane decides what can enter or leave a cell and helps hold the shape. A ribosome is used to create proteins.

*Notes: The student lists three structures and describes the function of two of the structures (five key elements).*

*Please note that student responses are scored for science content only, not for accurate spelling, grammar, or punctuation.*

**Question 1, Sample C – 2 points**

The golgi aparatus, the nucleus, and the nuclear evelope.

The golgi aparatus filters the cell, the nucleus is like to power house, and the nuclear evelope regulates what enters and leaves the nucleus.

*Notes: The student lists three structures and correctly describes the function of one structure, the nuclear envelope (four key elements).*

*Please note that student responses are scored for science content only, not for accurate spelling, grammar, or punctuation.*

**Question 1, Sample D – 1 point**

Mitochondrion, Nucleus, and the cell wall.

The nucleus holds the all of the genetic information that the cell needs, the mitochondrion aids in makin protiens, and the cell wall is what helps protect the cell and hold it together.

*Notes: The student lists two correct structures, mitochondrion and nucleus (the cell wall is not part of animal cell). The student correctly describes the function of the nucleus (three key elements).*

*Please note that student responses are scored for science content only, not for accurate spelling, grammar, or punctuation.*

**Reporting Category 2: Developmental and Organismal Biology**

**Question 2**

**Define the term homeostasis.**

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**Describe a change inside or outside the human body that could affect homeostasis of the human body and describe how the body might respond involuntarily to that change.**

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## Question 2

### Key Elements

- Homeostasis is the maintenance of a body's internal environment.

AND

- The body responds by having counter reactions such as sweating when hot.
- The body responds by not sweating, blood vessels constricting.
- Introduction of infection, fever
- Cold environment, shivering
- Glucose level rises above a set point, pancreas secretes insulin, glucose level drops.
- Glucose level drops below a set point, pancreas secretes glucagon, glucose level rise.

### RUBRIC:

<b>3 points</b>	<b>Three key elements</b>
<b>2 points</b>	<b>Two key elements</b>
<b>1 point</b>	<b>One key element</b>
<b>0 points</b>	<b>Other</b>

### Question 2, Sample A – 3 points

**Define the term homeostasis.**

the maintaining of a constant internal environment

**Describe a change inside or outside the human body that could affect homeostasis of the human body and describe how the body might respond involuntarily to that change.**

an increase in heat or physical activity would cause sweat, the body's attempt of maintaining a constant internal temperature

*Notes: The student defines homeostasis, describes a change that could affect homeostasis, and describes how the body might respond to that change (three key elements).*

*Please note that student responses are scored for science content only, not for accurate spelling, grammar, or punctuation.*



**Question 2, Sample B – 2 points**

**Define the term homeostasis.**

Homeostasis is the process of regulating the body's functions.

**Describe a change inside or outside the human body that could affect homeostasis of the human body and describe how the body might respond involuntarily to that change.**

If it is very cold outside, the body may shiver. This is its attempt to warm up. This is also an act of homeostasis.

*Notes: The student provides an incorrect definition of homeostasis, but correctly describes a change that could affect homeostasis and describes how the body might respond to that change (two key elements).*

*Please note that student responses are scored for science content only, not for accurate spelling, grammar, or punctuation.*

**Question 2, Sample C – 1 point**

**Define the term homeostasis.**

homeostasis is the equal balance of living. it is an average.

**Describe a change inside or outside the human body that could affect homeostasis of the human body and describe how the body might respond involuntarily to that change.**

cold temperature decreases the body temperature, so the body must use homeostasis to warm to body up to its average temperature.

*Notes: The student provides an incorrect definition of homeostasis, but correctly describes a change that could affect homeostasis; the description of how the body might respond to that change is incomplete (one key element).*

*Please note that student responses are scored for science content only, not for accurate spelling, grammar, or punctuation.*

**Question 2, Sample D – 0 points**

**Define the term homeostasis.**

Keeping everything at an even level (leveling it all out).

**Describe a change inside or outside the human body that could affect homeostasis of the human body and describe how the body might respond involuntarily to that change.**

Maybe sweating or shivering

*Notes: The student provides zero key elements.*

*Please note that student responses are scored for science content only, not for accurate spelling, grammar, or punctuation.*

### Reporting Category 3: Genetics

#### Question 3

A population of fish lives in a pond near an industrial park. Many of the fish develop abnormal growths on their gills, but the growths do not affect their survival.

Describe a potential cause of this growth and what happens within the cells.

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Is it likely that this trait will be inherited by the next generation? Explain why or why not.

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### Question 3

#### Key Elements

- The fish were probably exposed to high levels of a substance that can cause genetic mutations.

AND

- Mutation is not occurring in its gametes.
- Mutations in gametes can cause the gamete cell to not produce a viable offspring.
- The trait will not be inherited because the growth prevents them from reproducing.

#### RUBRIC:

<b>2 points</b>	<b>Two key elements</b>
<b>1 point</b>	<b>One key element</b>
<b>0 points</b>	<b>Other</b>

#### Question 3, Sample A – 2 points

**Describe a potential cause of this growth and what happens within the cells.**

The potential cause of these growths is that the industrial park polluted the water that the fish lives in, so the cells didn't get the message of what they were supposed to make so they started dividing more rapidly.

**Is it likely that this trait will be inherited by the next generation? Explain why or why not.**

It is not likely that this trait will be inherited by the next generation, because it is not a inheritable trait.

*Notes: The student described a potential cause of the growth and explained that it is not likely that the trait will be inherited (two key elements).*

*Please note that student responses are scored for science content only, not for accurate spelling, grammar, or punctuation.*

**Question 3, Sample B – 1 point**

**Describe a potential cause of this growth and what happens within the cells.**

some kind of radioactive substance must have been put in the pond causing the cell to form mutations

**Is it likely that this trait will be inherited by the next generation? Explain why or why not.**

it will not be passed on unless the sex chromosomes are harmed

*Notes: The student identifies a potential cause of the growth, but incorrectly refers to “sex chromosomes” in Part Two, rather than gametes, or sex cell (one key element).*

*Please note that student responses are scored for science content only, not for accurate spelling, grammar, or punctuation.*

**Question 3, Sample C – 0 points**

**Describe a potential cause of this growth and what happens within the cells.**

defect in their traits passed on by their parents

**Is it likely that this trait will be inherited by the next generation? Explain why or why not.**

yes becuz it passes down from generation to generation

*Notes: The student provides zero key elements.*

*Please note that student responses are scored for science content only, not for accurate spelling, grammar, or punctuation.*

**Reporting Category 4: Evolution and Historical Perspective**

**Question 4**

**Current knowledge of alleles helps to explain what Charles Darwin did not understand when he was trying to explain inheritance.**

**List two statements that describe how alleles affect inherited traits.**

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**Describe how variation in alleles affects natural selection within a species.**

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## Question 4

### Key Elements

Explanation must include 2 of the following:

- Organisms can have different alleles for (some) single traits.
- Alleles are independently assorted during reproduction.
- Alleles are segregated during reproduction.
- Alleles are passed on to offspring.
- Alleles can be dominant/co-dominant or recessive.
- Alleles determine individual's genotype and phenotype.
- Similar phenotypes can have different genotypes (homozygous and heterozygous).

AND

- Assortment of and changes in alleles can lead to variation within a species, which may lead to better survival and reproduction (evolution).

OR

- Assortment of and changes in alleles can lead to variation within a species, which may lead to differential survival and reproduction.

OR

- Other plausible description of the connection between alleles and evolution

### RUBRIC:

<b>3 points</b>	<b>Three key elements</b>
<b>2 points</b>	<b>Two key elements</b>
<b>1 point</b>	<b>One key element</b>
<b>0 points</b>	<b>Other</b>

**Question 4, Sample A – 3 points**

Alleles are either dominant or recessive, usually the dominant trait is shown. Alleles come from both parents. The necessary traits are passed on and the organisms without the necessary traits die.

*Notes: The student provides three key elements: “Alleles are either dominant or recessive;” “Alleles come from both parents;” and “necessary traits are passed on and the organisms without the necessary traits die.”*

*Please note that student responses are scored for science content only, not for accurate spelling, grammar, or punctuation.*

**Question 4, Sample B – 2 points**

Alleles are what is inherited from each parent. They determine what the offspring will look like. Alleles are what is passed in different species. Different variation in alleles vary and change.

*Notes: The student provides two key elements: “inherited from each parent” and “determine what the offspring will look like.” However, the student provides no explanation of how natural selection is affected.*

*Please note that student responses are scored for science content only, not for accurate spelling, grammar, or punctuation.*

**Question 4, Sample C – 1 point**

Alleles are inherited independently. The alleles are not forced to be inherited. The variation provides the species new gene or characteristic.

*Notes: The student provides one key element: “Alleles are inherited independently.” However, the student provides two incorrect responses: “alleles are not forced to be inherited” and “variation provides the species new gene or characteristic.”*

*Please note that student responses are scored for science content only, not for accurate spelling, grammar, or punctuation.*



**Question 4, Sample D – 0 points**

Both parents contribute DNA to their offspring. But the dominant parent genes can contribute more. When natural selection has occurred you can often predict what the offspring may look like.

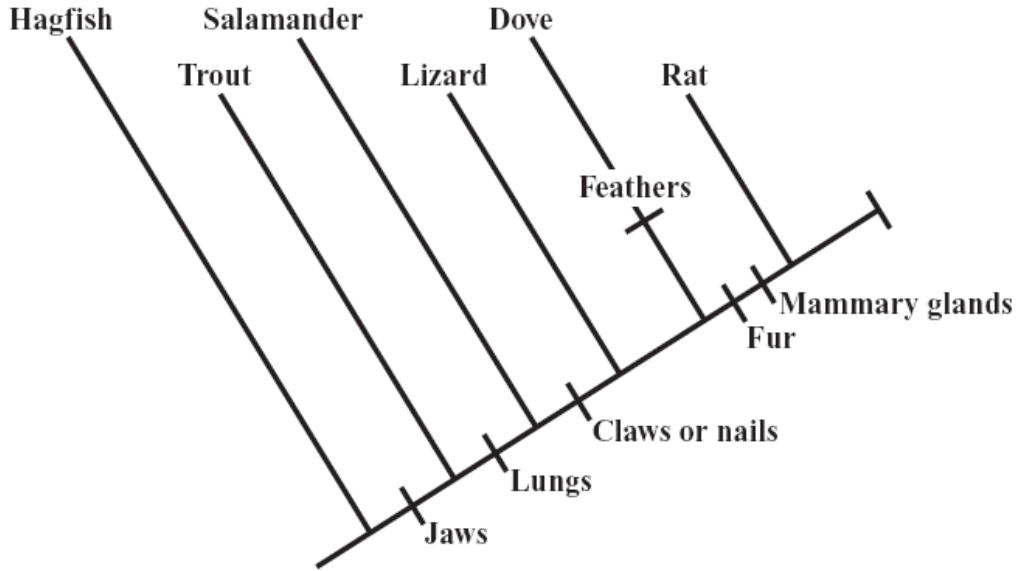
*Notes: The student provides zero key elements.*

*Please note that student responses are scored for science content only, not for accurate spelling, grammar, or punctuation.*

**Reporting Category 4: Evolution and Historical Perspective**

**Question 5**

The diagram below, called a cladogram, shows a proposed evolutionary relationship among animals.



According to this cladogram, what four characteristics separate a trout from a rat?


## Question 5

### Key Elements

- Lungs
- Claws or nails
- Fur
- Mammary glands

### RUBRIC:

<b>2 points</b>	<b>Four key elements</b>
<b>1 point</b>	<b>Two or three key elements</b>
<b>0 points</b>	<b>Other</b>

### Question 5, Sample A – 2 points

Mammary Glands

Fur

Claws or nails

Lungs

*Notes: The student provides four key elements.*

*Please note that student responses are scored for science content only, not for accurate spelling, grammar, or punctuation.*

### Question 5, Sample B – 1 point

Trouts have gills and rats dont.

Rats have lungs and Trouts dont.

Rats have fur and Trouts dont.

Rats have claws and nails, and Trouts dont.

*Notes: The student provides three key elements.*

*Please note that student responses are scored for science content only, not for accurate spelling, grammar, or punctuation.*

**Question 5, Sample C – 0 points**

mammary glands feathers

*Notes: The student provides one key element.*

*Please note that student responses are scored for science content only, not for accurate spelling, grammar, or punctuation.*