

## 2008 Biology Performance Event Released Form Rubric

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### Question #1

**Maximum number of Points: 1**  
**1 Point**

The student correctly provides any reasonable testable question or statement of problem that:

- identifies what will be tested or measured
- will generate quantifiable data
- has a control or comparison inherent in the question

Exemplary responses take these appropriate forms:

- Does (independent variable) affect (dependent variable)?
- How does (independent variable) affect (dependent variable)?
- Will (independent variable) affect (dependent variable)?

Any one of the following is acceptable:

- How does light intensity influence the photosynthetic rate?
- How does light affect the amount of bubbles (gas) produced?
- How does light affect the amount of oxygen produced?

OR

- any reasonable testable question or statement of problem that relates the independent and dependent variables

**0 Point**

The student does not correctly provide a reasonable testable question or statement of problem that meets the criteria listed above. Incorrect responses may include:

- to test the effect of light
- to see if bubbles are made
- to find out the rate of photosynthesis

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## Question #2

**Maximum number of Points: 1**  
**1 Point**

The student correctly provides any reasonable hypothesis based on the testable question or statement of a problem that predicts an effect, or the lack of effect, of the independent variable on the dependent variable.

Exemplary responses take these appropriate forms:

- If (independent variable) (description of change in independent variable), then (dependent variable) (description of event).
- As the (independent variable) (description of changes), the (dependent variable) (description of observed changes in dependent variables).
- The (qualitative/quantitative change in independent variable) of (independent variable), the (quantitative change in dependent variable).

Any one of the following is acceptable:

- If light intensity increases, then the photosynthetic rate will increase.
- If light intensity increases, then the number of bubbles will increase.
- The number of bubbles will increase because light intensity affects photosynthesis.
- The amount of gas will increase when light intensity increases.

OR

- any reasonable hypothesis based on the testable question that predicts an effect, or the lack of effect, of the independent variable on the dependent variable

NOTE: The “if, then” format does not have to be used in the student response in order for the student to earn full credit.

**0 Point**

The student does not provide a reasonable hypothesis based on the testable question or statement of a problem that predicts an effect, or the lack of effect, of the independent variable on the dependent variable. Incorrect responses may include:

- More light makes bubbles better.
- If it is increased, then so will other.
- I think that there will be more bubbles with light.

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**Question #3:****Maximum number of Points: 1****1 Point**

The student correctly identifies the independent variable for this investigation. The variable that is purposely manipulated (changed) by the experimenter is the independent variable. The independent variable is the factor believed to cause a change in the dependent variable.

Any one of the following is acceptable:

- amount of light
- light intensity
- candelas

OR

- any other reasonable independent variable that is believed to cause a change in the dependent variable of this investigation

**0 Point**

The student does not correctly identify the independent variable for this investigation. Incorrect responses may include:

- amount of gas
- number of bubbles
- rate of photosynthesis

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**Question #4:****Maximum number of Points: 1****1 Point**

The student correctly identifies the dependent variable for this investigation. The variable that changes in response to the independent variable and is observed (collected as data) is the dependent variable.

Any one of the following is acceptable:

- photosynthetic rate
- number of bubbles

- amount of oxygen ( $O_2$ )
- amount of oxygen produced per minute
- amount of gas
- bubbles per minute

OR

- any other reasonable dependent variable that changes in response to the independent variable

### **0 Point**

The student does not correctly identify the dependent variable for this investigation. Incorrect responses may include:

- bubbles
- oxygen
- gas

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### **Question #5:**

**Maximum number of Points: 2**

**2 Points**

The student correctly identifies two independent variables that could also influence the photosynthetic rate. The variable that is purposely manipulated (changed) by the experimenter is the independent variable. The independent variable is the factor believed to cause a change in the dependent variable.

Any two of the following are acceptable:

- temperature
- carbon dioxide
- pH
- color of light

OR

- any other independent variable that could potentially influence the photosynthetic rate

### **1 Point**

The student correctly identifies one independent variable that could also influence the photosynthetic rate. Possible correct variables (for 1 point) include:

- wavelength
- green light
- black light
- type of light
- incandescent light
- fluorescent light
- UV light
- acidity, alkalinity, or pH
- source of water (chlorinated or not)

### **0 Point**

The student does not correctly identify any independent variables that could also influence the photosynthetic rate. Possible incorrect responses may include:

- light
- number of bubbles
- amount of oxygen

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### **Question #6:**

**Maximum number of Points: 1**

### **1 Point**

The student correctly identifies why it is important to keep some conditions constant during an investigation. Constants are factors that remain the same and have fixed values. Their purpose is to isolate the factor (independent variable) that can affect the results.

Any one of the following is acceptable:

- Their purpose is to isolate the factor (independent variable) that can affect the results.
- Their purpose is to make a fair comparison between the independent and dependent variables possible.
- The constants are important because other variables could affect the results of the investigation.

OR

- any valid statement explaining why constants are important including examples related to this investigation

**0 Point**

The student does not correctly identify why it is important to hold some conditions constant during an investigation.

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**Question #7:**

**Maximum number of Points: 2**

**2 Points**

The student correctly identifies two constants for this investigation. Constants are factors that remain the same and have fixed values. Their purpose is to isolate the factor (independent variable) that can affect the results.

Any two of the following are acceptable:

- temperature
- pH
- absence of other light sources
- water
- salinity
- amount of time spent counting

OR

- any other reasonable factor that should be kept constant for this investigation

**1 Point**

The student correctly identifies one factor that should be kept constant for this investigation.

**0 Point**

The student does not correctly identify any factors that should be kept constant for this investigation. Possible incorrect responses may include:

- amount of light
- amount of oxygen produced

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**Question #8:**

**Maximum number of Points: 3**

**3 Points**

The student correctly identifies three pieces of equipment for this investigation.

Any three of the following are acceptable:

- light source
- timer
- water container
- test tube
- funnel

OR

- any other piece of equipment needed for this experiment

**2 Points**

The student correctly identifies two pieces of equipment for this investigation.

**1 Point**

The student correctly identifies one piece of equipment for this investigation. Possible correct responses (for 1 point) include:

- darkening device to cover the plants
- safety equipment (may only give credit for one piece of safety equipment)

**0 Point**

The student does not correctly identify any pieces of equipment for this investigation. Possible incorrect responses may include:

- lab table
- lab
- data chart

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**Question #9:**

**Maximum number of Points: 4**

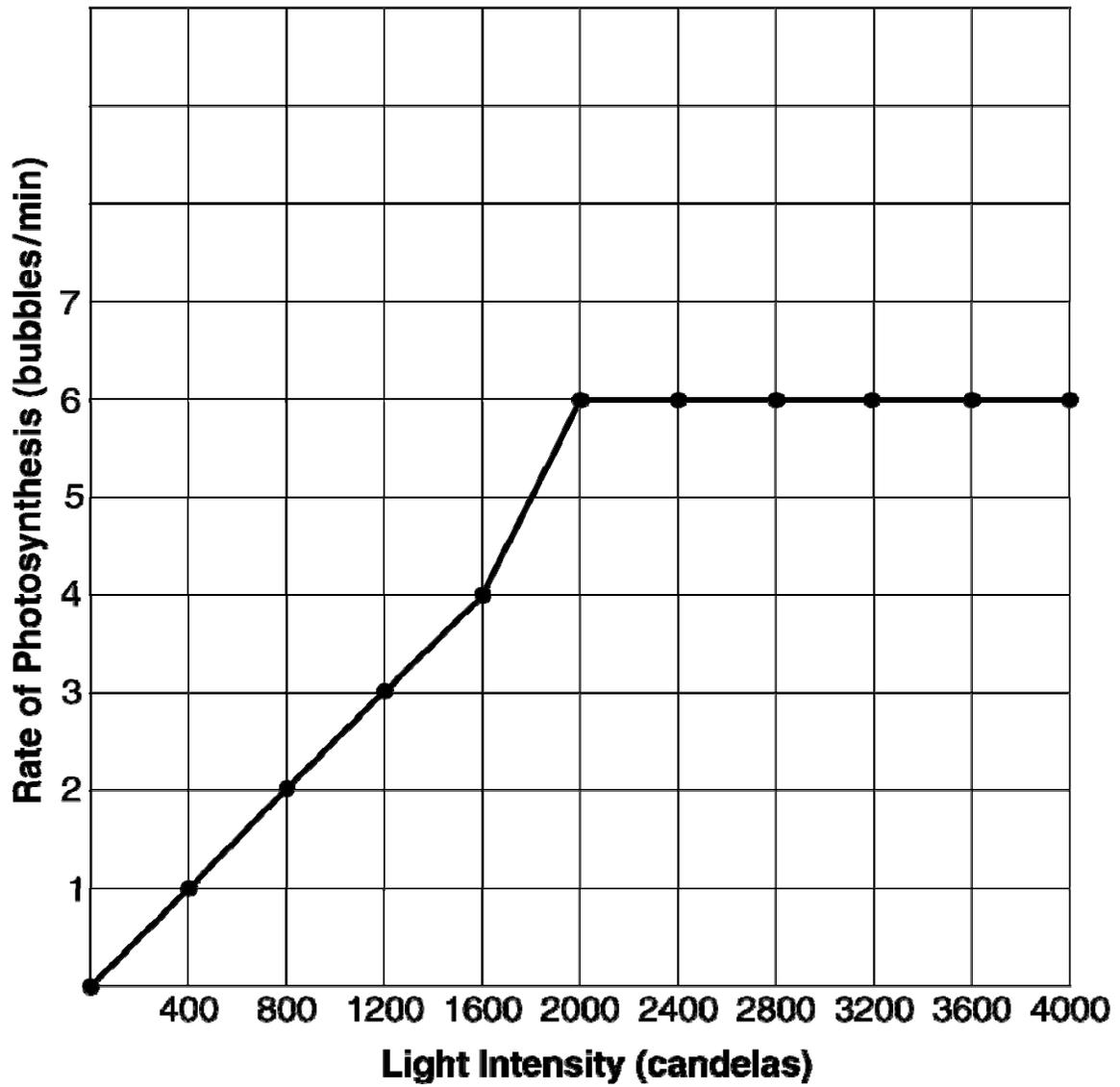
**4 Points**

The student correctly includes all four elements on the graph.

**One point for each of the following:**

- **Appropriate title:** a statement of the relationship between the independent and dependent variables or a statement of what is being tested
- **Both axes correctly labeled, with units** if appropriate
- **Appropriate number scales labeled along each axis:** numbers written on the grid lines, numbers that allow all data to be plotted, consistently scaled
- **All data points correctly plotted and connected by lines or line of best fit**

## Light Intensity and Rate of Photosynthesis



### **3 Points**

The student correctly provides three of the four elements on the graph.

### **2 Points**

The student correctly provides two of the four elements on the graph.

### **1 Point**

The student correctly provides one of the four elements on the graph.

### **0 Point**

The student does not correctly provide any of the four elements on the graph.

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## **Question #10:**

**Maximum number of Points: 3**

### **3 Points**

The student provides a procedure that includes all three of the required elements:

- Procedure provides a qualitative outline that includes three or more steps that are logical and appropriate for **answering the question**.
- Procedure provides enough **specific, quantitative, and appropriate information** that a knowledgeable person could conduct the investigation and obtain the same results.
- Procedure indicates an understanding that the **independent variable changed**, the effect on the dependent variable is observed, and there is a **need to hold all other factors constant**.

Any three of the following are acceptable:

- Cut plant lengths to equal length.
- Place light source  $x$  distance from plant.
- Turn on the light source.
- Perform steps again for each light intensity.

OR

- any other valid experimental procedure that meets the criteria above for this investigation

**2 Points**

The student correctly identifies two steps of the procedure for this investigation.

**1 Point**

The student correctly identifies one step of the procedure for this investigation. Possible correct responses may include:

- Measure water salinity.
- Measure water acidity, alkalinity, or pH.
- Check all beakers are the same size.
- Record temperature.

**0 Point**

The student does not correctly identify any steps of the procedure for this investigation.

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**Question #11:**

**Maximum number of Points: 1**

**1 Point**

The student correctly predicts the results for this investigation.

Any one of the following is acceptable:

- 6

OR

- 6 bubbles

**0 Point**

The student does not correctly predict the results for this investigation.