

Biology
Standard and Honors
Summer Reading Packet

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Resources for extra help

<http://science.pppst.com/scientificmethod.html>. Scroll down the page and click the Steps of the Scientific Method ppt. Website with a very detailed background for experimental design. All of the mandatory problems involve experimental design.

<http://mdk12.org>. School Improvement In Maryland website. On this website there are resources for students and parents as well as all previously released HSA tests.

<http://apps.montgomeryschoolsmd.org/hsaprep/selection.aspx?email=kerianne@yahoo.com&name=kerianne>. On this website, students are able to pull up the previously released HSA's and select whether to practice in random order, by topic, or by indicator.

DIRECTIONS:

The problems with asterisks (**) next to the problem are those that are required to complete (Data Analysis 1, BCR 2, Data Analysis 2, Technical reading 1, BCR 5 and Technical Reading 2). Any problem that does not have asterisks is extra preparations for the 1st semester.

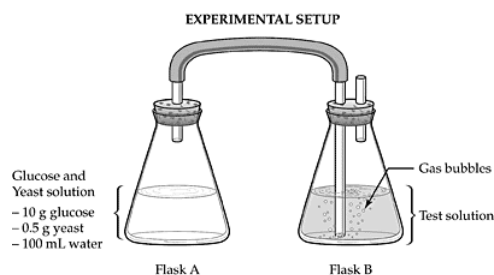
BCR's- please complete each BCR in paragraph form. Answer each bullet.

Technical readings- read the selection and circle the correct answer choice for the selected response question.

Data Analysis- read the background information, analyze the graph and circle the correct answer choice from the selected response question.

BCR 1

A group of students wants to determine whether a gas is released when glucose is added to a solution of living yeast cells and water. Their experimental setup is shown below.

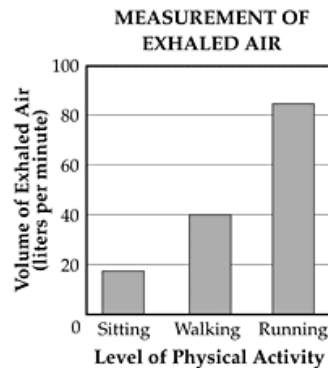


The students add glucose to a mixture of yeast and water in Flask A. If a gas is released, the test solution in Flask B will turn yellow. The students observe and record the appearance of Flask B at the beginning of the experiment, and again after 24 hours.

- Explain the importance of using a control in the experiment.
- Describe a control for this experiment. Be sure to include the specific parts of the setup.
- Compare the control to the original experimental setup.

**Data Analysis 1

A group of students measured the volume of air they exhaled during three different activities: sitting, walking, and running. The volume of exhaled air is directly related to the amount of carbon dioxide produced. The data the students collected are summarized in the graph below.



According to the data, as physical activity increases, the amount of carbon dioxide produced

- A decrease
- B increases
- C remains constant
- D decrease then increases

**BCR 2

A pharmaceutical company is selling a new allergy medicine. The company claims their medicine is the fastest-acting and longest-lasting. They also claim that it has the fewest side effects. The company's claims are based on a study conducted with 10 patients chosen at random.

Should consumers believe the claims made by this company? In your response, be sure to

- evaluate the study conducted by the pharmaceutical company

- describe any changes you would make to the study that could strengthen the company's claims
- describe methods to produce more reliable data, and explain how these could strengthen the company's claims

**Data Analysis 2

A group of students conducted an experiment to study the growth of bean plants. An equal number of bean plants of similar size were planted in containers A and B. Each day for five days, Container A received water only, while Container B received an equal amount of weak fertilizer solution. The table below shows the average height of the plants in each container for each day of the experiment.

PLANT GROWTH EXPERIMENT

Day	Average Height (in centimeters)	
	Container A: Water Only	Container B: Water plus Fertilizer
1	2.0	2.0
2	2.2	2.3
3	2.3	2.8
4	2.5	3.2
5	2.6	3.8

Which of these is being tested in this experiment?

- A effect of water on plant height
- B effect of fertilizer on plant height
- C maximum height the plants will grow
- D number of days the plants will grow

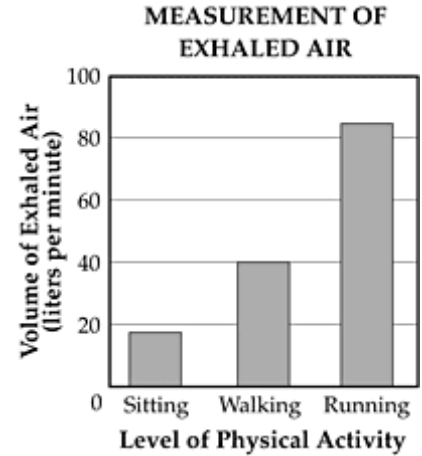
Data Analysis 3

Use the information and the graph below to answer the following item.

A group of students measured the volume of air they exhaled during three different activities: sitting, walking, and running. The volume of exhaled air is directly related to the amount of carbon dioxide produced. The data the students collected are summarized in the graph below.

Which of these processes produces carbon dioxide?

- A. mitosis
- B. diffusion
- C. respiration
- D. photosynthesis



****Technical Reading 1**

EXOTIC SPECIES VERSUS NATIVE SPECIES, WHO'S WINNING?

The introduction of non-native or “exotic” organisms is thought to be responsible for about half of the endangered or threatened species in the United States. This often happens by the “crowding out effect,” in which an exotic plant or animal survives better than a native organism. Exotic species usually have no natural predators or parasites in their new environments. This enables them to take over entire areas where native species used to live. Biologists call this phenomenon eco-invasion. Chris Bright, an author on this subject, says that a non-native species will establish itself by adjusting to its new surroundings. “It tends to get better and better at exploiting an area’s resources and at suppressing native species,” says Bright.

The island of Guam is an example of an area that has been affected. The brown tree snake was accidentally introduced to the island about 60 years ago. Since then, nine of eleven native bird species have become extinct due to overpopulation by the brown tree snake.

Another example involves the Eurasian zebra mussel. Scientists believe this mussel was accidentally transported to the United States by ships in 1988. Colonies of the zebra mussels have since caused costly damage to waterpipes around the Great Lakes.

Airplane and boat traffic across the world has been blamed for the introduction of exotic organisms. Species are usually contained in certain areas because of natural borders such as mountains, oceans, and deserts. However, natural borders are no longer effective boundaries with the increase in worldwide travel.

1. Which of these explains why the number of exotic organisms is increasing in ecosystems around the world?

- A. The amount of global travel is increasing.
- B. Increasing temperatures favor non-native organisms.
- C. Native organisms are migrating to more remote locations.
- D. The number of prey organisms is increasing worldwide

2. Which of these is a false statement about exotic species?

- A. They often out-compete native species.
- B. They often lead to the extinction of other species.
- C. They usually have predators in their new environments.
- D. They are transported to new areas by airplanes and boats.

Medical researchers are studying a new drug to treat anemia. Eligible patients are asked if they would like to participate in the study. If a patient does participate, there is a 50% chance that the patient will receive the actual anemia medication and a 50% chance that the patient will receive a placebo, or sugar pill. The placebo is not meant to have any effect on the patient's anemia. The study is double-blinded, meaning that neither the researchers nor the patients know which kind of pill is being taken—the actual medication or the placebo.

- Explain why a placebo is being used in the study.
- Explain why it is important to conduct a double-blinded study.
- Describe both the possible benefits and risks of drug trials, such as the one in the example, to both the patient and society.

BCR 4

In an experiment, a group of students placed ten raisins in a container with 100 milliliters of water. They covered the container and let the raisins sit overnight. The students removed the raisins from the container and observed that they were larger. They also observed that the volume of water in the container had decreased. What happened to the raisins to cause them to become larger? In your response, be sure to:

- name the process that caused the raisins to become larger
- describe how this process caused the raisins to become larger
- explain the role of this process in living systems

Data Analysis 4/5

Read the description of the experiment and use the table of results below to answer the following question.

A student designed an experiment to see if plants grow better when watered with a sugar solution. He divided the plants into six groups, measured the initial height of each plant, and calculated the average height for each group. Once a week for two months, he watered the plants in each group using a different sugar solution for each plant group. At the end of two months, he measured the final height of each plant and calculated the average height for each group. The student's data are shown in the table below.

EFFECT OF SUGAR SOLUTION ON THE HEIGHT OF PLANTS

Plant Group	Percent Sugar Solution	Average Initial Height (centimeters)	Average Final Height (centimeters)
A	0	2	30
B	10	2	28
C	20	3	15
D	30	2	10
E	40	3	(died)
F	50	3	(died)

Which of these structures transport water throughout the plant?

- A. epidermal tissues
- B. vascular tissues
- C. chloroplasts
- D. mitochondria

Which of these statements explains why the plants in Groups E and F died?

- A. the high sugar content caused too much water to move out of the root cells.
- B. the high sugar content caused too much water to move into the root cells
- C. the high sugar content prevented the plant from capturing energy
- D. the high sugar content clogged the pores in the cell membranes

****BCR 5**

Students studied a species of fish. They wanted to find out if these fish grow faster in warmer water. The students designed an experiment to determine how different water temperatures affect the growth of the fish.

They placed one fish in a tank at 26°C and another fish in a tank at 22°C. The fish were fed the same amount of food during the experiment. The mass of each fish was recorded at the beginning and at the end of the experiment. The data the students collected are shown in the table below.

EFFECTS OF WATER TEMPERATURE ON THE GROWTH OF FISH

Temperature (°C)	Starting Mass (g)	Final Mass (g)	Percent Change
26	3.68	7.84	113%
22	6.80	9.09	34%

Analyze the procedure and the data from the experiment. In your response, be sure to

- include the hypothesis that the students were most likely investigating
- explain whether their data supports this hypothesis
- describe how other variables would affect the outcome of the results
- explain how the experiment could be redesigned to gather more reliable data

**Technical Reading 2

THE GOOD, THE BAD, THE ZEBRA MUSSEL

Dreissena polymorpha, the zebra mussel, is a species of mussel that is native to East European waterways. Before their discovery in the Great Lakes region in 1988, zebra mussels were unknown in North America. They were probably brought in by ships traveling to the Great Lakes. By 1998, zebra mussels had spread to the lakes and streams of 12 states.

Zebra mussels have an impact on an ecosystem soon after they colonize a waterway. Their larvae spread rapidly, settling on almost any available surface. They quickly establish large colonies. Zebra mussels compete with native freshwater mussel populations so effectively that the native mussel populations quickly decline or totally disappear.

In a study of Lake Erie, researchers noted that just two years after the first zebra mussels colonized the lake, the water in the lake was six times clearer. Because mussels feed on plankton, the basis of the lake's food chain, they had reduced the plankton population by 80%.

The greater clarity of the water allowed light to reach greater depths. This resulted in increased growth of aquatic plants. Pollution inhibited the growth of some of these plants in the past, but when pollution decreased in Lake Erie and the water became clearer, the plants flourished, providing cover and nurseries for some types of fish.

Zebra mussels filter large amounts of water through their bodies. Researchers estimate that zebra mussels filter a large percentage of the water in Lake Erie every week. As they filter the water, they remove toxic chemicals and pollutants like PCBs. PCBs accumulate in the fatty tissues of organisms. Because of their ability to filter water and their high body-fat content, zebra mussels build up more than ten times the amount of PCBs and other toxic contaminants from the water than the native mussels. Some birds and fish absorb these contaminants when they feed on the zebra mussels. The contaminants are then passed up the food chain.

Scientists have studied the short-term effects of zebra mussel invasions on the ecology of North American waters. However, scientists will need to conduct additional studies to determine the long-term effects of these invasions.

1. Researchers believe that zebra mussels are ten times more effective in removing toxic contaminants like PCBs than are native mussels. Which of these experiments would test this hypothesis?

- A. Place 20 zebra mussels in a tank with PCBs and 20 zebra mussels in another tank without PCBs. Test PCB levels of each tank after one week.**
- B. Place 20 zebra mussels in a tank with PCBs and 20 native mussels in another tank without PCBs. Test PCB levels of each tank after one week.**
- C. Place 20 zebra mussels in a tank with PCBs and 20 native mussels in another tank with PCBs. Test PCB levels of each tank after one week.**
- D. Place 20 native mussels in a tank with PCBs and 20 native mussels in a tank without PCBs. Test PCB levels of each tank after one week.**

2. A scientist was testing the hypothesis that zebra mussels cause a decrease in the population of bluegill, a type of fish. The mussels feed on copepods, a type of plankton that is also eaten by bluegill and other fish. In an experiment, he counted the number of bluegill and the number of copepods in an aquarium containing one kiloliter of water. He then added zebra mussels. After two weeks, and again after four weeks, he counted the copepods, bluegill, and zebra mussels. Which set of experimental data supports his hypothesis that the number of bluegill decline because zebra mussels eat copepods?

A.

Number of Organisms			
Weeks	Zebra Mussels	Copepods	Bluegill
0	50	2,000	7
2	300	120,000	24
4	1,900	200,000	33

C.

Number of Organisms			
Weeks	Zebra Mussels	Copepods	Bluegill
0	50	2,000	33
2	300	120,000	24
4	1,900	200,000	7

B.

Number of Organisms			
Weeks	Zebra Mussels	Copepods	Bluegill
0	50	210,000	33
2	300	120,000	24
4	1,900	2,000	7

D.

Number of Organisms			
Weeks	Zebra Mussels	Copepods	Bluegill
0	50	210,000	24
2	300	120,000	7
4	1,900	2,000	33