

Summer Enrichment Packet for Rising Biology Students

ANSWER KEY



PRINCE GEORGE'S COUNTY PUBLIC SCHOOLS
Division of Academics
Department of Curriculum and Instruction

Answer Key

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Week	Answers
Week One Thinking Like A Scientist	Claim Evidence and Reasoning (C-E-R)
	<p>1. Claim- Mitosis requires less energy than sexual reproduction does. Evidence- Mitosis can occur in seconds and does not require a mate to reproduce. Sexual reproduction requires two compatible parents. Reasoning- Energy is required to find a compatible mate, produce sex cells, and for fertilization. Therefore Mitosis requires less energy than sexual reproduction does.</p> <p>2. Claim- Cold air weighs more than hot air. Evidence- When I filled a 9-centimeter diameter balloon with cold air, it weighed 1 gram and when I weighed the same size balloon with hot air, it weighed 0.5 grams. Reasoning When molecules are cooled, they move closer together and when they are heated up, they move farther apart. Because of this more molecules can fit into a balloon when the air going in is cold than when the air going in is warm.</p> <p>3. Claim- Solid A is denser than Solid B Evidence- Solid A density is 2 grams/ 6 cm³ = 0.33 g/cm³ Solid B density is 0.5 grams/ 6 cm³ = 0.08 g/cm³ Reasoning- We know that density = mass/volume. When calculating the difference in density of Solid A to Solid B, we found that Solid A density = 0.33 g/cm³ but Solid B density is only 0.08 g/cm³ so Solid A is more dense than Solid B.</p> <p>4. Claim- Plants grow better in sunlight. Evidence- Between day 1 and 5, the plant that was placed closest to the sunlight grew 4 inches and the plant with the least amount of sunlight access only grew 1 inch. Reasoning- The sun provides energy for plants. Energy is used to help a plant grow taller. Since our evidence showed that the plant that was exposed to the most sunlight grew the most then plants must grow better in sunlight.</p>
	C-E-R: Identifying Liquids
	<p>Answers will vary.</p>
	Controls and Variables
	<p>1. Prince Burgers and Fries A. Group B B. The type of sauce C. Amount of gas experienced by the customers D. The new sauce works.</p> <p>2. Temperature vs. Light Intensity A. Temperature B. Light Intensity</p> <p>3. Food vs. Mass Gain A. Food B. Mass Gain</p>

	<p style="text-align: center;">Experimental Design</p> <ol style="list-style-type: none"> 1. Flower Power <ol style="list-style-type: none"> A. Mendel tested more than one independent variable: location of the plant, frequency of watering, and type of water. B. He should keep everything the same in regard to the plants (number of plants, soil type, location, and frequency of watering), and only test the type of water. 2. Brainiacs While it seems Marie and Rachel made improvements, since there was no control group and no specific details as to what Marie's test for them was, further testing would be needed to determine the effectiveness of the snacks. 3. Microwave Miracle <ol style="list-style-type: none"> A. Godfrey's hypothesis is that if he microwaves the fish food then the fish will be able to swim through the maze faster because microwaves make you smarter. B. The fish receiving the regular food are in the control group. C. Independent Variable- The type of food (microwave food and regular food) D. Dependent Variable- The time to complete the maze. E. Godfrey's should conclude that microwaving food does not affect intelligence. Evidence- When analyzing the average times for each group, the microwaved food group decreased by 9.625 seconds while the control group only decreased by 6.625 seconds. 4. Bubble Time Answers will vary.
<p style="text-align: center;">Week Two Science and Engineering Practices</p>	<p style="text-align: center;">Analyzing Data</p> <ol style="list-style-type: none"> 1. Mouse Litters The drug did work since the average litter was 7, while the mice that did not take the drug had an average litter of 5. 2. Cow Growth Rates <ol style="list-style-type: none"> A. Graph- Graphs will vary. B. The experimental feed actually slowed down Bessie's growth rate, with a giant boost towards the end. It's important that the experiment used twin cows because their DNA is the same, resulting in more accurate results. 3. Food Sales (Scatterplot) <ol style="list-style-type: none"> A. Ice cream shows a positive correlation; coffee shows no correlation B. A park manager could use this information when ordering food for the park throughout the year. For example, the park manager should make sure there is more ice cream for sale in the summer, and more burgers for sale in the spring and fall. He/she should always have coffee.
	<p style="text-align: center;">Scientific Processes: How Can A Causal Question Be Answered?</p> <p>Answers will vary.</p>
	<p style="text-align: center;">Scientific Inquiry in Medicine (By Frank W. Jackson, MD)</p> <p>Answers will vary.</p>
<p style="text-align: center;">Week Three Cell Structure and Function (Part I)</p>	<p style="text-align: center;">Plant and Animal Cells</p> <p style="text-align: center;">Organelle and Functions are listed. The illustrations will vary.</p> <ul style="list-style-type: none"> • Mitochondria- convert energy in food molecules to energy the cell can use to carry out its functions. • Cell Nucleus- directs all of the cell's activities • Endoplasmic Reticulum- carries proteins and other materials from one part of the cell to another. • Golgi Apparatus- receives proteins and other newly formed materials from the endoplasmic

	<p>reticulum, packages them, and distributes them to other parts of the cell</p> <ul style="list-style-type: none"> • Cell Membrane- controls what substances come into and out of a cell • Cytoplasm- region between the cell membrane and the nucleus. • Vacuole- storage area of a cell • Chloroplast- captures energy from sunlight and uses it to produce food for the cell • Cell Wall- helps to protect and support the plant cell
	<p style="text-align: center;">Looking Inside Cells</p> <ol style="list-style-type: none"> 1. Cytoplasm 2. Endoplasmic Reticulum 3. Nucleus 4. Mitochondrion 5. Cell Membrane 6. Organelles 7. Cell Wall 8. Cell Membrane 9. Nucleus 10. Cytoplasm 11. Mitochondria 12. Endoplasmic Reticulum
<p style="text-align: center;">Week Four Cell Structure and Function (Part II)</p>	<p style="text-align: center;">Modeling Cell Structures</p> <p>Answers will vary.</p>
	<p style="text-align: center;">Organ and Tissue Transplants</p> <ol style="list-style-type: none"> 1. Autografts come from the patient's own body, so the patient's immune system does not recognize them as foreign. 2. If doctors use an autograft, tissue probably won't be rejected. A person's skin has a very large area, so doctors can move an unburned section from one part of the body to another without endangering he patient. 3. Organs or tissues from a close relative are more likely to be similar to the patient's own organs and tissues and so they are less likely to be recognized as foreign by the patient's immune system. 4. Answers will vary. Sample: It would be more difficult to transplant an organ system than an organ because an organ system is made of more than one organ. Transplanting a skeleton, for example, might be impossible there are over 200 bones in the human body.
	<p style="text-align: center;">Are They Plants or Animals?</p> <p>Annotations and Summaries will vary.</p>
<p style="text-align: center;">Week Five Photosynthesis and Respiration</p>	<p style="text-align: center;">Photosynthesis</p> <p>Part A As light intensity and carbon dioxide concentration increase, the rate of photosynthesis initially (increases). This is because light energy and (carbon dioxide) are inputs for the photosynthesis process. Eventually, increasing the light intensity or carbon dioxide concentration (causes no further increase in the) rate of photosynthesis. This is because the processes involved in photosynthesis are working as efficiently as they can.</p> <p>As temperature increases, the rate of photosynthesis initially (increases). Eventually, photosynthesis reaches its maximum rate. The temperature increases and causes the rate of photosynthesis to (decrease). This is because the processes involved in photosynthesis work best at a particular temperature.</p> <p>Part B Answers will vary. Sample response: Photosynthesis helps support life on Earth because it gives living things the oxygen and energy that they need. Plants release oxygen as a byproduct of photosynthesis, which animals require. Energy produced by plants moves through ecosystems.</p>

	<p style="text-align: center;">Respiration</p> <ol style="list-style-type: none"> 1. Glucose 2. Carbon Dioxide 3. Oxygen 4. Water 5. Energy 6. In the cytoplasm 7. In the mitochondria 8. Fermentation does not require oxygen, while respiration does. It produces less energy than respiration. 9. Alcoholic Fermentation 10. Lactic-acid Fermentation
	<p style="text-align: center;">History of Fermentation</p> <ol style="list-style-type: none"> 1. Timelines will vary. 2. Louis Pasteur determined that the process of fermentation is caused by yeast. 3. Two of the oldest uses of fermentation are to make alcoholic beverages and to make bread rise. 4. Fermentation is used in medicine today to produce antibiotics.
<p style="text-align: center;">Week Six Cell Processes and Energy (Part I)</p>	<p style="text-align: center;">The Cell Cycle</p> <p>Annotations will vary.</p>
	<p style="text-align: center;">Mitosis</p> <ol style="list-style-type: none"> 1. Stages of Mitosis <ol style="list-style-type: none"> A. Prophase B. Metaphase C. Prophase D. Cytokinesis E. Telophase F. Anaphase 2. Onion Root Tip- Online Activity <p>Interphase- 20 cells, 55.56%</p> <p>Prophase- 10 cells, 27.78%</p> <p>Metaphase- 3 cells, 8.33%</p> <p>Anaphase- 2 cells, 5.56%</p> <p>Telophase- 1 cell, 2.78%</p> <p>Total- 36 cells, 100%</p>
	<p style="text-align: center;">Getting to Know: Meiosis</p> <p>Annotations and summaries will vary.</p>
<p style="text-align: center;">Week Seven Cell Processes and Energy (Part II)</p>	<p style="text-align: center;">The Process of Meiosis</p> <p>Answers will vary. Illustrations should include the entire process of Meiosis.</p>
	<p style="text-align: center;">Meiosis Virtual Lab</p> <p>Answers will vary.</p>
	<p style="text-align: center;">Mitosis vs. Meiosis</p> <p>Answers will vary. Students should draw and use either a three-way Venn Diagram or a graphic organizer of their choice to compare/contrast mitosis and meiosis.</p>
<p style="text-align: center;">Week Eight Energy in Ecosystems</p>	<p style="text-align: center;">Food Chains and Food Webs</p> <ol style="list-style-type: none"> 1. Answers will vary. Students may select any four of the eight food chains. 2. Leopard seal, killer whale, and Elephant seal

3. One; algae
4. A
5. C
6. B

Energy Pyramid

Amount of energy passed from each trophic level:

- Calories available from grass: 10,000
- Calories transferred to the grasshopper: 1,000
- Calories transferred to the snake: 100
- Calories transferred to the eagle: 10

1. 10 blades of grass (=1/2 the weight of a grasshopper, or 1 g)
2. 100 blades of grass (=10 blades/grasshopper x 5 grasshoppers/snake x 2 snakes/eagle)
3. Answer: 2800 blades of grass (=100 blades/eagle x 4 eagles x 7 days/week)
4. Much of this energy is used for metabolic processes and/or is lost as heat
5. Answers will vary. Answers should include that pyramids are a good way to represent that only a fraction of the energy from a lower trophic level passes up to each higher level.