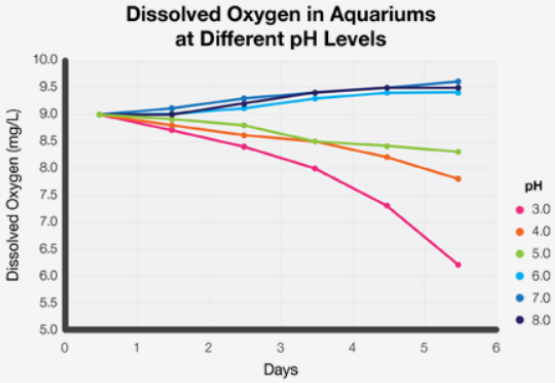
FlinnPREP™ for Practice Exam 2
Untimed Free Response

1. An ecologist is studying the impact of acid precipitation on the populations of several different species of green algae in a lake. As part of her overall assessment, she wants to determine the impact of increasing acidity on the three main species of green algae in the lake. She set up several tanks with different pH levels and different combinations of the three species. In each tank, the total dissolved oxygen was measured daily over six days. The results for the tanks containing all three green algae species are shown below.



List one important constant when measuring dissolved oxygen. (1 pt)

Identify the pH of tanks where respiration is occurring faster than photosynthesis and provide evidence for the claim. (2 pt)

Explain why dissolved oxygen was chosen as the dependent variable in this experiment. (2 pt)

Predict the expected change in pH if respiration occurs at a faster rate than photosynthesis. (1 pt)

Describe the type of feedback occurring when the amount of acid rain causes a decrease in primary productivity, and explain its impact on homeostasis of the ecosystem. (2 pt)

Under optimal conditions, species A and species B both experience decreased primary productivity per gram when cultured together in a tank than when they are cultured in separate tanks. Based on this evidence, identify and explain one possible ecological relationship between species A and species B. (2 pt)

2. Catalase is a common protein enzyme found in many organisms living in oxygen environments. Catalase decomposes hydrogen peroxide (H_2O_2) to hydrogen (H_2) and oxygen (O_2). Below are the results for an enzyme catalase lab experiment running at three different temperatures: 10 °C, 35 °C and 60 °C. The results below show how long it took for paper discs of filter paper to float after being soaked in catalase solution and dropped into a solution of dilute hydrogen peroxide. The oxygen gas and hydrogen gas adhere to the filter paper, increasing buoyancy as the amount of gas increases.

Catalase Activity at Various Temperatures

Temperature (°C)	Trial 1 (s)	Trial 2 (s)	Trial 3 (s)	Average (s)
10	45	40	50	45
35	10	20	15	15
60	120	150	120	130

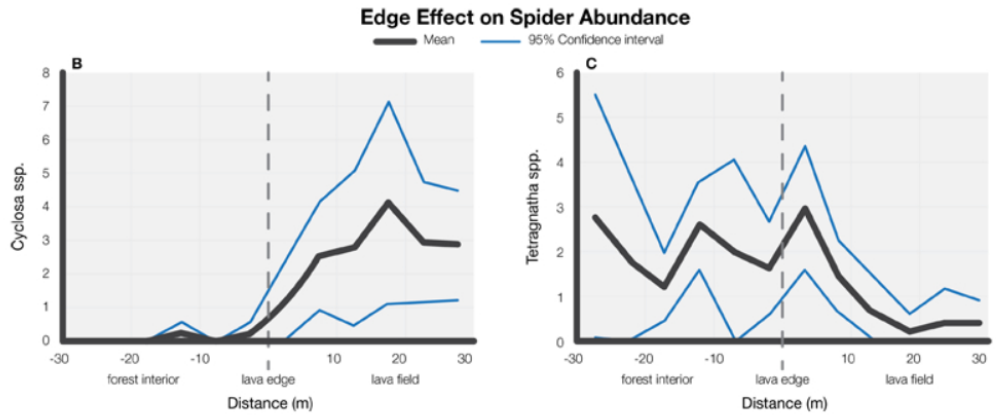
Write a claim that answers the question: What is the relationship between temperature and catalase activity? (1 pt)

Explain and justify two pieces of evidence that support your claim. (2 pts)

3. Describe two ways the atmosphere of early Earth changed to provide an environment suitable for the synthesis of organic molecules that were precursors to the biological molecules seen in living things today. Discuss one way that experiments related to early Earth's atmosphere support the theory that all life has a common ancestor.

4

4.



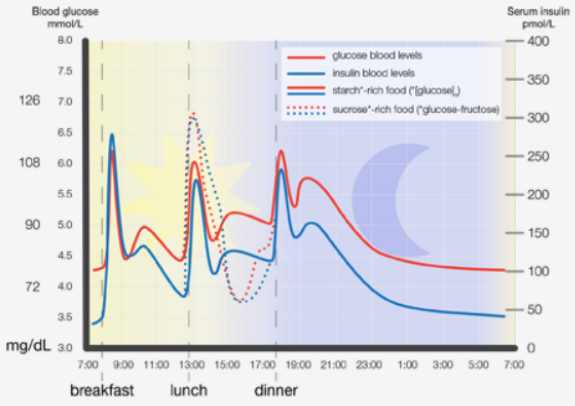
Kipuka are islands of land found within a sea of volcanic rock. Many forest kipuka exist on the banks of Mauna Loa in Hawaii. The distribution of two different genera of spiders that inhabit the same kipukas are displayed in the graph above. Similar species of spiders found on different kipuka show greater genetic differences than those within one kipuka.

Identify the genus of spider that is more likely to occupy the lava field surrounding the kipuka.

Describe the evolutionary mechanism responsible for the greater difference in genetics between spiders on different kipuka compared to spiders inhabiting the same kipuka.

Describe one ecological relationship between the two genera of spiders that helps them both survive on the same kipuka.

5.



Living organisms use glucose as a source of chemical energy to maintain order. Glucose is ingested by humans and transported throughout the circulatory system to individual cells for cellular respiration. The concentration of glucose in the circulatory system is highly regulated. The homeostatic blood glucose concentration in humans is ~90mg/dL. When blood glucose levels are elevated, the pancreas secretes the hormone, insulin. Insulin causes the liver to convert excess glucose to glycogen, thus decreasing the overall concentration of blood glucose in the circulatory system.When insulin is not present, the liver converts glycogen back into glucose, releasing it into the blood.

A. Identify the type of feedback mechanism that regulates blood glucose levels in humans. (1 pt)

B. Predict the effects of a malfunctioning pancreas that is unable to secrete sufficient quantities of insulin on the overall health of a human.Justify your prediction. (3 pts)

6. A researcher studied a population of *Biston betularia* (Peppered Moth) over many generations in an open woodland. It was observed that this species appeared in two distinct color patterns: a dominant black phenotype and a recessive light phenotype. Upon further investigation, it was discovered that the coloration of this species is controlled genetically through a single locus. The researcher also observed that *Biston betularia* spent much of the day resting on light-colored trees avoiding predation from visual predators such as birds. The data collected by the researcher can be found in the table below.

	Population of *Biston betularia* at the beginning of the season		Population of *Biston betularia* at the end of the season	
Year	% of dark moths	% of light moths	% of dark moths	% of light moths
1	3	97	1	99
2	4	96	2	98
3	2	98	1	99

4	7	93	7	93
5	15	85	18	82
6	29	71	32	68
7	55	45	58	42
8	83	17	89	11
9	90	10	96	4
10	95	5	96	4

The researcher noticed that during the fourth year of the study, pollution was beginning to impact the habitat of *Biston betularia.* The light-colored trees in which *Biston betularia* resided upon were beginning to darken from the pollution of nearby industry.

A. Describe the source of variation in the color pattern of *Biston betularia.* (1 pt)

B. Identify the adaptation that increased the fitness of *Biston betularia* in the first year of the study. Justify your answer. (2 pts)

C. Explain the changes in allele frequencies observed by the researcher during a single year of the study as well as the changes in allele frequencies observed throughout the 10 year study. (3 pts)

D. Assuming Hardy-Weinberg Equilibrium, calculate the frequencies of the dark allele and light allele in the fourth generation. Round to two decimal places. (2 pts)

E. Predict the consequences of a decrease in industrialized processes on the population of *Biston betularia.* Justify your answer. (2 pts)

Finished

FLINNPREP™
P.O. Box 219
Batavia, IL 60510
800-452-1261
866-452-1436
flinn@flinnsci.com