



Dear future AP Biology student:

Congrats! You have signed up for AP Biology for the 2020-2021 school year at Eastlake High School. AP Biology is the culmination of Biology at the high school level. It is an extremely interesting course as it provides real-world examples and synthesizes the concepts you have been introduced to in your previous Biology and Chemistry classes. If you love learning about the world around you in terms of how biological systems interact, you are in the right place.

Upon successful completion of AP Biology, you will have covered content that is equivalent to the first *year* of college majors Biology; both lecture and lab credits can apply, depending on the college. This is *double* what other AP classes at Eastlake are teaching and means that the course will move at a fast pace. As stated in the course catalog, you should expect to spend between 5-8 hours *outside of class* working on AP Biology every week. Being on time, present, and prepared for class will also be critical to your success. A big role on being successful in this class is hard work and perseverance. To be a successful AP Biology student, you must embrace the idea of learning independently and advocating for yourself if you do not understand the content or the applications. Engaging in successful study habits is part of the learning process. This includes daily reflections, completing nightly homework, forming a study group, and seeking teacher assistance during office hours and Wolf Time. These habits will serve you well in class and in your future when you move on to the university-level, post-secondary education, or the work force.

The following packet is the summer assignment for AP Biology 2020-2021. You will need to recall information from your previous Biology and Chemistry classes as well as learn new information that will be critical to your success in AP Biology. **On the first day of class in the Fall, you must bring in a completed packet. You must also bring in this letter signed by yourself and your parent/guardian. The work will be collected and awarded effort/accuracy points based on the evidence provided along with the correct answers (except where noted). Your baseline knowledge and skills will be assessed during the first week of classes (whether online or in-person). Depending on your results, you may need to engage in additional study as your success in this class is dependent on your prior knowledge. I would ordinarily send a syllabus at this time as well, however, with the uncertainties about school in the Fall I'll send that later.**

To make the most of this packet and start the semester off right, follow the instructions on the pages. Do not try to finish after school ends for the summer—the topics should be fresh in your mind for the Fall! Do not attempt to do it all the night before the first day of classes—you will find yourself buried in Bio! Start working in early August so that you can truly decide if you need a refresher or need to relearn this content. There are resources linked in the following pages to help you, if needed. Resist the temptation to type every question into Google for the answer, lots of students did that during the 2020 AP Biology exam. I prefer that you get something wrong on your work than you copy someone's correct answer.

Looking forward to seeing you all in September,  
Mr. Cerveny

I \_\_\_\_\_ (full name) acknowledge that I have thoroughly read this cover sheet/letter and I am aware of the expectations of this course.

\_\_\_\_\_  
(student signature)

\_\_\_\_\_  
(parent signature)

### Instructions:

1. **TODAY:** Save this document to a place where you will be able to access it after your LWSD password resets. No, really! Do this NOW! Before you forget! Did you do it?
2. **TODAY:** Please check that all the links work from whatever computer you plan on working from. They should, but let's not take any chances!
3. **Early August:** Begin working your way through this packet. You may already know how to do a lot of this, which is great! For anything you don't know, use the resources provided to help you. **You can complete this assignment digitally or print it out and complete it by hand. Either way, you need to bring it with you on the first day of class!**

### Resources:

The [Openstax Biology](#) text is an excellent resource for reviewing information from past classes and will be listed as an optional resource in AP Biology. Check it out now and learn how to navigate it using the search bar and the contents bar on the left side of the page. It has interactive quizzes and interactive media which will help you visualize concepts.

The following are links to video sources on chemistry and biology concepts that will show up throughout the year. As you are working through the practice problems, you should use these videos as a reference to help you fill in gaps in content knowledge and/or understanding.

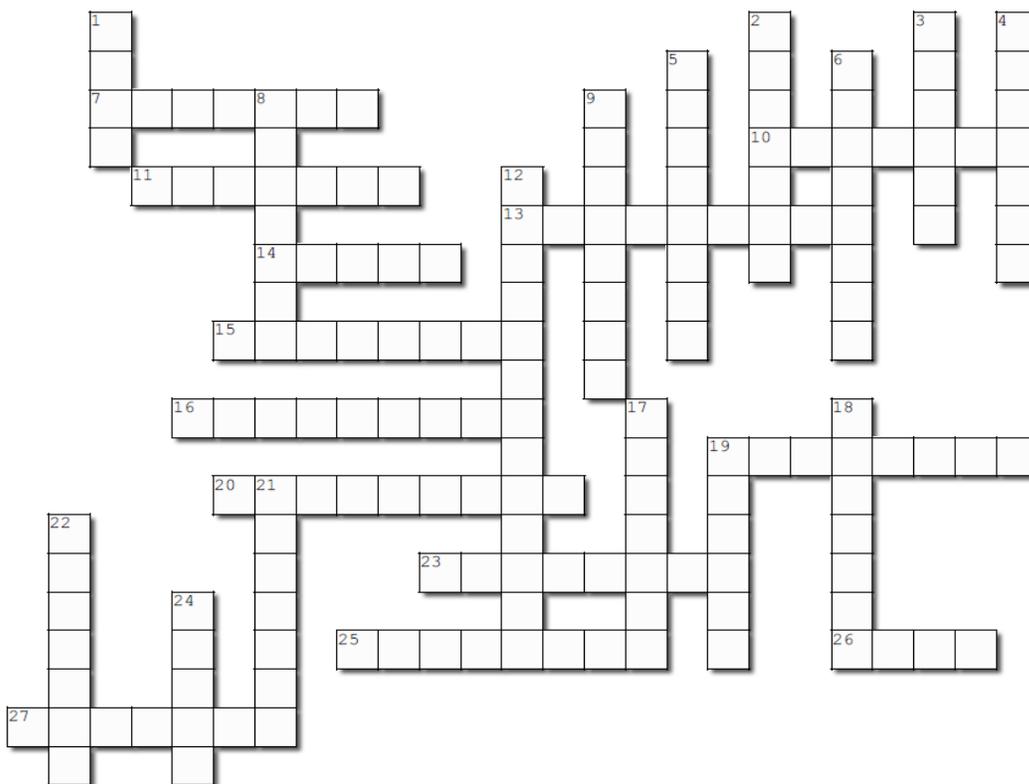
<b>Chemistry Review Resources</b>	<b>Biology Review Resources</b>
<a href="#">Bozeman Science - Chemistry</a> <a href="#">Khan Academy</a>  If you find you need some chemistry review, check out this textbook  <a href="#">Openstax Chemistry textbook</a>	<a href="#">Bozeman Science - Biology</a> <a href="#">Amoeba Sisters</a> <a href="#">Khan Academy</a>
<b>Scientific Method Review Resources</b>  <a href="#">Bozeman Science - Scientific Method</a>	

## AP Biology Lingo

As you go through the assignment, you will notice a number of terms in **bold**. This is intentional. There are a number of terms that will appear all year long that are referred to as “command terms” or “prompts”. Using the word bank and clues below, complete the crossword puzzle by matching the terms to the definitions.

COMPARE	CONTRAST	EXPLAIN	DISCUSS	EFFECT
IDENTIFY	ANALYZE	SUMMARIZE	DESCRIBE	SUPPORT
INDICATE	APPLY	CALCULATE	SHOW	ESTIMATE
PROVIDE	EVALUATE	DIFFERENTIATE	PREDICT	CLAIM
SUGGEST	DEFINE	EVIDENCE	POSE	INTERPRET
PERFORM	JUSTIFY	PROPOSE		

Complete the crossword puzzle below



Created using the Crossword Maker on TheTeachersCorner.net

### Horizontal

- 7. Apply what you've learned to a new situation
- 10. Say that something will or might happen
- 11. Suggest an idea or plan for consideration or discussion
- 13. Explain the meaning of something
- 14. Put something to use for a specific purpose
- 15. Point out or show
- 16. tell the main idea: beginning middle and end
- 19. Suggest a value without performing a full calculation
- 20. Work out a number
- 23. Write about data, facts or information and provide a conclusion
- 25. available body of facts that indicates whether a statement is valid
- 26. Write down details, steps, or calculations
- 27. Supply something useful or necessary

### Vertical

- 1. Present or suggest a problem or question
- 2. Back up your answer with details
- 3. Give a meaning for a word or phrase
- 4. Defend, prove or show something is right or reasonable
- 5. Give a picture or characteristics of something in words
- 6. Name, list, and give an example
- 8. Write an answer covering the how and why, give reasons for your answer
- 9. Point out differences between 2 or more objects
- 12. State differences between two or more things
- 17. Point out similarities between 2 or more objects
- 18. Give information writing from different points of view
- 19. Result or consequence that can be positive or negative
- 21. To study something, to learn relationship of the parts
- 22. Carry out or complete an action
- 24. Statement that is an answer to a question

## Chemistry Review: Atomic Structure

1. Using a periodic table complete the following table

<b>Element</b>	<b>Carbon</b>	<b>Hydrogen</b>	<b>Oxygen</b>	<b>Nitrogen</b>	<b>Phosphorus</b>	<b>Sulfur</b>	<b>Sodium</b>	<b>Potassium</b>	<b>Chlorine</b>	<b>Magnesium</b>	<b>Calcium</b>
Symbol											
Atomic Number											
Atomic Mass											
# electrons (neutral)											
Type* (M, N, L)											
Electronegativity (compared to Carbon) <sup>‡</sup>	=		>								
Size (compared to Carbon) <sup>‡</sup>											
# electrons in outermost energy level											
Reactivity (compared to Carbon) <sup>‡</sup>	=										
Max # of bonds											

\*For Type use M = metal, N = non-metal, L = metalloid

<sup>‡</sup>When compared to Carbon use >, < or =

2. **Draw** the Lewis Dot structures for C, O, N, and S
3. **Define** electronegativity and explain why Chlorine has a higher electronegativity than Oxygen
4. **Explain** why Sodium is more reactive than Carbon
5. **Explain** why Oxygen and Sulfur have similar chemical properties. Which substance is more electronegative and why?
6. **Describe** what an isotope is. Propose an explanation as to why isotopes may be useful for tracing molecules through biological processes.

### Chemistry Review: Bonds and Intermolecular Forces

1. **Identify** the three types of chemical bonds and how they are different.
2. **Explain** why some bonds are polar while others are not. How can you predict whether a bond is polar or non-polar? How can you tell if a molecule is polar or non-polar?
3. If you were to take 2 ice cubes and put one on a block of wood and the other on a same-sized block of copper which ice cube would melt the fastest. **Explain** your answer.
4. Explain why CO<sub>2</sub> is a non-polar molecule even though its bonds are polar.
5. For the following substances, **Identify** the type of bond present.

Cl<sub>2</sub> H<sub>2</sub>O HCN MgO CuCl<sub>2</sub> Ti NaCl C<sub>6</sub>H<sub>12</sub>O<sub>6</sub> NH<sub>4</sub>Cl H<sub>3</sub>PO<sub>4</sub>

6. **Identify** the substances in #4 that are polar?
7. **Describe** what a Hydrogen bond is and **explain** why it is so important to biology.
8. The molecules that make up olive oil are all non-polar. **Explain** how the lipid molecules bond to each other.

### Chemistry Review: Types of Reactions

1. **Explain** what a chemical reaction is.
2. **Describe** the characteristics of each of the following reactions:  
Combustion, Synthesis, Single Replacement, Double Replacement, Decomposition
3. **Contrast** exothermic and endothermic reactions.
4. Using the following chemical reaction, complete the table



What are the products of this reaction?	
What are the reactants?	
How many CO <sub>2</sub> s are needed to make 1 C <sub>6</sub> H <sub>12</sub> O <sub>6</sub> ?	
What sort of energy transformation is occurring?	
Is the reaction spontaneous or does it require an energy input?	

## Chemistry Review: Properties of Water

<p>1. The molecule of water is described as a polar molecule. Polar molecules have an unequal sharing of electrons. <b>Indicate</b> how this unequal sharing is present in a diagram in the space below. Do not copy &amp; paste from the internet.</p>	<p>2. Water is an excellent solvent. With water being a polar molecule, it can be an extremely strong solvent for other polar molecules. <b>Provide</b> an example of how water acting as a solvent is important for living organisms.</p>
<p>3. <b>Define</b> <i>adhesion</i> and <i>cohesion</i> and <b>provide</b> examples of each.</p>	<p>4. <b>Describe</b> the surface tension. <b>Explain</b> how water's hydrogen bonds contribute to this property.</p>
<p>5. When water cools and solidifies, it floats the liquid phase. <b>Describe</b> what is happening as the water cools and <b>explain</b> why ice floats. Propose a reason related to your description and explanation regarding why plants can survive a winter buried in snow.</p>	<p>6. <b>Define</b> specific heat. How does water compare to other substances in terms of specific heat?</p>
<p>7. When your body temperature rises, you begin to sweat. <b>Describe</b> how the specific heat of water relates to evaporative cooling.</p>	<p>8. <b>Explain</b> how the specific heat of water results in temperature moderation between coastal and inland regions.</p>

10. Hydrogen bonds are responsible for many of water's properties. Select one of the above properties and **explain** how hydrogen bonds contribute to the property.

## Chemistry Review: Polymers and Macromolecules

1. Define *monomer*
2. Define *polymer*
3. Complete the following table:

Type of Macromolecule	Elements present	Monomer	Polymer	Examples in Animal Cells	Examples in Plant Cells

## Biology Review: Cell Energetics

1. Define metabolism:
  
2. There are two types of reactions in metabolic pathways: anabolic and catabolic.
  - a. Which reactions release energy?
  
  - b. Which reactions consume energy?
  
  - c. Which reactions build up larger molecules?
  
  - d. Which reactions break down molecules?
  
  - e. Which reactions are considered “uphill”?
  
  - f. What type of reaction is photosynthesis?
  
  - g. What type of reaction is aerobic cellular respiration?
  
  - h. What type of reaction is anaerobic cellular respiration?
  
  - i. Which reactions require enzymes to catalyze reactions?

## Biology Review: Cell Structure

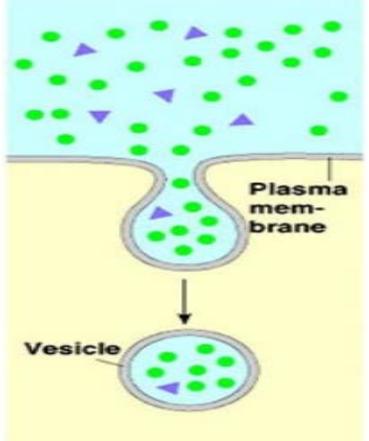
Complete the following table by writing the name of the correct organelle or cell part in the column to the right.

Description	Organelle or Cell Part
1. Rigid structure located outside of the plasma membrane. Provides protection and support. Surrounds the cells of plants, fungi, and prokaryotes.	
2. Selectively permeable membrane composed of a phospholipid bilayer. Described using the fluid mosaic model.	
3. The semi-fluid material within the cell located between the plasma membrane and the nucleus.	
4. Controls the cell's activities and functions. Contains the cell's DNA or "genetic blueprint"	
5. Strands of DNA and protein located in the nucleus. Condenses into chromosomes during cell division.	
6. The site of protein synthesis. May be attached to the endoplasmic reticulum or "free-floating" in the cytoplasm.	
7. Network of folded membranes covered with ribosomes and continuous with the nuclear membrane. Builds proteins for cell membranes or for excretion from the cell.	
8. Network of folded membranes not covered with ribosomes. Site of lipid synthesis and storage. Site of biochemical reactions.	
9. Flattened stack of tubular membranes. Modifies, sorts, and packages proteins into vesicles for transport within the cell or for secretion from the cell.	
10. Membrane-bound compartment used for storage of materials such as water. Common in plant cells where they are quite large. If found in animal cells, they are very small.	
11. Membrane-bound compartment that stores digestive enzymes. Digests worn out organelles, food particles, and ingested bacteria. Occur in animal cells. Not typically found in plant cells.	
12. Captures light energy and converts it to chemical energy, i.e. glucose. Found in green plants and algae.	
13. Transforms the energy stored in glucose into a form usable by the cell, i.e. ATP. Found in animal and plant cells.	

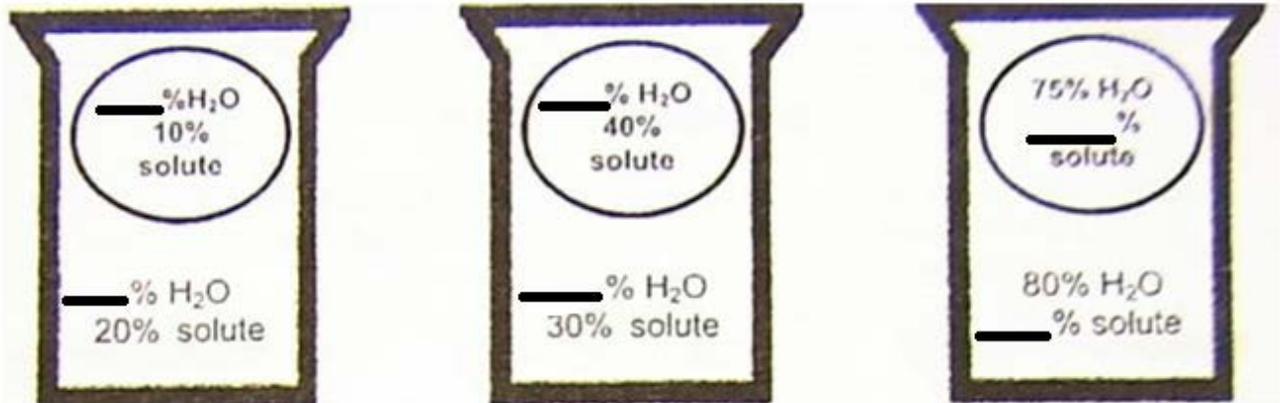
Place an “X” in the appropriate column(s) to indicate whether the following structures and organelles are found in plant cells, animal cells, fungal cells, and/or prokaryotic cells.

<b>Organelle or Cell Part</b>	<b>Plant Cells</b>	<b>Animal Cells</b>	<b>Fungal Cells</b>	<b>Prokaryotic Cells</b>
1. Cell Wall				
2. Plasma Membrane				
3. Cytoplasm				
4. Nucleus				
5. Chromatin/DNA				
6. Ribosomes				
7. Mitochondria				
8. Chloroplasts				
9. Rough Endoplasmic Reticulum				
10. Smooth Endoplasmic Reticulum				
11. Golgi Apparatus				
12. Vacuoles				
13. Lysosomes				

8. Complete the following chart using what you know about transport in cells.

TRANSPORT	REQUIRES ENERGY? (Yes or No)	TYPE OF MOLECULE (and an example!)	DRAWING (You draw. Don't find a picture on the internet!)
		Small nonpolar molecules Ex: carbon dioxide	
Facilitated Diffusion: carrier protein			
	No	Small polar molecules Ex: water	
	Yes	Ions Ex: Na <sup>+</sup> , K <sup>+</sup>	
Phagocytosis			
			 <p>The diagram illustrates the process of endocytosis. It shows a cross-section of a cell's plasma membrane, which is a phospholipid bilayer. On the outside of the cell (top), there are several green circles and purple triangles representing molecules. The plasma membrane is shown curving inward to form a pocket that traps some of these molecules. An arrow points downwards from this pocket to a newly formed vesicle inside the cell. The vesicle is a small, spherical structure with a membrane, containing the trapped molecules. Labels 'Plasma membrane' and 'Vesicle' are included with leader lines pointing to their respective parts.</p>
		Large nonpolar molecules Ex: cholesterol	

9. Below are animal cells placed in beakers of various concentrations. Assume the cells are permeable to only water.
- Fill any missing information.
  - Draw arrows to indicate the direction of water movement.
  - Label the tonicity of the cell as isotonic, hypertonic, or hypotonic.



### Biology Review: Feedback Loops and Homeostasis

For each of the following, state whether it is positive or negative feedback:

- \_\_\_\_\_ If blood temperature rises too high, specialized neurons in the hypothalamus of the brain sense the change. These neurons signal other nerve centers, which in turn send signals to the blood vessels of the skin. As these blood vessels dilate, more blood flows close to the body surface and excess heat radiates from the body.
- \_\_\_\_\_ If the blood temperature falls too low, specialized neurons in the hypothalamus of the brain sense the change and signals are sent to the cutaneous arteries (those supplying blood to the skin) to constrict them. Warm blood is then retained deeper in the body and less heat is lost from the surface.
- \_\_\_\_\_ Part of the complex biochemical pathway of blood clotting is the production of an enzyme that forms the matrix of the blood clot. This has a self-catalytic, or self-accelerating effect, so that once the clotting process begins, it runs faster and faster until, ideally, bleeding stops.
- \_\_\_\_\_ The walls of arteries stretch in the presences of high blood pressure. Baroreceptors located in these walls also stretch and as a result, a signal is sent to the brain which in turn slows down the body's heart rate. This slows the flow of blood through the arteries causing less pressure. As blood pressure drops, the baroreceptors become flaccid and a signal is sent to speed up the heart rate.
- \_\_\_\_\_ As fossil fuels are burned to release energy the produce CO<sub>2</sub> which accumulates in the atmosphere and oceans. As the CO<sub>2</sub> accumulates in the atmosphere is absorbs heat from the Earth, resulting in increased air temperature. This increased air temperature causes permafrost in the Artic tundra to thaw and release CO<sub>2</sub> that is produced through decomposition processes. When this CO<sub>2</sub> reaches the atmosphere, it absorbs more heat, leading to more permafrost thawing.

## Scientific Practices Review

Read the problem below and then graph the data. Remember that a good graph includes a title, axis labels and units, as well as appropriate scale, and a caption. Make sure to take up the whole graphing area!

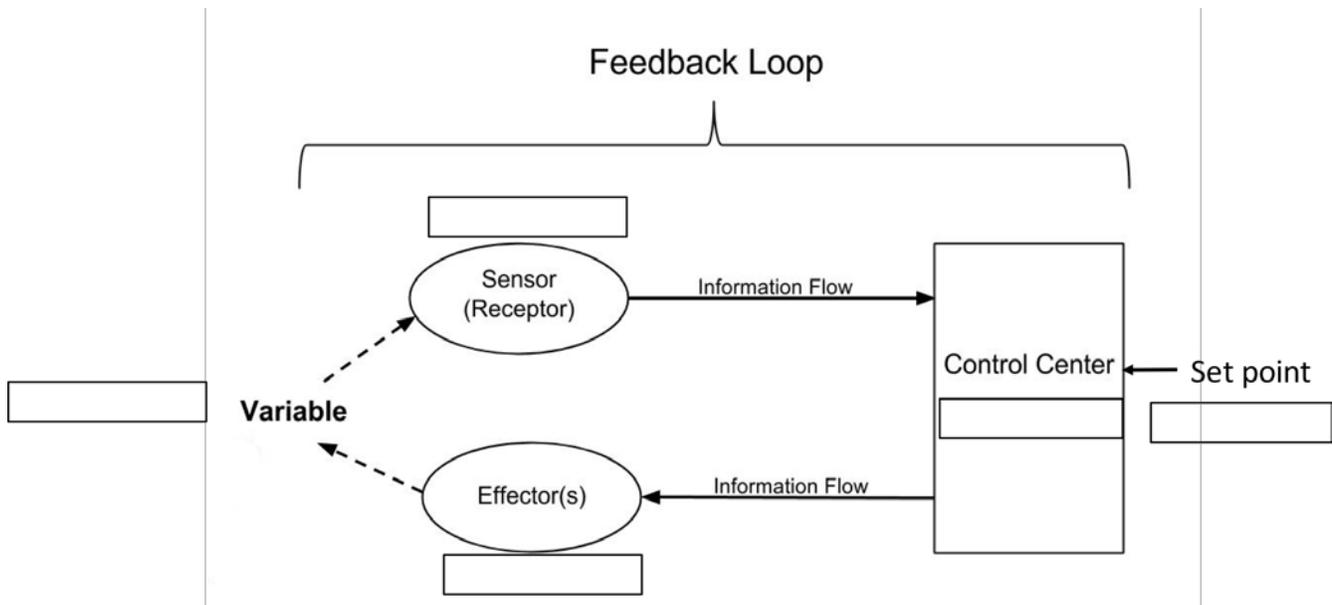
Festus is being tested for lactose intolerance. His blood is drawn and circulating glucose is measured over time. The normal range for blood glucose is 70-110 mg/dL. The normal range for blood pH is 7.35-7.45. If he can digest lactose, his blood glucose should rise and decrease. In a normal response the islet cells in his pancreas will detect the elevated concentration of glucose and release insulin to travel through his body and direct cells such as those in his liver to produce more glucose transporters and remove the excess glucose from the blood. If this happens, blood glucose concentrations should decrease with time.

Time	Blood Glucose (mg/dL)
0 minutes	96
15 minutes	105
30 minutes	146
45 minutes	143
60 minutes	98

Create your graph using the grid below. Do not just insert an Excel or other computer-generated graph


Using the information given in the scenario, the table and your graph above answer the following questions. Be sure to focus on the **bold type** words as these are the response prompts.

1. **Identify** the type of feedback being shown in this data set
2. Using the figure below, **identify** the indicated parts of the feedback loop involved in this test



3. **Identify** the independent and dependent variables for this test
4. **Describe** the trend of blood glucose concentration seen during the duration of the test.
5. **Calculate** the rate of increase in Festus' blood glucose concentration.
6. If Festus has Type I diabetes (he is unable to produce insulin), **predict** what the blood glucose response would look like. **Justify** your answer using information given in the scenario.

These next two questions are from past AP Biology exams (don't go looking them up yet). Answer the prompts as best you can. In this section, I am interested in seeing how you currently answer these types of questions. These will not be graded as correct or not, its more of a skills survey. All the information you need to answer the questions are either in the information given or from previous Biology courses.

In an experiment, rats averaging 300g of body mass were tested several times over a three-month period. For each individual rat, urine was collected over a three-hour period after ingestion of 10 mL of liquid (water, 1% ethyl alcohol solution, or 5% ethyl alcohol solution). The volume of urine was then measured, and the results were averaged for all individuals within each experimental group. The data are shown in the table below.

THREE-HOUR URINE OUTPUT FOLLOWING FLUID INGESTION

Fluid ingested (10 mL)	Water	1% Ethyl Alcohol	5% Ethyl Alcohol
Mean urine output (mL)	3.5	3.8	4.7

1. **Pose** ONE scientific question that the researchers were most likely investigating with the experiment.
2. **State** a hypothesis that could be tested to address the question you posed in part 1.
3. Using the data in the table, **describe** the effect of ethyl alcohol on urine production.

Use the figure and information below to answer the questions –

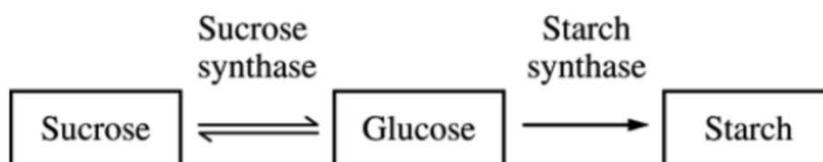


Figure 1. Simplified starch biosynthesis pathway in plants

A rice grain is a fruit that encloses a seed. Most of the dry mass of a rice grain is starch. In rice plants, starch is produced by hydrolyzing sucrose and then linking the released glucose molecules together into starch (Figure 1). The optimal temperature range for starch synthase activity in a strain of rice is 27°C – 30°C. The optimal temperature for sucrose synthase in the strain is 30°C – 35°C.

1. **Describe** how temperatures above 35°C most likely affect the structure and function of the starch synthase in the rice strain.
2. Using the information provided, **predict** the most likely consequences to starch content in mature rice grains if the rice is grown in an area where the average temperature during the growing season is 33°C.