

2023 AP Daily: Practice Sessions



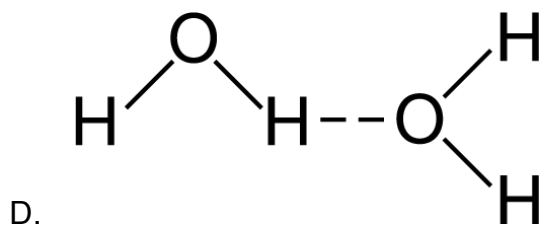
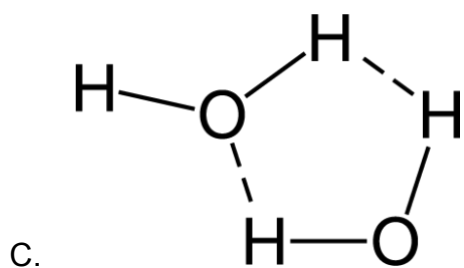
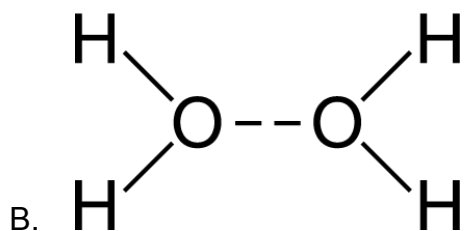
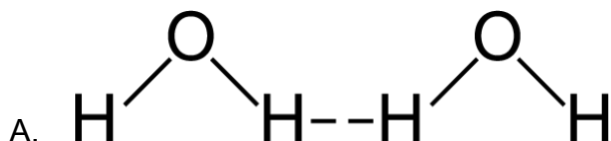
AP Biology

Session 1 – MCQ (Individual Questions)

1. Experimental evidence shows that the process of glycolysis is present and virtually identical in organisms from all three domains, Archaea, Bacteria, and Eukarya. Which of the following hypotheses could be best supported by this evidence?
 - A. All organisms carry out glycolysis in mitochondria.
 - B. Glycolysis is a universal energy-releasing process and therefore suggests a common ancestor for all forms of life.
 - C. Across the three domains, all organisms depend solely on the process of anaerobic respiration for ATP production.
 - D. The presence of glycolysis as an energy-releasing process in all organisms suggests that convergent evolution occurred.

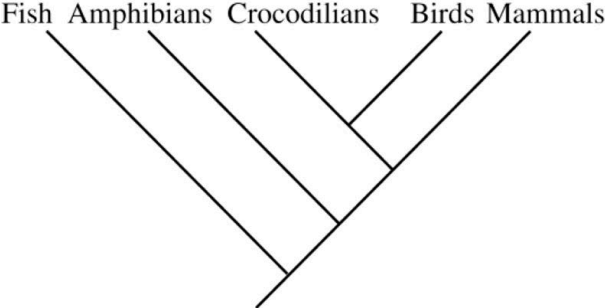
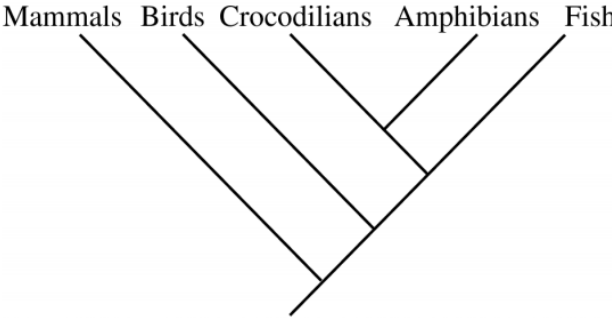
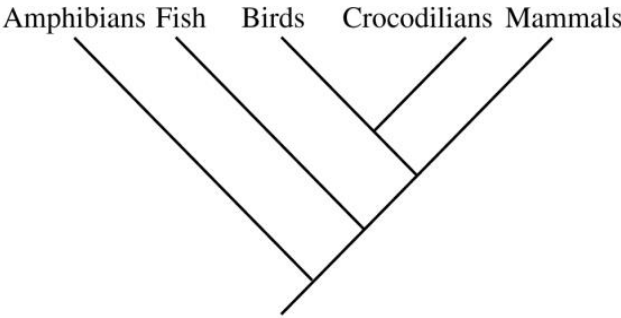
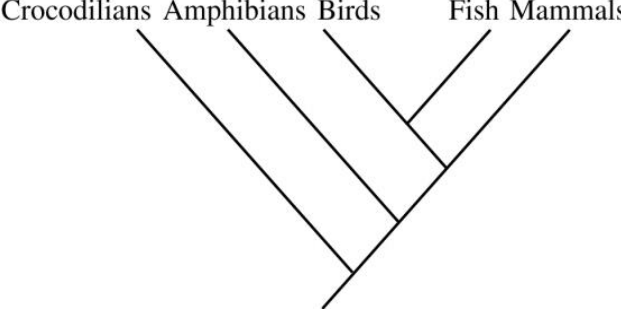
2. Water molecules are polar covalent molecules. There is a partial negative charge near the oxygen atom and partial positive charges near the hydrogen atoms due to the uneven distribution of electrons between the atoms, which results in the formation of hydrogen bonds between water molecules. The polarity of water molecules contributes to many properties of water that are important for biological processes.

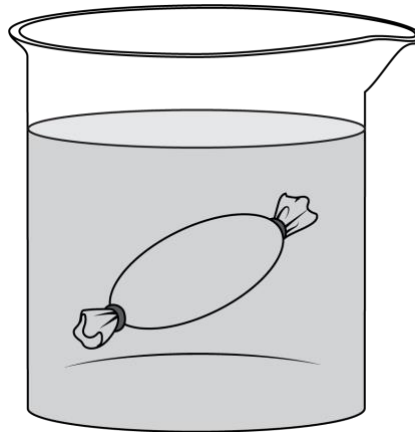
Which of the following models best demonstrates the arrangement of hydrogen bonds between adjacent water molecules?



Organisms	Derived Characters (+ indicates the character is present)					
	Hair	Jaws	Feathers	Amniotic Eggs	Two Pairs of Limbs	β -Keratin Scales
Mammals	+	+		+	+	
Crocodylians		+		+	+	+
Fish		+				
Amphibians		+			+	
Birds		+	+	+	+	+

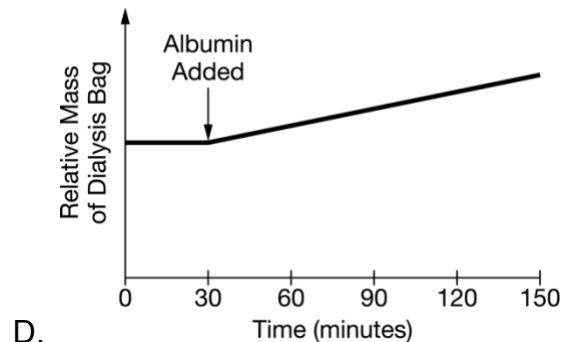
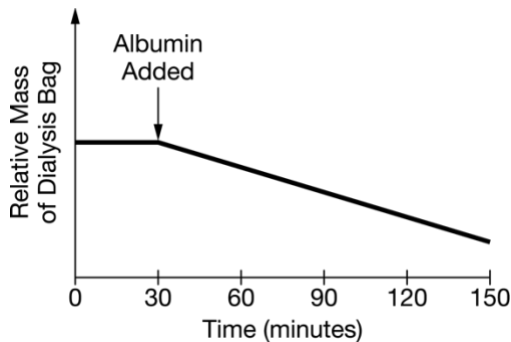
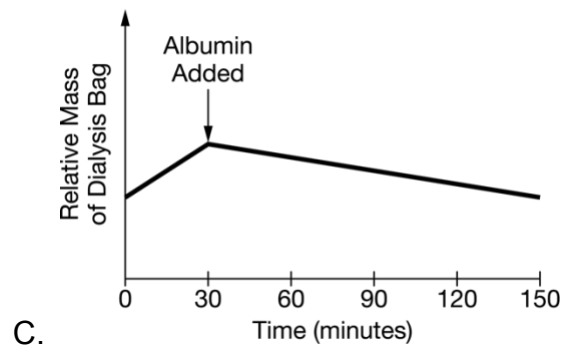
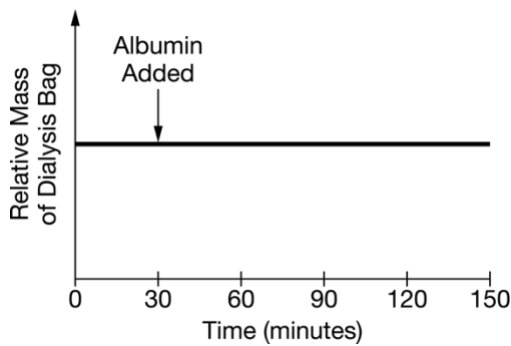
3. The table above shows derived characters for selected organisms. Based on the information in the table, which of the following cladograms best represents the evolutionary relationships among the organisms?

- A. 
- B. 
- C. 
- D. 



4. A student is using dialysis bags to model the effects of changing solute concentrations on cells. The student places one dialysis bag that contains 25 mL of distilled water into each of two beakers that are filled with 200 mL of distilled water (Figure 1). The membrane of each dialysis bag membrane contains pores that allow small solutes such as monoatomic ions to pass through but are too small for anything larger to pass. After 30 minutes, 5 mL of a concentrated solution of albumin (a medium-sized, water-soluble protein) is added to one of the two beakers. Nothing is added to the other beaker. After two more hours at room temperature, the mass of each bag is determined. There is no change in the mass of the dialysis bag in the beaker to which no albumin was added.

Which of the graphs best represents the predicted change in mass over time of the dialysis bag in the beaker to which albumin was added?



Treatment Group	Mean Seedling Height	Observations
Seedlings in potting soil	18.5 cm	The leaves have a dark green color and are normal in size.
Seedlings in sawdust	4.8 cm	The leaves have a grayish color and are small in size.

5. Students conducted a controlled experiment to investigate whether sawdust provides enough nutrients to support plant growth. The students separated ten nearly identical sunflower seedlings into two groups. They grew the seedlings in the first group in potting soil and the seedlings in the second group in sawdust composed mostly of cellulose. After twenty days, the students recorded observations about the seedlings in each group. The students' observations are presented in the table.

The observed differences between the groups most likely resulted from differences in the ability of the seedlings to produce which of the following monomers?

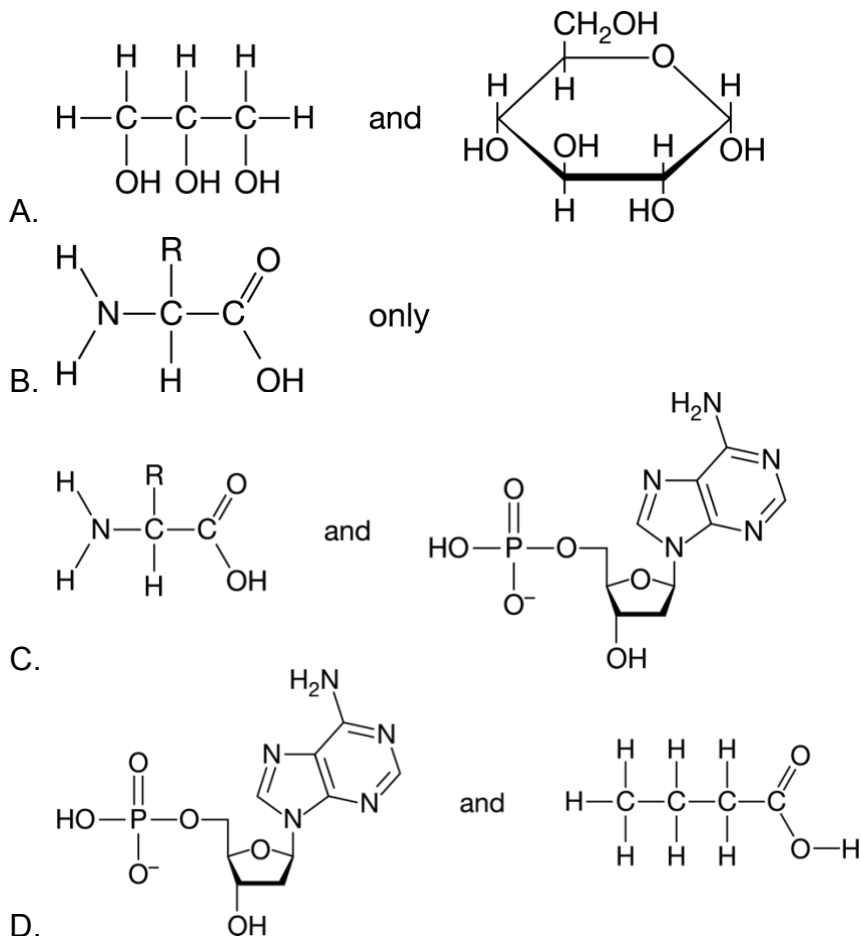


Table 1. An experiment to investigate the effect of salinity on pectinase function

Test Tube	Sodium Chloride Concentration (molar)	Temperature (degrees C)	Substrate Added	Pectinase Added
1	0	23	Yes	No
2	0	23	Yes	Yes
3	0.5	23	Yes	No
4	0.5	23	Yes	Yes
5	1.0	23	Yes	No
6	1.0	23	Yes	Yes
7	1.5	23	Yes	No
8	1.5	23	Yes	Yes

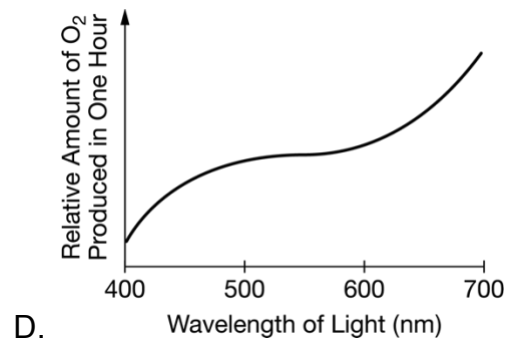
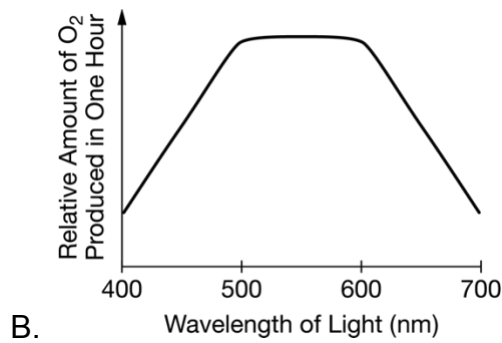
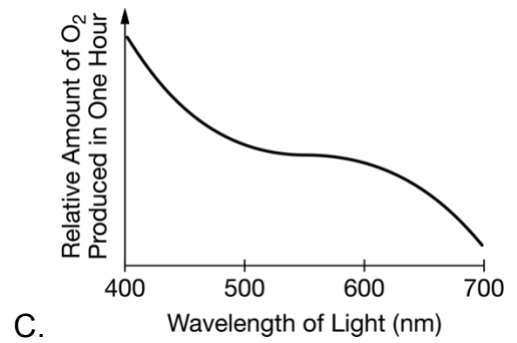
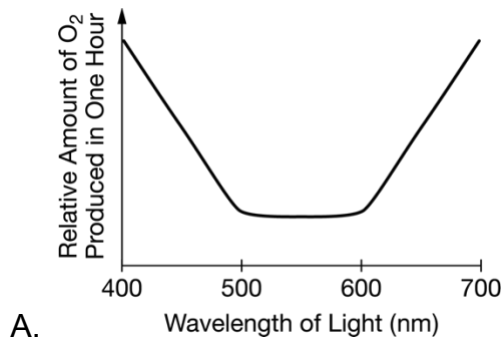
6. Pectinase is a protein that catalyzes the breakdown of pectic polysaccharides in plant cell walls. A researcher designs an experiment to investigate the effect of salinity on the ability of pectinase to lower the activation energy of the reaction involved. The design of the experiment is presented in Table 1. For each test tube, the researcher will measure the amount of product formed over 20 minutes.

Which of the following statements best helps justify the inclusion of test tube 5 in the experiment?

- A. It will act as a control for test tube 4 by showing the effect of the presence or absence of the substrate.
- B. It will act as a control for test tube 4 by showing the effect of a change in environmental temperature.
- C. It will act as a control for test tube 6 by showing the effect of the presence or absence of the enzyme.
- D. It will act as a control for test tube 6 by showing the effect of a change in sodium chloride concentration.

7. A researcher claims that spinach leaves capture the most energy from light waves in the range of 500 nm to 600 nm. To test the claim, the researcher will place spinach leaves in separate chambers and expose the leaves to different wavelengths of light. For each chamber, the researcher will measure the amount of oxygen gas (O_2) that is produced in one hour.

Which of the graphs best represents data from the experiment that will support the researcher's claim?



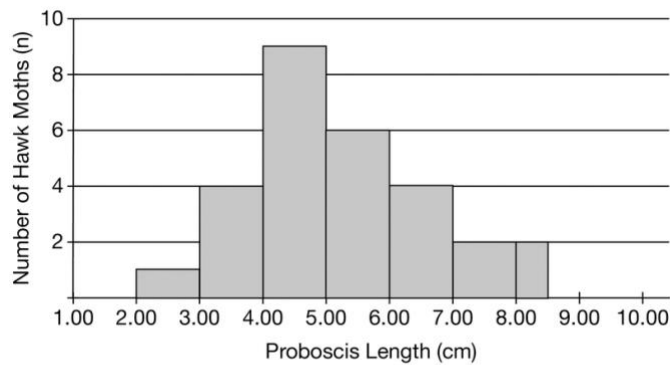
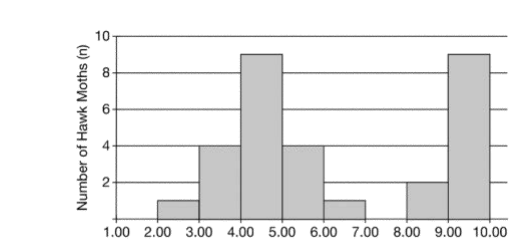
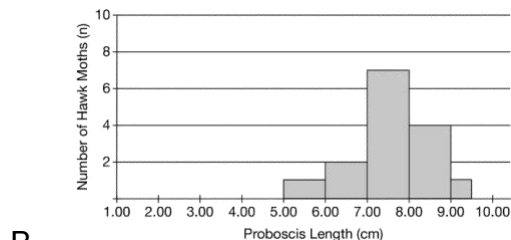
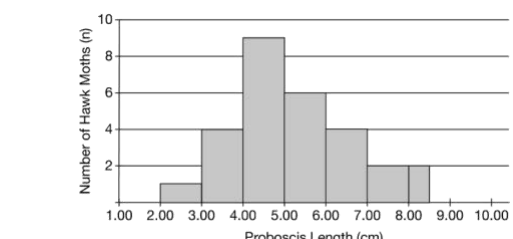
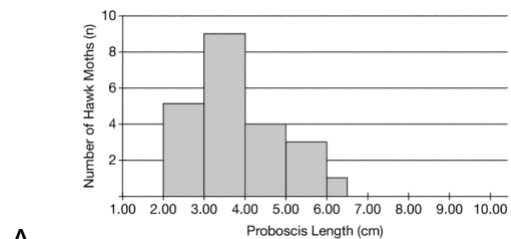


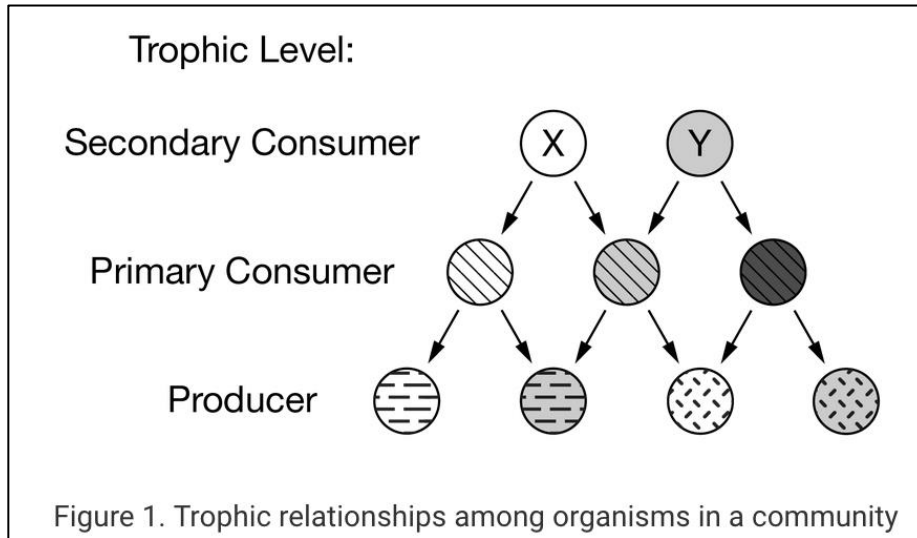
Figure 1. Proboscis length distribution in a population of tobacco hawk moths

8. Tobacco hawk moths, *Manduca sexta*, feed exclusively on sugar-rich nectar produced in the flowers of tobacco plants. To feed, the moth inserts its proboscis (a long, tubular mouthpart) into the flower to reach the nectary, which is usually at the end of a long tube in the flower. Moths will feed on the nectar of the tobacco plant species whose nectaries they can access. A study determined the proboscis sizes in one tobacco hawk moth population. The data are shown in Figure 1. The most abundant tobacco species in the population's habitat has a nectary tube that is 5 cm long.

Over the next year, a virus attacks and rapidly kills almost all plants of the tobacco species. A closely related species of tobacco that is resistant to the virus becomes established during that same year. The nectary tube in the resistant species averages 7.5cm. Scientists monitored the area for the next five years to determine how this change affected the moth population.

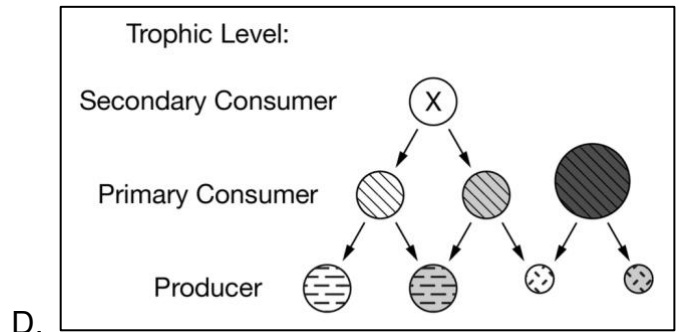
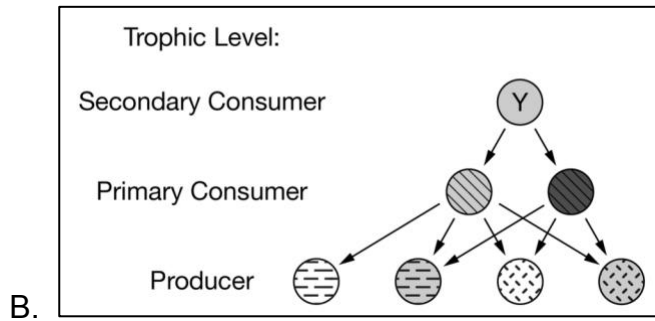
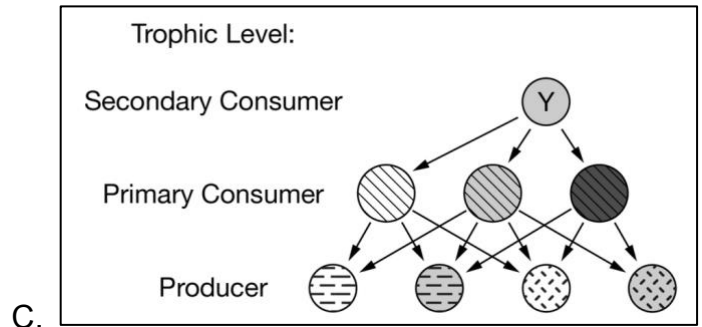
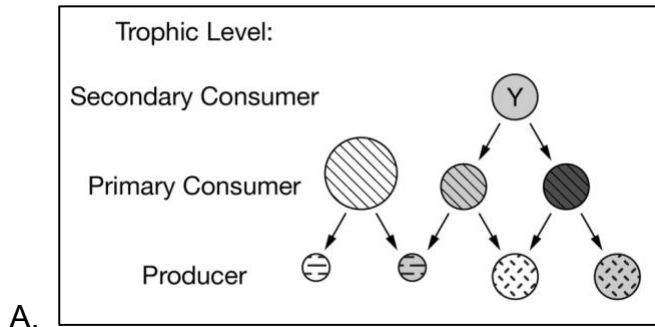
Which of the following best describes the expected distribution of proboscis size of the moths at the end of the five-year study?





9. Figure 1 shows a food web that describes the relationships within a community containing nine species. Each circle represents a separate species. The size of the circle represents the population size of the species relative to other species in the same trophic level.

Based on the information in Figure 1, which of the following best predicts a short-term effect of removing secondary consumer X from the community?



10. Cycloheximide (CHX) is a eukaryote protein synthesis inhibitor. It is used in biomedical research to inhibit protein synthesis in eukaryotic cells studied *in vitro*. Its effects are rapidly reversed by simply removing it from the culture medium.

In a translation experiment using a fungus culture, radiolabeled amino acids were added to the culture, allowing the researchers to measure the growth of a single polypeptide chain by measuring counts per minute (CPM). As the chain grew, the CPM increased. After a certain amount of time, CHX was added to the mixture, and the experiment continued. After an additional amount of time, the CHX was removed from the culture medium.

Which of the graphs best predicts the data collected during the experiment?

