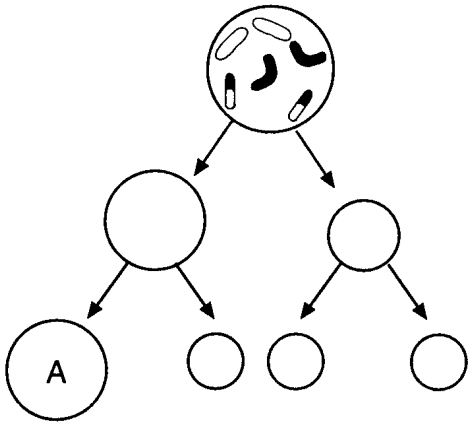
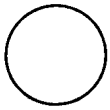
1. An incomplete diagram of meiosis in the ovary of an animal is shown below.



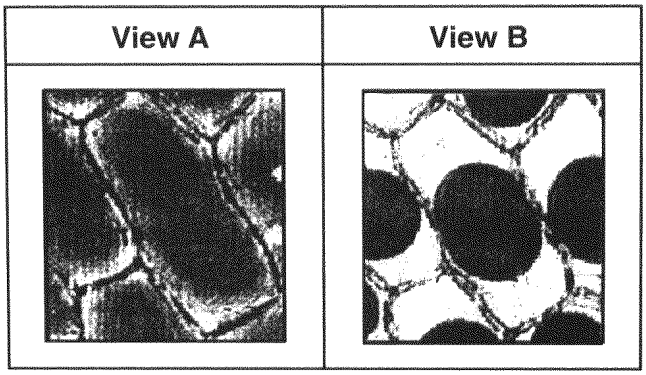
Answer Space



In the answer space at the right, draw in the chromosomes of cell *A*. Your drawing should show the usual result of the process of meiosis.

Base your answers to questions **2** through **4** on on the information and diagram below.

A student prepared a wet-mount slide of red onion skin and observed it under high power of a compound light microscope (view A). After adding a substance to the slide and waiting one minute, the student observed that there were changes in the cells (view *B)*.



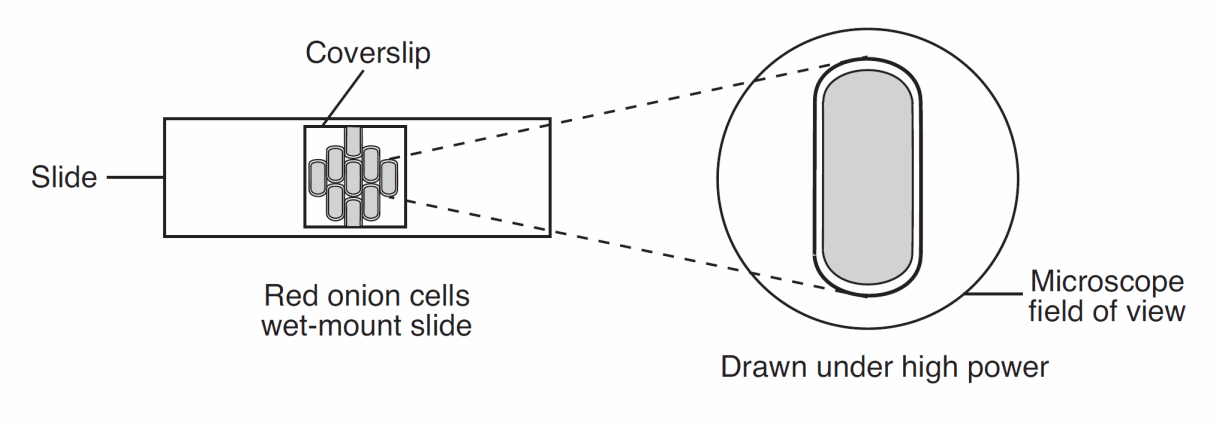
2. Identify *one* substance that could have been added to the cells on the slide in view A that would make them resemble the cells observed in view *B*.

3. Identify the specific substance that diffused to cause the change in appearance from view A to view *B*.

4. In the box above, sketch how view *B* would appear when viewed under lower power of the same compound light microscope.

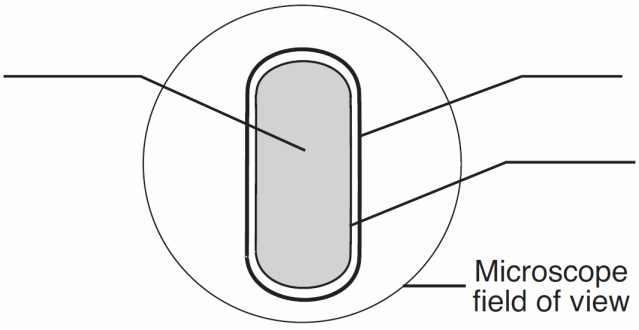
Base your answers to questions **5** through **7** on the information below and on your knowledge of biology.

A wet-mount slide of red onion cells is studied using a compound light microscope. A drawing of one of the cells as seen under high power is shown below.



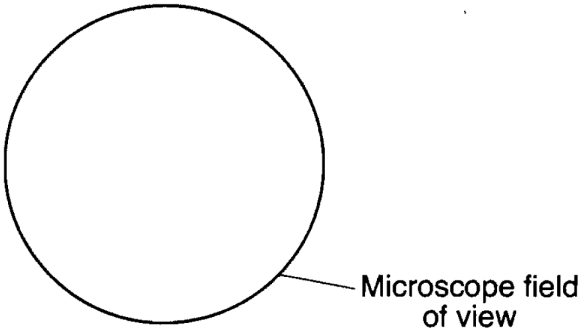
5. On the diagram below, label the location of each of the cell structures listed.

cell wall
cytoplasm
cell membrane



6. Describe the proper way to add a saltwater solution to the cells without removing the coverslip.

7. In the space below, sketch how the cell would look after the saltwater solution is added to it.



Base your answers to questions **8** through **10** on the information below and on your knowledge of biology.

Proteins on the surface of a human cell and on a bird influenza virus are represented in the diagram below.

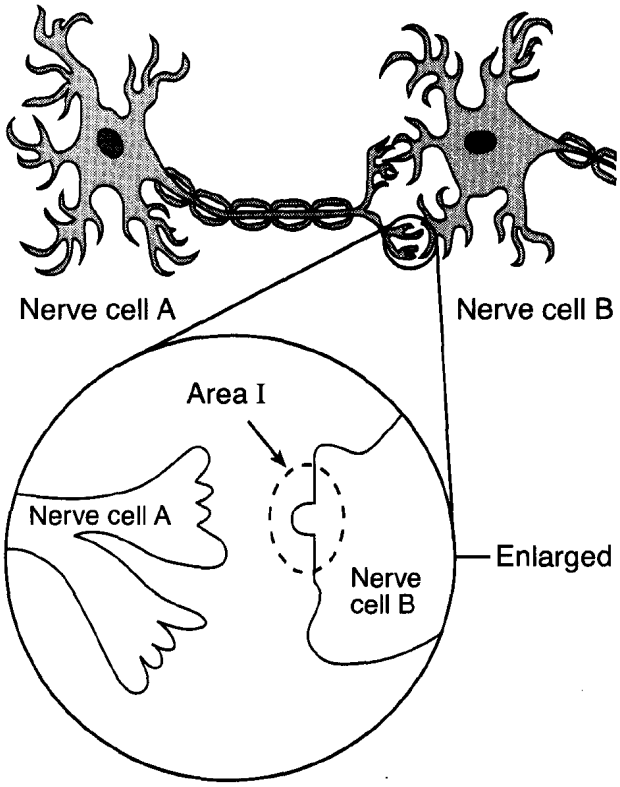
8. In the space below, draw a change in the bird influenza virus that would allow it to infect this human cell.

9. Explain how this change in the virus could come about.

10. Identify the relationship that exists between a virus and a human when the virus infects the human.

_____

Base your answers to questions **11** through **14** on the diagram of nerve cells below and on your knowledge of biology.



11 In the space below, sketch a chemical that might be released from nerve cell *A* and be connect to area I of nerve cell *B*.

12 Identify *one* substance, other than the secretions from nerve cells, used in cell communication.

13. Describe what would happen if a drug molecule shaped like ☐ were introduced into this nerve pathway.

14. In the space below, sketch a chemical molecule that might be released from nerve cell *A* and be recognized and bind to area I of nerve cell *B*.

Base your answers to questions **15** through **19** on the information below and on your knowledge of biology. The average level of carbon dioxide in the atmosphere has been measured for the past several decades. The data collected are shown in the table below.

0002330

Average CO_2 Levels in the Atmosphere

Year	CO_2 (in parts per million)
1960	320
1970	332
1980	350
1990	361
2000	370

15. Identify *one* specific human activity that could be responsible for the change in carbon dioxide levels from 1960 to 2000.

16. Using the information in the data table, construct a line graph on the grid on the next page, following the directions below.

    Mark an appropriate scale on each labeled axis.

17. Plot the data on the grid. Surround each point with a small circle and connect the points. image>0002329/image>

18. State *one* possible *negative* effect this change in CO_2 level has had on the environment of Earth.

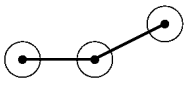
19. Calculate the net change in CO_2 level in parts per million (ppm) during the years 1960 through 2000.

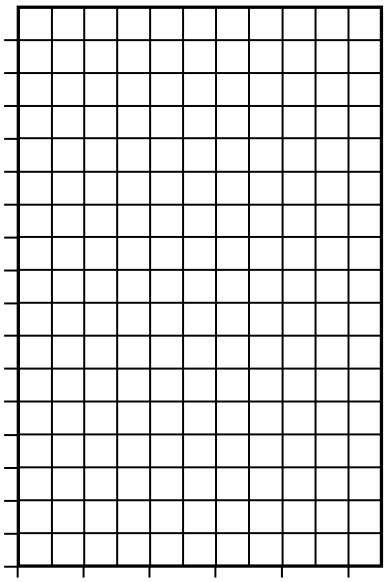
Base your answers to questions **20** and **21** on the information below and on your knowledge of biology.

An investigation was carried out to measure the rate of activity of catalase, an enzyme that breaks down hydrogen peroxide. Five 40-mL solutions of the enzyme at concentrations of 20%, 40%, 60%, 80%, and 100% were prepared. A filter paper disk was placed in each enzyme solution. Each soaked disk from the different enzyme concentrations was then added to different cups containing 30 mL of 1% hydrogen peroxide. The rate of catalase activity was inferred from measurements of how fast the disks rose from the bottom to the top of each cup. The following data were obtained: 40%–12.1 seconds, 80%–5.8 seconds, 100%–4.1 seconds, 20%–15.8 seconds, and 60%–9.9 seconds.

Enzyme Concentration (percent)	

Example:





Percentage of Catalase

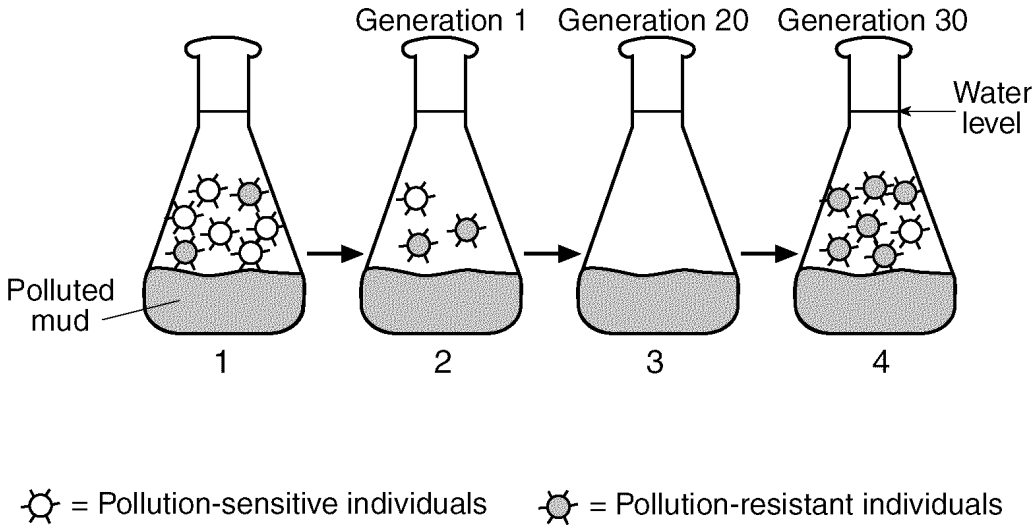
20. *a* Label the second column of the data table with an appropriate heading and record that label on the *y*-axis of the graph. [Be sure to include units.]
b Complete the data table so that the percent enzyme increases from the top to the bottom of the table.
c Mark an appropriate scale on each axis.
d Plot the data from your data table. Surround each point with a small circle and connect the points.

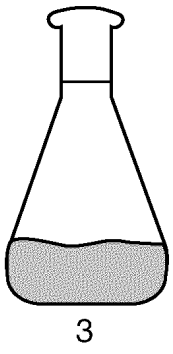
21. State *one* valid conclusion that relates enzyme concentration to reaction rate.

Base your answers to questions **22** and **23** on the information below.

Over the last 30 years, a part of the Hudson River known as Foundry Cove has been the site for many factories that have dumped toxic chemicals into the river. Some of these pollutants have accumulated in the mud at the bottom of the river. The polluted cove water contains many single-celled organisms and simple multicellular animals. Curiously, when the same species from nearby regions with nonpolluted sediments are moved to the polluted cove water, they die.

Scientists hypothesized that the organisms living in the cove have evolved so that they are able to survive in polluted water. To test this hypothesis, biologists tried to duplicate the history of the cove in the laboratory. They took a large number of one species of simple animal from a cove with unpolluted mud and placed them in a flask that contained polluted mud from Foundry Cove (diagram 1). Most of the animals died, but a few survived (diagram 2). The scientists then bred the survivors with each other for several generations producing offspring that were descendants of the survivors. When placed in Foundry Cove, most of these descendants survived. The diagrams below represent the steps in this investigation.





22. On the diagram of the flask above, sketch the animals that would be present in flask 3 after several generations of breeding in the laboratory.

23. Explain how the simple animals of Foundry Cove adapted to the polluted water. Your answer must include an explanation of the role of *three* of the following in this process.

- environment
- genetic variation
- selection
- reproduction
- survival of the fittest

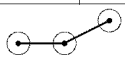
Base your answers to questions **24** through **28** on the information and data table below and on your knowledge of biology.

The results of blood tests for two individuals are shown in the data table below. The blood glucose level before breakfast is normally 80–90 mg/100 mL of blood. A blood glucose level above 110 mg/100 mL of blood indicates a failure in a feedback mechanism.

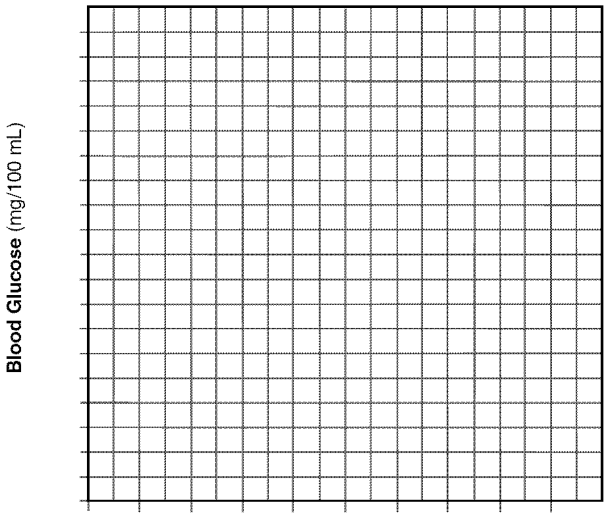
Injection of chemical X, a chemical normally produced in the body, may be required to correct this problem.

Data Table

Time	**Blood Glucose** (mg/100 mL)	
	Individual 1	**Individual 2**
7:00 a.m.	90	150
7:30 a.m.	120	180
8:00 a.m.	140	220
8:30 a.m.	110	250
9:00 a.m.	90	240
9:30 a.m.	85	230
10:00 a.m.	90	210
10:30 a.m.	85	190
11:00 a.m.	90	170

Example: 

Blood Glucose Levels



24. Using the information in the data table, construct a line graph on the grid provided above. Mark an appropriate scale on each labeled axis.

25. Plot the blood glucose levels for the individual who will most likely need injections of chemical X. Surround each point with a small circle and connect the points.

26. Identify chemical X.

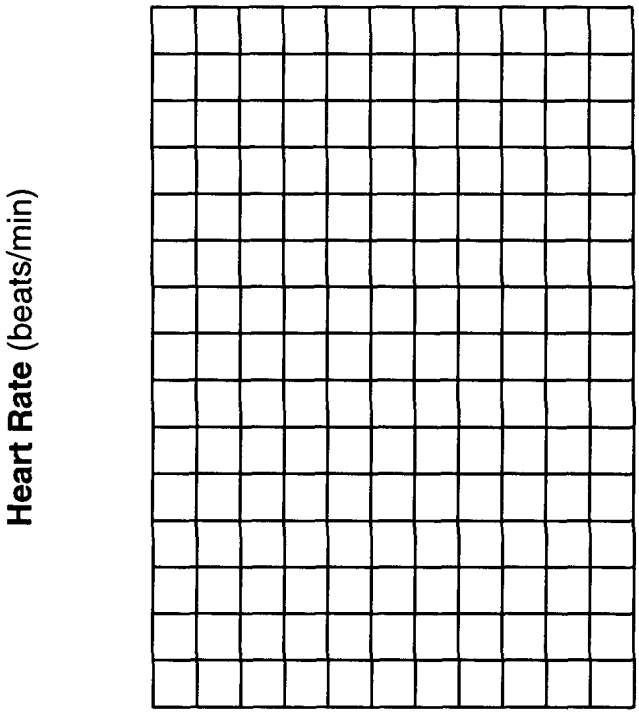
27. State *one* reason for the change in blood glucose level between 7:00 a.m. and 8:00 a.m.

28. What term refers to the relatively constant level of blood glucose of individual 1 between 9:00 a.m. and 11:00 a.m.?

Base your answers to questions **29** through **33** on the information below and on your knowledge of biology.

A student performed a laboratory investigation to determine the effect of temperature on the heart rate of Daphnia (water flea). The following temperatures and heart rates were recorded:

20°C—270 beats/min; 10°C—150 beats/min;
15°C—180 beats/min; 25°C—300 beats/min;
5°C—108 beats/min



Data Table

Temperature (°C)	**Heart Rate** (beats/min)

29. Which number indicates an acidic pH?

A) 14 B) 12 C) 3 D) 7

30. During which temperature interval did the greatest change in heart rate occur?

A) 5–10°C B) 10–15°C C) 15–20°C D) 20–25°C

31. Organize the data by filling in the data table. Complete both columns in the data table so that the temperature either increases or decreases from the top to the bottom of the table.

32. Mark an appropriate scale on each labeled axis.

33. Plot the data from your data table. Surround each point with a small circle and connect the points.

Base your answers to questions **34** through **38** on the passage and data table below and on your knowledge of biology.

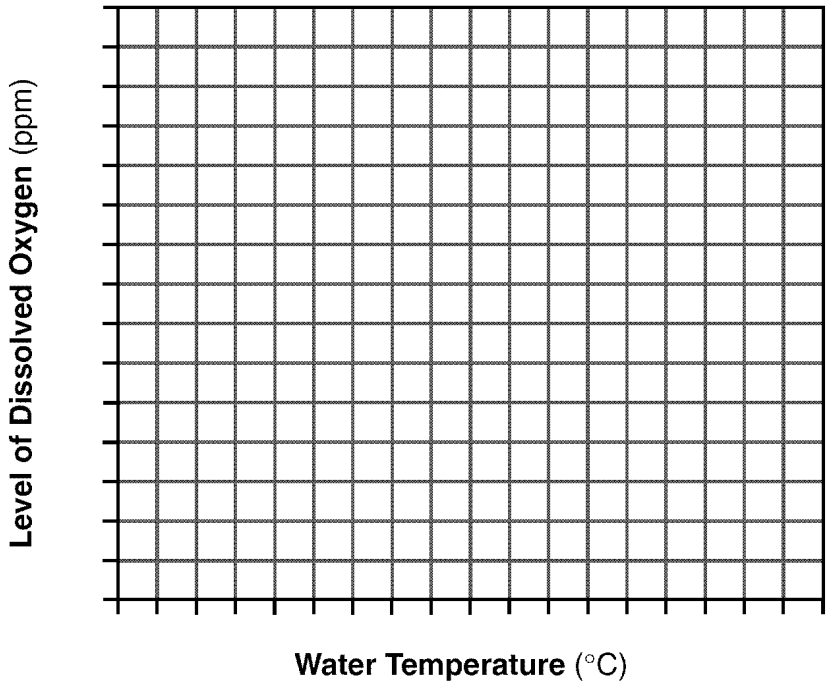
The amount of oxygen gas dissolved in water is important to the organisms that live in a river. The amount of dissolved oxygen varies with changes in both physical factors and biological processes. The temperature of the water is one physical factor affecting dissolved oxygen levels as shown in the data table below. The amount of dissolved oxygen is expressed in parts per million (ppm).

Dissolved Oxygen Levels at Various Temperatures

Water Temperature (°C)	Level of Dissolved Oxygen (ppm)
1	14
10	11
15	10
20	9
25	8
30	7

Dissolved Oxygen Levels at Various Temperatures

Example:



34. Mark an appropriate scale on each labeled axis.

35. Plot the data for dissolved oxygen on the grid. Surround each point with a small circle and connect the points, as shown in the example.

36. If the trend continues as shown in the data, what would the dissolved oxygen level most likely be, in parts per million, if the temperature of the water was 35°C?

37. State the relationship between the level of dissolved oxygen and water temperature.

38. Identify *one* physical or biological process taking place within the river, other than temperature change, that would affect the level of dissolved oxygen and state whether this process would increase or decrease the level of dissolved oxygen.

Base your answers to questions **39** through **43** on on the information and data table below and on your knowledge of biology.

The effect of temperature on the action of pepsin, a protein-digesting enzyme present in stomach fluid, was tested. In this investigation, 20 milliliters of stomach fluid and 10 grams of protein were placed in each of five test tubes. The tubes were then kept at different temperatures. After 24 hours, the contents of each tube were tested to determine the amount of protein that had been digested. The results are shown in the table below.

Protein Digestion at Different Temperatures

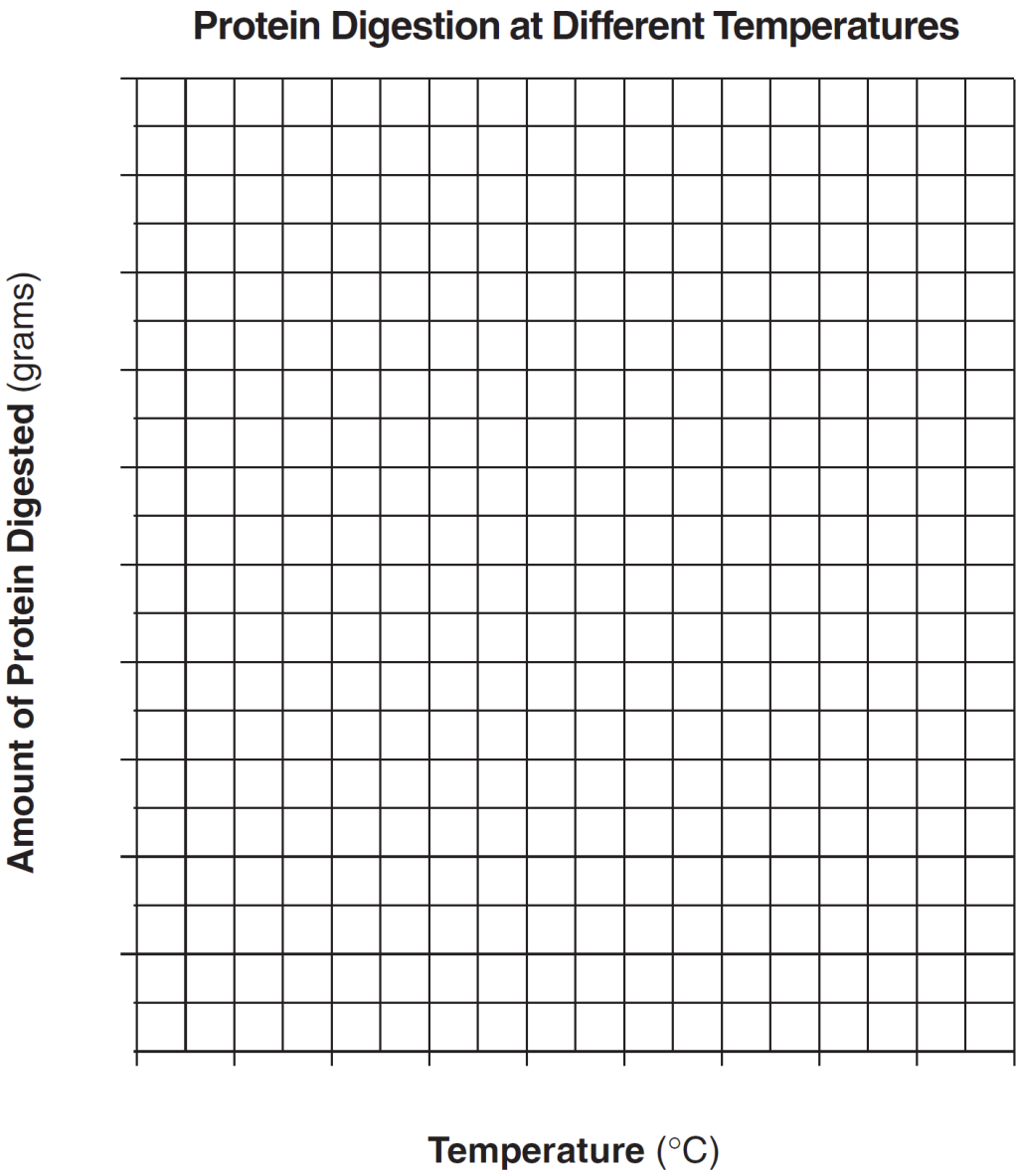
Tube #	**Temperature** (°C)	**Amount of Protein Digested** (grams)
1	5	0.5
2	10	1.0
3	20	4.0
4	37	9.5
5	85	0.0

39. The dependent variable in this investigation is the

A) size of the test tube
B) time of digestion
C) amount of stomach fluid
D) amount of protein digested

40. Mark an appropriate scale on each axis.

41. Plot the data on the grid. Surround each point with a small circle and connect the points as shown on the diagram.



42. If a sixth test tube identical to the other tubes was kept at a temperature of 30°C for 24 hours, the amount of protein digested would most likely be

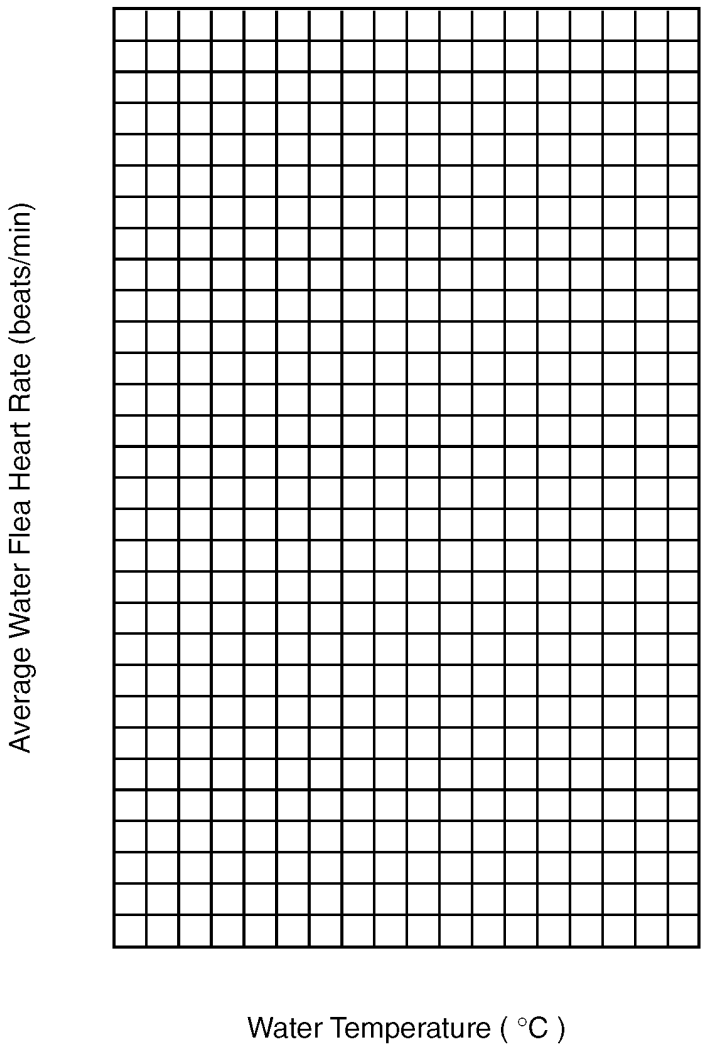
A) less than 1.0 gram
B) between 1.0 and 4.0 grams
C) between 4.0 and 9.0 grams
D) more than 9.0 grams

43. This investigation was repeated using 10 grams of starch instead of protein in each test tube. The contents of each tube were tested to determine the amount of starch that had been digested. The test results showed that no starch digestion occurred. Explain why no starch was digested.

Base your answers to questions **44** through **46** on the information below and on your knowledge of biology.

Three students each added equal volumes of pond water to four beakers and placed each beaker in a different water bath. Each student maintained the water baths at temperatures shown in the data table. The students then added an equal number of water fleas to each of their four beakers. After one hour, the students used microscopes to determine the average heart rate of the water fleas. The procedure was repeated for a total of three trials at each temperature. The results of the investigation are summarized in the data table.

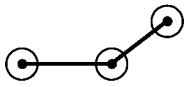
The Effect of Temperature on Water Flea Heart Rate



Water Flea Heart Rate

Water Temperature (°C)	Average Water Flea Heart Rate (beats/minute)
5	40
15	119
25	205
35	280

Example:



44. *a* Mark an appropriate scale on each labeled axis.
b Plot the data for the average heart rate on the grid. Surround each point with a small circle and connect the points.

45. The independent variable in this investigation is the

A) number of trials
B) number of water fleas
C) temperature of the water
D) average heart rate

46. State the relationship between temperature and heart rate in water fleas.