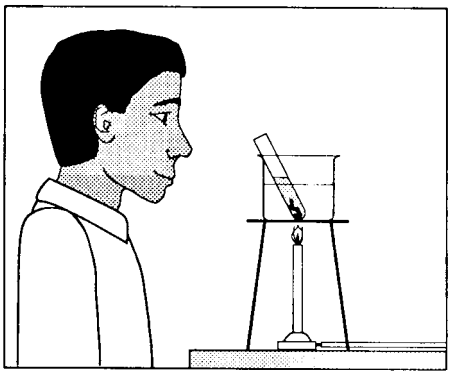
**Directions:** Answer the following questions. Record your answers on the answer sheet provided. Only answer on the answer sheet will be graded!

1. Base your answer on the diagram below and on your knowledge of biology.



Which statement describes *two* unsafe laboratory practices represented in the diagram?

1) The opening of the test tube is pointed toward the student and the student is not wearing goggles.
2) The beaker has water in it and the flame is under the tripod.
3) The test tube is unstoppered and the student is not wearing goggles.
4) The flame is too high and the test tube is unstoppered.

2. The directions for a laboratory activity call for 50 milliliters (ml) of solution *A*. A student accidentally takes 55 ml from the stock bottle. What should the student do with the extra 5 ml of solution *A*?

1) Dilute the extra 5 ml with 100 ml of water and pour it down the drain.
2) Pour the extra 5 ml down the drain and rinse the sink with cold water.
3) Set the extra 5 ml aside in a labeled beaker and ask the teacher for advice.
4) Return the extra 5 ml to the stock bottle and replace the cap.

3. Base your answer to the following question on the information below and on your knowledge of biology.

An experiment was designed to determine if chlorophyll is responsible for the growth of corn seedlings toward light. In the experiment, equal numbers of albino corn seedlings and green corn seedlings were grown at a temperature of 24°C. All other environmental conditions were the same for both groups of seedlings. The results of the experiment showed that both the albino seedlings and the green seedlings bent toward light.

Which hypothesis is being tested in this experiment?

1) Albino corn seedlings grow as fast as green corn seedlings.
2) Differences in genotypes produce variations in corn phenotypes.
3) Chlorophyll is needed for corn seedlings to grow toward light.
4) Light is required for germination of corn.

4. Diagrams, tables, and graphs are used by scientists mainly to

1) test a hypothesis
2) predict the independent variable
3) design a research plan for an experiment
4) organize data

5. The analysis of data gathered during a particular experiment is necessary in order to

1) design a control for that experiment
2) draw a valid conclusion for that experiment
3) formulate a hypothesis for that experiment
4) develop a research plan for that experiment

6. How does the control setup in an experiment differ from the other setups in the same experiment?

1) It utilizes a different method of data collection.
2) It differs in the one variable being tested.
3) It tests a different hypothesis.
4) It has more variables.

7. A student hypothesized that lettuce seeds would not germinate (begin to grow) unless they were covered with soil. The student planted 10 lettuce seeds under a layer of soil and scattered 10 lettuce seeds on top of the soil. The data collected are shown in the table below.

**Data Table**

| Seed Treatment | Number of Seeds Germinated |
|---|---|
| Planted under soil | 9 |
| Scattered on top of soil | 8 |

To improve the reliability of these results, the student should

1) repeat the experiment using a larger sample size
2) revise the hypothesis
3) conclude that light is necessary for lettuce seed germination
4) conclude that darkness is necessary for lettuce seed germination

8. Based on experimental results, a biologist in a laboratory reports a new discovery. If the experimental results are valid, biologists in other laboratories should be able to perform

1) an experiment with a different variable and obtain the same results
2) the same experiment and obtain the same results
3) the same experiment and obtain different results
4) an experiment under different conditions and obtain the same results

9. The current knowledge concerning cells is the result of the investigations and observations of many scientists. The work of these scientists forms a well-accepted body of knowledge about cells. This body of knowledge is an example of a

1) hypothesis
2) theory
3) research plan
4) controlled experiment

10. A new drug for the treatment of asthma is tested on 100 people. The people are evenly divided into two groups. One group is given the drug, and the other group is given a glucose pill. The group that is given the glucose pill serves as the

1) indicator
2) limiting factor
3) experimental group
4) control

11. A student performed an experiment to determine if treating 500 tomato plants with an auxin (a plant growth hormone) will make them grow faster. The results are shown in the table below.

| Days | Average Stem Height (cm) |
|---|---|
| 1 | 10 |
| 5 | 13 |
| 10 | 19 |
| 15 | 26 |
| 20 | 32 |
| 25 | 40 |

Explain why the student can *not* draw a valid conclusion from these results.

12. In an investigation designed to determine the effect of the amount of water on plant growth, two groups of equal-sized bean plants of the same species were grown under identical conditions, except for the amount of water they were given. One group was watered with 200 milliliters of water once a day, while the other group was watered with 400 milliliters of water once a day. After several days, the heights of the plants were measured. It was determined that the plants watered with 400 milliliters of water once a day showed more growth.

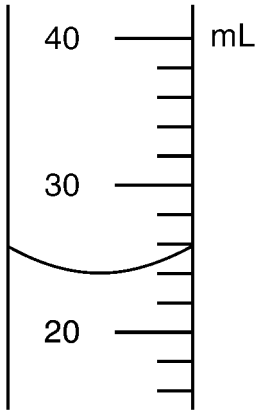
The variable in this investigation is the

1) group of bean plants watered with 200 ml of water
2) type of bean plants used in the experiment
3) amount of water given the plants each day
4) type of soil the bean plants were growing in

13. Which procedure is the most acceptable method for obtaining the accurate weight of a specimen in a laboratory experiment?

1) Make sure the balance weighs accurately before starting the measurement, and then record the weight for three trials and average the results.
2) Determine the weight of the specimen using one balance, and then measure the weight again using a different balance.
3) Have two classmates use different balances to determine the weight of the specimen, and average the values they obtain.
4) Readjust the balance after weighing the specimen, and then weigh the specimen again.

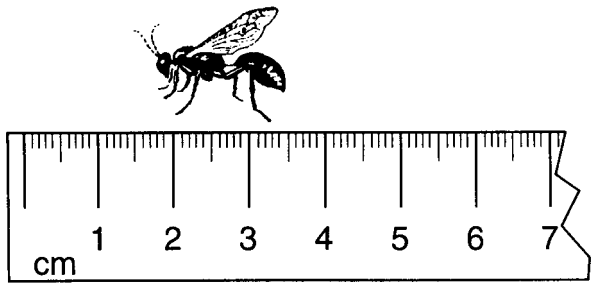
14. The diagram below shows a portion of a graduated cylinder.




What is the volume of the liquid in this cylinder?

1) 25 mL
2) 26 mL
3) 24 mL
4) 22 mL

15. The diagram below shows a wasp positioned next to a centimeter ruler.



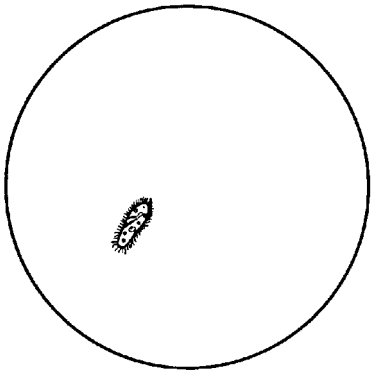

What is the approximate length of a wing of this wasp?

1) 1.0 mm
2) 1.4 cm
3) 3.5 cm
4) 35 mm

16. Which part of a microscope should be used with the low-power objective, but *not* with the high-power objective?

1) ocular
2) fine adjustment
3) diaphragm
4) coarse adjustment

17. Base your answer to the following question on the diagram below of a single-celled organism observed by a student using the low-power objective of a microscope.



As the student observes the organism under the high-power objective, the organism swims out of focus. To bring it back into focus, the student should

1) open the diaphragm
2) turn the fine adjustment
3) turn the ocular
4) adjust the light source

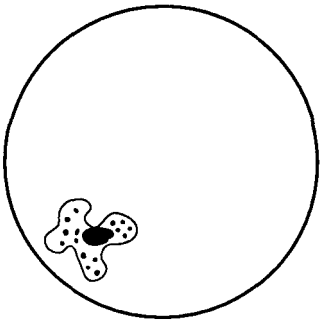
18. Which part of a compound light microscope should a student adjust to allow more light to pass through a specimen?

1) ocular
2) diaphragm
3) fine adjustment
4) stage

19. A transparent metric ruler is placed on the stage of a microscope and observed under low power. The diameter of the field of vision was found to be 2 millimeters. How many micrometers is the diameter?

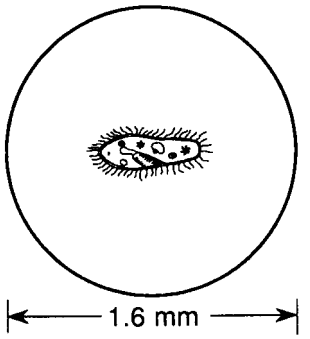
1) 2,000
2) 1,000
3) 200
4) 10

20. A student observed an ameba in the field of view of a compound light microscope as shown in the diagram below.



On the diagram, draw an arrow to indicate the direction the ameba would move if the student moved the slide on the stage to the left and down.

21. Base your answer to the following question on the diagram below, which represents a paramecium observed by a student using the low power objective (100×) of a compound light microscope.



Microscope Field of View

The approximate length of the paramecium is

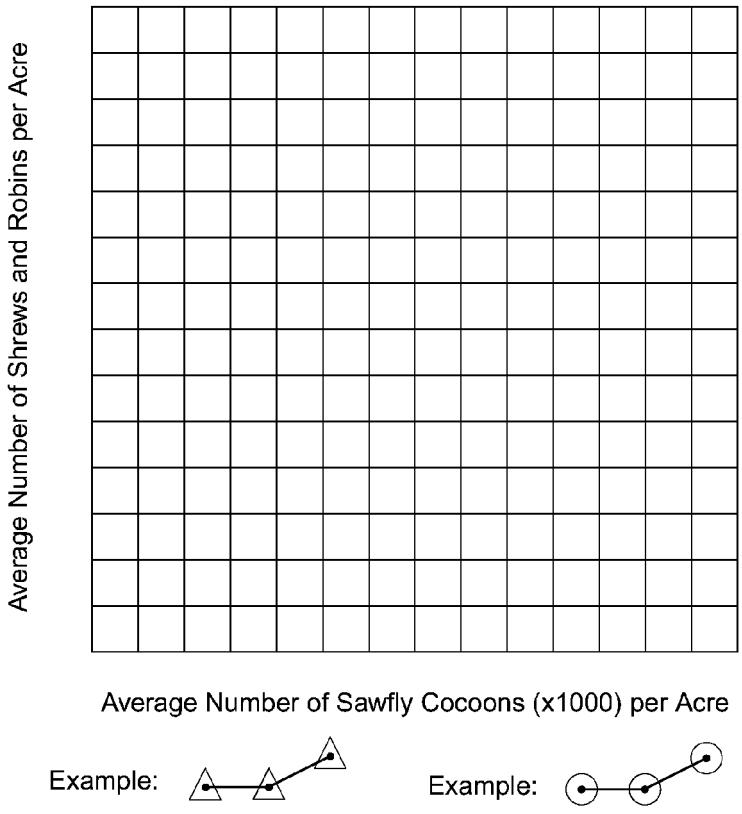
1) 160 μm
2) 300 μm
3) 40 μm
4) 700 μm

22. Base your answer to the following question on the information below.

An insect known as a sawfly is found in evergreen forests in North America. Sawfly cocoons are the main source of food for shrews (small mammals) and some bird species. Scientists studied 1-acre plots in various parts of a state to determine the average number of sawfly cocoons, shrews, and robins. The data collected are shown in the table below.

**Data Table**

| **Average Number of Sawfly Cocoons per Acre** (in thousands) | **Average Number of Shrews per Acre** | **Average Number of Robins per Acre** |
|---|---|---|
| 100 | 5.0 | 0 |
| 300 | 7.5 | 0.5 |
| 600 | 19.0 | 0.8 |
| 900 | 23.5 | 1.0 |
| 1200 | 23.5 | 1.3 |




*a* Mark an appropriate scale on each axis.

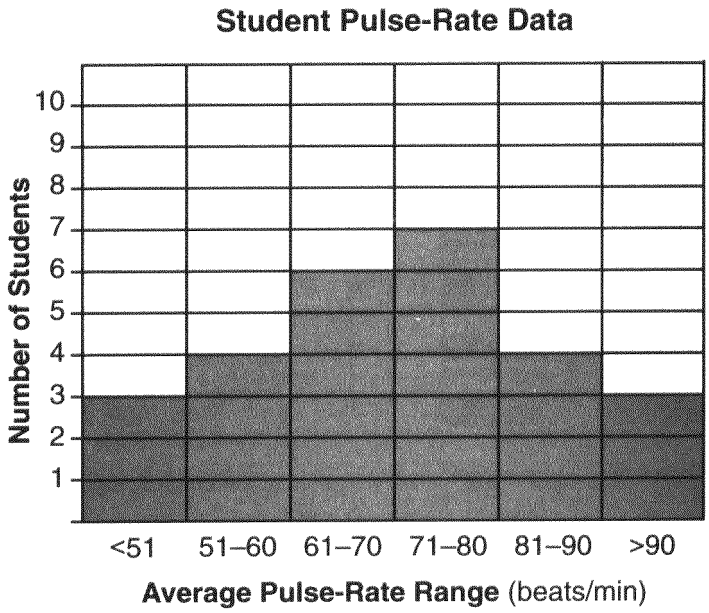
*b* Plot the data for shrews. Surround each point with a small circle and connect the points.

*c* Plot the data for robins. Surround each point with a small triangle and connect the points.

23. What is the average number of shrews per acre when the average number of sawfly cocoons is 500,000?

Base your answers to questions **24** and **25** on the information and graph below and on your knowledge of biology.

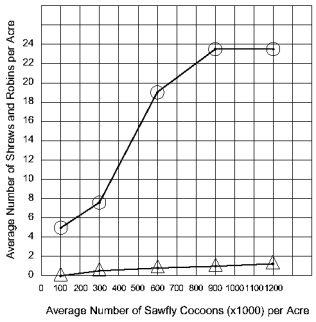
Pulse-rate data were collected from some students during their lunch time for the lab activity, Making Connections. The data are represented in the histogram below.




24. The histogram includes data from a total of how many students?
    1) 6 2) 10 3) 7 4) 27

25. State one way the data would most likely be different if the pulse rates were collected immediately after exercising instead of during lunch.

**Answer Key**

1. 1
2. 3
3. 3
4. 4
5. 2
6. 2
7. 1
8. 2
9. 2
10. 4
11. *Examples*: — There is no control group. — There is no basis for comparison. — There is no data on "normal" growth.
12. 3
13. 1
14. 3
15. 2
16. 4
17. 2
18. 2
19. 1
20. Moves to the right and up.
21. 4
22. 

23. 15 ) 1
24. 4
25. *Examples:* – The average pulse rate would be higher. – Increased activity causes an increase in pulse.

Name _____ Class _____ Date _____

1. _____

2. _____

3. _____

4. _____

5. _____

6. _____

7. _____

8. _____

9. _____

10. _____

11.

12. _____

13. _____

14. _____

15. _____

16. _____

17. _____

18. _____

19. _____

20.

Name _____ Class _____ Date _____

21. _____

22. Diagram on Separate Sheet

23.

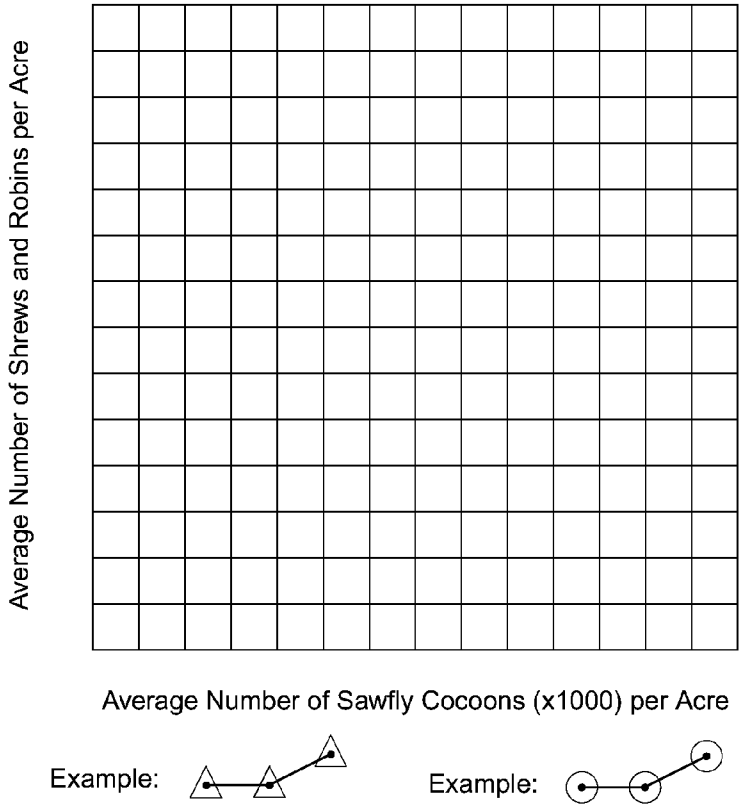
24. _____

25.

22.

**Data Table**

| **Average Number of Sawfly Cocoons per Acre** (in thousands) | **Average Number of Shrews per Acre** | **Average Number of Robins per Acre** |
|---|---|---|
| 100 | 5.0 | 0 |
| 300 | 7.5 | 0.5 |
| 600 | 19.0 | 0.8 |
| 900 | 23.5 | 1.0 |
| 1200 | 23.5 | 1.3 |




Example: 

Example: 