1. When heating a solution in a test tube, a student should
   1) point the test tube in any direction
   2) hold the test tube with two fingers
   3) cork the test tube
   4) wear goggles

2. Chlorophyll can be removed from leaves by boiling them in alcohol, a flammable solvent. In addition to wearing safety goggles, which is the safest procedure to follow?
   1) A stoppered test tube of leaves and alcohol should be held over a Bunsen burner.
   2) A stoppered test tube of leaves and alcohol should be placed into a beaker of alcohol on a tripod over a Bunsen burner.
   3) A beaker of leaves and alcohol should be placed on a tripod over a Bunsen burner.
   4) A beaker of leaves and alcohol should be placed into a larger beaker of water and heated on a hot plate.

3. Base your answer to the following question on 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 flame is too high and the test tube is unstoppered.
2) The opening of the test tube is pointed toward the student and the student is not wearing goggles.
3) The test tube is unstoppered and the student is not wearing goggles.
4) The beaker has water in it and the flame is under the tripod.

Base your answers to questions 4 and 5 on the information below, and on your knowledge of biology.

An experiment was carried out to answer the question "Does the pH of water affect the growth of radish plants?" Two groups of ten radish plants were set up. One group was watered with water having a pH of 3.0, and the other group was watered with water having a pH of 7.0. Both groups of plants received the same amount and intensity of light, the same amount of water, and they were grown in the same type of soil. The heights of the radish plants were measured every 2 days for a period of 2 weeks.

4. What was the dependent variable in this experiment?

1) heights of the plants
2) pH of the water
3) temperature of the water
4) type of soil
5. Which sentence is a possible hypothesis that was tested in this experiment?

1) Does the pH of water affect the growth of radish plants?
2) Will the amount of water alter the heights of the radish plants?
3) The temperature of the water will affect the heights of the radish plants.
4) The pH of the water will affect the heights of the radish plants.

6. An investigation was carried out to determine which of three antibacterial soaps is most effective. Four petri dishes labeled A, B, C, and D were set up. The same amount and type of bacteria was added to each dish. Next, 2 mL of a different brand of soap were added to dishes B, C, and D. Then, 2 mL of water were added to dish A, instead of soap. The dishes were incubated at 37°C for 24 hours. At the end of the investigation, the amount of bacteria in each dish was determined. Dish D had the least bacteria. It was concluded that the soap in dish D was the most effective soap to use against bacteria.

Which statement best describes the validity of this conclusion?

1) sample of bacteria was used in this investigation.
2) The conclusion is valid since too small
3) The conclusion is valid since the amounts of bacteria were measured at the end of the investigation.
4) The conclusion might not be valid since the investigation was carried out only once.
7. Base your answer to the following question on the information below and on your knowledge of biology.

Euglena are single-celled organisms that live in ponds. All euglena have chloroplasts and can make their own food. They can also take in food from the environment. The diagram below represents a euglena.

An experiment was set up to determine the effect of nitrates, a pollutant, on the number of chloroplasts present in euglena. Five tanks were set up, each with euglena and a different concentration of nitrate solution: 0%, 0.5%, 1.0%, 1.5%, and 2.0%.

The tanks were placed in a sunny location where each tank received the same amount of light.

Which statement correctly identifies a variable in this experiment?

1) The independent variable is the concentration of nitrate solution used.
2) The dependent variable is the number of euglena placed in the tanks.
3) The independent variable is the amount of sunlight.
4) The dependent variable is the number of tanks used.

8. An experiment was carried out to determine whether drinking caffeinated soda increases pulse rate. The pulse rates of two groups of people at rest were measured. Group A was then given caffeinated soda and group B was given caffeine-free soda. One hour after drinking the soda, the pulse rates were measured. The participants in the experiment were all the same age, and they were all given the same amount of soda.

What is the dependent variable in this experiment?

1) type of soda given to each group
2) amount of soda given to each group
3) pulse rate of each group
4) age of participants in each group

9. How does the CONTROL GROUP setup in an experiment differ from the other setups in the same experiment?

1) It tests a different hypothesis.
2) It has more variables.
3) It does not receive the experimental treatment (Independent Variable).
4) It utilizes a different method of data collection.

10. Which statement describes the best procedure to determine if a vaccine for a disease in a certain bird species is effective?

1) Vaccinate 100 birds and expose all 100 to the disease.
2) Vaccinate 100 birds and expose only 50 of them to the disease.
3) Vaccinate 50 birds, do not vaccinate 50 other birds, and expose all 100 to the disease.
4) Vaccinate 50 birds, do not vaccinate 50 other birds, and expose only the vaccinated birds to the disease.
In an experiment using chicken eggs, 100 fertilized eggs were injected with a saline (salt) solution containing vitamin B during day 1 of their incubation period. At the same time, a second group of 100 fertilized eggs was injected with plain saline solution. All the chicks that hatched on the 21st day were weighed and measured at hatching. The results are recorded in the data table below.

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Number of Eggs Hatched on the 21st Day</th>
<th>Average Weight of Chicks at Hatching (g)</th>
<th>Average Leg Length at Hatching (cm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vitamin B Injection</td>
<td>91</td>
<td>50</td>
<td>3.2</td>
</tr>
<tr>
<td>Saline Injection</td>
<td>66</td>
<td>35</td>
<td>1.5</td>
</tr>
</tbody>
</table>

11. The purpose of injecting the second group of eggs with plain saline solution is to

1) produce disease-resistant chicks
2) **provide a control for the experiment**
3) encourage the growth of larger eggs
4) increase the number of fertilized eggs

12. According to the data in the table, one effect of injecting vitamin B into chicken eggs is that it

1) changes the amount of yolk stored in the egg
2) produces larger eggs
3) **increases the number of eggs hatching on the 21st day**
4) increases the incubation period

13. In an experiment, what should be the relationship between the control group and the experimental group?

1) They should be different in size
2) They should resemble each other in at least two respects
3) They should not be similar in any respect
4) **They should be identical in all respects except one**

14. One hundred laboratory rats were used in a controlled study to determine the effect of aspirin on the frequency of heart attacks. Fifty rats were each given a daily injection containing 5.0 milligrams of aspirin for a period of 1 year. On a daily basis each of the other 50 rats would most likely receive an

1) oral dose of 100 mg of aspirin
2) **injection of 5.0 mg of water**
3) injection of 100 mg of aspirin
4) oral dose of 50 mg of water

15. Which statement best describes a hypothesis?

1) A hypothesis is the process of making careful observations.
2) The conclusion drawn from the results of an experiment is part of a hypothesis.
3) **A hypothesis serves as a basis for determining what data to collect when designing an experiment.**
4) The facts collected from an experiment are written in the form of a hypothesis.
16. Base your answer to the following question on An experimental setup is shown in the diagram below.

Which hypothesis would most likely be tested using this setup?

1) **Green water plants release a gas in the presence of light.**
2) Roots of water plants absorb minerals in the absence of light.
3) Green plants need light for cell division.
4) Plants grow best in the absence of light.
Diabetes is a disease characterized by consistently high blood glucose levels (at or above 126 mg/100mL) as a result of hormone deficiency. For a study of diabetes, blood glucose levels from individual A and individual B were recorded each hour over a 5-hour period following a meal. The results are shown in the data table below.

### Blood Glucose Levels (mg/100 mL)

<table>
<thead>
<tr>
<th>Hours</th>
<th>Individual A</th>
<th>Individual B</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>135</td>
<td>90</td>
</tr>
<tr>
<td>1</td>
<td>175</td>
<td>122</td>
</tr>
<tr>
<td>2</td>
<td>200</td>
<td>110</td>
</tr>
<tr>
<td>3</td>
<td>185</td>
<td>87</td>
</tr>
<tr>
<td>4</td>
<td>165</td>
<td>85</td>
</tr>
<tr>
<td>5</td>
<td>150</td>
<td>90</td>
</tr>
</tbody>
</table>
Which individual most likely has diabetes?

1) A  
2) B  
3) both A and B  
4) Neither A nor B

18. The table below shows an effect of secondhand smoke on the birth weight of babies born to husbands and wives living together during pregnancy.

<table>
<thead>
<tr>
<th>Effect of Secondhand Smoke on Birth Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wife: Nonsmoker</td>
</tr>
<tr>
<td>-----------------</td>
</tr>
<tr>
<td>Number of Couples</td>
</tr>
<tr>
<td>Average Weight of Baby at Birth</td>
</tr>
</tbody>
</table>

Based on these data, a reasonable conclusion that can be drawn about secondhand smoke during pregnancy is that secondhand smoke

1) is unable to pass from the mother to the fetus
2) slows the growth of the fetus
3) causes mutations in cells of the ovaries
4) blocks the receptors on antibody cells
19. A piece of refrigerated, cooked meat will remain safe to eat for a longer period of time than a refrigerated piece of raw meat of similar size. Which statement is a valid inference based on this information?

1) Cooking meat kills many bacteria and fungi.
2) Cool temperatures stimulate the growth of microbes on raw meat.
3) Raw meat cannot be preserved.
4) Cooked meat contains antibodies that destroy decomposers.

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

A student grew ten tomato plants from seed. After three weeks, the heights of the ten plants were measured in centimeters (cm). The results are shown below.

Tomato plant A = 5cm  Tomato plant F = 9cm
Tomato plant B = 3cm  Tomato plant G = 7cm
Tomato plant C = 3cm  Tomato plant H = 5cm
Tomato plant D = 3cm  Tomato plant I = 3cm
Tomato plant E = 5cm  Tomato plant J = 7cm

Organize the data by completing both columns in the data table below, so that the height of the plants increases from the top to the bottom of the table.

<table>
<thead>
<tr>
<th>Height of Plant (cm)</th>
<th>Number of Tomato Plants</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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Height of Tomato Plants After Three Weeks

Page 8
1. 4
2. 4
3. 2
4. 1
5. 4
6. 4
7. 1
8. 3
9. 3
10. 3
11. 2
12. 3
13. 4
14. 2
15. 3
16. 1
17. GRAPH
18. 2
19. 1

<table>
<thead>
<tr>
<th>Height of Plant (cm)</th>
<th>Number of Tomato Plants</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td>7</td>
<td>2</td>
</tr>
<tr>
<td>9</td>
<td>1</td>
</tr>
</tbody>
</table>