

1. In an appropriately designed experiment, a scientist is able to test the effect of

- A) **a single variable**                      B) multiple variables  
C) the hypothesis                          D) scientific observations

Base your answers to questions 2 and 3 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.

2. Which activity might help to increase the validity of this experiment?

- A) **repeating the experiment several times**  
B) using two different types of radish seeds in each group  
C) using the same pH for both groups of plants  
D) placing one set of plants in sunlight and one in darkness

3. What was the dependent variable in this experiment?

- A) **heights of the plants**    B) pH of the water  
C) temperature of the water    D) type of soil

4. A company that manufactures a popular multivitamin wanted to determine whether their multivitamin had any side effects. For its initial study, the company chose 2000 individuals to take one of their multivitamin tablets per day for one year. Scientists from the company surveyed the participants to determine whether they had experienced any side effects. The greatest problem with this procedure is that

- A) only one brand of vitamin was tested    B) the study lasted only one year  
C) the sample size was not large enough    D) **no control group was used**

5. 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?

- A) type of soda given to each group    B) amount of soda given to each group  
C) **pulse rate of each group**    D) age of participants in each group

6. A student conducted an experiment to determine if listening to different types of music would affect pulse rate. She thought that pulse rate would change with different types of music. Each person participating in her experiment listened to seven different selections of music for 30 seconds each. The pulse rates were taken after each 30-second interval of music. Based on her experiment, the student concluded that a person's pulse rate changed when listening to different types of music.

The component missing from this experiment is a

- A) prediction                      B) hypothesis                      C) **control group**                      D) research plan

7. Which statement about the use of independent variables in controlled experiments is correct?

- A) A different independent variable must be used each time an experiment is repeated.  
B) The independent variables must involve time.  
C) **Only one independent variable is used for each experiment.**  
D) The independent variables state the problem being tested.

8. Which procedure would most likely provide valid results in a test to determine if drug *A* would be effective in treating cancer in white mice?

- A) injecting 1 mL of drug *A* into 100 white mice with cancer
- B) injecting 1 mL of drug *A* into 100 white mice with cancer and 0.5 mL of drug *X* into 100 white mice without cancer
- C) injecting 1 mL of drug *A* into 100 white mice with cancer and 0.5 mL of drug *X* into another group of 100 white mice with cancer
- D) injecting 1 mL of drug *A* into 100 white mice with cancer and 1 mL of distilled water into another group of 100 white mice with cancer**

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

- A) Vaccinate 100 birds and expose all 100 to the disease.
- B) Vaccinate 100 birds and expose only 50 of them to the disease.
- C) Vaccinate 50 birds, do not vaccinate 50 other birds, and expose all 100 to the disease.**
- D) Vaccinate 50 birds, do not vaccinate 50 other birds, and expose only the vaccinated birds to the disease.

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

- A) It tests a different hypothesis.
- B) It has more variables.
- C) It does not receive the experimental treatment (Independent Variable).**
- D) It utilizes a different method of data collection.

11. 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

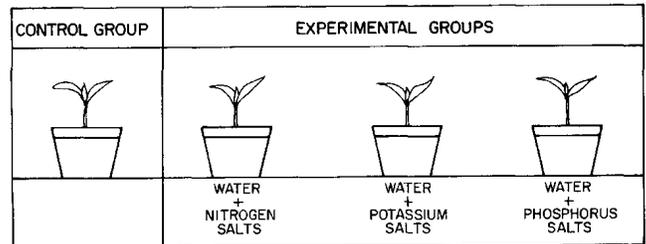
- A) type of bean plants used in the experiment
- B) amount of water given the plants each day**
- C) type of soil the bean plants were growing in
- D) group of bean plants watered with 200 ml of water

12. 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

- A) experimental group
- B) limiting factor
- C) control**
- D) indicator

Base your answers to questions **13** and **14** on the information and diagrams below and on your knowledge of biology.

An experiment was performed to determine the effect of different mineral salts on plant growth. Forty pots containing identical plants were divided into four equal groups and placed in a well-lighted greenhouse. Each pot contained a nonmineral potting medium and one plant. Materials were then added to each experimental group of pots as shown



13. Which measurement would most likely be taken to determine the effect of different mineral salts upon the experimental groups?

- A) weight of the medium in each pot
- B) temperature of the 40 pots
- C) height of the 40 plants**
- D) distance of each plant from the light source

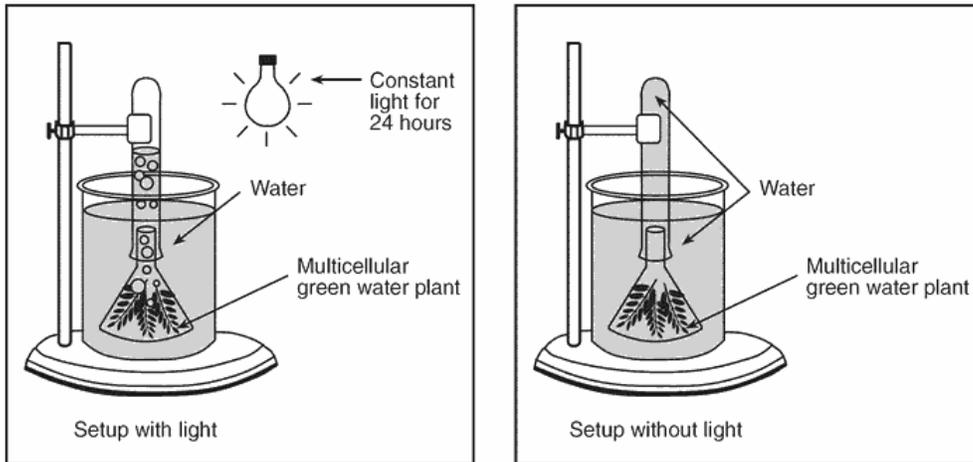
14. What was added to the control group of pots?

- A) water, only**
- B) nitrogen salts, only
- C) potassium salts, only
- D) potassium and phosphorus salts

15. 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

- A) oral dose of 100 mg of aspirin
- B) injection of 5.0 mg of water**
- C) injection of 100 mg of aspirin
- D) oral dose of 50 mg of water

16. An experimental setup is shown in the diagram below.



Which hypothesis would most likely be tested using this setup?

- A) **Green water plants release a gas in the presence of light.**
  - B) Roots of water plants absorb minerals in the absence of light.
  - C) Green plants need light for cell division.
  - D) Plants grow best in the absence of light.
17. A mineral supplement designed to prevent the flu was given to two groups of people during a scientific study. Dosages of the supplement were measured in milligrams per day, as shown in the table below.

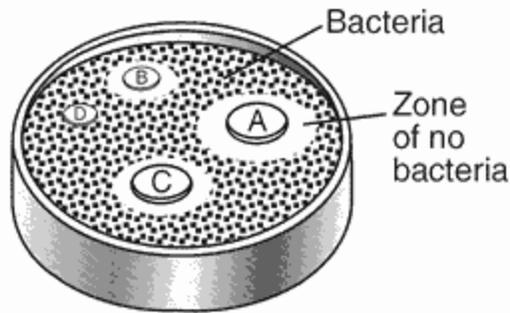
### Supplement Dosages

Group	Dosage (mg/day)
A	100
B	200

After 10 weeks, neither group reported a case of the flu. Which procedure would have made the outcome of this study more valid?

- A) test only one group with 200mg of the supplement
  - B) test the supplement on both groups for 5 weeks instead of 10 weeks
  - C) test a third group that receives 150mg of the supplement
  - D) test a third group that does not receive the supplement**
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18. The development of an experimental research plan should *not* include a
- A) list of safety precautions for the experiment
  - B) list of equipment needed for conducting the experiment
  - C) procedure for the use of technologies needed for the experiment
  - D) conclusion based on data expected to be collected in the experiment**
19. Which statement most accurately describes scientific inquiry?
- A) It ignores information from other sources.
  - B) It does not allow scientists to judge the reliability of their sources.
  - C) It should never involve ethical decisions about the application of scientific knowledge.
  - D) It may lead to explanations that combine data with what people already know about their surroundings.**

20. An experiment was carried out to determine which mouthwash was most effective against bacteria commonly found in the mouth. Four paper discs were each dipped into a different brand of mouthwash. The discs were then placed onto the surface of a culture plate that contained food, moisture, and bacteria commonly found in the mouth. The diagram below shows the growth of bacteria on the plate after 24 hours.



Which change in procedure would have improved the experiment?

- A) using a smaller plate with less food and moisture  
 B) using bacteria from many habitats other than the mouth  
**C) using the same size paper discs for each mouthwash**  
 D) using the same type of mouthwash on each disc
21. Researchers performing a well-designed experiment should base their conclusions on
- A) the hypothesis of the experiment  
**B) data from repeated trials of the experiment**  
 C) a small sample size to insure a reliable outcome of the experiment  
 D) results predicted before performing the experiment
22. A student is investigating the effect of different environmental factors on the growth of a certain species of bean plant over a period of 30 days. Which factor would *not* function as a variable in this investigation?
- A) species of bean plant**  
 B) soil moisture content  
 C) amount of light  
 D) atmospheric temperature
23. An investigation was designed to determine the effect of ultraviolet light on mold spore growth. Two groups of mold spores were grown under identical conditions, except one group was exposed only to ultraviolet light, while the other group was grown in total darkness. In this investigation, the group of mold spores grown without receiving any ultraviolet light is known as the
- A) **control**                      B) hypothesis  
 C) dependent variable        D) limiting factor

24. Bumblebees show some ability to control their own body temperature. During cold weather, bumblebees have been observed warming their flight muscles by shivering. The bees are able to maintain a body temperature several degrees above that of the surrounding air. Regulation of their internal body temperature is an example of
- A) diffusion                      B) synthesis  
 C) respiration                  D) **homeostasis**
25. In order for the human body to maintain homeostasis, the breakdown of glucose to release energy must be followed by the
- A) production of oxygen  
 B) division of the cell  
**C) removal of wastes**  
 D) production of receptor molecules
26. As a result of their metabolic activities, many organisms produce harmful substances. These substances are eliminated by the process of
- A) ingestion                      B) secretion  
 C) pinocytosis                  D) **excretion**
27. The removal of carbon dioxide and nitrogenous wastes from an organism illustrates the life function known as
- A) regulation                      B) nutrition  
 C) respiration                    D) **excretion**
28. In which process are simple materials chemically combined to form more complex materials?
- A) synthesis**                      B) pinocytosis  
 C) hydrolysis                      D) cyclosis
29. Organisms combine simple molecules to form complex molecules by the process of
- A) ingestion                      B) **synthesis**  
 C) regulation                      D) hydrolysis
30. Nutrition involves those activities by which organisms
- A) remove cellular waste products  
**B) obtain and process materials needed for other activities**  
 C) exchange gases with their environment  
 D) absorb and circulate materials

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Base your answers to questions **31** through **33** on the spaces provided.

Daphnia are freshwater organisms sometimes referred to as "water fleas." Design an experiment that could be used to test the effects of temperature on the size of a daphnia population. In your experimental design, be sure to:

31. Identify the type of data that will be collected.
32. Describe how the control group will be treated differently from the experimental group.
33. State a hypothesis to be tested.

Answer Key

Unit Test 1 Controlled Experiments 2017

1. A
  2. A
  3. A
  4. D
  5. C
  6. C
  7. C
  8. D
  9. C
  10. C
  11. B
  12. C
  13. C
  14. A
  15. B
  16. A
  17. D
  18. D
  19. D
  20. C
  21. B
  22. A
  23. A
  24. D
  25. C
  26. D
  27. D
  28. A
  29. B
  30. B
  31. –change in the number of daphnia in the population –number of daphnia at each temperature
  32. –The control group will be at normal temperature for the species. –The control group will be at normal freshwater pond temperature, while the experimental groups will be at other temperatures.
  33. –As temperature increases, the daphnia population decreases.  
–Temperature has an effect on the size of a daphnia population.  
–If the temperature decreases, then the size of the daphnia population decreases.
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