SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

An article in a local newspaper reported that dogs kept as pets tend to be overweight. Veterinarians say that diet and exercise will help these chubby dogs get in shape. The veterinarians propose two different diets (Diet A and Diet B) and two different exercise programs (Plan 1 and Plan 2). Diet A: owners control the portions of dog food and dog treats; Diet B: a mixture of fresh vegetables with the dog food and substitute regular dog treats with baby carrots. Plan 1: three 30-minute walks a week; Plan 2: 20-minute walks daily. Sixty dog owners volunteer to take part in an experiment to help their chubby dogs lose weight.

1) Identify the following:
   a. the subjects:
   b. the factor(s) and the number of level(s) for each:
   c. the number of treatments:
   d. whether or not the experiment is blind (or double-blind):
   e. the response variable:

2) Design an experiment to determine whether the diet and exercise programs are effective in helping dogs to lose weight.

A group of people are concerned that the coach of a local high school men’s and women’s basketball teams alters the amount of air in the basketball to gain an unfair advantage over opponents during home games. The idea is that the basketballs are pumped up with one pound per square inch less air than required, and his teams practiced with these altered balls all week prior to home basketball games. Since these under-pumped basketballs would react differently to being shot at a basket, the team that practiced with these balls would have an unfair advantage when it came to shooting free-throws.

3) Describe how to use a retrospective study to determine if the home teams have an unfair advantage when shooting free-throws.

Researchers plan to investigate a new medication that may reduce blood pressure for individuals with higher than average blood pressure. 90 volunteers with higher than average blood pressure are solicited. Volunteers are randomly assign 100 mg of the medicine, 200 mg of the medicine, or a placebo. Blood pressure will be measured at the beginning and at the conclusion of the study.

4) Identify the subjects.

5) Identify the treatments.

6) Identify the response variable.

7) Describe an advantage to random assignment of treatment.

8) Describe an advantage of the placebo.

9) Describe a disadvantage of using volunteers in this study.

10) Is this study blind?

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

11) 400 patients suffering from chronic back pain were randomly assigned to one of two groups. Over a four-month period, the first group received acupuncture treatments and the second group received a placebo. Patients who received acupuncture treatments improved more than those who received the placebo.
   A) Prospective observational study
   B) Experiment
   C) Retrospective observational study

12) A researcher wished to assess the importance of exercise in weight-loss programs. 412 people, all considered to be at least 20 pounds overweight, were randomly assigned to one of two groups. Over a two-month period, the first group followed a particular diet but were instructed to perform no exercise other than walking. The second group followed the same diet but also performed aerobic exercise for one hour each day. At the end of the two months, the weight loss of each participant was recorded. The average weight loss for the second group was greater than the average weight loss for the first group.
   A) Experiment
   B) Prospective observational study
   C) Retrospective observational study
13) Among a group of married women who were tracked for ten years, those who worked full time were more likely to divorce than those who did not work full time.
   A) Experiment  
   B) Prospective observational study  
   C) Retrospective observational study

**An observational study is described. Identify the specified element.**

14) An educational researcher used school records to determine that in the year 2000 in one school district, 84% of children living in two-parent homes graduated high school while 75% of children living in single-parent homes graduated high school. Determine the parameter of interest.
   A) School district  
   B) Year of high school graduation  
   C) Percentage of children living in two-parent homes  
   D) High school graduation rate  
   E) Type of home (single or two-parent)

15) In a group of 500 women, those who smoked moderately did worse on tests of reaction time than those who did not smoke. Identify the subjects studied.
   A) Women  
   B) Women who smoke moderately  
   C) Women who do not smoke  
   D) Adults who smoke moderately and adults who do not smoke  
   E) Women who smoke moderately and women who do not smoke

**Determine whether the experiment is single-blind, double-blind, or neither.**

16) Is the Addison Wesley Algebra I text superior to the currently used text, in promoting learning of algebra? Evaluators only are informed that Group A will test from the current text and Group B will test from AW text.
   A) Single-blind  
   B) Double-blind  
   C) Neither

**A designed experiment is described. Identify the specified element.**

17) 780 participants suffering from depression were randomly assigned to one of three groups. Over a four-month period, the first group received a low dosage of an experimental drug, the second group received a high dosage of the drug, and the third group received a placebo. At the end of the period each participant rated their mood on a scale of 1–5. Identify the treatments.
   A) The dosage of the drug  
   B) The experimental drug, mood  
   C) The experimental drug  
   D) Mood level 1, mood level 2, mood level 3, mood level 4, mood level 5  
   E) Placebo, low dosage, high dosage

18) In a clinical trial, 780 participants suffering from high blood pressure were randomly assigned to one of three groups. Over a one-month period, the first group received a low dosage of an experimental drug, the second group received a high dosage of the drug, and the third group received a placebo. The diastolic blood pressure of each participant was measured at the beginning and at the end of the period and the change in blood pressure was recorded. The biggest decrease in blood pressure was for those who received the low dosage of the drug. Identify the response variable measured.
   A) The participants in the experiment  
   B) The treatment received (placebo, low dosage, high dosage)  
   C) The dosage of the drug  
   D) Change in diastolic blood pressure  
   E) The one-month period
19) 780 men suffering from high blood pressure were randomly assigned to one of three groups. Over a four-month period, the first group received a low dosage of an experimental drug, the second group received a high dosage of the drug, and the third group received a placebo. The biggest decrease in blood pressure was for those who received the low dosage of the drug. Identify the subjects studied.

A) The dosage of the drug
B) Change in diastolic blood pressure
C) Men suffering from high blood pressure
D) Adults suffering from high blood pressure
E) The treatment received (placebo, low dosage, high dosage)

20) An education researcher was interested in examining the effect of the teaching method and the teacher on the reading level of students with learning disabilities. 257 students with learning disabilities participated in an experiment. There are four different teachers (Juliana, Felix, Sonia, and Helen) and three different teaching methods (A, B, and C). Students are randomly assigned to a teaching method and a teacher. Those who studied with Sonia using method B achieved the highest scores on a reading test. Identify the subjects studied.

A) Score on reading test
B) Teaching method
C) Students who studied with Sonia using method B
D) Teacher
E) Students with learning disabilities

21) 780 participants suffering from depression were randomly assigned to one of three groups. Over a four-month period, the first group received a low dosage of an experimental drug, the second group received a high dosage of the drug, and the third group received a placebo. At the end of the period each participant rated their mood on a scale of 1-10. Identify the factor(s) in the experiment and the number of levels for each.

A) The experimental drug (3 levels)
B) The experimental drug (3 levels), mood (10 levels)
C) Mood (10 levels)
D) The dosage of the drug (3 levels)
E) Placebo, low dosage, high dosage (3 levels)

Describe the design of the experiment (completely randomized or blocked).

22) In a clinical trial, 780 participants suffering from high blood pressure were randomly assigned to one of three groups. Over a one-month period, the first group received a low dosage of an experimental drug, the second group received a high dosage of the drug, and the third group received a placebo. The diastolic blood pressure of each participant was measured at the beginning and at the end of the period and the change in blood pressure was recorded. The biggest decrease in blood pressure was for those who received the low dosage of the drug.

A) Completely randomized over one factor (experimental drug)
B) Completely randomized over one factor (experimental drug), blocked by diastolic blood pressure
C) Blocked by experimental drug, blocked by diastolic blood pressure
D) Completely randomized over two factors (experimental drug, diastolic blood pressure)
E) Completely randomized over one factor (diastolic blood pressure), blocked by experimental drug
SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

Design an appropriate experiment or study.
23) An ice cream company wants to introduce a new flavor. They are considering two possibilities – Mint Delight and Chocolate Fiesta. They want to know which one customers will prefer. Design an experiment to investigate this question.

24) A medical researcher believes that supplements of glucosamine can help to reduce the pain of arthritis. She would like to test the supplement at two different dosage levels. Design an experiment to test the conjecture. Be sure to identify the factors, the levels, treatments, and response variable.

Identify the flaw(s) in the experiment or study described.
25) A manufacturer of tennis rackets would like to test their new racket. The company sponsors 10 tennis players who will be playing at Wimbledon. To test the racket, they have each player serve 30 times with their old racket. Then they have each player serve 30 times with the new racket. They compare the percentage of good serves with the two rackets. Identify the flaw(s) in this experiment and suggest some improvements.

Provide an appropriate response.
26) Marketing researchers wonder if the color and type of a candy’s packaging may influence sales of the candy. They manufacture test packages for chocolate mints in three colors (white, green, and silver) and three types (box, bag, and roll). Suspecting that sales may depend on a combination of package color and type, the researchers prepare nine different packages, then market them for several weeks in convenience stores in various locations. What is the response variable?

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

Identify the flaw(s) in the experiment or study described.
27) Researchers reported that for men, being unmarried increases the risk of depression. These findings were based on the medical records of 400 married men and 500 unmarried men. Since there is no random assignment, this conclusion is not justified because there may be lurking variables. Which of the following are possible lurking variables?

A) I, II, III
B) III, IV
C) II, IV
D) II, III, IV
E) II, III, IV, V

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

Provide an appropriate response.
28) A consumer group wants to see if a new education program will improve the spending habits of college students. Students in an economics class are randomly assigned to three different courses on spending habits. How many treatments are there?

29) A headline in a local newspaper announced “Video game playing can lead to better spatial reasoning abilities.” The article reported that a study found “statistically significant differences” between teens who play video games and teens who do not, with teens who play video games testing better in spatial reasoning. Do you think the headline was appropriate? Explain.
1) a. 60 chubby dogs
   b. diet (two levels) and exercise (two levels)
   c. four treatments (Diet A and Plan 1, Diet A and Plan 2, Diet B and Plan 1, Diet B and Plan 2)
   d. This design is at best single-blind, since the owners know which diet and exercise plan their
dogs are on, but the evaluators do not have to be given this information.
   e. weight loss

2) A retrospective study is an observational study in which past games are reviewed to see how many free-throws the
team made when they had the altered basketballs versus when they had basketballs pumped up correctly. The
differences in the number or percentage of free-throws made would be compared between the two types of
basketballs.

4) The subjects are the 90 volunteers with higher than average blood pressure.

5) There are 3 treatments, 100 mg, 200 mg, and the placebo.

6) The response variable is the change in blood pressure.

7) Randomization will equalize variability for which we cannot control, helping to ensure comparable, homogeneous
treatment groups. We may be able to establish causation as opposed to association.

8) We have an extra comparison with a control group. Blood pressure may change due to other
variables.

9) We are not able to generalize the results to a larger population.

10) The subjects are blind, assuming the 100 mg, 200 mg and placebo appear to be the same.

11) B

12) A

13) B

14) D

15) E

16) A

17) E

18) D

19) C

20) E

21) A

22) A

23) Answers may vary. Obtain a group of volunteers. Randomly assign volunteers to one of two groups. Group 1 will
taste first Mint Delight and then Chocolate Fiesta. Group 2 will taste first Chocolate Fiesta and then Mint Delight.
Volunteers will give each flavor a rating. Researcher will compare the average rating for Mint Delight and for
Chocolate Fiesta. Make sure volunteers don’t know which flavor is which.
24) Answers may vary. Obtain a group of volunteers who suffer from arthritis. Each patient's condition should be evaluated by a doctor at the start of the experiment. Agree on a time period for the study – for example two months. Randomly assign volunteers to one of three groups. Each day for the duration of the study each patient in group 1 will receive a low dose of glucosamine, each patient in group 2 will receive a higher dose of glucosamine, and each patient in group 3 will receive a placebo. At the end of the two-month period the doctor will evaluate each patient’s progress. Based on the amount of inflammation and the patient's report on the amount of pain, the doctor could give each patient a numerical score to represent their improvement. The researcher would then compare the average score for the three groups. Have the evaluating doctor blinded to whether the patient received placebo, low dose, or high dose of the supplement.
Factor: glucosamine
Levels: placebo, low dose, high dose
Treatments: placebo, low dose, high dose
Response variable: improvement in pain and inflammation of arthritis
25) Since the tennis players are sponsored by the company they will be biased. Other tennis players should be used. The control is not the same for all tennis players – each player is using their old tennis racket. The control should be the same for all players. The players should be blinded to which racket they are using. This would not be possible if the control were the player's old racket as this racket would be familiar to them. However, if the control were a different racket, it would be possible to blind the players. Also, the person recording the percentage of good serves should be blinded to which racket the player is using. They should randomize the order, not always have the control racket used first and the new racket used second. Volunteers should be randomly assigned to one of two groups. Group 1 will use the control racket first and the new racket second. Group 2 will use the new racket first and the control racket second.
26) Sales
27) D
28) Since there is only one factor at three levels, there are three treatments.
29) No, this was not a controlled experiment, so no determination of cause and effect can be made. Perhaps there is something about teens who play video games that make them good at video games and at spatial reasoning, or perhaps teens with good spatial reasoning enjoy the games more.