Exam

Name_____

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

1) Which statement describes experimentation?
   A) Experimentation should test at least two or more hypotheses at the same time.
   B) Some hypotheses cannot be tested by experimentation.
   C) Variables in an experiment cannot be manipulated by the researcher.
   D) True randomization of subjects is impossible during experimentation.

   Answer: B

2) How did Barry Marshall test the hypothesis that *H. pylori* causes stomach ulcers?
   A) He ingested live *H. pylori* and developed acute stomach pain.
   B) He fed spicy foods to laboratory rats to eliminate an alternate hypothesis.
   C) He interviewed physicians who performed surgeries on ulcer patients.
   D) He surveyed people with stomach ulcers about the acidity of their food.

   Answer: A

3) What is the purpose of double-blind experiments?
   A) to ensure that the hypothesis is scientifically testable
   B) to see if the experimental group responds differently than the control group
   C) to minimize the effects of human bias on the results
   D) to help the subjects in an experiment understand the treatment they are receiving

   Answer: C

4) What might be the next step if the results from one test of a new drug are found to be statistically significant?
   A) The hypothesis is accepted as correct.
   B) The hypothesis should be tested again.
   C) The hypothesis will be called a theory.
   D) The hypothesis is rejected.

   Answer: B

5) What is a standard probability that is accepted by most researchers as statistical significance?
   A) 10% B) 0.01% C) 5% D) 0.05%

   Answer: C

6) When would a large difference between the means of the control and treatment groups be very likely to be statistically significant?
   A) only if the hypothesis is false
   B) only if the experimental result is not practically significant
   C) only if the experimental result is practically significant
   D) only if the sample size is large

   Answer: D

7) Which experimental factor can be manipulated?
   A) placebo B) bias C) control D) variable

   Answer: D

8) Which group would be the most effective control subjects in a test of an experimental treatment?
A) The control group should be kept well informed of what treatment they are getting.
B) The control group should have characteristics like the experimental subjects.
C) The control group should be a different age or gender than the experimental subjects.
D) The control group should be given different doses of the experimental treatment.

Answer: B

9) Which item suggests that scientific information on a website may be unreliable?
A) The site backs up its claims with references to primary sources.
B) A reputable medical establishment maintains the site.
C) The site avoids anecdotal evidence.
D) The site is set up to allow you to buy the product being described.

Answer: D

10) Consider this hypothesis: "Drinking *Echinacea* tea reduces the duration and severity of colds." Which statement is the best prediction based on this hypothesis?
A) If cold sufferers don't drink *Echinacea* tea, then they will catch a cold very easily.
B) If cold sufferers drink *Echinacea* tea, then the tea will reduce their stress.
C) If cold sufferers drink *Echinacea* tea, then they will feel better sooner.
D) If cold sufferers drink *Echinacea* tea, then a tea ingredient will destroy the cold viruses.

Answer: C

11) Which biologists contributed to the germ theory of disease?
A) Darwin and Mendel
B) Watson and Crick
C) Warren and Marshall
D) Pasteur and Koch

Answer: D

12) Observations showed that people with relatively high stress levels get a relatively high number of colds. What word describes this relationship?
A) experiment
B) variable
C) correlation
D) hypothesis

Answer: C

13) A strong correlation exists between stress and susceptibility to colds. What does this mean?
A) People with high stress must encounter more cold viruses.
B) Stress must directly cause susceptibility to colds.
C) Stress might or might not affect susceptibility to colds.
D) A high susceptibility to colds must directly cause stress.

Answer: C

14) Which feature is necessary for a scientific hypothesis?
A) It is falsifiable.
B) It is a theory about supernatural events.
C) It can be proven true.
D) It is not based on observations.

Answer: A

15) What step should occur after numerous observations are used to form a sensible, inductively reasoned hypothesis?
A) The hypothesis must be tested.
B) The hypothesis becomes a scientific law.
C) The hypothesis is discarded as incorrect.
D) The hypothesis is recognized as proven.

Answer: A

16) What expectation, based on a hypothesis, uses deductive reasoning?
A) predictions B) statistical tests C) correlations D) data

Answer: A

17) Which factor is a disadvantage for a correlational experiment?
A) It is expensive and time consuming.
B) It is not feasible for rare diseases or environmental factors of interest.
C) It is only feasible for hypotheses for which an experimental treatment can be applied.
D) Subjects may not know exposure levels.

Answer: C

18) In which situation might observations be used to test a hypothesis rather than a laboratory experiment?
A) to test the effects of caffeine on the behavior of adolescent males and females
B) to test the ability of Alzheimer's patients to identify the smell of specific odors
C) to test how antioxidants in vitamins will affect skin cancer cells in college students
D) to test the relationship between dinosaur fossils found in Canada and the United States

Answer: D

19) What would a news report on CNN that describes recently published research on a new treatment for colds be an example of?
A) primary source B) secondary source
C) anecdote D) peer-reviewed report

Answer: B

20) Which statement makes a prediction for the hypothesis "The number of bird species in a particular wetland have decreased due to construction traffic."?
A) If bird numbers decrease in a wetland, then construction vehicles polluted the environment.
B) If construction vehicles enter a wetland, then new predators will reduce the bird populations.
C) If construction equipment enters a wetland area, then the frightened birds will not find food.
D) If construction vehicles disturb wetland areas, then the amount of bird species will decrease.

Answer: D

21) Consider these experimental processes:
- Dr. Jones is evaluating cancer patients for their responses to a new therapeutic drug.
- Mr. Bromley is conducting a survey of weight loss for his professor.
- Ms. Bradley is a consultant conducting a health and wellness survey for a drug company.
- Dr. Postgate is analyzing biopsy samples from rats given a placebo or an experimental drug for reducing inflammation.

Which situation describes potential observer bias in the experimental process?
A) Mr. Bromley asks each student in the study the same questions.
B) Ms. Bradley does not know the name of the company nor the drug name being tested.
C) Samples are labeled with numbers so Dr. Postgate cannot identify each rat's treatment type.
D) Dr. Jones knows which patients are receiving the placebo and which are receiving the drug.

Answer: D

22) What does sampling error refer to?
A) the difficulty in accurately measuring results that are incalculable
B) the intentional biases on the part of researchers
C) the experimental results that do not support the hypothesis being tested
D) the differences between a group of experimental subjects and the population as a whole

Answer: D

23) Which statement would be appropriate scientific hypothesis?
A) Rude people catch more colds than polite people.
B) Cold viruses should be allowed to reproduce just like anything else.
C) People protected from chilly temperatures catch fewer colds.
D) Going to school when you have a cold is unethical.

Answer: C

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

24) What type of subject is treated like an experimental subject but does not receive the experimental treatment?

Answer: control

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

25) Experimental subjects are given a pill to test its effectiveness on reducing the duration of a cold. How should the control group be treated?
A) Let the control group choose whether or not to take any pills.
B) Give the control group two pills instead of one.
C) Give the control group a pill that does not affect the duration of colds.
D) Do nothing with the control group.

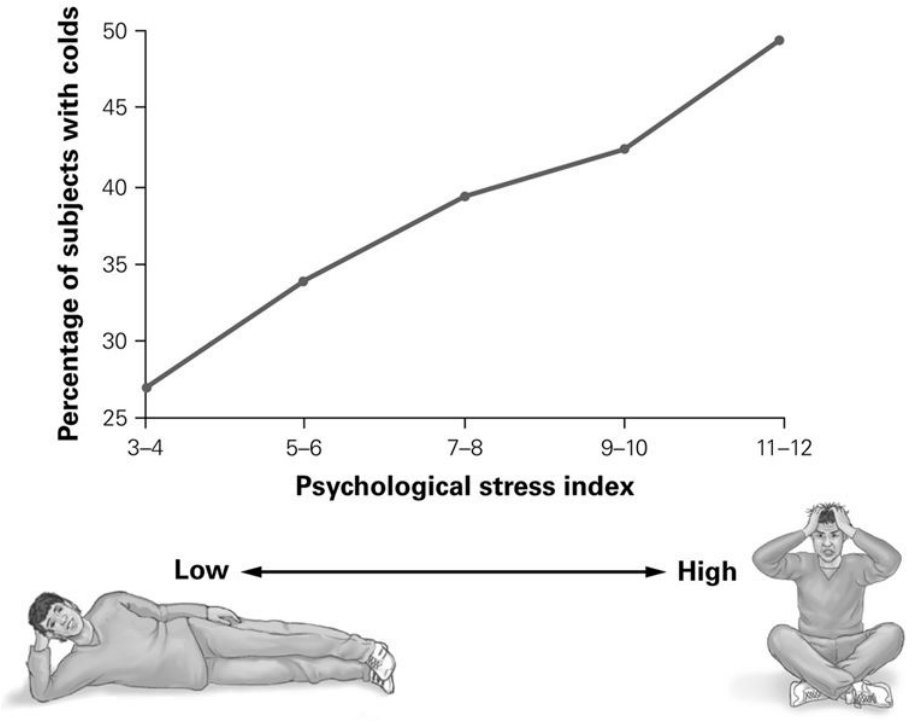
Answer: C

26) Mehran heard that drinking a high protein supplement after football training would improve his muscle mass. Who should be selected for the control group in his experiment to test his hypothesis?
A) volunteers from the general campus population who are not given any protein drink
B) randomly selected teammates in training who are given a placebo instead of a protein drink
C) randomly selected teammates who are given only small amounts of a protein drink
D) volunteers from the local community who are given a placebo instead of a protein drink

Answer: B

27) Which statement is an example of anecdotal evidence?
A) an article on bowel disorders on a medical website
B) information about side effects on the label of a bowel disorder drug
C) Dr. Chowdury's research on bowel disorders, which was published in a scientific journal
D) Dr. Jackson's personal statement about the effectiveness of his cure for bowel disorders

Answer: D



28) According to the graph, what is the relationship between stress and the likelihood of infection by a cold virus?
A) People with a stress index of 11-12 are more likely to catch a cold.
B) People with a stress index of 3-4 are more likely to catch a cold.
C) People with a stress index of 5-6 are more likely to catch a cold.
D) People at all stress levels have an equal chance of catching a cold.

Answer: A

29) The incidence of cancer in people living within 100 yards of overhead power lines is recorded. What epidemiological technique would be used in this example?
A) cross-sectional survey
B) cohort study
C) ecological study
D) correlational experiment

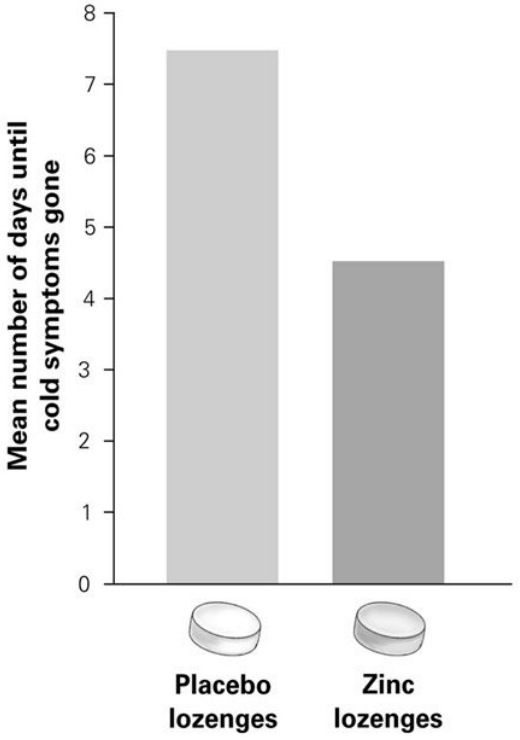
Answer: C

30) What outcome results when many independent scientific studies support a well-tested hypothesis?
A) The hypothesis would be considered a scientific theory.
B) The hypothesis is a fact that cannot be refuted.
C) Further experiments would not occur unless a sufficient alternative is proposed.
D) The hypothesis is now be referred to as a prediction.

Answer: A

31) Which experimental scenario would likely produce the most objective results?
A) a double-blind study involving a new heart disease treatment
B) an experiment that is slightly biased but does not use a model organism
C) a single-blind experiment testing the effects of caffeine on blood pressure
D) an unbiased investigation that shows a strong correlation between two variables

Answer: A



32) According to the graph, how did the number of days with cold symptoms compare for people taking placebo lozenges or zinc lozenges?
A) People taking the placebo had cold symptoms for 7 more days than people taking the zinc lozenges.
B) People taking the zinc lozenges had cold symptoms for 7 more days than people taking the placebo.
C) People taking the placebo had cold symptoms for 3 more days than people taking the zinc lozenges.
D) People taking the zinc lozenges had cold symptoms for 3 more days than people taking the placebo.

Answer: C

33) A researcher hypothesized that tributyltin (an additive in boat paint) causes reproductive defects in marine snails developing in the water. In an experiment testing the effects of tributyltin on developing snails, which condition should be used as a control?
A) Developing snails are kept in a dry tank to avoid exposure to contaminated water.
B) Snails developing in a water tank are exposed to boat paint without tributyltin.
C) Developing snails are kept in a water tank cleaned with chlorine bleach.
D) Snails developing in a water tank are exposed to extremely low levels of tributyltin.

Answer: B

34) When graphing data, what scientific information do scientists plot on the *x* axis?
A) control
B) dependent variable
C) independent variable
D) sampling error

Answer: C

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

35) What type of reasoning takes the form of "if/then" statements?

Answer: Deductive

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

36) Which statement is a testable hypothesis?
A) Sleeping 8 hours a night makes you feel better when you have a cold.
B) Taking zinc lozenges at the first sign of cold symptoms is wise.
C) Being a good driver makes you less likely to catch a cold.
D) Avoiding contact with other people reduces the chance of catching a cold.

Answer: D

37) Why is the scientific method used?
A) to test ideas about how the natural world works
B) to memorize scientific facts about experiments
C) to establish economic policies for the world
D) to determine legal responsibilities for scientists

Answer: A

38) Why might scientists be wary of the results of a single experiment testing a particular treatment, even when the results are peer reviewed and statistically significant?
A) A single experiment may have eliminated most of the alternative hypotheses.
B) The results may not be true for humans if the experiment used a model organism.
C) The experiment was likely to have had many biases that affected the results.
D) The experimental and control groups may be too alike.

Answer: B

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

39) What type of reasoning is used to make a hypothesis based on previously established observations?

Answer: Inductive

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

40) What would result from an ideal experiment?
A) small treatment effect
B) high sampling error
C) low standard error
D) large confidence interval

Answer: C

41) Some published, peer-reviewed research reported that using zinc lozenges reduced the length and severity of cold symptoms. Why might some scientists still be skeptical about using zinc lozenges to treat a cold?
A) Ideas about vitamin C have been discredited, so zinc will also be ineffective.
B) Most people get zinc in their diet, so extra zinc lozenges may not affect a cold.
C) Other reasons may explain why people taking zinc lozenges recovered faster.
D) Model organisms were not used in the zinc lozenge research.

Answer: C

42) Why are model organisms used to test hypotheses?
A) The hypotheses have results that are always applicable to humans.
B) Human subjects have already been tested.
C) The hypotheses are likely to apply only to the model organism.
D) The hypotheses are potentially too dangerous to perform on human subjects.

Answer: D

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

43) What type of experimental result (two words) is one that is very unlikely to be due to chance differences between the experimental and control groups?

Answer: statistically significant

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

44) Which hypothesis is testable using scientific methods?
A) The dinosaur *Tyrannosaurus rex* was a scavenger, not a predator.
B) People with type O blood are natural meat eaters.
C) Bees can see ultraviolet light that humans can't.
D) Peacocks like to display their large tail feathers.

Answer: C

45) What does it mean to say that experimental results are peer reviewed?
A) The results are analyzed by other scientists before they are published.
B) The results are obtained from experiments with a large sample size.
C) The results are obtained from double-blind experiments.
D) The results are obtained from experiments with a low sampling error.

Answer: A

46) According to scientific evidence, what is the best prevention method known for reducing the chance of contracting a common cold?
A) washing your hands frequently and effectively
B) eating 500 mg of vitamin C a day
C) drinking *Echinacea* tea at least once a day
D) using throat lozenges that contain zinc

Answer: A

47) How can sampling error be reduced?
A) by performing statistical tests on experimental data
B) by monitoring changes in the experimental and control groups
C) by performing double-blind experiments
D) by increasing the sample size

Answer: D

48) What is the specialized branch of mathematics that is used to compare data?
A) epidemiology
B) statistics
C) cross-sectional mathematics
D) computational mathematics

Answer: B

49) Why are hypotheses never accepted as proven by scientists?
A) Alternative hypotheses might provide a better explanation.
B) Hypotheses are only opinions and cannot be proven true.
C) Experimentation only tests predictions, but not hypotheses.
D) Hypotheses change every time a new experiment is conducted.

Answer: A

50) Which hypothesis did Warren and Marshall test related to *Helicobacter pylori* bacteria and stomach ulcers?
A) Eating spicy food increases *H. pylori* in the stomachs of people susceptible to ulcers.
B) Acute stomach pain is often caused by *H. pylori* bacteria, not ulcers.
C) The cause of many stomach ulcers is the bacterium *H. pylori,* not spicy food.
D) *H. pylori* bacteria decrease acid production in the stomachs of people with ulcers.

Answer: C

51) The average annual temperature for geographic regions is plotted on the *x* axis of a graph. The spiciness of local food in that region is plotted on the *y* axis. If the spiciness of local food increases as the average annual temperature increases, then what can be concluded?
A) Warm temperatures cause spices to grow better for food use.
B) Spiciness of food and annual average temperature are correlated.
C) Spicy food is common in warm climates due to local cultures.
D) No relationship exists between temperature and the use of spices.

Answer: B

52) What would experimental results with very high statistical significance mean?
A) A true difference between treatment and control groups likely exists.
B) The hypothesis being tested is correct.
C) The experiment had proper controls.
D) The experiment had no bias.

Answer: A

53) Which type of study observes specific human populations for unusually high levels of a disease?
A) a case-control study
B) an ecological study
C) a cross-sectional survey
D) a correlational experiment

Answer: B

54) Which statement is a testable scientific hypothesis?
A) Eating fish reduces the chance of having a stroke.
B) Smoking makes people less attractive.
C) Embryonic stem cell research will allow scientists to find a cure for diabetes.
D) Antioxidants from food are better than antioxidants from a vitamin pill.

Answer: A

55) What type of scientific information would include a news report?
A) primary source
B) secondary source
C) tertiary source
D) anecdotal evidence

Answer: B

56) What is a statistically significant result?
A) a result that is likely due to chance differences between groups
B) a result that the media can report as valid but scientists must consider unsupported by research
C) a result that is unlikely due to chance
D) a result that has real-world importance but is not necessarily based on mathematical probability

Answer: C

57) When might bias in an experiment occur?
A) A technician knows which samples are from the control group.
B) A subject does not know who is in the control or experimental groups.
C) A researcher randomly assigns subjects to the control or experimental group.
D) A subject finds out the results of the experiment after it is finished.

Answer: A

58) Why are double-blind experiments used?
A) The results will be more controlled.
B) The results will be more biased.
C) The results will be more objective.
D) The results will be more statistically significant.

Answer: C

59) In science, what would an individual's personal experience or endorsement be considered?
A) a peer review
B) anecdotal evidence
C) a primary source
D) circumstantial evidence

Answer: B

60) Why are correlations less convincing than controlled experimental results?
A) Correlations cannot be statistically significant.
B) Correlations cannot be observed outside the laboratory.
C) Correlations do not eliminate as many alternative hypotheses.
D) Correlations are subject to greater bias than experimental results.

Answer: C

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

61) What type of reasoning is used to make predictions based on a hypothesis?

Answer: Deductive

62) What two-word phrase is defined as an explanation for a set of related observations based on well-supported hypotheses from numerous, independent lines of research?

Answer: scientific theory

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

63) What does statistical analysis of experimental results determine?
A) whether the experiment proves that the hypothesis being tested is correct
B) whether the proper controls were used in the experiment
C) the likelihood that the results are due to the experimental treatment
D) the amount of bias in the experimental design

Answer: C

64) A botanist conducted an experiment to test the effect of light on plants. Fifty plants were grown under different amounts of artificial daylight for 60 days. The amount of water and fertilizer was constant. At the end of the experiment, the size of each leaf was measured. What was the dependent variable in this experiment?
A) leaf's size
B) length of the experiment
C) amount of artificial daylight
D) type of fertilizer

Answer: A

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

65) What type of evidence would include a personal opinion on the effectiveness of a dietary supplement in preventing colds?

Answer: anecdotal

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

66) What would be the most trustworthy source of scientific information?

A) science reports in newspapers and on TV
B) peer-reviewed research publications
C) anecdotal evidence
D) paid advertisements

Answer: B

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

67) What is the scientific information collected from well-designed experiments that should allow researchers to either reject or support a hypothesis?

Answer: data

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

68) When is an experiment considered to be double-blind?

A) The hypothesis being tested is not based on previous observations.
B) Both participants and researchers are unaware of group member identities.
C) It has already been performed by different researchers.
D) The results of the experiment are only revealed to certain researchers.

Answer: B

69) Which procedure describes a cohort study?

A) Examine the incidence of lung disease in all females over the age of 50 in a city by a coal plant.
B) Compare lifetime exposure to coal plant emissions between individuals with lung cancer and individuals without lung cancer in the general population.
C) Question all people in an area about their exposure to coal plant emissions and whether they have any lung diseases.
D) Measure lifetime exposure to coal plant emissions and the incidence of lung cancer in a group of individuals living in a small town.

Answer: D

70) What is a scientific theory?

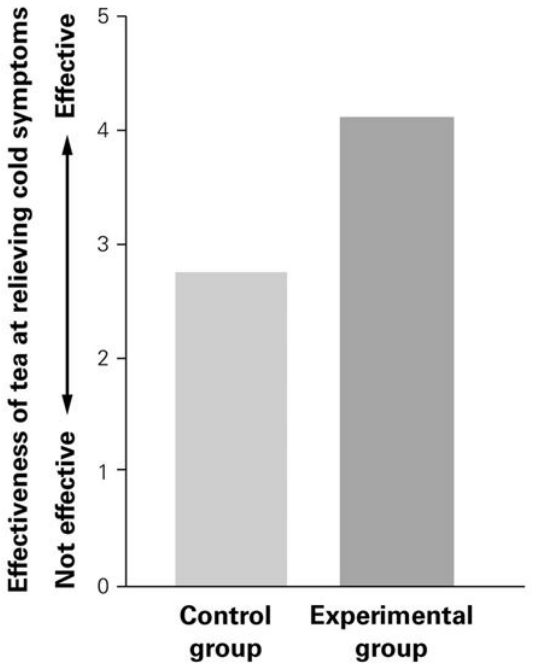
A) a logical opinion proposed by one person
B) an explanation supported by large amounts of experimental evidence
C) any testable explanation for a question or problem
D) an explanation that cannot be modified with new experimental evidence

Answer: B

71) Ideally, what should an experiment studying the effect of a cold medicine have?

A) double-blind procedures
B) subjects of only one gender
C) a small sample size
D) no control group

Answer: A



72) According to the graph, how did the results of the control group compare with the results of the experimental group?
A) There was no difference between the results from both groups.
B) Echinacea tea was more effective for the experimental group.
C) Echinacea tea was more effective for the control group.
D) Placebo tea was more effective for the control group.
Answer: B

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

73) What is an intentionally ineffective treatment given to members of a control group in an experiment?
Answer: placebo

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

74) Which control should be used to test the prediction that a certain drug prevents cataracts in females over age 65?
A) female participants younger than 65
B) female subjects over 65 that are given placebos
C) male subjects over 65
D) alternative drugs thought to prevent cataracts
Answer: B

75) When an experiment has a large sample size, and there is a large difference between the results in the experimental and control groups, how likely is it that the experimental results are statistically significant?
A) very unlikely B) very likely C) somewhat likely D) unlikely
Answer: B

76) When would an experimental result be considered statistically significant?
A) The experiment is double blind.
B) The result supports the hypothesis being tested.
C) The result is unlikely to be due to chance alone.
D) Experimental and control subjects are randomly assigned.

Answer: C

77) In statistics, what is a sample?
A) the correlation between the two different experimental factors
B) the mean of a population to be studied
C) a small subgroup of a population to be studied
D) a range of values with a high probability of containing the true mean

Answer: C

78) Why is the random assignment of individuals to experimental and control groups important for an experiment?
A) It ensures that the results of the experiment will be statistically significant.
B) It ensures that bias has been completely eliminated from the experiment.
C) It ensures that the sampling error will have no effect on the results of the experiment.
D) It ensures that each group will better represent the population as a whole.

Answer: D

1) B
2) A
3) C
4) B
5) C
6) D
7) D
8) B
9) D
10) C
11) D
12) C
13) C
14) A
15) A
16) A
17) C
18) D
19) B
20) D
21) D
22) D
23) C
24) control
25) C
26) B
27) D
28) A
29) C
30) A
31) A
32) C
33) B
34) C
35) Deductive
36) D
37) A
38) B
39) Inductive
40) C
41) C
42) D
43) statistically significant
44) C
45) A
46) A
47) D
48) B
49) A
50) C

51) B
52) A
53) B
54) A
55) B
56) C
57) A
58) C
59) B
60) C
61) Deductive
62) scientific theory
63) C
64) A
65) anecdotal
66) B
67) data
68) B
69) D
70) B
71) A
72) B
73) placebo
74) B
75) B
76) C
77) C
78) D