Exam

Name_____

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

1) Physiology is the study of
    A) the tissues and organs of the body at the microscopic level.
    B) the structure of the body.
    C) growth and reproduction.
    D) the normal function of living organisms.
    E) the facial features as an indication of personality.
   Answer: D

1) _____

2) The literal meaning of the term *physiology* is knowledge of
    A) math.   B) nature.   C) science.   D) chemistry.   E) organs.
   Answer: B

2) _____

3) Because anatomy and physiology have different definitions, they are usually considered separately in studies of the body.
    A) True   B) False
   Answer: B

3) _____

4) The following is a list of several levels of organization that make up the human body.
1. tissue
2. cell
3. organ
4. molecule
5. organism
6. organ system

The correct order from the smallest to the largest is
    A) 6, 4, 5, 2, 3, 1.
    B) 2, 4, 1, 3, 6, 5.
    C) 4, 2, 3, 1, 6, 5.
    D) 4, 2, 1, 3, 6, 5.
    E) 4, 2, 1, 6, 3, 5.
   Answer: D

4) _____

5) "Glucose is transported from blood into cells because cells require glucose to meet their energy needs." This type of explanation is
    A) teleological.
    B) theological.
    C) mechanistic.
    D) scatological.
    E) metalogical.
   Answer: A

5) _____

6) "Glucose is transported from blood into cells by transporters in response to insulin." This type of explanation is

6) _____

    A) metalogical.
    B) mechanistic.
    C) theological.
    D) teleological.
    E) scatological.

Answer: B

7) Which of the following is a buffer zone between the outside world and most of the cells of the body?

7) _____

    A) extracellular fluid
    B) red blood cells
    C) cell membrane
    D) intracellular fluid
    E) All of the answers are correct.

Answer: A

8) Which of the following is one of Cannon's "internal secretions"?

8) _____

    A) hormones
    B) nutrients
    C) inorganic ions
    D) water
    E) None of the answers are correct.

Answer: A

9) The study of body function in a disease state is

9) _____

    A) histology.
    B) necrology.
    C) microbiology.
    D) physiology.
    E) pathophysiology.

Answer: E

10) Homeostasis is the ability of the body to

10) _____

    A) quickly restore changed conditions to normal.
    B) prevent the external environment from changing.
    C) ignore external stimuli to remain in a state of rest.
    D) prevent excessive blood loss.
    E) prevent the internal environment from changing.

Answer: A

11) Oxytocin is a hormone that is released in response to cervical dilation. It in turn causes more uterine contractions that will further dilate the cervix. Which type of feedback loop does oxytocin trigger?

11) _____

    A) nociceptive feedback   B) local control
    C) negative feedback   D) positive feedback

Answer: D

12) How genetics influences the body's response to drugs is called   12) _____
    A) pharmacokinetics.
    B) pharmacodynamics.
    C) pharmacogenetics.
    D) pharmacogenomics.
    E) pharmageddon.
    Answer: D

13) A physician basing clinical decisions on primary research published in biomedical literature is   13) _____
    doing _____ medicine.
    A) holistic
    B) traditional
    C) evidence–based
    D) whimsical
    E) alternative
    Answer: C

14) A study in which a participant acts as an experimental subject in part of the experiment and a   14) _____
    control in another part of the experiment is called a _____ study.
    A) crossover   B) retrospective   C) meta–analysis   D) double–blind
    Answer: A

15) The Internet database for molecular, cellular, and physiological information is called the _____   15) _____
    Project.
    A) Human Genome
    B) Physiognomy
    C) Manhattan
    D) Physiosome
    E) Physiome
    Answer: E

16) A placebo is   16) _____
    A) a drug or treatment that is expected to have no pharmacological effect.
    B) any drug being tested in a clinical trial.
    C) a hole in a cavity wall through which an organ protrudes.
    D) a nutritive and respiratory organ in fetal development.
    E) any drug in a class of drugs commonly used as pain relievers.
    Answer: A

17) A technique used to resolve contradictory results in scientific studies is   17) _____
    A) meta–analysis.
    B) longitudinal analysis.
    C) prospective analysis.
    D) cross–sectional analysis.
    E) retrospective analysis.
    Answer: A

18) A scientifically logical guess is a

    A) model.

    B) variable.

    C) theory.

    D) hypothesis.

    E) law.

    Answer: D

18) _____

19) If a scientific model is supported or verified repeatedly by multiple investigators, it may become a

    A) hypothesis.

    B) variable.

    C) law.

    D) theory.

    E) model.

    Answer: D

19) _____

20) Place these terms in the typical sequence in which they appear in the process of scientific inquiry: experimental data, theory, model, observation, hypothesis, replication.

    A) observation, replication, model, experimental data, hypothesis, theory

    B) replication, hypothesis, experimental data, theory, model, observation

    C) experimental data, theory, model, observation, hypothesis, replication

    D) observation, hypothesis, experimental data, replication, model, theory

    E) theory, observation, experimental data, hypothesis, replication, model

    Answer: D

20) _____

21) You are interested in learning more about Parkinson's disease, a neurological disorder that primarily affects motor function. Which is the best source to begin your investigation?

    A) MedlinePlusPubMed

    B) physiology textbook

    C) public library

    D) Ask.com

    E) a physician

    Answer: A

21) _____

22) Which of the following systems does NOT exchange material with the internal and external environments?

    A) digestive system

    B) urinary system

    C) circulatory system

    D) respiratory system

    E) All of the above.

    Answer: C

22) _____

23) The human environment is terrestrial, dry, and highly variable. However, our bodies expend enormous amounts of energy maintaining a constant internal environment. Studying why our bodies do this is what kind of scientific endeavor?

    A) anatomical
    B) mechanistic
    C) teleological
    D) meterological
    E) translational

23) _____

Answer: C

24) Individuals with Type I diabetes do not make enough insulin. Which of the following would be a mechanistic explanation of how insulin is used by the body?

    A) Since all cells need glucose, insulin is required.
    B) Insulin binds to its receptor which triggers the movement of glucose transporters to the cell membrane.
    C) Insulin is a hormone involved in glucose transport.
    D) Cells need insulin because glucose will not cross the cell membrane.
    E) Without insulin most cells in the body would be unable to produce enough ATP.

24) _____

Answer: B

25) Excretion is a function of the body. Which of the following would be considered excretion?

    A) Movement of glucose from the kidney to the blood stream.
    B) Movement of oxygen from the lungs to the blood stream.
    C) Movement of salt from sweat glands to the surface of the skin.
    D) Movement of sodium from the intestines to the bloodstream.
    E) Movement of potassium from kidney cells into one's urine.

25) _____

Answer: C

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

26) What is a nocebo effect?

26) _____

Answer: It is the phenomenon whereby a patient who has been informed of the side effects of a drug he is taking is more likely to experience some of the side effects than an otherwise similar patient receiving the same drug who has not been so informed.

27) List the key concepts or themes in physiology.

27) _____

Answer: See Table 1.1 in the chapter.

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

28) Adaptive significance is an important concept in physiology because it describes the

    A) parameters necessary to maintain a constant internal environment.
    B) importance of a highly variable external environment.
    C) physiological functions that promote an organism's survival.
    D) similarities between ancient and modern marine organisms.
    E) ability of an organism to monitor and restore its internal state to normal conditions when necessary.

28) _____

Answer: C

29) You conduct an experiment on twenty 18-year-old male subjects to see how various intensities of exercise influence heart rate. Which of the following is/are considered an independent variable?

    A) heart rate
    B) sex of subjects
    C) age of subjects
    D) intensity of exercise
    E) More than one of the answers is correct.

29) _____

Answer: D

30) You conduct an experiment on twenty 18-year-old male subjects to see how various intensities of exercise influence heart rate. Which of the following is/are considered a dependent variable?

    A) sex of subjects
    B) intensity of exercise
    C) heart rate
    D) age of subjects
    E) More than one of the answers is correct.

30) _____

Answer: C

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

31) Why are physiology and anatomy frequently studied together?

31) _____

Answer: This is discussed in the "Physiology Is an Integrative Science" section of the chapter.

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

32) *You want to display data on the finish times of the 10 fastest race horses in a single race at the Kentucky Derby.*
Which type of graph would be best to display this information?

    A) line graph   B) scatter plot   C) bar graph

32) _____

Answer: C

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

33) *You want to display data on the finish times of the 10 fastest race horses in a single race at the Kentucky Derby.*
What would the labels be for the graph axes?

33) _____

Answer: The x-axis is horse name or number; the y-axis is finish time in minutes.

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

34) *A horse runs 10 races, each a mile long, during a 6 'month period, and you are interested in determining if the horse's race time changes with experience. You set up a graph to display the race finish times of this horse.*
Which type of graph would be best to display the race finish times of this horse?

    A) line graph   B) bar graph   C) scatter plot

34) _____

Answer: A

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

35) *A horse runs 10 races, each a mile long, during a 6 ʹmonth period, and you are interested in determining if the horse's race time changes with experience. You set up a graph to display the race finish times of this horse.*
What would the labels be for the graph axes?

35) _____

Answer: The x–axis is race number or date; the y–axis is finish time in minutes.

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

36) *There are 10 cloned horses, born on the same day, with identical chromosomes. They are each subjected to the same physical training regimen, but given daily injections of different concentrations of a particular vitamin. They all run the same race. You set up a graph to explore a relationship between race finish time and vitamin dose.*
Which type of graph is best to explore a relationship between race finish time and vitamin dose?

36) _____

   A) line graph   B) scatter plot   C) bar graph

Answer: B

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

37) *There are 10 cloned horses, born on the same day, with identical chromosomes. They are each subjected to the same physical training regimen, but given daily injections of different concentrations of a particular vitamin. They all run the same race. You set up a graph to explore a relationship between race finish time and vitamin dose.*
What are the labels for the graph axes?

37) _____

Answer: The x–axis is vitamin dose; the y–axis is finish time in minutes.

ESSAY. Write your answer in the space provided or on a separate sheet of paper.

38) What is the difference between a peer–reviewed article and a review article?

Answer: A peer–reviewed article describes original research by one author (or group of authors working together) that has gone through a screening process in which a panel of qualified scientists evaluate the work. A review article is a summary (usually a collection of published research that was previously peer–reviewed, usually from more than one independent lab) that discusses a particular topic in the field.

39) What is the major problem with the deconstructionist view of biology?

Answer: Return to the topic of function and process. The deconstructionist view of biology predicted that once we uncovered the sequence of the human genome, the inner workings of the human body would be revealed. In reality, it is possible to know HOW a gene codes for a particular protein without knowing WHY that protein exists. Our knowledge of the human genome is only a piece of the puzzle.

40) Sarah has just flown around the world in the last 48 hours. She is having trouble sleeping, a condition known as insomnia. How do you think Sarah's long flights and her insomnia are related to biological rhythms?

Answer: Our sleep–wake cycle is a biological rhythm that lets our body know when it is time to rest. Most likely Sarah has ignored the signals like sleepiness, changes in body temperature, and mood that her body is sending. By ignoring these rhythms she has disrupted the cycle and the body is struggling to maintain homeostasis.

41) Why is it necessary to label the axes of a graph?

Answer: A graph with no axis labels is meaningless—without knowing what trend is being illustrated, there is no communication of scientific information.

42) Why is it necessary to space grid marks on a graph proportionally to the quantity measured (example: each square represents one centimeter)?

Answer: If this is not done, a trend would be obscured or even misrepresented.

43) Explain why the prefix homeo– is used in the term *homeostasis*. Why do some physiologists prefer the term *homeodynamics* over *homeostasis*?

Answer: The prefix homeo–, meaning like or similar, is used to indicate that the body's internal environment is maintained within a range of acceptable values rather than a fixed state. Some physiologists argue that the term *homeodynamics* better reflects the small but constant changes that continuously take place in the internal environment, as opposed to *homeostasis*, which erroneously implies lack of change.

44) Explain why animals are used in research. Are there any limitations to the application of animal data to human physiology? Could these limitations be addressed using cell or tissue culture, or computer simulations?

Answer: (Note to instructor: This may be a good question to ask early in the semester, then again toward the end, after the organ systems have been covered.) There is a brief discussion of using humans or animals in research in the chapter. This question is intended to stimulate students to think about how science is done, how data are generated, and how the process is challenged by social issues. Generally, there are limitations to the usefulness of computer simulations and cell/tissue culture systems for the same reason that nonhuman animal data are not 100% applicable to human physiology. How human organ systems perform may be different in very subtle ways from corresponding systems in other species. Cells in culture are in an artificial environment, and while much has been learned from such systems, it has also been noted that the behavior of cells in culture is not identical to cells in a living body. Furthermore, cells cultured from established lines can change over time, becoming less like the original cells from which they were derived, and presumably less like normal cells. Computer simulations are valuable, but are only as good as the data entered, and given that we don't know everything there is to know about physiology, we can't write a perfect computer program. All three approaches are useful, but for different reasons, and therefore one research system does not completely substitute for another, nor is it appropriate to abandon one entirely.

45) You conduct an experiment on twenty 18–year–old male subjects to see how various levels of exercise influence heart rate. Explain why only 18–year–old males were used as subjects.

Answer: An important part of scientific inquiry is to remove sources of variation from among subjects. By choosing subjects of one gender in a particular age group, it is easier to determine that the dependent variable (heart rate, in this case) depends *only* on the independent variable, level of exercise. This also allows a study to have fewer participants, assuming that subjects were randomly assigned to a level of exercise. If subjects were of random ages and genders, data would have to be collected from many more individuals.

46) Use the following terms to develop a concept map:

brain, sensory neuron, an eye, foot, soccer ball, motor neuron

Answer: Eye sees soccer ball.
Sensory neuron sends visual information.
Brain receives information and formulates a plan.
Motor neuron carries action information.
Foot muscle contracts and the ball is kicked.

47) Provide an example of a control system. Be sure to include the three main components: an input signal, a controller, and an output signal.

Answer: Variable. One example is blood glucose concentration. The input signal is a blood glucose concentration outside of the normal range, the controller is the pancreas, and the output signal is release of either insulin or glucagon.

48) Write a teleological explanation for why heart rate increases during exercise. Now write a mechanistic explanation for the same phenomenon.

Answer: Teleological: Heart rate increases because the increased activity of skeletal and cardiac muscles requires increased delivery of blood contents such as oxygen and glucose. Mechanistic: Heart rate increases in response to signals from the brain (pacemaker cells of the heart are stimulated by the nervous system).

49) What is a hypothesis? What are the steps involved in following the scientific method? How does one distinguish the dependent variable from the independent variable in an experiment? How are each of these represented on a graph?

Answer: This is discussed in "The Science of Physiology" section of the chapter and in Figure 1.15.

50) You are designing a study to assess the effects of a new treatment for hypertension. What ethical considerations would you employ when monitoring your progress?

Answer: Major considerations should involve assessing the efficacy of the treatment such that the control group patients are not deprived as well as ensuring that the experimental treatment is not less effective than the standard treatments.

51) You are designing a study to assess the effects of a new drug treatment for hypertension. In your study of this drug's efficacy in treating hypertension, your subjects are white males, ages 40 to 60 years. Is your study applicable to all people? Explain.

Answer: Possibly, but not necessarily. There are gender differences in appropriate therapies because of physiological effects of higher testosterone in males compared to females, for example. Drugs are often not tested in children, and children also have a different hormonal environment than adults (again, sex hormones are a good example, because their levels are low until just before the onset of puberty). There are also racial differences in effectiveness of therapies, and while it is a contentious issue as to whether these represent genetic or socioeconomic influences, they should be considered.

52) High cholesterol levels have been shown to be a contributing factor to heart disease and death due to cardiovascular disease for many decades. In the 1970s, scientists used this information to develop a hypothesis that giving a medicine to reduce blood cholesterol levels could reduce the chances of developing cardiovascular disease or dying from cardiovascular disease. They tested a group of people living in a town called Framingham, Massachusetts. This study became known as the Framingham Study, and it is very well known because it did not support the hypothesis that giving cholesterol–lowering medications would reduce the risk of developing or dying from cardiovascular disease. Does this mean that high cholesterol is not a risk factor for heart disease? What does this demonstrate about the scientific process, especially as it pertains to human studies? You can find a copy of the study online and read it, if necessary.

Answer: This demonstrates the difficulty in doing human research because, even though elevated cholesterol levels are a risk factor for cardiovascular disease, reducing cholesterol levels without addressing the reason those levels were high in the first place may not have the expected effect on reducing heart disease. Human testing on hypotheses is important because humans don't always respond to treatments like other animals do, they may actually respond quite differently and each person may respond differently from the rest. It is why we need to test each hypothesis in circumstances as similar to the actual real group that would be treated.

Use the table and graph below to answer the following questions.

Heart rates (bpm) of *Sprague-Dawley* rats after administration of various concentrations of epinephrine.

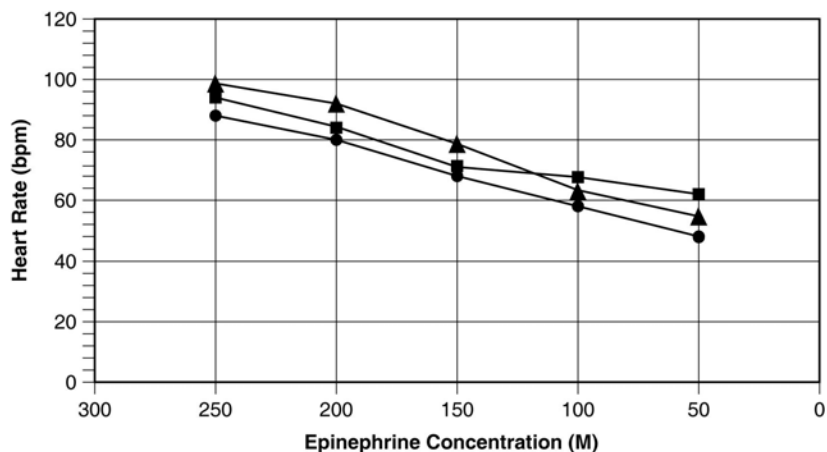|	Heart Rates		
Epinephrine (mg)	Animal 1	Animal 2	Animal 3
50	48	62	55
100	58	67	63
150	67	70	79
200	80	85	93
150	67	70	79

Table 1.1

Figure 1.1

53) List all of the errors in Figure 1.1.

Answer: 1. The units of concentration are labeled as M when they should be mg.
2. The x-axis is in decreasing order of concentration.
3. The graph needs a legend.

54) What is the reason for using a line graph to express the results of this study?

Answer: Line graphs are commonly used when the independent variable (x-axis) is a continuous phenomenon. In this study the concentration of epinephrine is a continuous function. The line allows for interpolation (i.e., estimating values between the measured values).

55) Use Table 1.1 to graph the data appropriately. What can you CONCLUDE based on the new figure?

Answer: Graphs should address the errors in Figure 1.1.
This small sample suggests that an increase in epinephrine concentration increases the average heart rate of *Sprague 'Dawley* rats.

Use the table and graph below to answer the following questions.

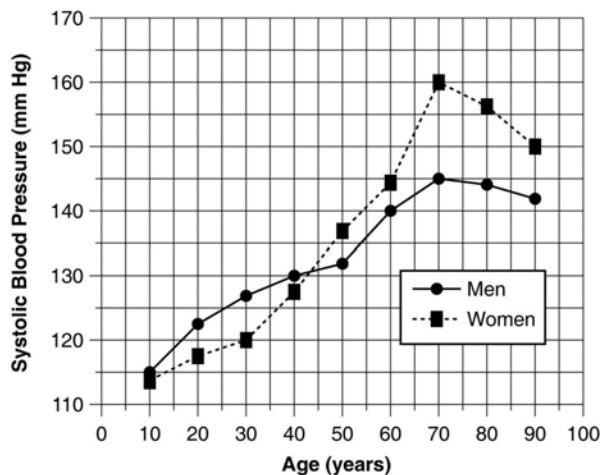| Average systolic blood pressure at various ages for males (M) and females (F).		
Average Blood Pressure		
Age	**M**	**F**
10	115	113
20	122	117
30	127	120
40	130	128
50	131	136
60	140	144
70	145	160
80	144	156
90	142	150

Table 1.2

Figure 1.2

56) Summarize the data shown in Figure 1.2.

Answer: The systolic pressure of both genders increases with age. Under age 40, the systolic pressure of males is higher than that of females. After age 40, the systolic pressure of females is higher than that of males. The greatest rate of increase is from ages 50 to 70 in both genders. Blood pressure declines after age 70.

57) Referring to Table 1.2, what general trend in systolic blood pressures is seen as both men and women increase in age?

Answer: The systolic pressure of both genders increases with advancing age.

58) Referring to Figure 1.2, at approximately what age do men begin to show higher systolic blood pressures than women? At what age does this trend reverse?

Answer: From age 10 to 40, male pressures are higher; after age 40, female pressures are higher.

59) You are doing an experiment to determine if caffeine consumption affects reaction time.
   A. Which is the dependent variable?
   B. Which is the independent variable?
   C. Briefly describe some ways you might manipulate the independent variable.
   D. Name three stimuli you could use, and how you might measure reaction time for each.
   E. Write an appropriate hypothesis for this study.
   F. You compute the following average values from your experiment. What would be a logical conclusion for these data?
      Average caffeine consumer's reaction time: 400 ms
      Average noncaffeine consumer's reaction time: 650 ms
   G. Sketch a simple graph to convey these results to your classmates. What kind of graph did you choose? Why? Which variable did you plot on the x–axis? Which one did you plot on the y–axis? Why?
   H. Do the results of this experiment support the hypothesis you chose?

   Answer: A. Reaction time
           B. Caffeine consumption
           C. Vary the amounts of caffeine consumed; vary the source, for example, use coffee, pills, cola drinks, and/or chocolate; vary both the amounts and sources.
           D. Answers will vary. Example: a computer–based timer could measure the time elapsed between the subject's detecting the appearance of an object on the computer monitor and depressing a key on the keyboard. Auditory or touch stimuli could be used, too.
           E. Depending on the answer to C, could choose: "Consumption of caffeine decreases reaction time" or similar statement.
           F. Consumption of caffeine improves reaction time by 250 ms, on average.
           G. Bar graph; allows comparison of the average of two groups. The x'axis: group, caffeine or none. The y–axis: reaction time in milliseconds.
           H. Yes, in case of hypothesis written in D.

Following is a table of data collected from one section of an 8 A.M. physiology lab. There were 20 students present, 10 men and 10 women. Information collected from the students included their height, weight, age, gender, and resting pulse rate. In addition, the students were surveyed to see if they smoked cigarettes, considered themselves "regular exercisers," if they had consumed caffeine the morning of the lab, and if they had eaten breakfast that day. A "y" or "n" (yes or no) was recorded to indicate their answers. Each student did "jumping jacks" for 5 minutes and recorded the time required to regain their resting heart rate, which is listed on the table as "recovery time." Finally, each student participated in an exercise designed to measure their reaction time (in milliseconds) in catching an object dropped by a lab partner according to specified criteria. Use this table to answer the following questions. Ignore statistical problems caused by small sample size, and so on.

DATA COLLECTED DURING HUMAN PHYSIOLOGY LAB

| ID	Ht cm	Wt kgs	AGE YRS	GENDER	SMOKE?	REG EXERCISE?	CAFFEINE?	RESTING PR (BPM)	RECOVERY TIME (Mins)	break fast?	REACTION TIME (MS)
MH	168	75	24	F	N	N	Y	72	5	N	180
JH	175	68	20	F	N	Y	N	108	4	N	201
Su	157	57	27	F	N	Y	N	44	3	N	137
Sa	178	67	22	F	N	N	N	48	7	Y	156
SH	178	61	32	F	N	N	Y	72	4	Y	206
D	170	55	36	F	Y	Y	Y	72	3	Y	232
A	168	57	19	F	Y	Y	N	72	1	Y	146
AN	162	54	20	F	Y	Y	Y	65	2	Y	166
CA	165	57	33	F	Y	N	Y	68	2	N	228
MS	155	55	28	F	Y	N	N	77	4	N	202
AVG	167.5	60.6	26.1					69.8	3.5		185.4
AVG Values	With	Brkfast	Females					65.8	3.4		181.2
AVG Values	Without	Brkfast	Females					73.8	3.6		189.6
M	178	92	38	M	N	N	Y	62	4	N	158
P	170	82	33	M	Y	Y	Y	61	4	N	158
G	175	80	23	M	N	Y	N	75	4	N	193
S	175	69	21	M	N	N	N	90	3	N	174
CH	179	82	19	M	N	N	Y	64	1	N	174
GM	184	75	22	M	Y	Y	N	80	2	Y	150
MP	178	70	27	M	N	Y	Y	69	1	Y	145
DM	190	102	23	M	Y	Y	Y	72	1	Y	170
RB	193	95	21	M	Y	N	N	68	4	Y	153
BF	185	97	20	M	Y	N	N	68	3	Y	163
AV-M	181	84	25					71	2.7	MEN	164
AV-F	168	61	26					70	3.5	WOMEN	185
AVG	174	72	25					70	3	ALL	175
AVG Values	With	Brkfast	Males					71.4	2.2		156.2
AVG Values	Without	Brkfast	Males					70.4	3.2		171.4

Table 1.3
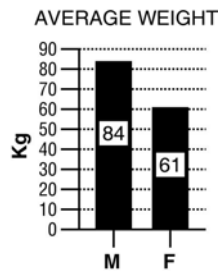
Figure 1.3

For these questions, the data were separated and analyzed by gender.

60) Refer to Table 1.3 and Figure 1.3 (bar graph).
   A. Write a hypothesis regarding gender and weight.
   B. What is the dependent variable? What is the independent variable?
   C. Based on the data in the graph above, what is your conclusion?
   D. Why is a bar graph a good choice for presentation of these data? Would another type of chart be as effective?

Answer: A. Males weigh more than females.
   B. Weight depends on gender; thus weight is dependent, gender is independent.
         C. Males weigh more than females.
         D. Bar graph allows comparison of the average of two groups. No.

61) Refer to Table 1.3.
   A. Write a hypothesis regarding gender and recovery time.
   B. What is the dependent variable? What is the independent variable?
   C. Create a graph using the averages from the data table. Based on these data, what do you conclude?

   Answer: A. A prediction such as "Males recover from exercise more quickly than females" would be appropriate.
   B. The independent variable is gender; the dependent variable is recovery time.
   C. A bar graph such as the one below is appropriate. In this study, men recovered from exercise more quickly than women.
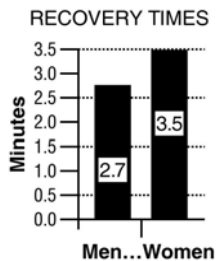

62) Refer to Table 1.3.
   A. Write a hypothesis regarding the effects of breakfast consumption on reaction time.
   B. What is the dependent variable? What is the independent variable?

   Answer: A. A prediction such as "Eating breakfast prior to testing improves reaction time of subjects (compared to subjects who did not eat breakfast)" is appropriate.
   B. The independent variable is breakfast consumption; the dependent variable is reaction time.

63) Refer to Table 1.3.
   A. Disregarding gender, write a hypothesis that expresses the relationship between weight and height.
   B. What is the dependent variable? What is the independent variable?
   C. From the data in Table 1.3, construct a graph that examines this relationship.

   Answer: A. A prediction such as "As height increases, weight increases" would be appropriate.
   B. The dependent variable would be weight, the independent variable is height.
   C.

14
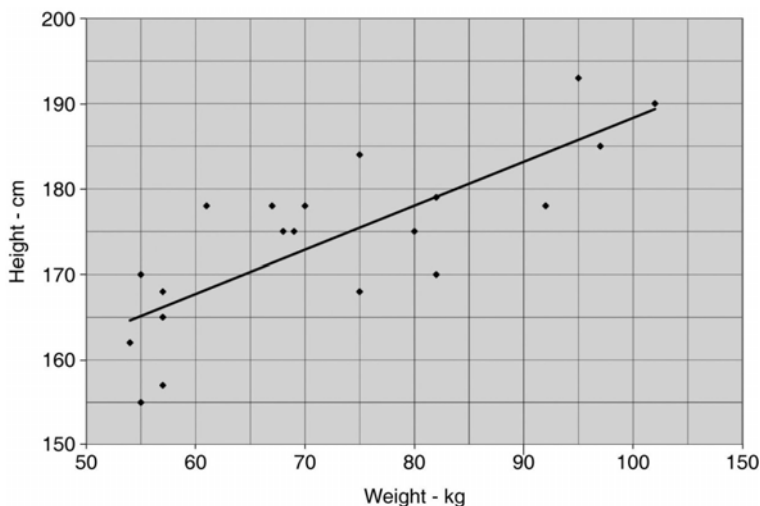
64) Table 1.3 shows data on various factors that may or may not be related to resting pulse rate, time to recovery to resting pulse rate after a few minutes of exercise, and reaction time measured by how quickly a student could press a keyboard key after seeing a computer–generated prompt. For each question below, write a testable hypothesis, identify the dependent and independent variables, sketch an appropriate graph of the results, and draw a conclusion from the data presented in the table. Discuss your results.
   A. Does caffeine consumption have an effect on resting pulse rate?
   B. Does age play a role in resting pulse rate? Does weight?
   C. Is there a relationship between eating breakfast and recovery time?
   D. Is there a relationship between reaction time and height?
   E. Do women who smoke show differences in their resting pulse rates compared to female nonsmokers or to male smokers and nonsmokers?
   F. Does regular exercise have an effect on resting pulse rate?

Answer: Answers will vary, but examples follow (conclusions written here are based on cursory examination of graphed data—no statistical tests of significance were performed).
   A. Hypothesis: Caffeine consumption increases heart rate.
   Independent variable: caffeine consumption.
   Dependent variable: resting pulse rate.
   Conclusion: Mean pulse rates between caffeine–drinking (68 bpm) and control subjects 73 bpm) are similar (large variation between individuals); hypothesis rejected.
   B. Hypothesis: Pulse rate is lower in older people and is higher in heavier people.
   Independent variables: age and weight.
   Dependent variables: resting pulse rate.
   Conclusion: Pulse rate was similar in all groups; hypothesis rejected.
   C. Hypothesis: People who ate breakfast have a faster reaction time.
   Independent variable: breakfast consumption.
   Dependent variable: pulse rate.
   Conclusion: People who ate breakfast had a faster reaction time (168.7 msec vs. 180.5 msec); hypothesis supported.
   D. Hypothesis: There is no relationship between height and reaction time.
   Independent variable: height.
   Dependent variable: reaction time.
   Conclusion: Reaction time did not vary with height; hypothesis supported.
   E. Hypothesis: Smokers of both genders have a higher resting pulse rate than nonsmokers of either gender, and males and females are affected equally.
   Independent variables: smoking and gender.
   Dependent variable: pulse rate.
   Conclusion: There was no difference in pulse rate in any of the groups (70.4 bpm in nonsmokers vs. 70.3 bpm in smokers); hypothesis rejected.
   F. Hypothesis: People who exercise regularly have a lower resting pulse rate.
   Independent variable: exercise.
   Dependent variable: pulse rate.
   Conclusion: Regular exercise had no effect on resting pulse rate (68.9 bpm in nonexercisers vs. 71.8 bpm in exercisers); hypothesis rejected.

   Discussion may cover issues such as the effect of small sample size, use of adults of limited age range, lack of control over treatments (Were the subjects honest about age, eating breakfast, consuming caffeine, smoking, and exercising? Were the quantitative data of height and weight determined in the lab using the same equipment and same data collector?), the value of statistical analysis, and so on. It is likely that students will be surprised by some of the results and could make erroneous conclusions. For example, pulse rate may vary with age, but without including children and senior citizens in the sample population, this trend would be missed.

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

65) The law of mass balance states:
    A) if one is to survive they must have a certain amount of mass.
    B) that all matter is neither created or destroyed.
    C) that homeostasis can be maintained when the load of a substance is continuously lost.
    D) that all substances in the body have equal mass.
    E) if a substance is to remain constant any gain must be offset by an equal loss.

65) _____

Answer: E

66) Mass balance involves determining the total amount of a substance in the body. We can determine the rate of production (i.e. Mass Flow) of this substance by which of the following formulas?
    A) (concentration of a substance) × (volume/min)
    B) (amount of substance / min) × (concentration of the substance)
    C) intake + production – excretion – metabolism.
    D) volume of flow / (amount of substance / min)
    E) (concentration of a substance) / volume flow

66) _____

Answer: A

67) _____ are kept within normal range by physiological control mechanisms which are used if the variable strays too far from its _____.
    A) Independent variables, steady state
    B) Setpoints, regulated variable
    C) Regulated variables, setpoint
    D) Steady state values, integrating center
    E) Dependent variables, lowest value

67) _____

Answer: C

68) The vasodilation of blood vessels surrounding muscles due to the production of carbon dioxide during exercise is an example of which of the following?
    A) long–distance control
    B) neural control
    C) reflex control
    D) hormonal control
    E) local control

68) _____

Answer: E

69) Which of the following are used to keep our systems at or near their setpoints?
    A) feedback loops
    B) positive feedback loops
    C) feedforward control loop
    D) response loops
    E) open control loops

69) _____

Answer: A