Test Bank

Anatomy & Physiology

Fourth Edition

Elaine N. Marieb
Katja Hoehn

This Test Bank is adapted from the
Human Anatomy & Physiology, Eighth Edition
Test Bank by Jerri K. Lindsey.

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Contents

Preface

This Test Bank was developed to accompany *Anatomy & Physiology*, Fourth Edition, by Elaine N. Marieb and Katja Hoehn. Each chapter contains a variety of questions, including:

- Matching Questions
- True/False Questions
- Multiple-Choice Questions
- Fill-in-the-Blank/Short Answer Questions
- Clinical Questions

Since it is often difficult to measure student understanding of conceptual ideas, especially in physiology, emphasis is placed on the proper design of multiple-choice questions. Because multiple-choice questions test comprehension as well as recall, a large number of these questions are provided. Additionally, objective questions lend themselves well to machine scoring, which is often necessary with large classes.

For each question in this Test Bank, the following information is provided:

Answer:	Correct answer. The essay questions include short answers that may be expanded upon by the instructor or student.
Diff:	Level of difficulty. Noted as 1 (relatively easy; requires a thorough knowledge of vocabulary), 2 (harder; requires greater in-depth understanding of vocabulary and basic concepts), and 3 (hard; requires a thorough understanding of vocabulary and concepts as well as analysis of this information).
Page Ref:	Reference to the page(s) where the vocabulary or concept can be found, and may include relevant figure and table numbers.

This Test Bank is intended as a complete question source to accompany the text, but it can also be used to supplement any existing questions an instructor may already be using. The Test Bank is formatted so that an instructor can cut and paste questions for preparation of an exam. An interactive Macintosh and Windows CD-ROM version of this Test Bank is available, which will allow you to easily alter the questions provided or add new questions to fit your class. Visit the Pearson Higher Education catalog page to download the electronic version of this printed Test Bank and other available instructor supplements at www.pearsonhighered.com.

Since testing is an integral part of any course, and science courses in particular are an ideal arena to explore logical thought processes, we hope this Test Bank will serve as a nucleus for developing critical thinking in students and will enhance the learning experience for both students and instructors.

We are always looking for new questions to add to this Test Bank, so please feel free to suggest questions you would like to see added to the next edition.

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Chapter 1 The Human Body: An Introduction

Matching Questions

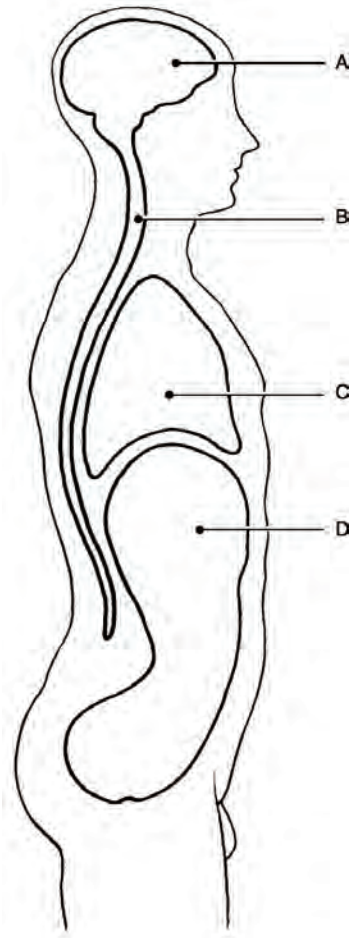

Figure 1.1

Using Figure 1.1, match the following cavities:

1) Thoracic cavity.

Answer: C
Diff: 1 Page Ref: 15–16; Fig. 1.9

2) Cranial cavity.

Answer: A
Diff: 1 Page Ref: 15–16; Fig. 1.9

3) Abdominal cavity.

Answer: D
Diff: 1 Page Ref: 15–16; Fig. 1.9

4) Vertebral cavity.

Answer: B
Diff: 1 Page Ref: 15–16; Fig. 1.9

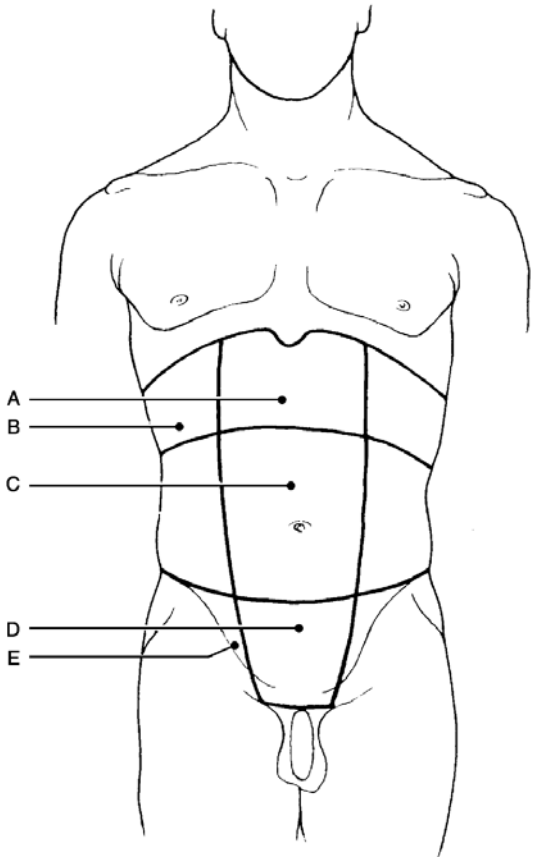

Figure 1.2

Using Figure 1.2, match the following regions:

5) Umbilical region.

Answer: C
Diff: 1 Page Ref: 17; Fig. 1.12

6) Right hypochondriac.

Answer: B
Diff: 1 Page Ref: 17; Fig. 1.12

7) Hypogastric (pubic) region.

Answer: D
Diff: 1 Page Ref: 17; Fig. 1.12

8) Epigastric region.

Answer: A
Diff: 1 Page Ref: 17; Fig. 1.12

9) Right iliac (inguinal) region.
Answer: E
Diff: 1 Page Ref: 17; Fig. 1.12

Match the following systems to their functions:

10) Directly causes mechanical motion.
Diff: 1 Page Ref: 6; Fig. 1.3c

11) Responds to environmental changes by transmitting electrical impulses.
Diff: 1 Page Ref: 6; Fig. 1.3d

12) Provides support and levers for muscles to work on.
Diff: 1 Page Ref: 6; Fig. 1.3b

13) Protects underlying organs from mechanical damage and synthesizes vitamin D.
Diff: 2 Page Ref: 6; Fig. 1.3a

A) Muscular
B) Skeletal
C) Integumentary
D) Nervous

Answers: 10) A 11) D 12) B 13) C

Match the following systems to their functions:

14) Controls the body with chemical molecules called hormones.
Diff: 2 Page Ref: 6; Fig. 1.3e

15) Delivers oxygen and nutrients to the tissues.
Diff: 1 Page Ref: 6; Fig. 1.3f

16) Produces antibodies that neutralize foreign substances.
Diff: 1 Page Ref: 7; Fig. 1.3g

17) Removes and filters excess fluid from tissues.
Diff: 1 Page Ref: 7; Fig. 1.3g

A) Immune
B) Endocrine
C) Cardiovascular
D) Lymphatic

Answers: 14) B 15) C 16) A 17) D

Match the following examples of feedback mechanisms:

18) Blood glucose levels
Diff: 2 Page Ref: 9–10

19) Blood pressure
Diff: 3 Page Ref: 9–10

20) Blood clotting
Diff: 2 Page Ref: 9–10

21) Delivering a baby
Diff: 2 Page Ref: 9–10

A) Negative feedback

B) Positive feedback

Answers: 18) A 19) A 20) B 21) B

Match the following systems and organs:

22) Arteries, veins, heart.
Diff: 1 Page Ref: 6; Fig. 1.3f

23) Trachea, bronchi, alveoli.
Diff: 1 Page Ref: 7; Fig. 1.3h

24) Adrenal glands, pancreas, pituitary.
Diff: 1 Page Ref: 6; Fig. 1.3e

25) Esophagus, large intestine, rectum.
Diff: 1 Page Ref: 7; Fig. 1.3i

26) Kidneys, bladder, ureters.
Diff: 1 Page Ref: 7; Fig. 1.3j

A) Digestive

B) Cardiovascular

C) Urinary

D) Respiratory

E) Endocrine

Answers: 22) B 23) D 24) E 25) A 26) C

Match the following cavities and organs:

27) Stomach.
Diff: 1 Page Ref: 15; Fig. 1.9

28) Heart.
Diff: 1 Page Ref: 15; Fig. 1.9

29) Uterus.
Diff: 1 Page Ref: 15; Fig. 1.9

30) Brain.
Diff: 1 Page Ref: 15; Fig. 1.9

31) Lungs.
Diff: 1 Page Ref: 15; Fig. 1.9

A) Cranial
B) Abdominopelvic
C) Thoracic

Answers: 27) B 28) C 29) B 30) A 31) C

Match the following regional terms and common terms:

32) Arm.
Diff: 1 Page Ref: 13; Fig. 1.7

33) Buttock.
Diff: 1 Page Ref: 13; Fig. 1.7

34) Head.
Diff: 1 Page Ref: 13; Fig. 1.7

35) Knee (anterior aspect).
Diff: 1 Page Ref: 13; Fig. 1.7

36) Chest.
Diff: 1 Page Ref: 13; Fig. 1.7

A) Brachial
B) Gluteal
C) Cephalic
D) Patellar
E) Thoracic

Answers: 32) A 33) B 34) C 35) D 36) E

Match the regional/directional terms and examples:

37) The bridge of the nose is _____ to the left eye.
Diff: 2 Page Ref: 12; Tbl. 1.1

38) The upper arm is _____ to the forearm.
Diff: 2 Page Ref: 12; Tbl. 1.1

39) The heart is _____ to the stomach.
Diff: 2 Page Ref: 12; Tbl. 1.1

40) The fingers are _____ to the wrist.
Diff: 2 Page Ref: 12; Tbl. 1.1

41) The stomach is _____ to the spine.
Diff: 2 Page Ref: 12; Tbl. 1.1

A) Medial

B) Distal

C) Proximal

D) Anterior

E) Superior

Answers: 37) A 38) C 39) E 40) B 41) D

True/False Questions

1) Positive feedback mechanisms tend to increase the original stimulus.
Answer: TRUE
Diff: 1 Page Ref: 9–10

2) The anatomical position means the body is standing at attention with the palms facing forward and the thumbs pointing away from the body.
Answer: TRUE
Diff: 1 Page Ref: 13; Fig. 1.7

3) The elbow is proximal to the shoulder.
Answer: FALSE
Diff: 1 Page Ref: 12; Tbl. 1.1

4) The serous membrane that lines the peritoneal cavity wall is called visceral peritoneum.
Answer: FALSE
Diff: 2 Page Ref: 16–17

5) A major function of serous membranes is to decrease friction.
Answer: TRUE
Diff: 1 Page Ref: 16–17

6) The right hypochondriac region contains the majority of the stomach.
Answer: FALSE
Diff: 1 Page Ref: 17; Fig. 1.12

7) Lungs carry out an excretory function.

Answer: TRUE
Diff: 2 Page Ref: 7

8) Embryology concerns the structural changes that occur in an individual from conception through old age.

Answer: FALSE
Diff: 1 Page Ref: 2

9) A tissue consists of groups of similar cells that have a common function.

Answer: TRUE
Diff: 1 Page Ref: 4

10) It is important for any organism to maintain its boundaries, so that its internal environment remains distinct from the external environment surrounding it.

Answer: TRUE
Diff: 1 Page Ref: 4

11) Without some sort of negative feedback mechanism, it would be impossible to keep our body chemistry in balance.

Answer: TRUE
Diff: 1 Page Ref: 9

12) Regardless of the variable being regulated, all homeostatic control mechanisms have at least three interdependent components.

Answer: TRUE
Diff: 2 Page Ref: 9; Fig. 1.4

13) The epigastric region is located superior to the umbilical region.

Answer: TRUE
Diff: 1 Page Ref: 17; Fig. 1.12

Multiple–Choice Questions

1) Histology would be best defined as a study of _____.
   A) cells
   B) tissues
   C) cell chemistry
   D) the gross structures of the body

Answer: B
Diff: 1 Page Ref: 2

2) The study of the heart may incorporate many aspects of anatomy but as a whole you would say it is _____ anatomy.
   A) microscopic
   B) gross
   C) developmental
   D) systemic

Answer: B
Diff: 1 Page Ref: 2

3) An increased rate of breathing as a result of an increased buildup of carbon dioxide in the bloodstream would be best described as an example of _____.
   A) maintaining boundaries
   B) excretion of metabolic waste
   C) responsiveness
   D) metabolism

   Answer: B
   Diff: 2 Page Ref: 5

4) Average body temperature is _____ degrees centigrade.
   A) 98
   B) 68
   C) 47
   D) 37

   Answer: D
   Diff: 1 Page Ref: 8

5) If you consider your home air conditioner in terms of homeostasis, then the wall thermostat would be the _____.
   A) control center
   B) receptor
   C) effector
   D) variable

   Answer: A
   Diff: 2 Page Ref: 8–9

6) What is the main, general purpose of negative feedback?
   A) to control all body system tissues
   B) to maintain homeostasis
   C) to keep the body's sugar high
   D) to regulate excretion

   Answer: B
   Diff: 2 Page Ref: 8–9

7) What is the specific name for the hip region?
   A) manus
   B) inguinal
   C) pedal
   D) coxal

   Answer: D
   Diff: 1 Page Ref: 13; Fig. 1.7

8) An oblique cut is one that is cut _____.
   A) horizontal right and left
   B) diagonally between the vertical and horizontal
   C) vertical right and left
   D) perpendicular to vertical and horizontal

   Answer: B
   Diff: 2 Page Ref: 13

9) The heart lies in the _____ cavity.
A) superior mediastinal
B) pleural
C) dorsal
D) pericardial

Answer: D
Diff: 1 Page Ref: 15; Fig. 1.9

10) The cavities housing the eyes are called _____ cavities.
A) frontal
B) cranial
C) nasal
D) orbital

Answer: D
Diff: 1 Page Ref: 17

11) A structure that is composed of two or more tissues would be a(n) _____.
A) complex tissue
B) organ system
C) organ
D) complex cell

Answer: C
Diff: 1 Page Ref: 4

12) _____ cavities are spaces within joints.
A) Nasal
B) Synovial
C) Orbital
D) Oral

Answer: B
Diff: 2 Page Ref: 17–18

13) Which of the following would *not* be a functional characteristic of life?
A) movement
B) responsiveness to external stimuli
C) maintenance of boundaries
D) decay

Answer: D
Diff: 2 Page Ref: 4–6

14) Which term means toward or at the back of the body, behind?
A) anterior
B) lateral
C) distal
D) dorsal

Answer: D
Diff: 1 Page Ref: 12; Tbl. 1.1

15) The single most abundant chemical substance of the body, accounting for 60% to 80% of body weight, is _____.
A) oxygen
B) protein
C) water
D) hydrogen

Answer: C
Diff: 1 Page Ref: 8

16) What is the posterior side of the patella called?
A) sural
B) crural
C) antecubital
D) popliteal

Answer: D
Diff: 2 Page Ref: 13; Fig. 1.7

17) Which of the following statements is true concerning feedback mechanisms?
A) Positive feedback mechanisms always result in excessive damage to the host.
B) Negative feedback mechanisms tend to increase the original stimulus.
C) Negative feedback mechanisms work to prevent sudden severe changes within the body.
D) Blood glucose levels are regulated by positive feedback mechanisms.

Answer: C
Diff: 2 Page Ref: 9–11

18) The anatomical position is characterized by all of the following *except* _____.
A) body erect
B) arms at sides
C) palms turned posteriorly
D) thumbs pointed laterally

Answer: C
Diff: 1 Page Ref: 11; Fig. 1.7

19) A good example of a positive feedback mechanism would be _____.
A) body temperature regulation
B) regulating glucose levels in the blood
C) enhancement of labor contractions
D) blood calcium level regulation

Answer: C
Diff: 1 Page Ref: 9–10

20) Which of the following describes a parasagittal plane?
A) a transverse cut just above the knees
B) two cuts dividing the body into left and right halves
C) any sagittal plane except the median
D) any cut dividing the body into anterior and posterior

Answer: C
Diff: 2 Page Ref: 13

21) Which of the following organs or structures would be found in the left iliac region?
A) appendix
B) stomach
C) liver
D) intestines

Answer: D
Diff: 2 Page Ref: 17; Fig. 1.12

22) The parietal pleura would represent a serous membrane _____.
A) covering individual lungs
B) lining the thoracic cavity
C) covering the heart
D) lining the abdominal cavity

Answer: B
Diff: 2 Page Ref: 16

23) Which one of the following systems responds to environmental stimuli?
A) muscular
B) lymphatic
C) immune
D) nervous

Answer: D
Diff: 2 Page Ref: 6; Fig. 1.3

24) Choose the anatomical topic and definition that is *not* correctly matched.
A) Gross anatomy: study of structures visible to the eye.
B) Microscopic anatomy: study of structures too small to be seen by the naked eye.
C) Cytology: study of the structures in a particular region.
D) Embryology: study of the changes in an individual from conception to birth.

Answer: C
Diff: 1 Page Ref: 2

25) Homeostasis is the condition in which the body maintains _____.
A) the lowest possible energy usage
B) a relatively stable internal environment, within limits
C) a static state with no deviation from preset points
D) a dynamic state within an unlimited range

Answer: B
Diff: 2 Page Ref: 8–9

26) In which cavities are the lungs located?
A) pleural, ventral, and thoracic
B) mediastinum, thoracic, and ventral
C) pleural, dorsal, and abdominal
D) pericardial, ventral, and thoracic

Answer: A
Diff: 1 Page Ref: 15; Fig. 1.9

27) Choose the following statement that is *not* completely correct regarding serous membranes.
A) Serosa are very thin, double–layered structures.
B) Serous membranes are divided into parietal and visceral membranes with a potential space between the two.
C) Visceral pericardium covers the surface of the heart, and parietal pericardium lines the walls of the heart.
D) Serous membranes secrete a watery lubricating fluid.

Answer: C
Diff: 2 Page Ref: 15–16

28) Place the following in correct sequence from simplest to most complex:

1. molecules
2. atoms
3. tissues
4. cells
5. organ

A) 1–2–3–4–5
B) 2–1–4–3–5
C) 2–1–3–4–5
D) 1–2–4–3–5

Answer: B
Diff: 2 Page Ref: 3; Fig 1.1

29) Which of these is *not* part of the dorsal cavity?
A) cranial cavity
B) thoracic cavity
C) spinal cord
D) vertebral cavity

Answer: B
Diff: 1 Page Ref: 15–16; Fig. 1.9

30) In which abdominopelvic cavity is the stomach located?
A) right upper
B) right lower
C) left upper
D) left lower

Answer: C
Diff: 2 Page Ref: 16; Fig. 1.9

31) Which of the following statements is the most correct regarding homeostatic imbalance?
A) It is considered the cause of most diseases.
B) The internal environment is becoming more stable.
C) Positive feedback mechanisms are overwhelmed.
D) Negative feedback mechanisms are functioning normally.

Answer: A
Diff: 3 Page Ref: 10

32) Subdivisions of anatomy include which of the following?
A) gross, macroscopic, visual, and microscopic
B) gross, regional, dissection, and surface
C) regional, surface, visual, and microscopic
D) gross, regional, systemic, and surface

Answer: D
Diff: 2 Page Ref: 2

33) The term *pollex* refers to the _____.
A) great toe
B) calf
C) fingers
D) thumb

Answer: D
Diff: 1 Page Ref: 13; Fig. 1.7

34) The dorsal body cavity is the site of which of the following?
A) intestines
B) brain
C) lungs
D) liver

Answer: B
Diff: 1 Page Ref: 15; Fig. 1.9

35) Select the most correct statement.
A) The immune system is closely associated with the lymphatic system.
B) Organ systems operate independently of each other to maintain life.
C) The endocrine system is not a true structural organ system.
D) Organ systems can be composed of cells or tissues, but not both.

Answer: A
Diff: 2 Page Ref: 7; Fig. 1.3

36) One of the functional characteristics of life is irritability. This refers to _____.
A) indigestible food residues stimulating the excretory system
B) sensing changes in the environment and then reacting or responding to them
C) the nervous system causing all living things to sometimes experience anger
D) the necessity for all organisms to reproduce

Answer: B
Diff: 3 Page Ref: 5

37) Which of the following are survival needs of the body?
A) nutrients, water, movement, and reproduction
B) nutrients, water, growth, and reproduction
C) water, atmospheric pressure, growth, and movement
D) nutrients, water, atmospheric pressure, and oxygen

Answer: D
Diff: 3 Page Ref: 6–8

38) The anatomical position is used _____.
A) rarely, because people don't usually assume this position
B) as a standard reference point for directional terms regardless of the actual position of the body
C) only when a body is lying down
D) as the most comfortable way to stand when dissecting a specimen

Answer: B
Diff: 2 Page Ref: 11

39) What is a vertical section through the body, dividing it into left and right, called?
A) frontal
B) regional
C) sagittal
D) transverse

Answer: C
Diff: 1 Page Ref: 13

40) What is a vertical section through the body, dividing it into anterior and posterior regions called?
A) frontal
B) median
C) sagittal
D) transverse

Answer: A
Diff: 1 Page Ref: 13–14; Fig 1.8

41) Which body cavity protects the nervous system?
A) cranial
B) dorsal
C) vertebral
D) thoracic

Answer: B
Diff: 1 Page Ref: 15

42) Which of the following describes the operation of the heart and blood vessels?
A) systemic anatomy
B) cardiovascular anatomy
C) systemic physiology
D) cardiovascular physiology

Answer: B
Diff: 1 Page Ref: 2

Fill–in–the–Blank/Short Answer Questions

1) Similar cells that have a common function are called _____.

Answer: tissues
Diff: 1 Page Ref: 4

2) What does the “principle of complementarity of structures and function” mean?

Answer: What a structure can do depends on its specific form, or "structure determines function."
Diff: 2 Page Ref: 2

3) The term that describes the back of the elbow is _____.

Answer: olecranal
Diff: 2 Page Ref: 13; Fig. 1.7

4) The term that describes the heel region is _____.

Answer: calcaneal
Diff: 1 Page Ref: 13; Fig. 1.7

5) The elbow is _____ to the wrist.

Answer: proximal
Diff: 2 Page Ref: 12; Tbl 1.1

6) The _____ cavity contains tiny bones that transmit sound vibrations to the organ of hearing in the inner ear.

Answer: middle ear
Diff: 1 Page Ref: 17

7) _____ is explained by chemical and physical principles and is concerned with the function of specific organs or organic systems.

Answer: Physiology
Diff: 1 Page Ref: 2

8) What is a dynamic equilibrium of your internal environment termed?

Answer: homeostasis
Diff: 2 Page Ref: 8–9

9) Which cavity contains the bladder, some reproductive organs, and the rectum?

Answer: pelvic
Diff: 1 Page Ref: 15; Fig. 1.9

10) What is the serous membrane that covers the intestines called?

Answer: visceral
Diff: 1 Page Ref: 16

11) _____ physiology concerns urine production and kidney function.

Answer: Renal
Diff: 1 Page Ref: 2

12) What broad term covers all chemical reactions that occur within the body cells?

Answer: metabolism
Diff: 1 Page Ref: 5

13) What is the function of the serous membranes?

Answer: They act to reduce friction and allow the organs to slide across cavity walls.
Diff: 2 Page Ref: 16

14) Fully describe the anatomical position for the human body.

Answer: The body is erect, arms hanging at the sides, palms forward, and thumbs pointed away from the midline.
Diff: 2 Page Ref: 11

15) What does gross anatomy study?

Answer: Larger structures of the body that can be seen with the naked eye.
Diff: 2 Page Ref: 2

16) Can lungs carry out excretory functions? Explain your answer.

Answer: Yes, carbon dioxide is a metabolic waste the lungs excrete.
Diff: 2 Page Ref: 5

17) The higher we go in the mountains, the greater the atmospheric pressure, which causes a loss of oxygen. Comment on this statement.

Answer: The statement is backwards—the higher we go, the less atmospheric pressure, therefore less oxygen.
Diff: 2 Page Ref: 8

18) Why is anatomical terminology necessary?

Answer: Anatomical terms are precise words that have limited usage, which prevents confusion when describing the location of body parts.
Diff: 2 Page Ref: 11

19) The five cavities of the head are cranial, oral, nasal, middle ear, and _____.

Answer: orbital
Diff: 2 Page Ref: 17

20) The ability to sense changes in the environment and respond to them is called _____.

Answer: responsiveness or irritability
Diff: 1 Page Ref: 5

21) What is the single most abundant chemical substance in the body?

Answer: water
Diff: 1 Page Ref: 8

22) Why must a normal body temperature be maintained in order for chemical reactions to be continued at life-sustaining rates?

Answer: If body temperature is too low, chemical reactions slow and eventually stop. If body temperature is too high, chemical reactions speed up and body proteins lose their normal shape, resulting in loss of function.
Diff: 3 Page Ref: 8

23) What is the pathway between the receptor and the control center in the reflex pathway called?

Answer: afferent pathway
Diff: 1 Page Ref: 9; Fig. 1.4

24) What type of homeostatic feedback reflex is the withdrawal reflex?

Answer: negative
Diff: 3 Page Ref: 9

25) Why are the abdominopelvic cavity organs the most vulnerable in an automobile accident?

Answer: The walls of the abdominal cavity are formed only by trunk muscles and are not reinforced by bone. The pelvic organs receive a somewhat greater degree of protection from the bony pelvis.
Diff: 3 Page Ref: 16

26) What is the goal of all of the negative feedback mechanisms of the body?

Answer: The goal is to prevent sudden severe changes within the body.
Diff: 2 Page Ref: 9–10

27) Which feedback mechanism causes the variable to deviate further and further from its original value or range?

Answer: positive feedback
Diff: 2 Page Ref: 9–10

28) What can happen when the usual negative feedback mechanisms are overwhelmed and destructive positive feedback mechanisms take over?

Answer: Homeostatic imbalances increase our risk for illness and produce the changes we associate with aging.
Diff: 3 Page Ref: 10

29) Which body system would be most affected by a lower than normal atmospheric pressure?

Answer: respiratory system
Diff: 3 Page Ref: 8

Clinical Questions

1) A small family was traveling in its van and had a minor accident. The children in the back seats were wearing lap belts, but still sustained numerous bruises about the abdomen, and had some internal organ injuries. Why is this area more vulnerable to damage than others?

Answer: The abdominal organs are the least protected in the body because they are not surrounded by a bony covering such as the ribs, pelvis, or cranium.
Diff: 3 Page Ref: 15; Fig. 1.9

2) A surgeon removed a section of tissue along a transverse plane for microscopic examination. What two names would the section be called?

Answer: A cross section or a transverse section.
Diff: 2 Page Ref: 13

3) Judy is 16 years old and collapses on the gym floor with severe pain in her chest wall. She is rushed by ambulance to the emergency room. Judy is diagnosed with pleurisy and is given an anti–inflammatory through the intravenous route. Explain why an anti–inflammatory would be prescribed for someone with pleurisy.

Answer: The pleural space contains a small amount of fluid that acts as a lubricant, allowing the pleurae to slide smoothly over each other as the lungs expand and contract. Pleurisy is an inflammation of the parietal pleura of the lungs. When inflammation occurs in the pleural space, the pleurae do not slide smoothly and this causes severe pain.
Diff: 3 Page Ref: 16–17

4) Explain why an 80–year–old woman requires a much longer time to recover from the flu than does a woman who is age 30.

Answer: As we age, our body's control systems become less efficient. As a result, our internal environment becomes less and less stable.
Diff: 3 Page Ref: 10

5) The nurse charted: "Patient has an open wound located on lateral aspect of leg." Describe where the wound is located.

Answer: The wound is located on the outer side of the leg.
Diff: 2 Page Ref: 12; Tbl. 1.1

6) The patient was admitted to the hospital with hypertension. The development of arteriosclerosis has increased peripheral resistance to blood flow, worsening his hypertension. This is an example of what type of feedback loop and why?

Answer: Positive feedback loops are common in pathophysiological perpetuation of disease. For example, arteriosclerotic hypertension results in positive feedback mechanisms that enhance and propagate the initial step in the chain of events, which is hypertension.
Diff: 3 Page Ref: 9–10

Matching Questions

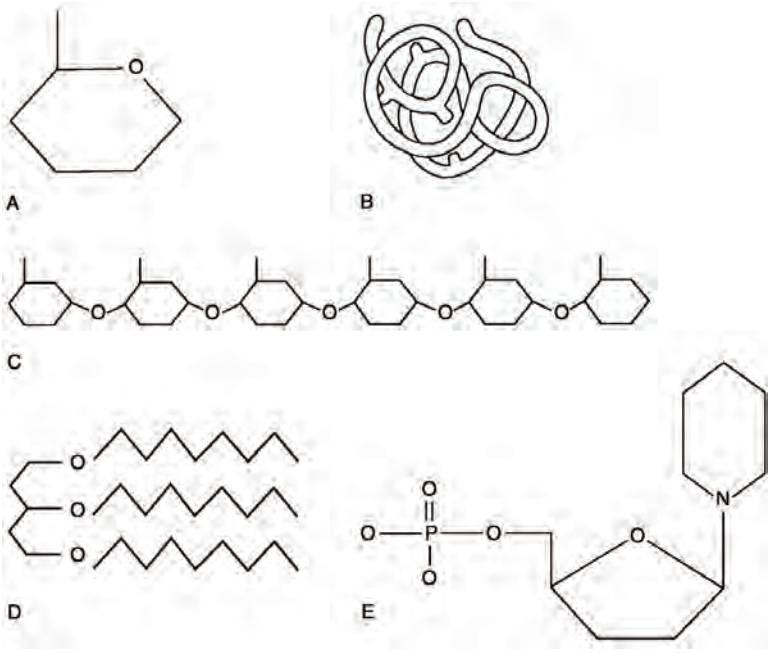

Figure 2.1

Using Figure 2.1, match the following:

1) Lipid.
Answer: D
Diff: 2 Page Ref: 39; Fig. 2.15b

2) Functional protein.
Answer: B
Diff: 2 Page Ref: 45; Fig. 2.19d

3) Nucleotide.
Answer: E
Diff: 2 Page Ref: 50; Fig. 2.22a

4) Polysaccharide.
Answer: C
Diff: 2 Page Ref: 39; Fig. 2.15c

5) Monosaccharide.
Answer: A
Diff: 2 Page Ref: 39; Fig. 2.15a

6) Polymer.

Answer: C
Diff: 2 Page Ref: 39; Fig. 2.15c

7) Tertiary (protein) structure.

Answer: B
Diff: 2 Page Ref: 45; Fig. 2.19c

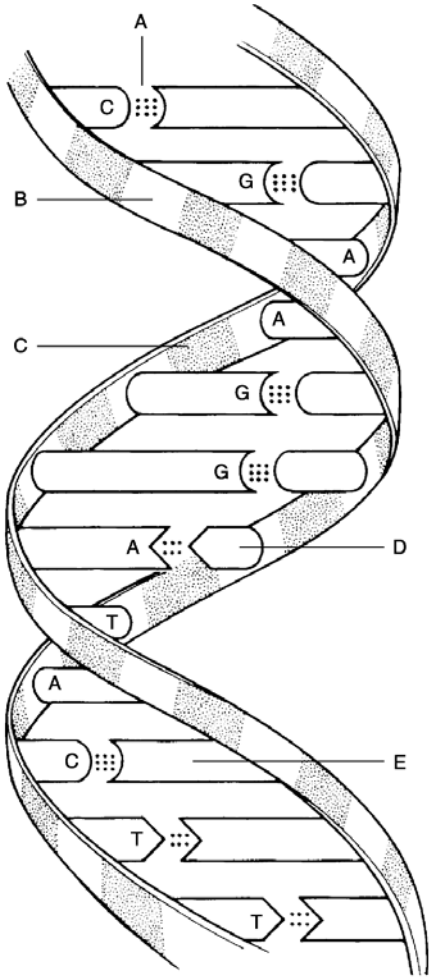

Figure 2.2

Using Figure 2.2, match the following:

8) Deoxyribose sugar.

Answer: B
Diff: 2 Page Ref: 50; Fig. 2.22

9) Thymine.

Answer: D
Diff: 2 Page Ref: 50; Fig. 2.22

10) Guanine.

Answer: E
Diff: 2 Page Ref: 50; Fig. 2.22

11) Phosphate.

Answer: C
Diff: 2 Page Ref: 50; Fig. 2.22

12) Hydrogen bonds.

Answer: A
Diff: 3 Page Ref: 50; Fig. 2.22

Match the following chemical bonds to the correct description:

13) A bond in which electrons are shared unequally.
Diff: 1 Page Ref: 30; Fig. 2.9

14) A bond in which electrons are completely lost or gained by the atoms involved.
Diff: 1 Page Ref: 27–28, 30

15) A bond in which electrons are shared equally.
Diff: 1 Page Ref: 30; Fig. 2.9

16) A type of bond important in tying different parts of the same molecule together into a three–dimensional structure.
Diff: 2 Page Ref: 30

A) Hydrogen bond

B) Polar covalent bond

C) Ionic bond

D) Nonpolar covalent bond

Answers: 13) B 14) C 15) D 16) A

Match the following particles to the correct description:

17) Electrically charged particle due to loss of an electron.
Diff: 1 Page Ref: 27

18) Neutral subatomic particle.
Diff: 1 Page Ref: 21

19) Smallest particle of an element that retains its properties.
Diff: 1 Page Ref: 21

20) Smallest particle of a compound that still retains its properties.
Diff: 2 Page Ref: 24

A) Cation

B) Neutron

C) Molecule

D) Atom

Answers: 17) A 18) B 19) D 20) C

Match the following:

21) Water.
Diff: 1 Page Ref: 24

22) Carbon.
Diff: 1 Page Ref: 21

23) Dry ice (frozen carbon dioxide).
Diff: 1 Page Ref: 24

24) Blood.
Diff: 1 Page Ref: 24–25

A) Element

B) Mixture

C) Compound

Answers: 21) C 22) A 23) C 24) B

Match the following:

25) Can be measured only by its effects on matter.
Diff: 1 Page Ref: 20

26) Anything that occupies space and has mass.
Diff: 1 Page Ref: 19

27) Although a man who weighs 175 pounds on Earth would be lighter on the moon and heavier on Jupiter, his _____ would not be different.
Diff: 2 Page Ref: 19

28) Is a function of, and varies with, gravity.
Diff: 2 Page Ref: 19

A) Matter
B) Energy
C) Mass
D) Weight

Answers: 25) B 26) A 27) C 28) D

Match the following:

29) Legs moving the pedals of a bicycle.
Diff: 1 Page Ref: 20

30) When the bonds of ATP are broken, energy is released to do cellular work.
Diff: 1 Page Ref: 20

31) Energy that travels in waves. Part of the electromagnetic spectrum.
Diff: 1 Page Ref: 20

32) Represented by the flow of charged particles along a conductor, or the flow of ions across a membrane.
Diff: 1 Page Ref: 20

A) Electrical energy
B) Radiant energy
C) Mechanical energy
D) Chemical energy

Answers: 29) C 30) D 31) B 32) A

Match the following:

33) Heterogeneous, will not settle.
Diff: 1 Page Ref: 26

34) Heterogeneous, will settle.
Diff: 1 Page Ref: 26

35) Homogeneous, will not settle.
Diff: 1 Page Ref: 24–25

36) Will not scatter light.
Diff: 1 Page Ref: 24–25

A) Suspensions

B) Colloids

C) Solutions

Answers: 33) B 34) A 35) C 36) C

True/False Questions

1) The atomic weight is only an average of relative weights of an atom and its isotopes, and it may vary from the weight of a specific isotope.
Answer: TRUE
Diff: 2 Page Ref: 23

2) Emulsions and colloids are the same thing.
Answer: TRUE
Diff: 1 Page Ref: 26

3) Chemical properties are determined primarily by neutrons.
Answer: FALSE
Diff: 1 Page Ref: 23

4) A charged particle is generally called an ion.
Answer: TRUE
Diff: 1 Page Ref: 27

5) Isotopes differ from each other only in the number of electrons contained.
Answer: FALSE
Diff: 1 Page Ref: 23

6) About 60% to 80% of the volume of most living cells consists of organic compounds.
Answer: FALSE
Diff: 1 Page Ref: 34

7) Lipids are a poor source of stored energy.
Answer: FALSE
Diff: 1 Page Ref: 42; Tbl. 2.2

8) Current information theorizes that omega–3 fatty acids decrease the risk of heart disease.
Answer: TRUE
Diff: 1 Page Ref: 42

9) Glucose is an example of a monosaccharide.

Answer: TRUE
Diff: 1 Page Ref: 38–40

10) A molecule consisting of one carbon atom and two oxygen atoms is correctly written as CO_2.

Answer: TRUE
Diff: 1 Page Ref: 30; Fig. 2.8

11) The lower the pH, the higher the hydrogen ion concentration.

Answer: TRUE
Diff: 1 Page Ref: 36

12) Covalent bonds are generally less stable than ionic bonds.

Answer: FALSE
Diff: 2 Page Ref: 28–30

13) Hydrogen bonds are comparatively strong bonds.

Answer: FALSE
Diff: 1 Page Ref: 30

14) The fact that *no* chemical bonding occurs between the components of a mixture is the chief difference between mixtures and compounds.

Answer: TRUE
Diff: 1 Page Ref: 26

15) Alpha particles, although relatively weak energy particles, are second only to smoking as a cause of lung cancer.

Answer: TRUE
Diff: 1 Page Ref: 23–24

16) No chemical bonding occurs between the components of a mixture.

Answer: TRUE
Diff: 2 Page Ref: 26

17) All organic compounds contain carbon.

Answer: TRUE
Diff: 1 Page Ref: 37

18) A dipeptide can be broken into two amino acids by dehydration synthesis.

Answer: FALSE
Diff: 1 Page Ref: 44; Fig. 2.18

19) The pH of body fluids must remain fairly constant for the body to maintain homeostasis.

Answer: TRUE
Diff: 1 Page Ref: 35–36

20) Mixtures are combinations of elements or compounds that are physically blended together but are not bound by chemical bonds.

Answer: TRUE
Diff: 2 Page Ref: 24

21) Buffers resist abrupt and large changes in the pH of the body by releasing or binding ions.

Answer: TRUE
Diff: 2 Page Ref: 36–37

Multiple–Choice Questions

1) Which of the following elements is necessary for proper conduction of nervous impulses?
   A) Fe
   B) I
   C) P
   D) Na

Answer: D
Diff: 2 Page Ref: 22; Tbl. 2.1

2) Choose the statement that is false or incorrect.
   A) In chemical reactions, breaking old bonds requires energy and forming new bonds releases energy.
   B) Exergonic reactions release more energy than they absorb.
   C) Endergonic reactions absorb more energy than they release.
   D) A key feature of the body's metabolism is the almost exclusive use of exergonic reactions by the body.

Answer: D
Diff: 3 Page Ref: 33

3) In general, the lipids that we refer to as oils have _____.
   A) a high water content
   B) long fatty acid chains
   C) a high degree of saturated bonds
   D) a high degree of unsaturated bonds

Answer: D
Diff: 2 Page Ref: 40–42

4) The genetic information is coded in DNA by the _____.
   A) regular alteration of sugar and phosphate molecules
   B) sequence of the nucleotides
   C) three–dimensional structure of the double helix
   D) arrangement of the histones

Answer: B
Diff: 2 Page Ref: 49

5) Which of the following is *not* true of proteins?
   A) They may be denatured or coagulated by heat or acidity.
   B) Some types are called enzymes.
   C) They appear to be the molecular carriers of the coded hereditary information.
   D) Their function depends on the three–dimensional shape.

Answer: C
Diff: 2 Page Ref: 43–49

6) The single most abundant protein in the body is _____.
A) DNA
B) hemoglobin
C) collagen
D) glucose

Answer: C
Diff: 2 Page Ref: 47; Tbl. 2.3

7) Carbohydrates are stored in the liver and muscles in the form of _____.
A) glucose
B) triglycerides
C) glycogen
D) cholesterol

Answer: C
Diff: 2 Page Ref: 40

8) Which of the following describes coenzymes?
A) organic molecules derived from vitamins
B) two enzymes that perform the same function
C) metal ions
D) enzymes that work together

Answer: A
Diff: 2 Page Ref: 47–48

9) Which of the following is *not* a role of molecular chaperonins?
A) prevent accidental, premature, or incorrect folding of polypeptide chains
B) aid the desired folding and association process of polypeptides
C) help to translocate proteins and certain metal ions across cell membranes
D) promote the breakdown of damaged or denatured proteins
E) act as a biological catalyst

Answer: E
Diff: 2 Page Ref: 46–47

10) A chemical reaction in which bonds are broken is usually associated with _____.
A) the release of energy
B) the consumption of energy
C) a synthesis
D) forming a larger molecule

Answer: A
Diff: 2 Page Ref: 33

11) Salts are always _____.
A) ionic compounds
B) single covalent compounds
C) double covalent compounds
D) hydrogen bonded

Answer: A
Diff: 2 Page Ref: 27–28

12) The numbers listed represent the number of electrons in the first, second, and third energy levels, respectively. On this basis, which of the following is an unstable or reactive atom?
A) 2, 8, 8
B) 2, 8
C) 2
D) 2, 8, 1

Answer: D
Diff: 3 Page Ref: 27

13) A solution that has a pH of 2 could best be described as being _____.
A) acidic
B) basic
C) neutral
D) slightly acidic

Answer: A
Diff: 2 Page Ref: 36

14) Which of the following is the major positive ion outside cells?
A) nitrogen
B) hydrogen
C) potassium
D) sodium

Answer: D
Diff: 2 Page Ref: 22; Tbl. 2.1

15) Which of the following would be regarded as an organic molecule?
A) H_2O
B) NaCl
C) NaOH
D) CH_4

Answer: D
Diff: 1 Page Ref: 37

16) What is a chain of 25 amino acids called?
A) polypeptide
B) nucleotide
C) protein
D) starch

Answer: A
Diff: 2 Page Ref: 43–46

17) Which of the following constitutes a long chain of simple sugars?
A) monosaccharide
B) polysaccharide
C) protein
D) nucleic acid

Answer: B
Diff: 1 Page Ref: 39–40; Fig. 2.15

18) What level of protein synthesis is represented by the coiling of the protein chain backbone into an alpha helix?
A) primary structure
B) secondary structure
C) tertiary structure
D) quaternary structure

Answer: B
Diff: 1 Page Ref: 45; Fig. 2.19

19) Carbohydrates and proteins are built up from their basic building blocks by the _____.
A) addition of a water molecule between each two units
B) addition of a carbon atom between each two units
C) removal of a water molecule between each two units
D) removal of a nitrogen atom between each two units

Answer: C
Diff: 2 Page Ref: 37–38

20) Which statement about enzymes is *false*?
A) Enzymes raise the activation energy needed to start a reaction.
B) Enzymes are composed mostly of protein.
C) Enzymes are organic catalysts.
D) Enzymes may be damaged by high temperature.

Answer: A
Diff: 2 Page Ref: 47–49

21) Which of the following statements is false?
A) Chemical reactions proceed more quickly at higher temperatures.
B) Chemical reactions progress at a faster rate when the reacting particles are present in higher numbers.
C) Larger particles move faster than smaller ones and thus collide more frequently and more forcefully.
D) Catalysts increase the rate of chemical reactions.

Answer: C
Diff: 2 Page Ref: 33

22) Which of the following is true regarding the concentration of solutions?
A) Percent solutions are parts per 1000 parts.
B) Molarity is one mole of solute per 1000 ml of solution.
C) To calculate molarity, one must know the atomic number of the solute.
D) To calculate molarity, one must know the atomic weight of the solvent.

Answer: B
Diff: 2 Page Ref: 24–26

23) Select the statement about mixtures that is correct.
A) A solution contains solvent in large amounts and solute in smaller quantities.
B) Solutions contain particles that settle out in time.
C) Suspensions can change reversibly from liquid to solid.
D) Suspensions are homogeneous mixtures of two or more components.

Answer: A
Diff: 2 Page Ref: 24–26

24) Choose the answer that best describes HCO_3^-.
A) a bicarbonate ion
B) common in the liver
C) a weak acid
D) a proton donor

Answer: A
Diff: 1 Page Ref: 36–37

25) Select which reactions will usually be irreversible regarding chemical equilibrium in living systems.
A) glucose to CO_2 and H_2O
B) ADP + Pi to make ATP
C) H_2O + CO_2 to make H_2CO_3
D) glucose molecules joined to make glycogen

Answer: A
Diff: 3 Page Ref: 33

26) What happens in redox reactions?
A) both decomposition and electron exchange occur
B) the electron acceptor is oxidized
C) the electron donor is reduced
D) the reaction is always easily reversible

Answer: A
Diff: 2 Page Ref: 32

27) Choose the answer that best describes fibrous proteins.
A) rarely exhibit secondary structure
B) are very stable and insoluble in water
C) are usually called enzymes
D) are cellular catalysts

Answer: B
Diff: 2 Page Ref: 46

28) Which of the following does *not* describe the ATP molecule?
A) chemical work
B) mechanical work
C) transport
D) pigments

Answer: D
Diff: 1 Page Ref: 51–52; Fig. 2.24

29) Select the most correct statement regarding nucleic acids.
A) Three forms exist: DNA, RNA, and tDNA.
B) DNA is a long, double–stranded molecule made up of A, T, G, and C bases.
C) RNA is a long, single–stranded molecule made up of the bases A, T, G, and C.
D) TDNA is considered a molecular slave of DNA.

Answer: B
Diff: 2 Page Ref: 49–51

30) Which of the following is an example of a suspension?
A) cytoplasm
B) salt water
C) rubbing alcohol
D) blood

Answer: D
Diff: 2 Page Ref: 24–25; Fig. 2.4

31) Select the correct statement about isotopes.
A) Isotopes of the same element have the same atomic number but differ in their atomic masses.
B) All the isotopes of an element have the same number of neutrons.
C) All the isotopes of an element are radioactive.
D) Isotopes occur only in the heavier elements.

Answer: A
Diff: 2 Page Ref: 23–24

32) The four elements that make up about 96% of body matter are _____.
A) carbon, oxygen, phosphorus, calcium
B) nitrogen, hydrogen, calcium, sodium
C) carbon, oxygen, hydrogen, nitrogen
D) sodium, potassium, hydrogen, oxygen

Answer: C
Diff: 2 Page Ref: 22; Tbl. 2.1

33) An example of a coenzyme is _____.
A) copper
B) riboflavin (vitamin B_2)
C) iron
D) zinc

Answer: B
Diff: 1 Page Ref: 47–48

34) _____ is fat soluble, produced in the skin on exposure to UV radiation, and necessary for normal bone growth and function.
A) Vitamin K
B) Cortisol
C) Vitamin A
D) Vitamin D

Answer: D
Diff: 1 Page Ref: 42; Tbl. 2.2

35) In liquid XYZ, you notice that light is scattered as it passes through. There is *no* precipitant in the bottom of the beaker, though it has been sitting for several days. What type of liquid is this?
A) solution
B) suspension
C) colloid
D) mixture

Answer: C
Diff: 3 Page Ref: 26

36) Atom X has 17 protons. How many electrons are in its valence shell?
A) 3
B) 5
C) 7
D) 10

Answer: C
Diff: 3 Page Ref: 26–27

37) Which protein types are vitally important to cell function in all types of stressful circumstances?
A) structural proteins
B) molecular chaperones
C) catalytic proteins
D) regulatory proteins

Answer: B
Diff: 2 Page Ref: 46–47

38) If atom X has an atomic number of 74 it would have which of the following?
A) 37 protons and 37 neutrons
B) 37 electrons
C) 74 protons
D) 37 protons and 37 electrons

Answer: D
Diff: 2 Page Ref: 23

39) What does the formula $C_6H_{12}O_6$ mean?
A) There are 6 calcium, 12 hydrogen, and 6 oxygen atoms.
B) There are 12 hydrogen, 6 carbon, and 6 oxygen atoms.
C) The molecular weight is 24.
D) The substance is a colloid.

Answer: B
Diff: 2 Page Ref: 31

40) Two good examples of a colloid would be Jell-O® and _____.
A) blood
B) toenails
C) urine
D) cytosol

Answer: D
Diff: 3 Page Ref: 26

41) An atom with a valence of 3 may have a total of _____ electrons.
A) 3
B) 8
C) 13
D) 17

Answer: C
Diff: 3 Page Ref: 27

42) Which of the following is a neutralization reaction?
A) $HCl \rightarrow H^+ + Cl^-$
B) $NaOH \rightarrow Na^+ + OH^-$
C) $NH_3 + H^+ \rightarrow NH_4^{+2}$
D) $HCl + NaOH \rightarrow NaCl + H_2O$

Answer: D
Diff: 2 Page Ref: 36

43) The chemical symbol O═O means _____.
A) zero equals zero
B) both atoms are bonded and have zero electrons in the outer orbit
C) the atoms are double bonded
D) this is an ionic bond with two shared electrons

Answer: C
Diff: 1 Page Ref: 28

44) What is a dipole?
A) a type of bond
B) a polar molecule
C) a type of reaction
D) an organic molecule

Answer: B
Diff: 2 Page Ref: 30

45) What does CH_4 mean?
A) There is one carbon and four hydrogen atoms.
B) There are four carbon and four hydrogen atoms.
C) This is an inorganic molecule.
D) This was involved in a redox reaction.

Answer: A
Diff: 1 Page Ref: 24

46) Amino acids joining together to make a peptide is a good example of a(n) _____ reaction.
A) synthesis
B) decomposition
C) exchange
D) reversible

Answer: A
Diff: 1 Page Ref: 31

47) Which of the following is *not* considered a factor in influencing a reaction?
A) temperature
B) concentration
C) particle size
D) time

Answer: D
Diff: 2 Page Ref: 33

48) Which of the following is *not* an electrolyte?
A) HCl
B) Ca_2CO_3
C) H_2O
D) NaOH

Answer: C
Diff: 3 Page Ref: 35

49) Which property of water is demonstrated when we sweat?
A) high heat capacity
B) high heat of vaporization
C) polar solvent properties
D) reactivity
E) cushioning

Answer: B
Diff: 2 Page Ref: 34

50) Sucrose is a _____.
A) monosaccharide
B) disaccharide
C) polysaccharide
D) triglyceride

Answer: B
Diff: 1 Page Ref: 38

51) What is the ratio of fatty acids to glycerol in neutral fats?
A) 1:1
B) 2:1
C) 3:1
D) 4:1

Answer: C
Diff: 1 Page Ref: 40

52) In a DNA molecule, the phosphate serves _____.
A) as a code
B) to hold the molecular backbone together
C) to bind the sugars to their bases
D) as nucleotides

Answer: B
Diff: 1 Page Ref: 50; Fig. 2.22

53) Heat shock proteins (hsp) are a type of protein called _____.
A) coenzymes
B) cofactors
C) eicosanoids
D) chaperones

Answer: D
Diff: 2 Page Ref: 47

54) Which bonds often bind different parts of a molecule into a specific three-dimensional shape?
A) Carbon
B) Hydrogen
C) Oxygen
D) Amino acid

Answer: B
Diff: 2 Page Ref: 30

Fill-in-the-Blank/Short Answer Questions

1) The atomic number is equal to the number of _____.

Answer: protons (and electrons)
Diff: 1 Page Ref: 23

2) Molecules such as methane that are made of atoms that share electrons have _____ bonds.

Answer: covalent
Diff: 1 Page Ref: 29; Fig. 2.7

3) An atom with three electrons would have a valence of _____.

Answer: one
Diff: 2 Page Ref: 27–28

4) AB → A + B is an example of a(n) _____ reaction.

Answer: decomposition
Diff: 2 Page Ref: 32

5) _____ have a bitter taste, feel slippery, and are proton acceptors.

Answer: Bases
Diff: 1 Page Ref: 35

6) A holoenzyme is composed of an apoenzyme and a(n) _____.

Answer: cofactor
Diff: 2 Page Ref: 47

7) In a DNA molecule, guanine would connect to _____.

Answer: cytosine
Diff: 1 Page Ref: 49

8) The _____ molecule directly provides energy for cellular work.

Answer: ATP
Diff: 1 Page Ref: 51–52

9) Hydrogen bonds are more like a type of weak _____ than true bonds.

Answer: attraction
Diff: 2 Page Ref: 30

10) Weak acids and bases make good _____.

Answer: buffers
Diff: 2 Page Ref: 37

11) Starch is the stored carbohydrate in plants, while _____ is the stored carbohydrate in animals.

Answer: glycogen
Diff: 2 Page Ref: 40

12) How many phosphates would AMP have attached to it?

Answer: one
Diff: 2 Page Ref: 51; Fig. 2.23

13) What does the polar end of a phospholipid contain?

Answer: a phosphorus–containing group
Diff: 1 Page Ref: 43

14) What type of chemical bond can form between an element with 11 protons and an element with 17 protons?

Answer: ionic
Diff: 3 Page Ref: 27–28

15) What happens when globular proteins are denatured?

Answer: The active sites are destroyed.
Diff: 3 Page Ref: 46

16) Explain the difference between potential and kinetic energy.

Answer: Potential energy is inactive stored energy that has potential to do work. Kinetic energy is energy in action.
Diff: 3 Page Ref: 20

17) How can phospholipids form a film when mixed in water?

Answer: Phospholipids have both polar and nonpolar ends. The polar end interacts with water, leaving the nonpolar end oriented in the opposite direction.
Diff: 3 Page Ref: 43

18) What properties does water have that make it a very versatile fluid?

Answer: High heat capacity, high heat of vaporization, polarity and solvent properties, reactivity, and cushioning.
Diff: 3 Page Ref: 34

19) What advantages does ATP have in being the energy currency molecule?

Answer: Its energy is easy to capture and store; it releases just the right amount of energy for the cell's needs so it is protected from excessive energy release. A universal energy currency is efficient because a single system can be used by all the cells in the body.
Diff: 3 Page Ref: 51–52

20) Explain why chemical reactions in the body are often *irreversible*.

Answer: Chemical reactions that release energy cannot be reversed unless energy is put back into the system. Also, the body may use the chemicals solely for its energy, such as glucose, or some reactions produce molecules in excessive quantities (like CO_2 and NH_4) that the body needs to discard.
Diff: 3 Page Ref: 33

21) When a set of electrodes connected to a lightbulb is placed in a solution of dextrose and a current is applied, the lightbulb does not light up. When the same unit is placed in HCl, it does. Why?

Answer: HCl ionizes to form current–conducting electrolytes. Dextrose does not ionize, and therefore does not conduct current.
Diff: 3 Page Ref: 35

22) Describe the factors that affect chemical reaction rates.

Answer: Temperature increases kinetic energy and therefore the force of molecular collisions. Particle size: smaller particles move faster at the same temperature and therefore collide more frequently; also, smaller particles have more surface area given the same concentration of reactants. Concentration: the higher the concentration, the greater the chance of particles colliding. Catalysts increase the rate of the reaction at a given temperature. Enzymes are biological catalysts.
Diff: 3 Page Ref: 33

23) Protons and electrons exist in every atom nucleus except hydrogen. Is this statement true or false and why?

Answer: False—Hydrogen has one proton and one electron. It is the neutron that hydrogen does not have.
Diff: 3 Page Ref: 23; Fig. 2.2

24) A chemical bond never occurs in a mixture. Discuss this.

Answer: Mixtures come in three forms— solutions, colloids, and suspensions. Components of these mixtures always retain their original makeup and can be separated into their individual components; therefore no chemical bonding has taken place.
Diff: 3 Page Ref: 24–25

25) All chemical reactions are *theoretically* reversible. Comment on this statement.

Answer: It is possible to reverse any reaction if the products are still present. Those that are only slightly exergonic are easily reversible. Some would require an enormous amount of energy to reverse. In the simple reaction Na + Cl → NaCl the amount of energy it takes to reverse table salt to chlorine gas and sodium metal is enormous. The reversing of the covalently bonded sugar molecule once it is reduced to ATP molecules is even harder or next to impossible.
Diff: 3 Page Ref: 33

26) What is the major difference between polar and nonpolar covalent bonds?

Answer: Polar bonds have an unequal sharing of electrons resulting in a slight negative charge at one end of the molecule and a slight positive charge at the other end. Nonpolar bonds have an equal sharing of electrons, resulting in a balanced charge among the atoms.
Diff: 3 Page Ref: 30; Fig. 2.9

27) An amino acid may act as a proton acceptor or donor. Explain.

Answer: Amino acids have two components—a base group (proton acceptor) and an organic acid part (a proton donor).
Diff: 3 Page Ref: 43

28) Name at least four things you know about enzymes.

Answer: 1. They are proteins.
2. They have specific binding sites for specific substrates.
3. They lower the activation barrier for a specific reaction.
4. The names end in "ase."
5. They can be denatured.
6. They can be used again and again.

Diff: 2 Page Ref: 47–49

29) In the compound H_2CO_3, what do the numbers 2 and 3 represent?

Answer: The 2 indicates that there are two hydrogen atoms in the compound and the 3 indicates that there are three oxygen atoms in the compound.

Diff: 2 Page Ref: 24

30) Are all chemical reactions reversible? If not, why aren't they all reversible?

Answer: All chemical reactions are theoretically reversible, but only if the products are not consumed.

Diff: 3 Page Ref: 33

Clinical Questions

1) Mrs. Mulligan goes to her dentist and, after having a couple of cavities filled, her dentist strongly suggests that she reduce her intake of sodas and increase her intake of calcium phosphates in the foods she eats. Why?

Answer: Sodas are strong acids that can reduce bone and tooth salts. Calcium phosphate makes teeth hard and therefore more resistant to tooth decay.

Diff: 2 Page Ref: 35

2) Although his cholesterol levels were not high, Mr. Martinez read that cholesterol was bad for his health, so he eliminated all foods and food products containing this molecule. He later found that his cholesterol level dropped only 20%. Why did it not drop more?

Answer: Cholesterol is produced by the liver, in addition to being ingested in foods.

Diff: 3 Page Ref: 42

3) How can DNA be used to "fingerprint" a suspect in a crime?

Answer: The DNA of a person is unique to that individual. By obtaining the DNA from nucleated cells from the crime scene (e.g., tissue, sperm), enzymes may be used to break up the DNA into fragments. Because nearly everyone's DNA is different, it also breaks up into fragments differently. When the fragments are separated, they form patterns even more unique than fingerprint patterns. A match of suspect and crime scene DNA is strong evidence.

Diff: 3 Page Ref: 49–51

4) Why is it possible for us to drink a solution that contains a mixture of equal concentration of a strong acid and a strong base, either of which, separately, would be very caustic?

Answer: When an acid and base of equal strength are mixed, they undergo a displacement reaction to form a water and a salt.

Diff: 3 Page Ref: 35

5) A 65–year–old patient came to the emergency room with complaints of severe heartburn unrelieved by taking a "large handful" of antacids. Would you expect the pH to be high or low? Explain why.

Answer: You would expect a high pH. Taking antacids will neutralize the acidic stomach. Taking a "handful" of antacids can cause an alkaloid state. Certain drugs, such as corticosteroids and antacids that contain baking soda, will lead to metabolic alkalosis.

Diff: 3 Page Ref: 35–36

6) A 23–year–old male was riding his road bike in 100–degree heat, when he suddenly became nauseated and weak. He called 911 from his cell phone. When the ambulance came, the paramedics started intravenous therapy for severe dehydration. Explain the critical role of water to maintain homeostasis.

Answer: Water is the most abundant and important inorganic compound in living material. It makes up 60% to 80% of the volume of most living cells. The properties of water are: high heat capacity, high heat of vaporization, polar solvent properties, reactivity, and cushioning. In this case the bicyclist lost a large amount of water through perspiration in an effort to cool his body. This caused a disruption in homeostasis.

Diff: 3 Page Ref: 34

7) Brenda is a 26–year–old female who is being discharged from the hospital after a vaginal delivery of an 8–pound healthy infant. Brenda is instructed by the nurse to eat a diet high in fiber and to drink 8 glasses of water per day to prevent constipation. Explain the role of fiber and water to promote defecation.

Answer: Cellulose is a polysaccharide found in all plant products that adds bulk to the diet to promote feces through the colon. Water acts as a lubricating liquid within the colon, which eases feces through the bowel.

Diff: 3 Page Ref: 40

8) A 64–year–old man is admitted to the hospital for nonhealing pressure ulcers to his heels. He has been bedridden for 10 years because of a degenerative muscle disease. Explain why protein would be an important part of his diet to promote wound healing.

Answer: Protein composes 10% to 30% of cell mass and is the basic structural material of the body. Proteins regulate body processes. Skin, hair, and eyes are made of protein, as are the enzymes needed for digestion and absorption. Protein is essential for growth, maintenance, and repair of tissue.

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