Get Ready for Unit 1

Tissues, Organs, and Systems of Living Things

Answers for page 2

Multiple Choice

1. d

2. e

3. d

4. b

5. b

6. d

7. c

8. e

Answers for page 3

Written Answer

9. The eyepiece contains a lens that magnifies the image. The arm supports the eyepiece and the objective lenses at a set distance from the stage. The objective lens magnifies objects. There are different objective lenses that magnify at different strengths. The revolving nosepiece moves a new objective lens over the specimen. The stage supports the microscope slide and focuses light through the viewing area of the slide.

10. A: cell wall; B: cell membrane; C: cytoplasm; D: mitochondrion; E: chloroplast; F: vacuole; G: nucleus

11. *Sample answers*: **a.** red blood cell **b.** skin **c.** stomach **d.** circulatory system

12. If a membrane is selectively permeable, that means that not all materials can cross it. Some materials are kept on the outside of the membrane and some are kept on the inside of the membrane.

13.

Unicellular	Similarities	Multicellular
• one cell that can live on its own • cell is unspecialized and performs all of the necessary life functions	• made of cells • contain organelles	• many cells that depend on each other for life processes • cells are specialized and cannot survive on their own

14. Students should show a diagram in which two substances of different concentrations are separated by a selectively permeable membrane. The sides should be labelled appropriately as solute, and the direction of movement across the membrane should be shown from the area of high concentration to the area of low concentration.

15. The digestive system breaks down food so that organisms can get nutrients and energy from it. The respiratory system obtains oxygen from the air and releases carbon dioxide into the air. The circulatory system delivers nutrients and oxygen to cells and takes waste from cells.

16. Plant cells have cell walls, chloroplasts, and large central vacuoles. Animal cells can be many shapes. They do not contain cell walls or chloroplasts, but they do contain small vacuoles. Both types of cells contain mitochondria, ribosomes, endoplasmic reticulum, cell membranes, a nucleus, and Golgi bodies.

Section 1.1 Review

Studying the Structure of Cells

Answers for page 4

Multiple Choice

1. d

2. c

3. e

4. c

5. a

6. c

7. e

8. a

Answers for page 5

Written Answer

9. The microscope allowed scientists to see more detail and more magnified pictures of cells. As microscopes improved, cell biologists learned more about how cells function.

10.

Mitochondria	Similarities	Ribosomes
⌒ release energy from glucose ⌒ bean-shaped	⌒ found in plant and animal cells ⌒ produce substances necessary for cell survival ⌒ are cell organelles	⌒ produce proteins ⌒ small dots in cytosol

11. Chloroplasts trap energy from the Sun to make glucose through the process of photosynthesis. The cell wall provides support for the cell. Vacuoles contain water and are used to store or transport small molecules.

12. Plant cells produce glucose in chloroplasts through photosynthesis. The cells need mitochondria to release energy from the glucose through cellular respiration.

13. Drawings should show a cell with the cytoplasm labelled and an organelle within the cytoplasm.

14. The cell is an animal cell. It does not have a cell wall, chloroplasts, or a large central vacuole.

15. No, not all plant cells contain chloroplasts. Plant cells that are not responsible for performing photosynthesis do not need them. For example, the roots of the plant are underground and do not perform photosynthesis. Therefore, they usually do not contain chloroplasts.

16. During cellular respiration, glucose and oxygen react to produce carbon dioxide, water, and energy that is used by living things.

Section 1.2 Review

Genes: Answers and Questions

Answers for page 6

Multiple Choice

1. b

2. c

3. c

4. c

5. c

6. a

7. e

8. a

Answers for page 7

9. d

10. e

11. b

12. e

13. a

14. b

15. c

16. b

Answers for page 8

Written Answer

17. In 1953, James Watson and Francis Crick created the model of DNA used today.

18. There are 39 chromosomes in each sperm or egg. When they join in fertilization, 39 pairs are formed for a total of 78 chromosomes.

19. Chromosomes are made of DNA. Genes are segments of DNA. Chromosomes are contained in the nucleus of a cell.

20. It is the job of genes, thus DNA, to control the manufacture of proteins.

21. Pros: early identification of disorders like PKU can prolong life; can help people make choices about becoming parents; Cons: may lead to discrimination; reduced joy in living due to the potential of illness

22. The nucleus of an egg is removed. A cell from the animal that is to be cloned is removed and placed next to the egg in a bath of chemicals. The two cells fuse after being jolted with electricity. The fused cell begins to divide, and is then implanted into the uterus of a surrogate mother.

23. The sequence of building blocks in strand B is not the same as that in strand A. There is a C instead of an A in strand B. The sequence of the building blocks has changed because a mutation has occurred.

24. *Sample answer*: Wear sunscreen to reduce UV rays; do not smoke.

Answers for page 9

25. The nucleus does control all cell processes. It directs the production of the specific proteins that control the cell processes. But because the nucleus does not act like a person ordering the cell parts around, the statement is misleading.

26. *Sample answer*: Is this research worth pursuing? Who decides what disorders should be corrected? Who gets access to treatments, and who pays for the treatments? Who funds research, and who owns or manages the resulting product or technology? How far should society go in using available technologies? Opinions will vary.

27. Blood is taken from the heel a few days after birth and then examined for certain proteins. The test is repeated one week later.

28. Choice of graphic organizer will vary. DNA contains many genes. Long pieces of DNA make up chromosomes. A chromosome can contain many genes.

29. A: adenine; T: thymine; C: cytosine; G: guanine

30. Answers will vary. Transgenic organisms include bacteria used to manufacture insulin, crops that are resistant to drought or cold, and salmon that are injected with a growth hormone that makes them grow faster.

31. Karyotypes are used to tell the gender of a person and to screen for chromosome abnormalities, such as Down syndrome.

32. No, this person has 46 chromosomes, the normal number of chromosomes for a human. People with Down syndrome have 47 chromosomes.

Section 1.3 Review

Cells from Cells

Answers for page 10

Multiple Choice

1. d

2. d

3. b

4. c

5. e

6. e

7. a

8. b

Answers for page 11

9. c

10. b

11. c

12. a

13. e

14. a

15. e

16. b

Answers for page 12

Written Answer

17. Cells divide to maintain an efficient surface area to volume ratio.

18. A parent cell copies chromosomes to maintain the same amount of DNA and genes so that the offspring can function properly.

19. *Sample answer*: **I p**arked **m**iles **a**way **t**oday (interphase, prophase, metaphase, anaphase, telophase).

20. The cell needs to work efficiently. It must be small enough that oxygen and nutrients can diffuse in and waste can diffuse out quickly enough. The larger a cell is, the longer it will take for chemicals to diffuse across it.

21.

Mitosis	Similarities	Cytokinesis
• replication and division of the nucleus	• results in two copies • is necessary for cells to divide	• division of the cytoplasm

22. Anaphase. During anaphase, the proteins holding the two chromatids together break apart. The spindle fibres retract, each pulling a chromatid toward one end of the cell.

23. The replicated chromosomes could not be pulled apart during anaphase.

24. Animal cell cytokinesis involves the pinching in of the cell membrane. In plant cell cytokinesis, the Golgi body produces vesicles that create a cell plate. The cell plate eventually becomes a cell wall.

Answers for page 13

25. No. Mitosis is the replication of the nucleus; cytokinesis finishes the division of the cell.

26. The nuclear membrane disappears and the chromosomes get shorter and thicker.

27. The centrosomes make the spindle fibres.

28. Metaphase takes the longest. The spindle fibres need to form and reach each sister chromatid. The sister chromatids then have to move to the centre of the cell.

29. The spindle fibres are attached to each centromere, and the centrosome starts to pull the spindle fibres back to the poles. If a spindle fibre broke, its chromosome would not be moved to the pole and it might not be a part of the new nucleus.

30. A: centrosome; B: nucleolus; C: chromosome; D: spindle fibre; E: nuclear membrane

31. Telophase. There are two nuclei.

32. If the DNA did not coil up, it might get tangled or damaged during metaphase and anaphase.

Section 1.4 Review

The Cell Cycle

Answers for page 14

Multiple Choice

1. e

2. b

3. b

4. e

5. b

6. b

7. c

8. a

Answers for page 15

Written Answer

9. Skin cells must divide to replace cells that have died or been damaged. Nerve cells are protected inside the body.

10. Cells leave the cell cycle to specialize or to die.

11. Cancer occurs when cells divide rapidly. Some cancer cells do not know that they should leave the cell cycle to "die." Cancer cells can divide when they are not connected to other cells.

12. Proteins check for DNA mutations, telomerase can stop a cell from naturally dying, and suicide proteins can destroy damaged cells.

13. The mass of rapidly dividing cells grows to form a tumour. Further changes to the cells can produce cancer. The cancer cells invade and destroy neighbouring cells.

14. Many mutations in a cell are necessary to cause it to become cancerous. Also, most mutations are repaired during the cell cycle checkpoints.

15. During embryo development, suicide genes are important for the development of fingers and toes (the connecting tissue is killed). Also, cells that are dangerous to the organism due to a viral infection can be destroyed so that the infection is not spread.

16. *Sample answer*: avoid exposure to tobacco smoke, wear sunscreen, and avoid exposure to asbestos

Chapter 1 Review

Cells and More Cells

Answers for page 16

Multiple Choice

1. b

2. b

3. a

4. a

5. b

6. c

7. e

8. c

Answers for page 17

Written Answer

9. A and B are plant cells. C and D are animal cells. A: metaphase; B: cytokinesis; C: anaphase; D: cytokinesis

10. Answers will vary. *Sample answer*: Cell A contains a cell wall, chromatids, and centrosomes. Cell B contains spindle fibres, a cell plate, and DNA. Cell C contains a cell membrane, chromosomes, and spindle fibres. Cell D contains a nuclear membrane, a cell membrane, and a nucleolus.

11. Cells can specialize, and cells can keep their surface area to volume ratio efficient.

12. Students should draw the cell cycle and modify it so that after mitosis an arrow goes directly back into growth and preparation. Diagrams should indicate that the cell is not stopped from dividing at any of the normal cell checkpoints and continues to divide unchecked.

13. All daughter cells must contain the same amount of DNA as the parent. If DNA did not replicate, the number of chromosomes would be halved each time the cell divides.

14. Water moves from an area of high *concentration* to low concentration by *osmosis*. If the plant has not been watered, there is a higher concentration of water inside the cell than outside. The water then crosses the cell *membrane* out of the cell and the cell shrinks.

15. A mutation is a change in the DNA code. Mutagens are substances, such as X rays and certain chemicals, that cause mutations.

16. Cell division is the main process by which individuals reproduce. Cell division with mitosis results in identical cells being formed. Clones are identical.

Answers for page 18

17. It is a plant cell. The presence of chloroplasts is evidence for it being a plant cell, as well as the large vacuole.

18. Cell 1 is from Location C: a bone cell in metaphase. This cell has replicated its DNA and has a double set of DNA that is in the process of moving to its new nucleus. Cell 2 is from Location B: DNA has started to replicate. Cell 3 is from Location A: during the growth phase a cell must have a full set of DNA.

19. Collect a sample of cells and observe them under a microscope. Compare them to a "normal" sample. Observe and compare the rates of cell division in the samples.

20. Possible answer: What will happen to the cell? Why are the percentages important?

21. The cell will get bigger if it is placed into pure water. Osmosis will occur from the beaker water into the cell.

22. Headings should be Time, Mass, Change in Mass

23. Answers will vary. Advertisement should include key features of the chosen microscope.

24. Answers will vary. Song or poem should include details about the prevention of cell division if there are not enough nutrients to support cell growth, the DNA has not replicated, or the DNA is damaged.

Answers for page 19

25. *Sample answer*: plastic bag: cell membrane; paper clips: mitochondria; table tennis ball: nucleus; string: endoplasmic reticulum; paper dots: ribosomes. It is an animal cell because there is no cell wall.

26. The actors should be oxygen, carbon, and hydrogen. Three actors are joined together as a glucose molecule, and they encounter two other actors who are joined as an oxygen molecule. A fight ensues, and the glucose molecule breaks apart. The actors then recombine to make a water molecule and a carbon dioxide molecule.

27. The cells of a saltwater fish have a lower concentration of water in their cells compared to freshwater. If the concentration of water in the surroundings increases, water would enter the cells of the fish. The cells would swell and burst.

28. Muscle cells need more energy. They get energy through cellular respiration, which occurs in the mitochondria.

29. Mutagens cause mutations. If DNA is broken by radiation, it could reform incorrectly and result in a mutation. Cancer occurs when several mutations accumulate in a cell.

30. Answers will vary. Decisions should be based on how many people could be helped and the long-range impact of the research. Opinions will vary on which is more important. Causes can lead to

prevention or cures, but curing cancer would help many people who are sick or dying right now. However, a cure does not prevent cancer from occurring in others. Preventing cancer could mean that no one ever needs to be cured.

31. The organelles each perform a life function for the cell. The organelles in cells all have a specific role in protein or energy production. The organelles make the cell more efficient.

32. Answers will vary. Students should include at least three reasons that cell division may not continue: there are not enough nutrients to support cell growth, the DNA has not replicated, or the DNA is damaged. If a mutation occurred during replication, the next checkpoint may detect it. If it is not detected, the mutated cell could divide uncontrollably and produce a tumour.

Section 2.1 Review

Plant Cells, Tissues, and Organs

Answers for page 20

Multiple Choice

1. a

2. b

3. b

4. c

5. c

6. d

7. e

8. b

Answers for page 21

9. a

10. e

11. b

12. e

13. d

14. a

15. d

16. b

Answers for page 22

Written Answer

17. Cells are specialized according to the set of proteins they contain. Genes are responsible for producing proteins. Although all the cells in an organism contain all the same genes, not all genes are turned on in any given cell. One set of genes is turned on in one cell type and another set of genes is turned on in another cell type. The proteins produced in a cell determine the eventual

function of that cell. The cell is then said to be specialized for a given task.

18. Answers will vary. Diagrams should show an organ (such as a leaf) composed of tissue (mesophyll) composed of cells (one cell of the mesophyll layer).

19. The apical meristem is found at the tips of the stems and performs mitosis. If it is cut off, lateral meristems can cause side branches to grow. Inside the stem, meristem called cambium causes the formation of growth rings in woody plants.

20. They need ground tissue for support and vascular tissue for transport.

21. Phloem carries sugars from the leaves to other parts of the plant and xylem carries water from the roots to other parts of the plant, including leaves.

22. Root; A: root hairs; B: cortex; C: endodermis; D: pericycle; E: phloem; F: xylem

23. $6CO_2 + 6H_2O$ + light energy ‖ $C_6H_{12}O_6 + 6O_2$; Sunlight is absorbed through the leaves, CO_2 enters through the stoma in the leaf, water enters through the roots and travels up the xylem to the leaf. Sugar is made in the leaf and sent down the phloem to storage areas, and O_2 exits through the stoma]]

24. Taproots anchor the plant. Fibrous roots have a larger surface area for water absorption.

Answers for page 23

25. *Sample answer*: Specialized Cells and Tissues in Plants

26. A: vascular tissue; B: ground tissues; C: dermal tissue

27. D: xylem cells; E: phloem cells

28. Fibrous roots would be more successful because their roots spread to the sides (not downward). Taproots would not be able to cut through the rock, and the plant would not be able to grow.

29. Viruses are used to make tulips interesting colours. The tobacco mosaic virus (TMV) kills tomato plants.

30. A gall is an abnormal growth of plant tissue caused by insects or micro-organisms. It does not appear to harm the plant.

31. Flowers attract pollinators. The flower is the reproductive organ. Pollen must be transferred from flower to flower in order for seeds to be produced.

32. The male part of the flower makes pollen. The pollen is transferred by wind, insects, or birds to another flower's female parts. The pollen then joins with the egg and a seed forms.

Section 2.2 Review

Plant Organ Systems

Answers for page 24

Multiple Choice

1. d

2. b

3. d

4. a

5. c

6. e

7. c

8. e

Answers for page 25

Written Answer

9. Too little water reduces the amount of soil nutrients that the plant can absorb and prevents photosynthesis. Too much water reduces the oxygen available to roots for cellular respiration.

10. Adhesion is the tendency for water to stick to the walls of the xylem. Cohesion is the attraction of water molecules to each other.

11. As water exits the leaf, more water is pulled up the xylem to replace it. This causes more water to be absorbed by the root hairs.

12. Any three of leaf, mesophyll, phloem, cortex, and root.

13. (1) The arrows are going in the wrong direction. Water and minerals flow from the roots through the cortex and into the phloem and xylem. (2) Water does not flow sideways across cells. (3) The magnified illustration should be labelled pericycle, and the arrows should point the other direction.

14. Although root pressure moves some water up in the xylem, transpiration is the main source of water movement. As water evaporates from the leaves, there is room for more water to move into the leaves. Water in the xylem moves up, in part, from adhesion and cohesion, properties of water that make it stick to the sides of the xylem as well as other water molecules. Water is absorbed through the roots by osmosis.

15. When the leaf gets a lot of water and sunlight, the guard cells swell so that CO_2 can enter through the stomata. If there is not enough water or sunlight for photosynthesis, the guard cells shrink and close the stomata.

16. They both transport materials. Sugars are dissolved in water (carried in the xylem) and carried in the phloem.

Chapter 2 Review

Plants: From Cells to Systems

Answers for page 26

Multiple Choice

1. d

2. a

3. c

4. c

5. a

6. a

7. d

8. c

Answers for page 27

Written Answer

9. dermal: protection; vascular: transport; meristematic: growth; ground: support, storage, and photosynthesis

10. Auxin is a plant hormone. When auxin is released, it inhibits the growth of cells both below and behind the cells that released the auxin.

11. Carbon dioxide gas is taken in and oxygen gas is released.

12. ethylene; Companies ship unripe fruit all over the world, then ripen it with ethylene gas once the fruit reaches the market.

13. The root system takes in water and nutrients from the soil and moves these nutrients to the stem. The shoot system supports the plant, performs photosynthesis, and transports sap. Neither could exist without the other because photosynthesis depends on both these systems.

14. The terminal bud must be removed. The auxin released from cells in the terminal bud inhibits the lateral buds from growing. If the terminal bud is removed, the lateral buds grow and the plant becomes bushy.

15. A: flower; B: leaves; C: fruit; D: stem; E: root; G: root system; F: shoot system

16. Possible answers: Xylem and phloem work together to transport materials. Roots provide water for the leaves and leaves provide sugar for the roots to grow.

Answers for page 28

17. The procedure must include a control plant that is not modified, a plant that has the top side of its leaves coated with a substance like petroleum jelly, and a plant that has the underside of its leaves coated with the same substance. Plants should be monitored regularly (for example, hourly or twice a day) and watered as needed. Growth measurements and qualitative descriptions should be recorded.

18. Coating the underside of the leaf with a waterproof substance will block the stomata. This will prevent water movement in the plant, and the plant will wilt and then die. The untreated plant will grow normally and the top-treated plant should show no effect and grow normally.

19. Headings should be Time, Description, Height

20. The xylem are small tubes that run up the stem. The side of the stem placed into blue water carried the pigment to one half of the flower and coloured it blue. The other side of the stem carried red water to the other half of the flower and coloured it red.

21. You would need meristematic tissue. It is undifferentiated and can become any of the other tissues. You could obtain it at the tip of each shoot and at the tip of each root.

22. Possible answer: ground tissue: green (photosynthesis), giant (support and structure), garage (storage); meristem tissue: mitosis; vascular tissue: veins (transport); dermal tissue: dead skin

23. The letter should have a salutation, be written in paragraph format, and end with a closing. Arguments could include that roots are the only way to obtain water; the plant would fall over if the roots did not hold it in place; and the roots of many plants, such as the carrot, store extra food.

24. The diagram should show that as water is evaporated from leaves, it creates tensions that lead to more water being pulled up from the roots.

Answers for page 29

25. The drawing could be of palisade cell, plant cell in mitosis, xylem or phloem, or epidermis cell, with labels of ground, meristematic, vascular, and dermal tissues included.

26. The tree grows from the meristem tissue that is located at the ends of the stems. The trunk gets taller but does not grow from the ground.

27. The vascular tissue is close to the bark of the tree. The cut might sever the tissue, preventing the branches above the cut from getting any water.

28. The root hairs are very delicate. If the soil surrounding them is disturbed, they will break off and the plant will have no way to absorb water from the soil.

29. Lettuce would be the best plant, because its fibrous roots would help stabilize soil and prevent erosion and landslides.

30. The other fruits' rate of ripening would increase, because ethylene is a plant hormone that causes ripening.

31. Place the tap as far into the trunk as the xylem. Xylem carries sugar up to the leaves in the spring from the roots. Starch in the roots was converted to sugar to help the tree form new leaves in the spring. In the fall, the xylem carries only water and nutrients. The starch is carried in the phloem.

32. The plant grows more quickly than it should. When it runs out of nutrients, it cannot support its processes.

Section 3.1 Review

Cells and Tissues

Answers for page 30

Multiple Choice

For each question below, select the letter of the best answer.

1. e

2. a

3. a

4. b

5. b

6. c

7. b

8. a

Answers for page 31

9. d

10. d

11. e

12. d

13. c

14. e

15. a

16. e

Answers for page 32

Written Answer

17. Factors include chemical contaminants, such as heavy metals, pollution, parasites, and disease.

18. Skeletal muscle is made of cells that line up in the same direction, making the tissue look striped, or striated. It attaches to bone, making it possible for the body to move and is found in limbs, like arms and legs, and places where the body needs support, such as around the lower abdomen and back. Smooth muscle is made of cells that are tapered at both ends and do not have a striated appearance. It is found in blood vessels and the walls of internal organs like the esophagus
and stomach. It contracts more slowly than skeletal muscle, but its action can be sustained for a long time

19. Totipotent stem cells have not differentiated or specialized at all. If the cells are placed in the correct conditions, they have the potential to differentiate. Adult stem cells have differentiated to the level of tissue type. They can only be programmed to become other types of that same tissue.

20. Each tissue has specific functions. The shape of the cell helps the cell perform its function. For example, muscle cells are long so they can change shape to help the muscle move. Nerve cells have long projections out of them to help them connect to other nerve cells.

21. 1: totipotent stem cell; 2: pluripotent stem cell; 3: specialization; 4: bone stem cell

22. Bone tissue supports and protects the body.

23. The process of differentiation requires that all of the DNA be present in a cell. Depending on the environment of the cell, certain parts of DNA will be "turned on" and certain parts will be "turned off." If part of the DNA were missing, the DNA could not be activated and that cell could not specialize into a needed tissue.

24. In a specialized cell, many of the genes have been turned off. The cell is needed to perform a job and it could not do that job if it were dividing. The DNA would appear to be damaged to the cell cycle checkpoints.

Answers for page 33

25. Bone tissue is made of cells hardened by calcium. They have blood vessels run through them.

26. The calcium surrounding bone tissue provides strength and structure. The blood vessels deliver nutrients and take away waste.

27. The more projections the nerve cell has, the more cells it can be in contact with.

28. A: red blood cell; B: platelets; C: white blood cell

29. Blood includes red blood cells, white blood cells, and platelets, all in a matrix called plasma.

30. Skeletal muscle has striping on it. *Striated* means striped.

31. Epithelial tissue lines the surfaces of the body, both as a body covering and between internal organs. It is made of cells with strong connections between adjoining cell membranes, so they form a barrier. Connective tissue strengthens, supports, protects, binds, or connects cells and tissues. It consists of cells in an extra-cellular matrix that can range from a liquid (in blood), to elastic materials that can stretch (in ligaments), to mineral deposits (in bone). Both kinds of tissue are important structurally.

32. Characteristics that distinguish the four tissue types include cell shape, cell spacing, patterns on the cells, number of nuclei, and patterns the cells make.

Section 3.2 Review

Organs and Systems

Answers for page 34

Multiple Choice

1. d

2. a

3. c

4. b

5. b

6. b

7. a

8. c

Answers for page 35

9. c

10. e

11. a

12. e

13. a

14. d

15. b

16. e

Answers for page 36

Written Answer

17. The X ray shows structural issues in bones, the CT scan can show if an organ is damaged or misshapen, and the MRI shows internal details. The MRI is the most expensive test and is only needed when the patient has tissue damage, such as heart disease or bleeding in the brain.

18. An endoscope does not harm the patient. It uses a camera to view the surface of the internal organs of the digestive system, so the doctor can see the ulcer on a screen. A barium X ray exposes the patient to radiation, which stains the ulcer. The doctor can then see the ulcer on a monitor. Both imaging technologies are effective in diagnosing an ulcer.

19. A: esophagus; B: liver; C: stomach; D: small intestine; E: colon

20. They increase the surface area for nutrient and water absorption into the blood stream.

21. The enzymes in the stomach (pepsin) only work in an acidic environment.

22. Chemical digestion occurs in the mouth, stomach, and duodenum.

23. Food does not pass through the liver, the pancreas, or the gall bladder.

24. The movement of food is controlled by two sphincter muscles, one at the top of the stomach and one at the bottom of the stomach.

Answers for page 37

25. They prevent blood from flowing backward.

26. The left ventricle must pump blood to the entire body. The right ventricle only has to pump blood to the lungs, which are much closer.

27. The aorta leads from the heart and carries oxygenated blood to the body. The pulmonary artery leads from the heart to the lungs and carries deoxygenated blood.

28. Heart attack and stroke are both caused by blood clots that form in arteries. If the clot blocks a coronary artery, a heart attack occurs. If the clot travels to the brain, a stroke occurs.

29. Fat builds up on the walls of arteries and plaque deposits form. This decreases the diameter of the artery and restricts blood flow.

30. A balloon is inserted into a clogged artery, inflated, and then removed. This opens the artery to allow blood to flow through.

31. Epithelial cells that have cilia secrete mucus. The mucus catches foreign particles, such as bacteria and dust.

32. nasal cavity, pharynx, epiglottis, trachea, bronchus, bronchiole, alveoli

Section 3.3 Review

Maintaining Healthy Systems

Answers for page 38

Multiple Choice

1. e

2. b

3. d

4. e

5. d

6. b

7. d

8. e

Answers for page 39

Written Answer

9. Using biophotonics in surgeries results in fewer complications and less discomfort for the patient compared to traditional surgeries.

10. Ultrasound is used to see if the baby has a healthy heartbeat. It is a non-invasive, relatively safe test that does not cause birth defects.

11. Public health strategies track, research, and reduce the incidence of specific health problems in a society. Stop smoking ads are an example of a public health strategy.

12. The skin acts as a physical barrier that prevents a pathogen from entering the body.

13. They believe that the vaccination could be contaminated with animal diseases. Some children have severe allergic reactions to vaccines.

14. HIV attacks the immune system. This reduces the ability of that system to fight off any infections.

15. Both are viruses that are infectious diseases. A vaccine has not been developed for either disease. SARS is an airborne virus. West Nile Virus is carried by mosquitoes that transfer it to people they bite.

16. A PAP smear is taken by removing some cells from the cervix. These cells are then observed for abnormalities.

Chapter 3 Review

Animals: From Cells to Systems

Answers for page 40

Multiple Choice

1. a

2. b

3. c

4. c

5. e

6. b

7. c

8. b

Answers for page 41

Written Answer

9. The heart is composed of groups of tissues that work together to perform a certain function. The heart contains nervous tissue, muscle tissue (cardiac muscle), and connective tissue (blood).

10. Both are used to view internal structures of the body and help doctors make a diagnosis. A CT scan is produced by taking X rays of thin slices of a body part that are reconstructed by a computer into a three-dimensional image. An MRI is produced using radio signals in a magnetic field to create images of body parts.

11. Nervous tissue relays instructions to other tissues. Nerve cells are elongated so they can connect to several other cells. Muscle tissue changes shape to help move body parts. Muscle cells are designed to change their shape and to act by lengthening and shortening. Both tissues are specialized in their structure to help them do their function.

12. Fat is found between other organs and it prevents them from being damaged and from moving. Fat can be found under the skin and around all body organs.

13. The circulatory system transports nutrients and oxygen to cells and carries wastes from the cells to the organs in the excretory system.

14. Arrows should show that blood enters the heart in the right atrium, then into the right ventricle. It is pumped from the right ventricle through the pulmonary arteries to the lungs. Blood from the lungs re-enters the heart through the pulmonary veins into the left atrium. It moves into the left ventricle, then is

pumped to the rest of the body. The right side has deoxygenated blood. The left side has oxygenated blood.

15. The villi of the small intestine are small folds that increase the total surface area of the intestine membrane. More membrane is exposed and more nutrients can be absorbed. The alveoli are shaped like a grape cluster instead of balloon shape. This increases the surface area of membrane exposed to air.

16. CO_2 is in higher concentration in the capillary, and diffusion moves it from an area of high concentration to an area of lower concentration. O_2 diffuses from high concentration in the alveolus into the low-concentration capillary.

Answers for page 42

17. The toast is chewed in the mouth, travels down the esophagus, and enters the stomach, where it is saturated with acid. Then it travels to the small intestine, where digestive juices break it apart into nutrients. The nutrients are absorbed later in the small intestine. Excess water is re-absorbed by the large intestine and the wastes are expelled through the anus.

18. The sketch should be an oval divided down the middle. One tube should lead into one half of the oval, and one tube should lead out of the other half of the oval.

19. Blood travels through the gills inside capillaries. The water flows in the opposite direction of the blood. This maximizes the concentration of oxygen available.

20. The model could be folded paper. The idea is to show the way a membrane is folded to increase its surface area.

21. As a person exercises, their heart rate should increase. This is because exercise needs energy, and energy is created through cellular respiration, for which oxygen is required. The heart delivers oxygen to all body cells.

22. Measure heart rate while sitting for 15 seconds and multiply by 4 to determine the heart rate per minute. Measure heart rate while standing. Exercise for 2 minutes and then measure heart rate again.

23. Headings should be Position, Heart Beats in 15 s, Heart Beats in 60 s

24. Person B. He or she has the lowest resting rate, which indicates a healthy heart. Person B also has the lowest time needed for recovery.

25. Person A has the highest recovery time and a relatively high resting rate.

Answers for page 43

26. Ethics: embryos are destroyed, life is prolonged unnaturally, could lead to human clones; Benefits: can restore organs that have not been functioning, can grow new organs for use in transplants

27. Ulcers could form due to the acid in the stomach being in direct contact with the epithelial lining of the stomach. The pain occurs due to the exposure of nervous tissue.

28. If the septum does not close, oxygenated and deoxygenated blood might mix. This reduces the efficiency of the heart and might result in tissues dying from a lack of oxygen.

29. Since X rays are used on hard tissues, the doctor thinks a bone may be broken.

30. The narrower bronchioles will let less air through, and the wheezing sound occurs due to the pressure. It is difficult for the person to fill the lungs with air because the bronchioles lead to the lungs and cannot carry as much air as usual.

31. SARS is an infectious disease that affects the respiratory system and is readily transferred to others through the air. By wearing a mask, the doctor is helping to prevent the virus from entering his body through the respiratory system.

32. Answers will vary. Pamphlets should include warnings to reduce the amount of standing water, wear insect repellent, and cover bare skin.

Unit 1 Review

Tissues, Organs, and Systems of Living Things

Answers for page 44

Written Answer

1. Answers will vary. Graphic organizers should show appropriate links between terms.

2. Answers will vary. Personal opinions should be expressed. Testing could include non-invasive tests such as ultrasound and endoscopy. The format should be questions and answers.

3. *Sample answer*: I would label all of the organelles in each cell, and project the figure for the class. I would point out the differences between the two cells, including the shape and the different organelles and their functions. Plant cells have a cell wall (animal cells do not) that helps support the cell and plant. Plant cells have chloroplasts (animal cells do not) for photosynthesis. This allows plants to make their own food. Animals cannot make their own food. Plant cells contain large vacuoles (animal cells have smaller vacuoles) for storage.

4. Answers will vary but should include the following steps: crossing into the root hair of the plant by osmosis; being pushed and pulled toward the pericycle; entering the xylem and being attracted to other water molecules and to the sides of the xylem; being pulled up the xylem into the vein of the leaf; going through chemical reactions of photosynthesis and cellular respiration; exiting the plant as a gas through the stoma.

5. The material is unable to diffuse into the cell, or the concentration of the chemical in the fluid may be very low.

6. Since the distilled water does not contain any minerals, the concentration of minerals in the blood is higher than in the distilled water. The water will move into the blood cells and cause them to swell and burst.

7. Blood travels through arteries at higher pressure. The walls of the artery are thicker and would need a stronger needle. If the needle pierced an artery, the patient would bleed a lot. The blood in veins moves more slowly, and it is much safer to extract blood from them.

8. Answers will vary but may include the following elements: educate people about the virus and how it is transmitted; explain preventative measures, such as hand-washing and having people who are sick wear masks; track how many people have symptoms in which countries; identify the strain of the flu and develop a vaccine for it.

Answers for page 45

9. With fewer oxygen molecules in the air, my cells may not get enough oxygen, especially since I am exerting myself physically. My muscles may not get all of the oxygen they need to work well. Since the temperatures are high, I will sweat more and lose water. This can affect the concentration of solutes in my cells and I may feel thirsty. Since the air is dry, the cells that make mucus in my respiratory system may not be able to keep my air passageways as moist as they normally are.

10. The roots of the trees hold the soil to the shore. When the trees are cut down, the roots die and the soil leaks into the lake.

11. Plant vascular tissue consists of xylem and phloem. Xylem carries water and nutrients up and phloem carries food to storage and growth areas. Plants do not have a pump—the fluids move due to pressure, adhesion, cohesion, and transpiration. Animal vascular tissue consists of arteries, veins, and capillaries, all of which are present in all areas of an animal. Arteries lead to the heart and veins lead away from the heart. Capillaries link arteries and veins. Most animals require a pump (a heart) to move the fluid around.

12. Make a wet mount slide. Observe under a microscope and look for a nucleus, cell wall, and chloroplasts. If there are chloroplasts or a cell wall, it is a plant cell.

13. Brain cells have an average life span of 30 to 50 years. If a brain cell is damaged or destroyed as a result of exposure to alcohol, it may not be replaced right away, unlike cells in other areas of the body. If alcohol further interferes with the growth of new brain cells, a damaged cell may never be replaced. This could lead to permanent impaired brain function.

14. Plant B, which received no light, stopped growing and lost its leaves. Light is a necessary factor for the survival of a plant. Other observations include a qualitative description of the plant and leaves, such as the colour of the leaves and whether the plants were drooping, or the weight of the plants before and after the experimental period.

15. Does root growth depend on the quantity of water a plant is given?

16. Root growth only occurs in meristematic tissue. Mitosis will not occur if the cells do not obtain enough nutrients. If there is not enough water absorbed by the root hairs, the meristematic tissue will not divide and the plant root will not grow.

Answers for page 46

Literacy Test Prep

Asthma

Multiple Choice

17. a

18. d

19. c

20. b

21. d

Written Answer

22. If your BMI is too high or too low, your health is at risk. An obese person has a higher risk of developing heart disease. An underweight person has a higher risk of developing immune system problems. People need to eat properly and exercise regularly to maintain a healthy BMI.

Answers for page 47

Literacy Test Prep

Dialysis

Multiple Choice

23. b

24. c

25. b

26. a

27. b

Written Answer

28. The kidney and the dialysis machine both *filter* the blood using *diffusion* to keep *balance* and remove *toxins*. The kidney is an organ inside the body. The dialysis machine is an external device through which the blood is pumped. When kidneys fail, dialysis is required or the patient could get high blood pressure and other organs might fail.