Chapter Project Worksheet 1

Students' data tables and graphs will vary somewhat. In general, eggs will increase in size when they soak in vinegar and plain water, and they will decrease in size when they soak in liquids that have a lower concentration of water, such as salt water.

Chapter Project Worksheet 2

Column 4 in the table should read: 70 percent (liquid A); 92 percent (liquid B); 87 percent (liquid C); 79 percent (liquid D).

1. Liquids A and D would cause the cell to lose water; liquids B and C would cause the cell to take in water.
2. Possible answers might include shampoo, syrup, ketchup, or honey.

Discovering Cells Guided Reading and Study

Use Target Reading Skills
One possible way to complete the flowchart:
Discovering Cells
Hooke sees cells in cork; Leeuwenhoek sees many one-celled organisms; Schleiden concludes that all plants are made of cells; Schwann concludes that all animals (and all living things) are made of cells; Virchow proposes that new cells form only from cells that already exist.

1. Cells are the basic units of structure and function in living things.
2. The microscope made it possible for people to discover and learn about cells.
3. microscope
4. false
5. Compound microscope, Simple microscope
A thin slice of cork, Lake water
6. false
7. a. All living things are composed of cells. b. Cells are the basic unit of structure and function in living things. c. All cells are produced from other cells.
8. true
9. The lenses bend the light that passes through them.
10. center; edges
11. Resolution is the ability to clearly distinguish the individual parts of an object.
12. electron microscope
13. b

Discovering Cells Review and Reinforce

1. Hooke
2. Observed tiny, moving organisms
3. Schleiden
4. Concluded that all animals are made up of cells
5. Virchow
6. Magnification and resolution are both important properties of a microscope. Magnification is the ability to increase how large an object appears, whereas resolution is the ability to bring the details of the object into focus.
7. An electron microscope uses electrons instead of light to magnify an object, and it can view an object with much greater magnification and resolution than a light microscope.
8. Cells are the basic unit of structure and function in living things, and all living things are composed of cells.
9. b **10.** c **11.** a

Discovering Cells Enrich

1. Transmission electron microscopes (TEM) and transmission positron microscopes (TPM) both use beams of atomic particles to view specimens. However, the TPM uses beams of positrons, which do not harm living things, whereas the TEM uses beams of electrons, which living things cannot withstand. Therefore, unlike the TEM, the TPM can be used to view living specimens.
2. Acoustic microscopes bounce high-frequency sound waves off an object. The echoes of the sound waves are then translated onto a screen as a microscopic image.
3. Transmission positron microscopes and acoustic microscopes can be used to view cells that are still alive and functioning. Electron microscopes, on the other hand, can be used to view only cells that are no longer alive.

Design and Build a Microscope Technology Lab

For answers, see the Teacher's Edition.

Looking Inside Cells Guided Reading and Study

Use Target Reading Skills
Possible questions and answers:
How are animal cells different from plant cells? (Plant cells have a cell wall and chloroplasts.)
What do mitochondria do? (Mitochondria convert energy in food molecules to energy the cell can use.)

1. They are tiny cell structures inside a cell that carry out specific functions within the cell.
2. cell wall
3. a, b
4. It protects and supports the cell.
5. The cell membrane is just inside the cell wall.
6. It forms the outside boundary that separates the cell from its environment.
7. true
8. a, b, d
9. c
10. Converts energy in food molecules to energy the cell can use to carry out its functions
Carries proteins and other materials from one part of the cell to another
Produce proteins
Receive proteins and other materials from the endoplasmic reticulum, package them, and send them to other parts of the cell or outside the cell
Found only in plant cells; capture energy from sunlight and use it to make food for the cell
Are the storage areas of the cell
Contain chemicals that break down large food particles into smaller ones and break down old cell parts.
11. function
12. b, c

Looking Inside Cells Review and Reinforce

1. cytoplasm
2. endoplasmic reticulum
3. nucleus
4. mitochondrion
5. cell membrane
6. Organelles
7. cell wall
8. cell membrane
9. nucleus
10. cytoplasm
11. Mitochondria
12. endoplasmic reticulum
13. Ribosomes
14. Golgi bodies
15. chloroplasts
16. vacuole
17. Lysosomes

Looking Inside Cells Enrich

1. (1) builds new structures; (2) carries materials from place to place; (3) produces power; (4) produces food; (5) disposes of waste; (6) controls the rest of Cell City; (7) stores foods and water; (8) controls what enters and leaves Cell City
2. (1) ribosome; (2) endoplasmic reticulum; (3) mitochondrion; (4) chloroplast; (5) lysosome; (6) nucleus; (7) vacuole; (8) cell wall or cell membrane
3. Cell City represents a plant cell because it contains a chloroplast.

Chemical Compounds in Cells Guided Reading and Study

Use Target Reading Skills
Possible answers:
Type of Compound: carbohydrate
Elements in It: Carbon, hydrogen, oxygen
Its Functions: Store and provide energy and make up cellular parts
Type of Compound: Protein
Elements in It: Carbon, hydrogen, oxygen, nitrogen, and sometimes sulfur
Its Functions: Make up much of the structure of cells and speed up chemical reactions
Type of Compound: Lipid
Elements in It: Carbon, hydrogen, oxygen
Its Function: Store energy

1. element, atom
2. compound, molecule
3. Carbon, Proteins, Lipids, Nucleic acids
4. inorganic compounds
5. oxygen
6. Potatoes, noodles, rice, and bread have starch.
7. Cells use carbohydrates for energy and as components of some cell parts.
8. a. fats, b. oils, c. waxes
9. Both are energy-rich organic compounds made of carbon, hydrogen, and oxygen.
10. energy
11. Proteins
12. amino acids
13. They speed up chemical reactions in living things.
14. nucleic acids
15. true
16. a. DNA, b. RNA
17. **a.** Most chemical reactions within cells need water to take place. **b.** Water helps cells keep their size and shape. **c.** Water helps keep the temperature of cells from changing rapidly. d. Water helps carry substances into and out of cells.

Chemical Compounds in Cells Review and Reinforce

1. Sugars (or Starches)
2. Lipids
3. provide energy
4. Proteins
5. Nucleic acids
6. help produce proteins (or pass genetic material from parent to offspring)
7. h **8.** f **9.** i **10.** d **11.** e
12. g **13.** j **14.** c **15.** b **16.** a

Chemical Compounds in Cells Enrich

Amino Acids	A	B	C	D	E
A	AA	AB	AC	AD	AE
B	BA	BB	BC	BD	BE
C	CA	CB	CC	CD	CE
D	DA	DB	DC	DD	DE
E	EA	EB	EC	ED	EE

1. Each letter pair represents a unique two-amino acid protein.
2. 25 (5 × 5)
3. 6 × 6, or 36; 20 × 20, or 400
4. Increasing the number of amino acids each protein contains greatly increases the number of unique proteins that could be formed from just a few amino acids.

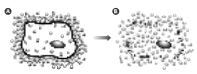
Which Food Is Fat-Free? Consumer Lab

For answers, see the Teacher's Edition.

The Cell in Its Environment Guided Reading and Study

Use Target Reading Skills
Have students write what they know about each Key Term before reading the definitions in the section. Explain that connecting what they already know about Key Terms helps them to remember the terms. As they read each passage that contains Key Terms, remind them to write the definitions in their own words.

1. selectively permeable
2. a. diffusion, b. osmosis, c. active transport
3. higher, lower
4.



5. osmosis
6. diffusion, osmosis, passive
7. Active transport requires the cell to use its own energy while passive transport does not.
8. a. Transfer proteins carry molecules into and out of the cell. b. The cell membrane engulfs a particle.
9. true

The Cell in Its Environment Review and Reinforce

1. osmosis
2. diffusion
3. active transport
4. Diffusion is the passive transport of any molecules across a selectively permeable membrane, whereas osmosis is the passive transport of water molecules across a selectively permeable membrane.
5. Both active and passive transport refer to the movement of substances across a selectively permeable membrane. Active transport requires the cell's energy, whereas passive transport does not.
6. Two methods of active transport are the use of transport proteins and transport by engulfing.
7. When cells are small, substances that enter and leave the cell have just a short distance to travel from the cell membrane to the places where they are needed within the cell.
8. true
9. Diffusion
10. osmosis
11. passive transport
12. Active transport

The Cell in Its Environment Enrich

1. Energy is not required because the passenger molecule is moving from an area of higher concentration to an area of lower concentration.
2. Passenger molecules need to be helped because they are unable to pass through the cell membrane on their own.
3. Active transport would be required because energy would be needed to move the substance from an area of lower to an area of higher concentration.
4. Facilitated diffusion with the help of a carrier molecule does not require cellular energy, whereas active transport with the help of a transport protein does require cellular energy.
5. The person's cells would be unable to take in or release the substance because the substance would be not be able to pass through the cell membrane.

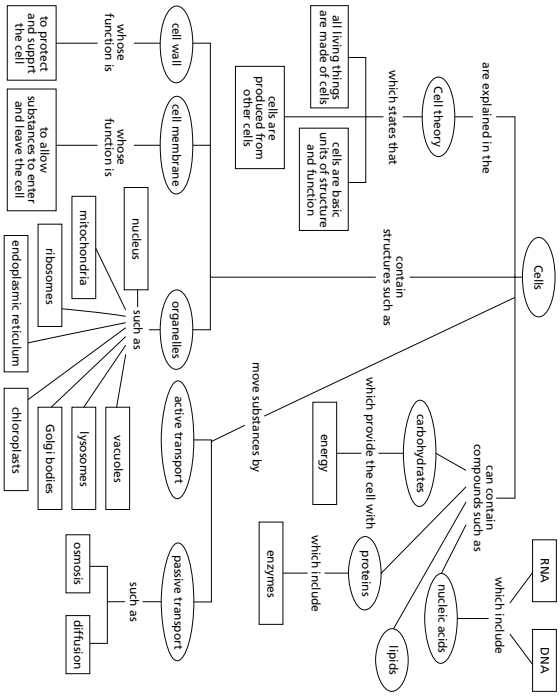
Key Terms

a. 8 **d.** 7 **g.** 3
b. 1 **e.** 6 **h.** 11
c. 9 **f.** 5 **i.** 4

All column, row, and diagonal sums = 18.

Connecting Concepts

This concept map is only one way to represent the main ideas and relationships in this chapter. Accept other logical answers from students.



Laboratory Investigation

Cell Membranes and Permeability

1. In cells with cell walls, the cell membrane is just inside the cell wall. In other cells, the cell membrane is the boundary that separates the cell from its environment.
2. Materials the cell needs to survive pass through the cell membrane into the cell, including food and oxygen. Waste products pass out through the cell membrane.

Observations

Data Table 1

Solution	Color Before	Color After
Starch in model cell	colorless or white	blue
Starch in test tube	colorless or white	colorless or white
Iodine in test tubes	dark rusty orange	light orange

Data Table 2 (sample data)

Potato Cube	Concentration of Substance	Distance of Diffusion (mm)
1	100%	2.0 mm
2	50%	1.0 mm
3	10%	less than 0.5 mm

Analyze and Conclude

1. The plastic bag represents the cell membrane.
2. The starch solution in the test tube was used as a control. It showed that starch left standing by itself for 24 hours did not change color.
3. The color change of the starch showed that iodine had mixed with the starch.
4. a. No, the starch did not move out of the bag. The liquid outside the bag did not turn blue.
b. Yes, the iodine did move into the bag. When it mixed with the starch, it turned blue. Also, the iodine outside the bag was lighter after the experiment.
5. The model cell membrane is permeable to iodine and impermeable to starch.
6. Higher concentrations resulted in the iodine diffusing farther into the potato cubes.

Critical Thinking and Applications

1. The membrane pores are larger than the iodine molecules. If they were not, the iodine molecules could not have moved into the model cell.
2. The membrane pores are smaller than the starch molecules. If they were not, starch molecules would have moved into the iodine solution, and the mixture would have turned blue.
3. Oxygen is needed for respiration. The oxygen from an oxygen mask is at a higher concentration than the concentration in air, so that oxygen will diffuse more rapidly into the blood cells that need it.

More to Explore

Most students will correctly predict that, the longer the time, the farther the solution will diffuse into the potato cube.

Chapter Performance Assessment

1. After osmosis occurred, the plant cell contents were smaller and more condensed, and the cell membrane had collapsed and pulled away from the cell wall.
2. The changes were caused by osmosis. When the water surrounding the cell became salty, it resulted in a lower concentration of water outside the cell than inside the cell. Water then moved out of the cell across the cell membrane from an area of higher concentration to an area of lower concentration.
3. The cell wall did not change because it is rigid.
4. To observe the effects of water moving into a plant cell by osmosis, students should modify their original plan by first adding salt water to the microscope slide and then adding plain water to the slide.
5. After osmosis had occurred, the plant cell contents would have become larger and less condensed, and the cell membrane would have expanded to push against the cell wall.

Cell Structure and Function ANSWER KEY

Chapter Test

1. b
2. d
3. c
4. a
5. b
6. c
7. d
8. b
9. d
10. b
11. Cells
12. plants
13. Proteins
14. osmosis
15. Active
16. true
17. resolution
18. vacuoles
19. true
20. Organic
21. Students' drawings of passive transport should show a molecule moving across a cell membrane from an area of higher concentration to an area of lower concentration. Their drawings of active transport should show a molecule moving across a cell membrane from an area of lower concentration to an area of higher concentration with the help of a transport protein, or they should show a food particle or smaller cell being engulfed by a cell. The labels should make it clear that passive transport does not require cellular energy, whereas active transport does require cellular energy.
22. Answers may vary, but should reveal that students understand that the larger the cell, the longer it would take for materials to be carried by the cytoplasm from the cell membrane to the center of the cell or for waste products to be carried from the center of the cell to the cell membrane. Students may say they would use two drawings of cells, one large and one small, to illustrate these ideas.
23. The cell theory is a theory describing the relationship between cells and living things. It states that: All living things are composed of cells; cells are the basic unit of structure and function in living things; and all cells are produced from other cells.
24. You can distinguish a plant cell from an animal cell by the presence of a cell wall and chloroplasts in the plant cell, because these structures are not found in animal cells. Also, a plant cell may have one large vacuole, whereas an animal cell may have no vacuole or several small vacuoles.
25. The cell could not survive without the cell membrane to control the substances that enter and leave the cell. All the materials the cell needs enter the cell through the cell membrane. Harmful waste products also leave the cell through the cell membrane.
26. tuna; margarine
27. bacon, ice cream, and margarine
28. Proteins: 18.2 grams; lipids: 27.1 grams; carbohydrates: 51.1 grams
29. It is important for the cell membrane to be selectively permeable so it can control which substances enter and leave the cell. The cell membrane usually is permeable to substances the cell needs, including oxygen and water. It also usually is permeable to harmful waste products, including carbon dioxide. The cell membrane usually is not permeable to some large molecules and salts.
30. If a freshwater organism were placed in salt water, its cells would shrink as they lost water to the environment. The cells would lose water because osmosis would result in the water moving from an area of higher concentration to an area of lower concentration, that is, from inside the cells to the saltwater environment.