

section of the leaf (do the cutting yourself rather than allowing students to use the razor blade). This will give the students an opportunity to observe chloroplasts in a plant cell.

Analyze Answers

1. Students' answers may vary but could include not being able to get a thin enough slice of onion, or adding too much water, which resulted in the cover slip sliding around.
2. Students' answers may vary but could include the cell's nucleus, cell membrane, or cell wall.
3. Students' answers may vary but could include that vacuoles are larger in plant cells because this helps the cell (and the plant) maintain its rigid shape.

Conclude and Apply Answer

1. Students' paragraphs may vary but should include the following responses to the questions:
 - (a) Using a compound light microscope to observe a plant cell
 - (b) Identifying the organelles present within a typical eukaryotic cell
 - (c) Cell wall, cell membrane, nucleus, vacuoles, and/or starch granules
 - (d) How to prepare a wet mount, the purpose of staining, the role of cell walls, vacuoles, etc.

■ USING THE FEATURE

Science Watch: Stem Cells, p. 38

This feature is an excellent starting point for several inquiry topics.

- Stem cell research brings to mind the explosion of experimentation and observation that led to the original cell theory. It is uncertain where current stem cell research is going to proceed. Students can research to discover some of the hopes and possibilities presented by recent advancements in stem cell research.
- In the rush to discover new uses for stem cells, a major stumbling block has been the development of new stem cell lines. The best source of stem cells has been embryonic stem cells that have not yet differentiated very much. The source of these cells is problematic and has led to the Canadian government to place severe restrictions on experimentation with human embryos. Students could research some of the controversy surrounding the use of stem cells for research.

Links to more information and photographs on this topic can be found at www.bcsce8.ca.

Science Watch Answers

1. Stem cells are cells that have not differentiated to become specialized cells such as neurons or red blood cells. This means that a scientist can encourage stem cells to become a number of different specialized cells. For example, bone marrow stem cells could be used to form functioning white blood cells for leukemia patients.
2. Some problems facing cell researchers are:
 - Adult stem cells cannot become specialized as easily as embryonic or fetal stem cells.
 - Stem cells divide continuously and therefore could cause cancerous growths.
 - Students might also believe that the fetus or embryo must be dead (or will die in the collection process) in order to collect stem cells, which raises ethical concerns. But stem cells can also be collected from umbilical cords and does not require any harm or death to the donor.
3. Students' answers may vary but could include the following:
 - Embryos have the potential to develop into human beings; therefore we should not use them to obtain stem cells.
 - When couples use *in vitro* fertilization there are embryos left over that will eventually be destroyed. Wouldn't it be beneficial to use stem cells from these embryos to cure a debilitating disease or perhaps save someone's life? We use organs from organ donors to save patients' lives.
 - There may be the temptation to create embryos for the express purpose of harvesting stem cells, such as to create a clone of yourself so that you have a supply of compatible organs should you ever need a transplant. In both cases you are exploiting another life to meet your own needs.

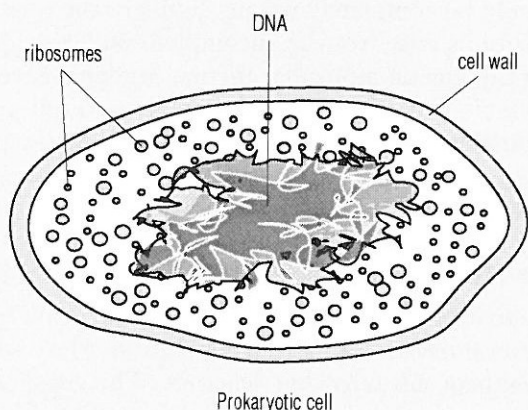
■ SECTION 1.2 ASSESSMENT, p. 39

Check Your Understanding Answers

Checking Concepts

1. The nucleus is the control centre of the cell.
2. The cell membrane is a protective barrier that also regulates what enters and leaves the cell.
3. Mitochondria break down glucose using oxygen to produce energy for the cell.
4. Vacuoles are storage containers used by cells.
5. Animal and plant cells break down glucose using oxygen in their mitochondria. Plant cells make their own glucose (chemical energy) through the process of photosynthesis.

6. Plant cells would eventually die once their supply of glucose has been used up. Without light, they would not be able to make any more food.
7. A cell membrane; B cytoplasm; C nucleus; D mitochondria; E chloroplast; F nucleus; G cell wall
8. The bottom, green cell is the plant cell. It has both a cell wall and chloroplasts.
9. Cytoplasm contains organelles, water, and other life-supporting materials.
10. Cell theory states that the cell is the basic unit of life and makes up all organisms. It also states that all cells come from other cells.
11. Students' answers may vary but could include the following: Scientists consider that cell theory is a main idea of modern biology because it explains the observations that we have made about cells and presents a logical framework that is testable. For example, if we observed cells being made from non-living materials, we would have to reject the cell theory.
- 12.



13. Students' answers may vary but could include that bacteria have cell membranes and ribosomes while viruses do not, and that viruses need other cells in order to reproduce while bacteria do not.

Understanding Key Ideas

14. The cell membrane must allow the exchange of nutrients and wastes to occur all over its surface. One opening would not allow this.
15.
 - Plant organelles: chloroplasts, cell wall
 - Plant and animal organelles: cell membrane, nucleus, mitochondria, endoplasmic reticulum, Golgi bodies, vesicles, vacuoles, ribosomes

- Animal organelles: lysosomes
16. Onion roots do not contain chloroplasts because the roots are covered with soil and therefore do not receive sunlight.
 17. Cell membranes need openings of various sizes because the molecules that must move through the membranes have different sizes.
 18. Animals obtain their food by eating other organisms and not through photosynthesis.
 19. In both cellular respiration and burning paper, fuel (food) is broken down in the presence of oxygen, and produces energy, carbon dioxide, and water.
 20. The equations for cellular respiration and photosynthesis are the reverse of each other.
Photosynthesis: Carbon dioxide + water + light → food (glucose) + oxygen
Cellular respiration: Glucose + oxygen → water + carbon dioxide + energy
 21. Plant cells need cell walls for support and therefore tend to have a regular shape. Animal cells do not have cell walls and can assume a variety of shapes.
 22. A virus takes over the DNA of a cell and uses it to produce more viruses.

Pause and Reflect Answer

Students' answers may vary but could include:

- Airport: air traffic control = nucleus; runways = endoplasmic reticulum
- Shopping mall: grocery store = mitochondrion; hallways and escalators = endoplasmic reticulum
- Hospital: power plant = mitochondrion; administration = nucleus

Other Assessment Opportunities

- Assessment Checklist 1, Making Observations and Inferences
- Assessment Checklist 2, Asking Questions
- Assessment Checklist 6, Developing Models
- Assessment Checklist 7, Scientific Drawing
- Assessment Checklist 15, Venn Diagram
- Assessment Checklist 23, Learning Skills
- Assessment Checklist 25, Safety Checklist
- Process Skills Rubric 1, Developing Models
- Process Skills Rubric 4, Problem Solving
- Process Skills Rubric 9, Questioning
- Assessment Rubric 4, Scientific Drawing Rubric
- Assessment Rubric 5, Conduct an Investigation Rubric
- Assessment Rubric 12, Using Tools, Equipment, and Materials Rubric