

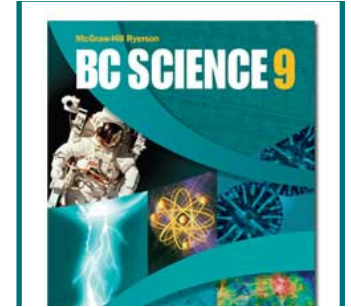
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- **for students to copy in their own hand-writing**
 - **in order to complete their class notes**
 - **if student did not have enough time in class**
 - **if student was away and missed this section**
- **for assistants and tutors to follow progress of the concepts taught**

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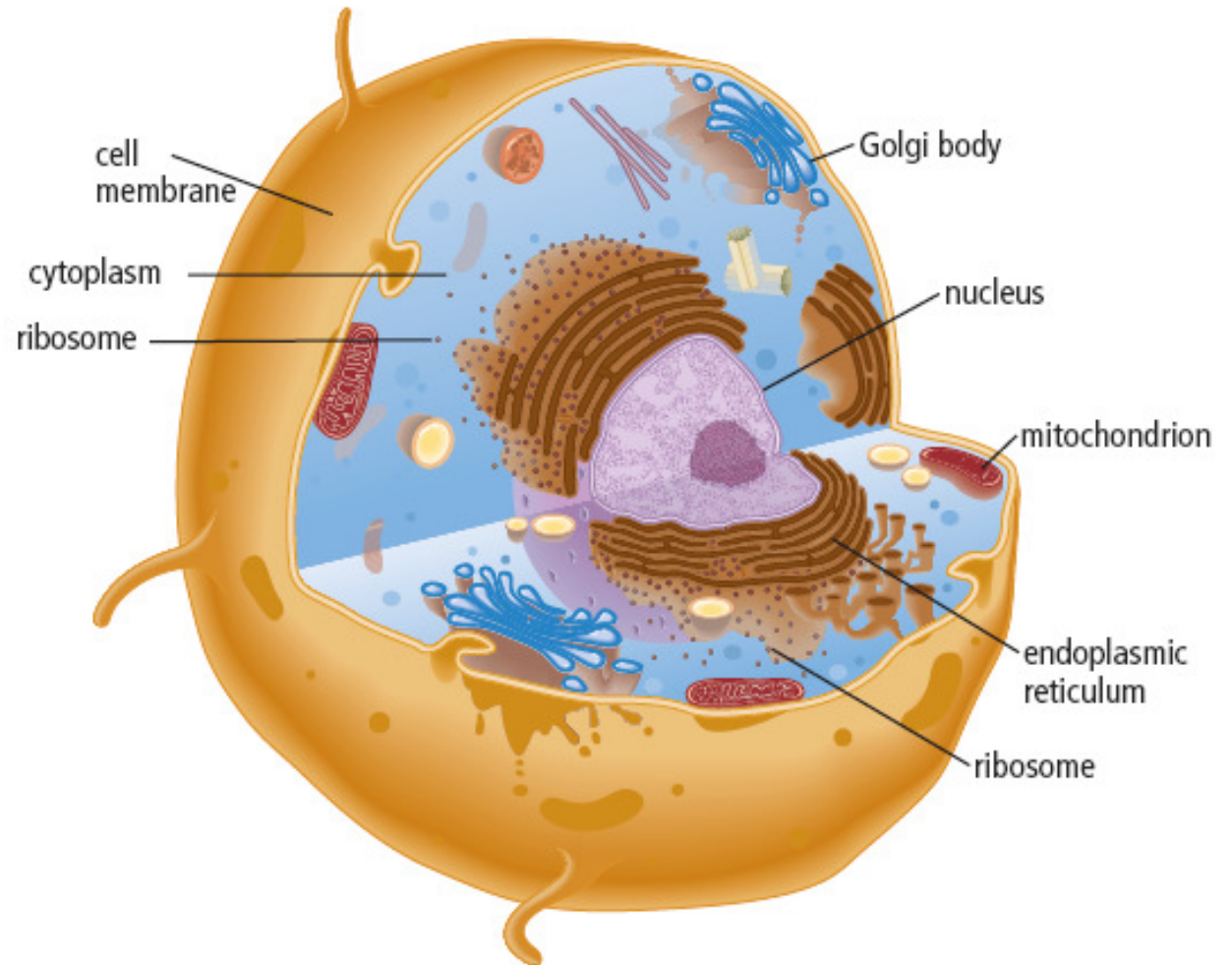
4.1 The Function of the Nucleus within the Cell



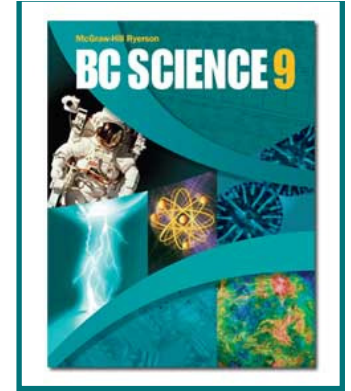
Animal Cells:

Animal cells are equipped with many structures that allow the cell to perform a variety of functions.

Centrioles are important to animal cell reproduction.



Cell Parts and Organelles



Animal Cell Parts (also found in plant cells)

cell membrane - thin covering that controls the flow of materials in and out of the cell.

cytoplasm - jelly-like substance contains the organelles (specialized cell parts)

mitochondria - provide energy for cells

ribosomes - manufacturing plants for proteins

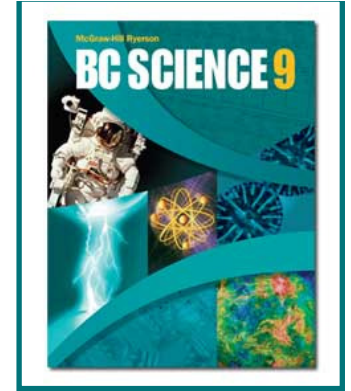
endoplasmic reticulum - membrane-covered channels that act as a transport system for materials made in the cell

Rough endoplasmic reticulum – contains ribosomes

Smooth endoplasmic reticulum – no ribosomes

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Cell Parts and Organelles

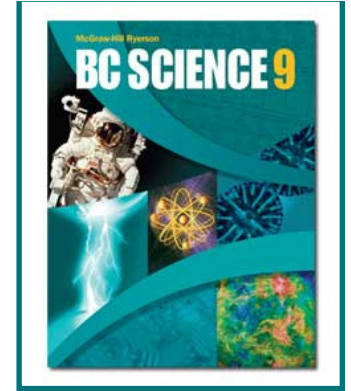


(plant and animal cell parts continued)

- vesicles - membrane-covered sacs formed by the endoplasmic reticulum. Vesicles transport new proteins to the Golgi body.
- Golgi body - sorts and packages proteins for transport
- nucleus - controls all cell activities
- nucleolus - membrane-free organelle that makes ribosomes
- nuclear membrane - protects the contents of the nucleus
- Nuclear pores - openings in the nuclear membrane that allow only certain materials to pass
- vacuoles - membrane-bound storage containers

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Cell Parts and Organelles



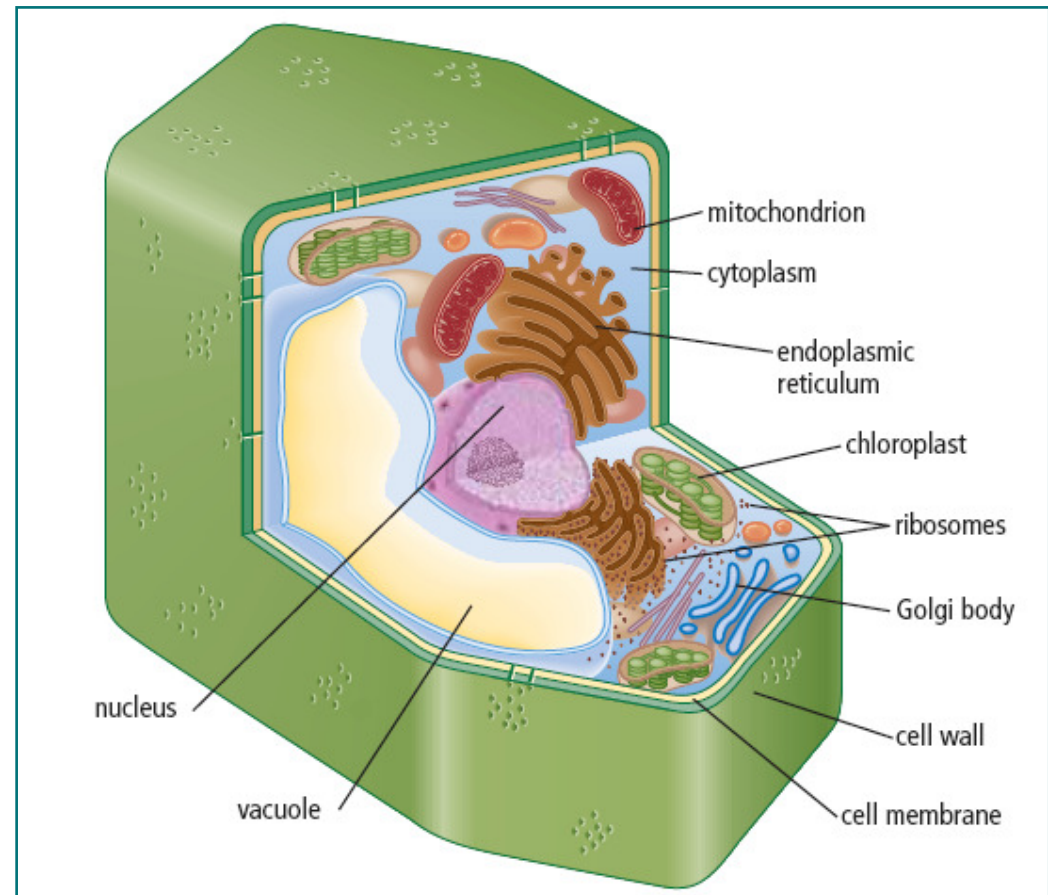
Plant Cells

Have 3 structures that animal cells do not have:

chloroplasts - trap energy from Sun to make glucose, food for the plant

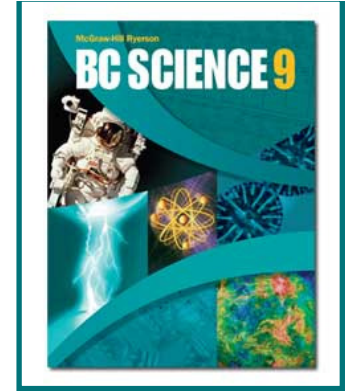
cell wall - tough, rigid structure that surrounds cell membrane, provides protection and structural support

large vacuoles - plant cells are equipped with a large vacuole for storing water



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The Nucleus and DNA



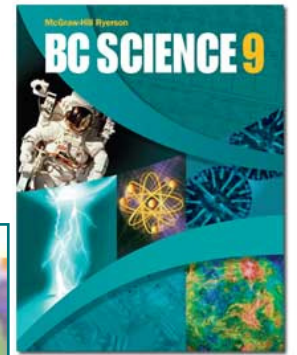
- The nucleus contains DNA (deoxyribonucleic acid); DNA is the molecule that has the master set of instructions for how cells function, what they will produce, and when they will die

Structure of DNA

- **DNA looks like a twisted ladder - two strands wrap around each other in a spiral shape.**
- **The sides of the DNA ladder are made of sugar and phosphate.**
- **The steps of the ladder are made of four nitrogen bases: adenine (A), guanine (G), cytosine (C), and thymine (T).**
- **The bases join in a specific way**
 - **A always joins with T**
 - **G always joins with C**



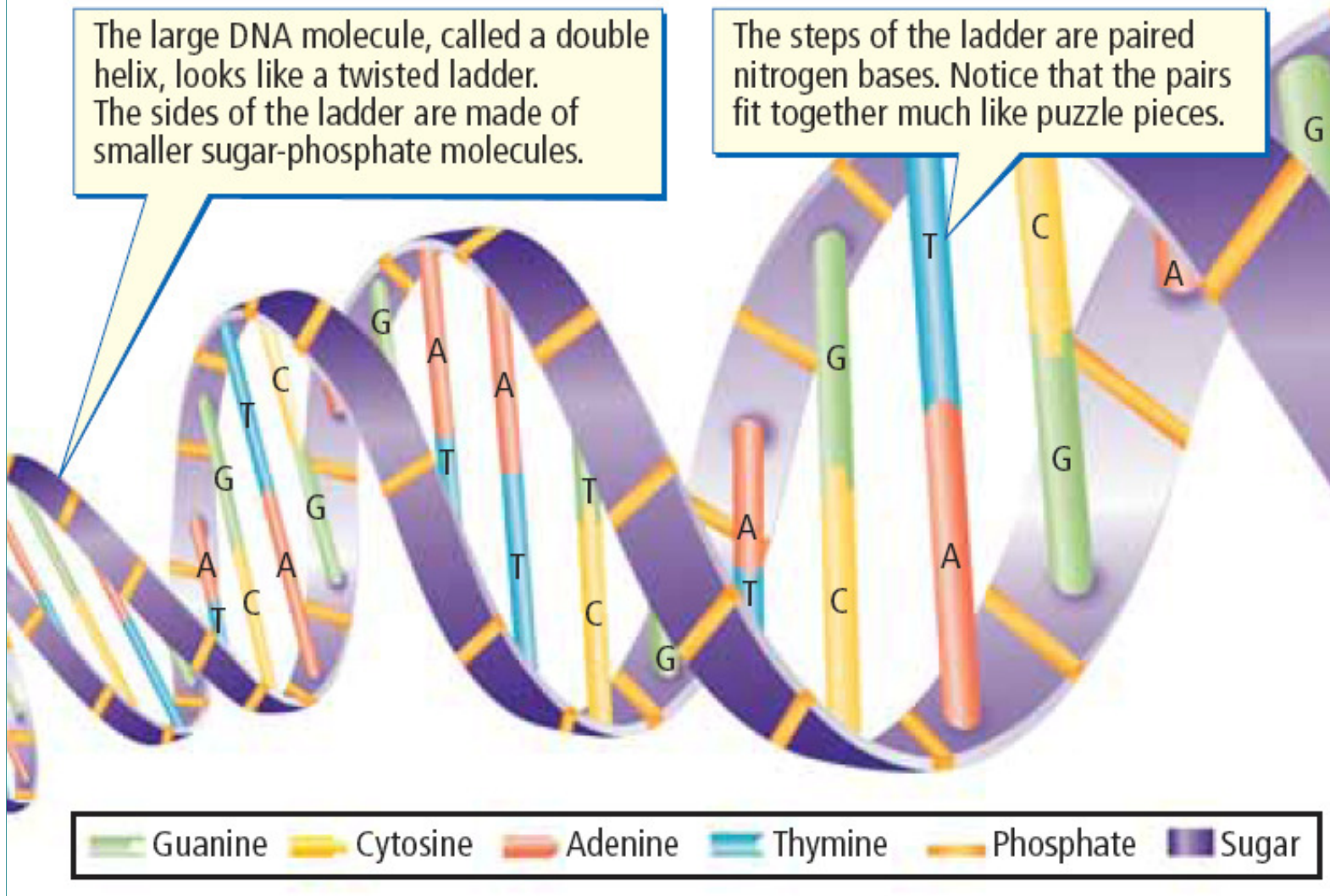
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DNA Structure

The large DNA molecule, called a double helix, looks like a twisted ladder. The sides of the ladder are made of smaller sugar-phosphate molecules.

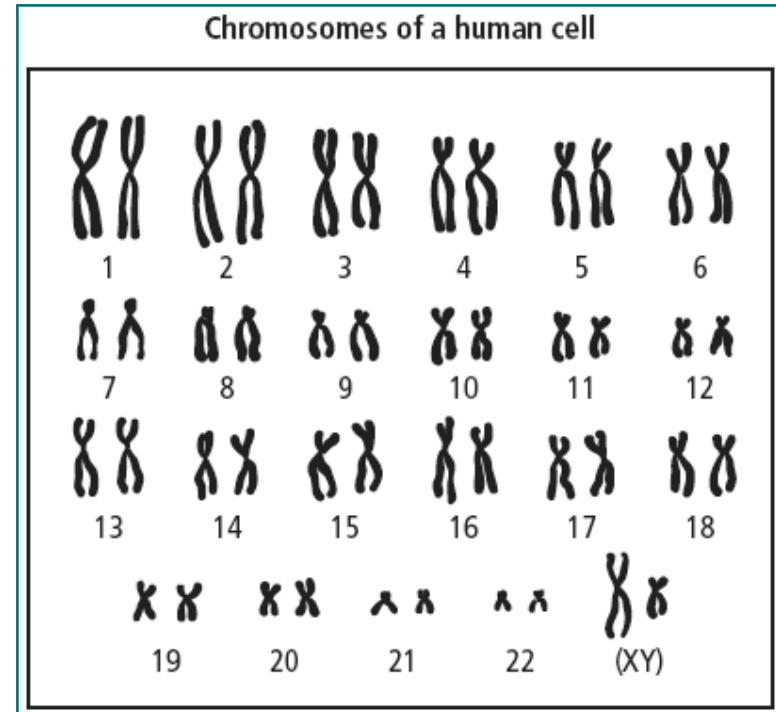
The steps of the ladder are paired nitrogen bases. Notice that the pairs fit together much like puzzle pieces.



DNA in the Nucleus



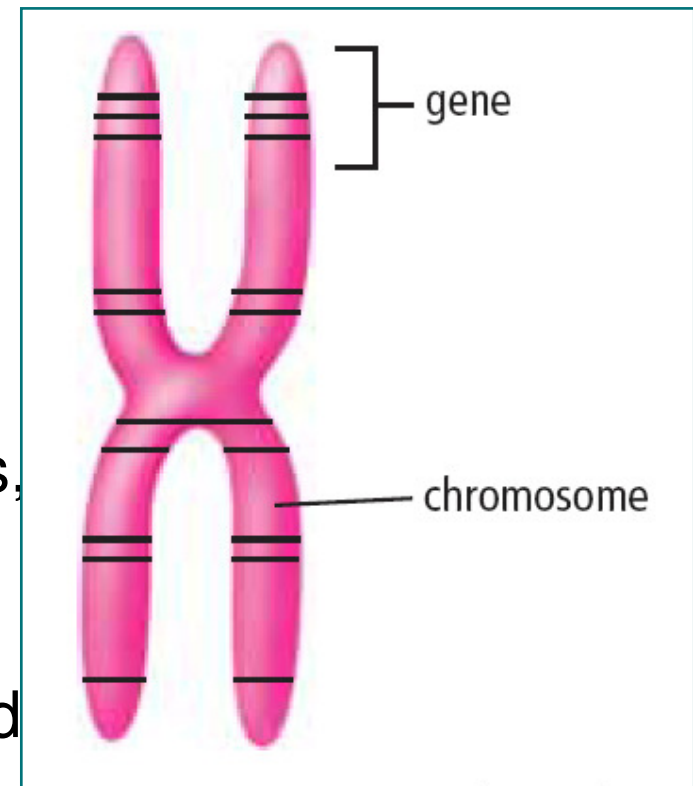
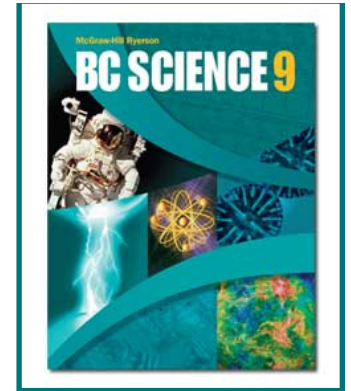
- Most of the time DNA is in the form of **chromatin**
- Chromatin coils tightly into X-shaped **chromosomes**
- Every organism has a specific number of chromosomes
- Human cells have 46 chromosomes arranged in 23 pairs
- The 23rd pair determines sex; XX for females and XY for males



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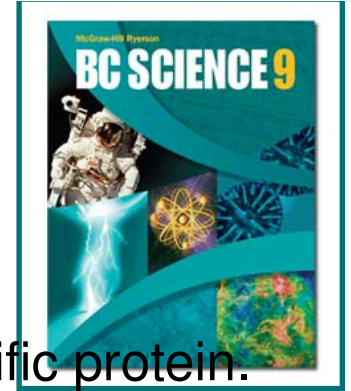
Genes

- Genes are small segments of DNA located on a chromosome
- Genes store the information needed to produce proteins
- Each chromosome can carry thousands of genes
- All your body cells have the same genes, but only specific genes are “read” in each cell to produce specific proteins
- Specialized proteins called enzymes and hormones carry out important specific functions in the body



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Production of Proteins



Protein production in the cell involves several important steps:

1. The nucleus receives a chemical signal to make a specific protein.
2. The DNA message for the protein is copied into a small molecule called RNA.
3. RNA leaves the nucleus through a nuclear pore.
4. The RNA message is delivered to a ribosome, the ribosome makes the protein.
5. The manufactured protein enters the endoplasmic reticulum (ER).
6. A vesicle forms at the end of the ER, and carries the protein to the Golgi body.
7. The Golgi body repackages the protein for transport out of the cell.
8. A vesicle forms off the end of the Golgi body to carry the protein to the cell membrane.
9. The vesicle attaches to the cell membrane, and its protein contents are released out of the cell.

Take the Section 4.1 Quiz See page 131