Cell Organelles and Their Functions

Name_____

Date_____

Below is a list of the organelles found in plant and animal cells. Match the organelle with the function it carries out inside a cell. Many of the cell organelles will be used more than once.

1) Cell Membrane	8) Cytoplasm	15) Nucleolus
2) Cell Wall	9) Cytoskeleton	16) Nucleoplasm
3) Central Vacuole	10) Golgi apparatus	17) Nucleus
4) Centriole	11) Leukoplast	18) Ribosome
5) Chloroplast	12) Lysosome	19) Rough endoplasmic reticulum
6) Chromoplast	13) Mitochondria	20) Smooth endoplasmic reticulum
7) Chromosome	14) Nuclear membrane	21) Vacuole

_____1. This is the control center of the cell.

_____2. This is made of DNA and is the storage area for all genetic information.

_____3. This is the site of protein synthesis in a cell.

_____4. This porous structure surrounds the nucleus, keeping it intact.

_____5. This internal membrane system is so extensive that it accounts for more than half the total membrane in a cell.

_____6. When newly formed proteins leave the rough endoplasmic reticulum, they are transported to this organelle, where the proteins are sorted and packaged.

_____7. This part of the cell manufactures the ribosomal subunits.

_____8. This part of the cell is surrounded by a very thick outer membrane to protect the rest of the cell from its strong enzymes.

_____9. The portion of the cell that exists outside of the nucleus.

_____10. The part of the cell that controls what enters and leaves the cell.

_____11. The part of the cell where chromosomes would be found.

_____12. This membrane connects the nuclear membrane to the cell membrane.

_____13. This part of the cell contains strong digestive enzymes to break down proteins, carbohydrates and lipids into small molecules that can be used by the rest of the cell.

_____14. These are the most numerous of the cell's organelles.

_____15. This serves as the "powerhouse" of the cell.

_____16. The place where lipids are manufactured.

_____17. This part contains the instructions for making proteins and other important molecules.

_____18. This organelle consists of two types of fibers called microfilaments and microtubules.

_____19. Choose 2 of the organelles from the list above that would never be found in a plant cell.

_____20. These three organelles all are surrounded by a double membrane.

_____21. This is the semi-fluid portion found inside the nucleus.

_____22. Newly made proteins are inserted into spaces of this organelle where they are modified and shaped into functioning proteins.

_____23. This organelle puts the "finishing touches" on proteins before they are shipped off to their final destinations.

_____24. Choose 5 organelles from the list above that would never be found in an animal cell.

_____25. This large structure in a plant cell is filled with water creating turgor pressure.

_____26. This is the site of photosynthesis in a plant cell.

_____27. These may be found free-floating in the cytoplasm or attached to the endoplasmic reticulum.

_____28. This part of the cell contains internal folds of membrane called cristae.

_____29. This part of the cell is involved with cell movement, cell shape and the separation of chromosomes during cell division.

_____30. This organelle has the unique ability to absorb the energy from the sun and convert it into a molecule of glucose.

_____31. This organelle contains pigments of all colors except green.

_____32. This organelle serves as a storage area for starch in a plant cell.

_____33. The type of endoplasmic reticulum to which no ribosomes are attached.

_____34. This serves as a storage area inside an animal cell.

_____35. This organelle is composed of tough, stringy cellulose fibers.

_____36. The type of endoplasmic reticulum to which ribosomes are attached.

_____37. This organelle is often found near the cell membrane. It consists of a stack of flattened sacs.

_____38. This organelle helps to "clean up" or destroy any debris that might build up inside the cell.

_____39. This organelle has an internal membrane system called thylakoids.

_____40. This is the site of cellular respiration.

_____41. This is an internal framework and support system to give shape and organization to a cell.

_____42. What two structures give the plant the strength and support needed to stand upright?

_____43. This part contains the green pigment chlorophyll.

_____44. This organelle gives fruits and flowers their color.

_____45. Which of the above would be found in both plant cells and in animal cells?

Name _____

Date _____

Surface Area – to – Volume Ratio in Living Cells

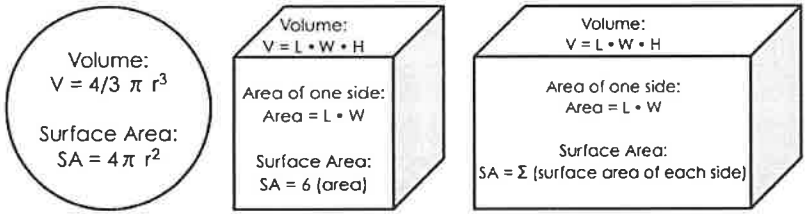
Introduction: Most cells are tiny, ranging in size from 1 to 1000 cubic micrometers. Why are cells so small, and why don't they grow to larger sizes? There are several problems faced by a cell as the size of the cell becomes too large. First, there is a limit to the amount of metabolic activity that a cell can carry out per unit time. The term "metabolism" refers to all of the chemical reactions that occur inside the cell. These reactions keep the cell alive. The larger the cell, the greater the metabolic rate must become, and there is a limit to the amount of metabolic activity that a cell can carry out. Second, the surface area of the cell determines the amount of materials that can be moved into the cell and the amount of waste products that can be moved out of the cell. As the cell increases in size, more materials will have to be moved into the cell to support it, and more waste products will have to be removed from the cell. Third, substances must be moved from one location to another within the cell. This is not easily accomplished if the cell is too large.

Questions to Consider:

1. How does the surface area to volume ratio change as the cell grows larger?
2. What will be the consequences to the cell as the cell becomes too large?

Instructions: Below you will find the equations for determining the volume of a sphere, a cube and a rectangle, as well as the equations for determining the surface area of a sphere, a cube, and a rectangle. Use these equations to determine the surface area to volume ratio in the following problems. After your calculations are complete, answer the analysis questions below.

Equations:



Calculating Surface Area to Volume Ratios:

A ratio is the relationship between two numbers, and it is used to compare numbers to each other. To find the surface area to volume ratio, make the surface area the numerator and the volume the denominator. Divide the numbers.

For example: If the surface area is 76 mm^2 and the volume is 40 mm^3, what is the surface area to volume ratio?
Surface Area / Volume = 76 /40 = 1.9
Surface Area to Volume ratio is 1.9 : 1

Note: Units are not used to calculate the surface area to volume ratio.

Problems. Show your work for every calculation. Please place your final answer in the blanks provided.

1. A square solid is 4 cm on each side.

_____ a) Calculate the volume of this cube:

_____ b) Calculate the surface area of this cube:

_____ c) Determine the surface area to volume ratio of this cube:

2. A rectangular solid has the dimensions of 5 cm x 4 cm x 2 cm.

_____ a) Calculate the volume of this rectangle:

_____ b) Calculate the surface area of this rectangle:

_____ c) Determine the surface area to volume ratio of this rectangle:

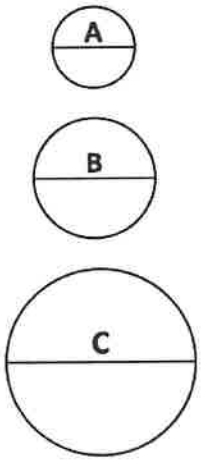
3. A sphere has a radius of 2 cm.

_____ a) Calculate the volume of this sphere:

_____ b) Calculate the surface area of this sphere:

_____ c) Determine the surface area to volume ratio of this sphere:

4. **Three cells are shown to the right. You will need a ruler to make your own measurements. Make all measurements in centimeters. Determine the surface area to volume ratio of each cell and complete the questions below.**



_____ a) What is the volume of A?

_____ b) What is the surface area of A?

_____ c) What is the surface area to volume ratio of A?

_____ d) What is the volume of B?

_____ e) What is the surface area of B?

_____ f) What is the surface area to volume ratio of B?

_____ g) What is the volume of C?

_____ h) What is the surface area of C?

_____ i) What is the surface area to volume ratio of C?

5. Describe what happens to the surface area to volume ratio as the size of the cell increases.

6. Which cell (A, B, or C) would most efficiently be able to move materials into and out of the cell? Explain.

7. Does a cell need a high or low surface area to volume ratio?

8. Why is the surface area of the cell critical for the survival of the cell?

9. In your own words, what three problems are faced by a cell as it increases in size?

10. The human body has about 100 trillion cells, ranging in size from 5 μm to 20 μm in diameter. What is the advantage of having many smaller cells instead of fewer large ones?

11. How does the flatness of the single-celled Paramecium shown in this picture affect the cell's surface area to volume ratio?

12. The volume of a cell (increases / decreases) much more rapidly than the surface area.

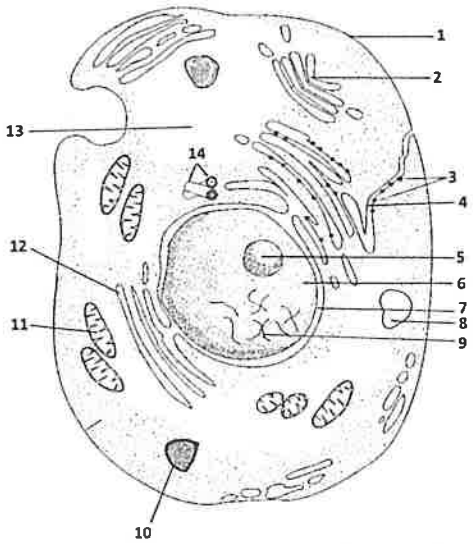
13. What single factor limits the size that most cells are able to obtain?

14. How is a cell's potential growth affected by its ratio of surface area to volume?

Plant and Animal Cells

Name_____

LABEL THE ANIMAL CELL ON THE RIGHT



_____ 1.
_____ 2.
_____ 3.
_____ 4.
_____ 5.
_____ 6.
_____ 7.
_____ 8.
_____ 9.
_____ 10.
_____ 11.
_____ 12.
_____ 13.
_____ 14.

_____ 15. Who first looked at cork cells under a microscope and called the "little boxes" that he observed "cells"?

_____ 16. Who was the first to observe microorganisms under his "simple" microscope?

_____ 17. Name given to the small internal structures of a cell that perform a specific function for the cell.

_____ 18. The breaking down of food into very small particles that can be used by cells.

_____ 19. The process of converting or burning food for energy.

_____ 20. The removal of liquid cell waste.

_____ 21. The ability to respond to a stimulus and adapt to the environment.

_____ 22. A substance that is produced in one cell but is used in another cell.

_____ 23. The part of the cell that controls all of the cell's activities.

_____ 24. Structures composed of DNA and contains the "code" for all of the genetic information of the cell.

_____ 25. The part of the cell that separates one cell from another cell; it also holds the parts of the cell inside.

_____ 26. The folds of membrane found inside the mitochondria to increase the surface area for cellular respiration.

_____ 27. The site of protein synthesis.

_____ 28. The part of the cell where chemical reactions convert food to ATP.

_____ 29. Part of the cell that contains strong enzymes used for digestion. These enzymes would destroy the cell if released into the cell.

_____ 30. The part of the cell that packages secretions and sends them to other cells.

_____ 31. A storage area for food and water.

_____ 32. Using the energy from food to build new cell parts, as in growth and repair.

_____ 33. Name given the semi-fluid material of the cell in which salts, minerals and organic molecules are dissolved.

_____ 34. This part of the cell functions primarily as an intracellular highway along which molecules can move from one cell part to another.

_____ 35. If the cell part in question #34 had ribosomes attached to it, it would be known as?

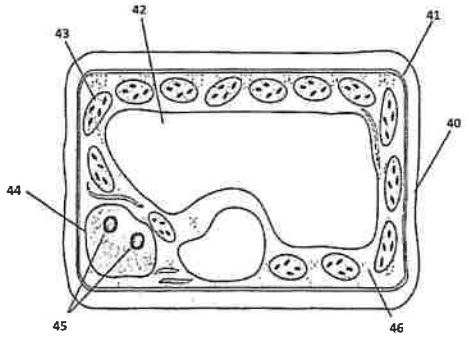
_____ 36. If the cell part in question #34 did not have ribosomes attached to it, it would be known as?

_____ 37. A complex network of strands of protein that help to maintain the shape of the cell.

_____ 38. Name two hair-like structures that extend from the cell surface. These assist in the movement of the cell.

_____ 39. The site in a cell where ribosomes are manufactured and partially assembled.

LABEL THE PARTS OF THE PLANT CELL



_____ 40.
_____ 41.
_____ 42.
_____ 43.
_____ 44.
_____ 45.
_____ 46.

_____ 47. The type of plastid that is colorless and is used for the storage of starch.

_____ 48. A very large, water-filled part of the plant cell. The function is to aid the cell wall in support.

_____ 49. Part of the cell that contains the blue, red and yellow pigments to give fruits and flowers their color.

_____ 50. Part of the cell that contains the green pigment chlorophyll.

_____ 51. Part of the plant cell that is rigid to support and protect the plant cell.

_____ 52. What organelle is found in animal cells but not in plant cells?

_____ 53. What is the name of the long strands of carbohydrates found in the cell wall to make it rigid?

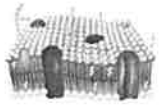
SHORT ANSWER QUESTIONS

1. What are the three parts to the cell theory? What three scientists provided the evidence for the cell theory?

2. What is the difference between prokaryotic cells and eukaryotic cells? Give an example of each type of cell.

3. List three structures found in plant cells but not in animal cells.

4. What is the relationship between the following terms: cells, tissues, organs, organ systems?

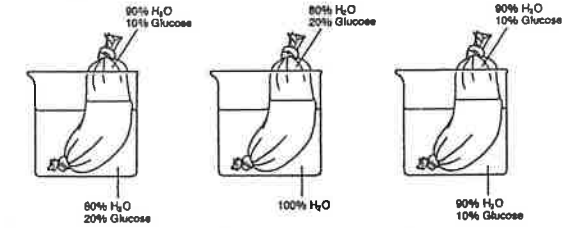


Transport Across the Cell Membrane

Name _____

Date _____

Study the diagrams below. Note the concentrations of the various solutions. The membrane is permeable to both water and glucose.



1. Draw arrows indicating the net movement of each material.
2. Is the solution in the beaker isotonic, hypertonic or hypotonic to the solution in the bag? Label each solution under the picture.
3. Are these substances moving across the membrane by active or passive transport? Explain.

4. Describe how the appearance of the bag at "A" might change after a period of time has passed.

5. Describe how the appearance of the bag at "B"" might change after a period of time has passed.

6. Describe how the appearance of the bag at "C"" might change after a period of time has passed.

7. What will happen to the movement of water and glucose when both sides of the membrane have reached equilibrium?

8. What molecule is largely responsible for the changes in volume of these bags?

The red blood cells in your blood must constantly be in an isotonic condition. A 0.9% salt solution is isotonic to red blood cells.

9. Draw a simple sketch of a red blood cell in an isotonic solution. Label the inside and the outside of the cell with the correct concentrations of salt and water.

10. Explain what will happen to the red blood cell if it is placed in a solution that is 99.3% water and 0.7% salt. Is the cell hypertonic or hypotonic to the solution?

11. Explain what will happen to the red blood cell if it is placed in a solution that is 90% water and 10% salt. Is the cell hypotonic or hypertonic to the solution?

12. What happens to an animal cell that is placed in a hypotonic solution? What is this condition called?

13. What happens to a plant cell when placed in a hypotonic solution? What is this condition called?

14. Account for these differences in plant cells and animal cells in questions 12 and 13.

15. Describe what would happen to a cell that was placed in a hypertonic solution. Would it matter if the cell were a plant cell or animal cell?

16. What would happen to the cell if it were placed in Beaker A?

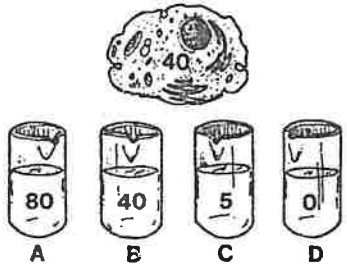
    Beaker B?

    Beaker C?

    Beaker D?

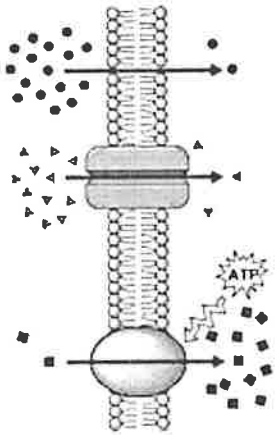
17. Which solution is isotonic to the cell?
18. Which solution(s) are hypertonic to the cell?
19. Which solution(s) are hypotonic to the cell?

Concentration of Solute Molecules in a Cell and Four Beakers

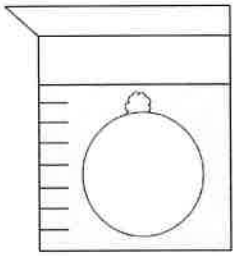


20. What is the purpose of the membrane surrounding the lysosome? Is active or passive transport being used here? Explain.

21. Three different processes are occurring in the drawing below. Name each process and describe it.



22. Referring to the drawing to the right: The beaker contains a 25% salt solution and the bag contains pure water. Label the drawing.



23. What is the concentration of water in the beaker?

24. Is the bag hypotonic or hypertonic to the beaker?

25. Is the beaker hypotonic or hypertonic to the bag?

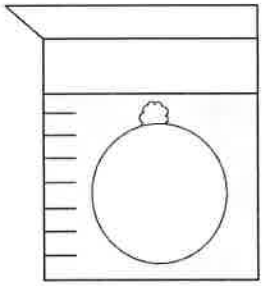
26. In which direction will water move?

27. What condition might occur if too much water moves out?

28. The movement of salt and water will continue until?

29. After equilibrium has been reached, what will happen to the movement of these molecules?

30. Referring to the drawing to the right: The beaker contains a 5% salt solution and the bag contains a 15% salt solution. Label the drawing.



31. What is the concentration of water in the beaker?

32. What is the concentration of the water in the bag?

33. Is the bag hypotonic or hypertonic to the beaker?

34. Is the beaker hypotonic or hypertonic to the bag?

35. In which direction will water move?

36. What condition might occur if too much water moves in?

37. The movement of salt and water will continue until?

38. After equilibrium has been reached, what will happen to the movement of these molecules?

39. Below is a drawing of a typical membrane. Label each of the following in the drawing: Phospholipids, Lipid bilayer, proteins, transport proteins, carbohydrates, cholesterol.