Name _____ Period _____

Regents Biology Date _____

REVIEW 2: CELLS

CELLS

Cells are the basic unit of both structure and function of all living organisms. This means that all living organisms are built out of cells and all the functions of a living organism are the result of the work of its cells. In other words, everything you do is the result of the work of your cells — walking, talking, even thinking and feeling. When you get sick, it is because your cells are not working correctly.

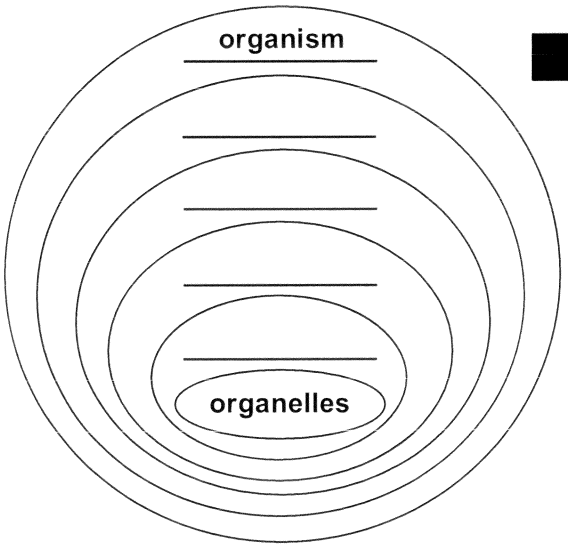
All cells come from existing cells. In other words, cells are only made from other cells growing and dividing in a process we call **mitosis**. This might seem obvious now, but at one time people believed in *spontaneous generation*, the idea that living things regularly emerged from nonliving things. Living creatures can be **unicellular** and made of only one cell (like a *Paramecium* or an *Amoeba*) or living creatures can be **multicellular** and made of many *trillions* of cells (like humans).

ORGANIZATION OF MULTICELLULAR BODIES

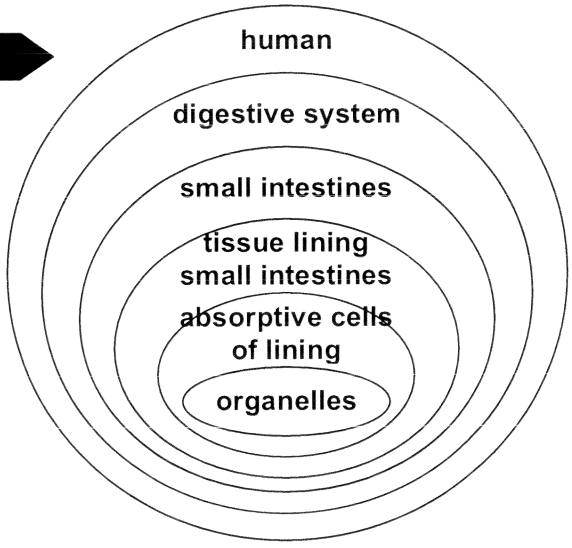
If cells are the building blocks of organisms, then how do you go from a trillion cells to an organized working body? This is done by organizing cells into coordinated groups:

- **organelles** are the working parts of cells
- **cells** are the working units of bodies
- **tissues** are a group of specialized cells working together in one function
- **organs** are a group of tissues working together
- an **organ system** is a group of tissues working together

Complete the labels on this diagram illustrating the organization of living creatures:



Here is a specific example of this organization in the human body:



Name _____ **Regents Biology**

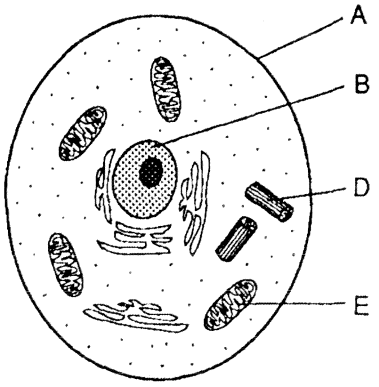
ORGANELLES

Name the following organelles

1. _____
   - controls the cell
   - contains hereditary material (chromosomes, genes, DNA)
2. _____
   - fluid/liquid in the cell – mostly water & salts
   - helps transport material around cell
3. _____
   - carries out cellular respiration
   - gives cell energy ("powerhouse of the cell").
4. _____
   - reads mRNA & builds proteins from amino acids.
5. _____
   - stores food, water and waste
   - food vacuoles may digest large molecules
   - waste vacuoles may excrete waste out the cell membrane
6. _____
   - carries out photosynthesis
   - only found in plant and algae cells
7. _____
   - gives **plant** cell shape, structure and protection
   - NEVER found in animal cells
8. _____
   - separates cell interior from environment
   - controls what enters and leaves the cell
     - material leaves & enters cells through _____
     - signals from other cells are received by _____
     - has _____ which are proteins that identify the cell and prevent the cell from being attacked by its own immune system

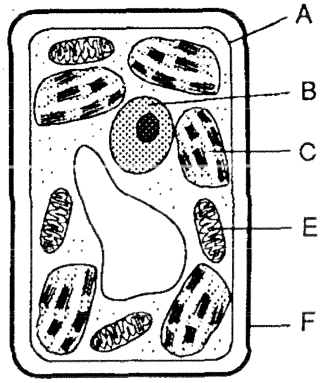
What kind of cell?

_____



What kind of cell?

_____



Label organelles:

A = _____

B = _____

C = _____

D = centriole (helps mitosis)

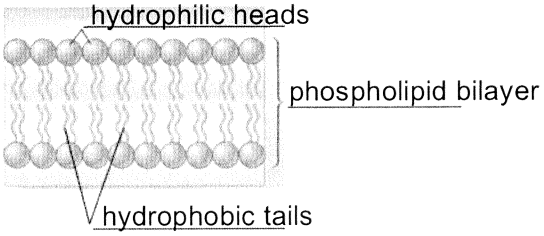
E = _____

F = _____

MOVEMENT ACROSS THE CELL MEMBRANE

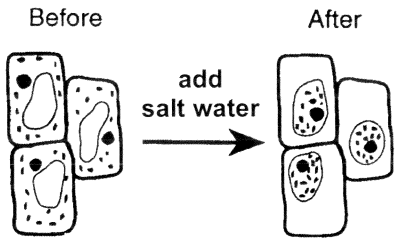
9. All cells need to move materials across the cell membrane.
   - _____, _____, and _____ need to move into the cell.
   - _____, _____, and _____ need to move out of the cell.

   a. The cell membrane is made of a double-sided lipid layer.

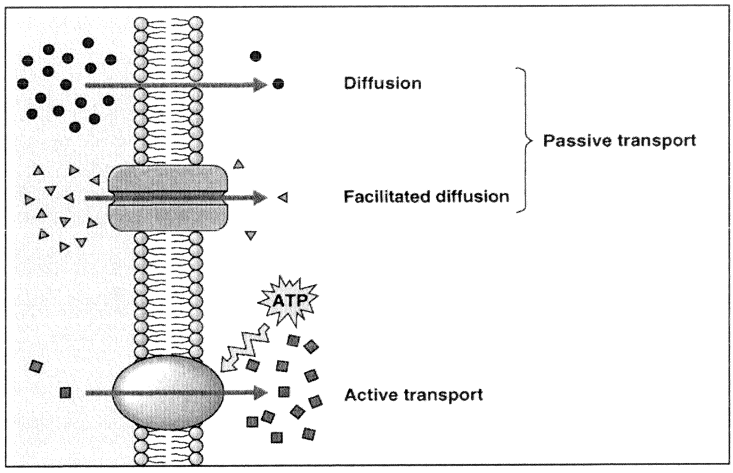


   b. Passive Transport
      - Diffusion: _____
        - Since the flow of materials is from _____ concentration to _____ concentration, diffusion requires _____ energy.
        - Lipids move directly through the membrane, so we call that process **simple diffusion**
        - Other small molecules (like glucose) cannot flow directly across the lipid layer, so there must protein channels that allow them to diffuse through the cell membrane. We call this process **facilitated diffusion** (diffusion with help).
      - Osmosis: _____
        - Since osmosis is just a special case of diffusion — the flow of **water** is still from _____ concentration of water to _____ concentration of water, osmosis requires _____ energy.

   c. Active Transport
      - When cells need to move material in the opposite direction as diffusion, from _____ concentration to _____ concentration, they need to pump it, so this **requires energy**.
      - _____ is the molecule that all cells use as energy.
      - Proteins in the cell membrane act as the active transport pumps.

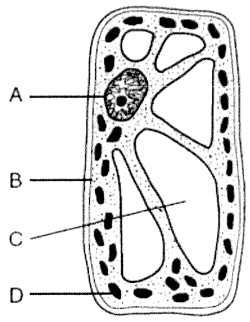


Osmosis: H_2O diffused out of the cells



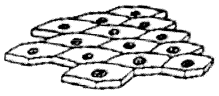
QUESTIONS

1. Which letter in the diagram to the right indicates a cell structure that directly controls the movement of molecules into and out of the cell?

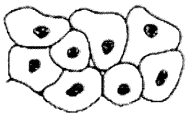


a. A
b. B
c. C
d. D

2. Some human body cells are shown in the diagrams below.


Cells from skin


Blood cells


Cells from lining of bladder


Cells from lining of trachea

These groups of cells represent different

a. tissues in which similar cells function together
b. organs that help to carry out a specific life activity
c. systems that are responsible for a specific life activity
d. organelles that carry out different functions

3. Which sequence illustrates the increasing complexity of levels of organization in multicellular organisms?

a. organelle → cell → tissue → organ → organ system → organism
b. cell → organelle → tissue → organ → organ system → organism
c. organelle → tissue → cell → organ → organ system → organism
d. cell → organism → organ system → organ → tissue → organelle

4. In a cell, information that controls the production of proteins must pass from the nucleus to the

a. cell membrane
b. chloroplasts
c. mitochondria
d. ribosomes

5. Describe how *two* of the cell structures listed below interact to help maintain a balanced internal environment in a cell.

   • mitochondrion • nucleus • cell membrane

   • ribosome • vacuole

   In your answer be sure to:

   a. select *two* of these structures, write their names, and state *one* function of each

   b. describe how each structure you selected contributes to the functioning of the other

   a. name _____ _____

      name _____ _____

   b. _____

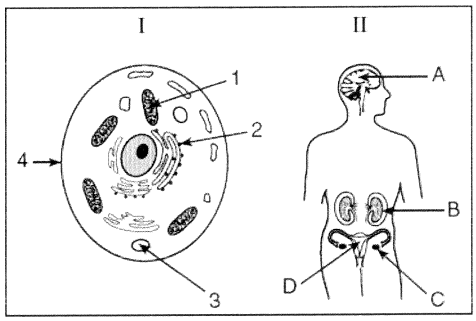
   _____

   _____

   _____

   _____

6. Which structures in diagram I and diagram II carry out a similar life function?



   a. 1 and C

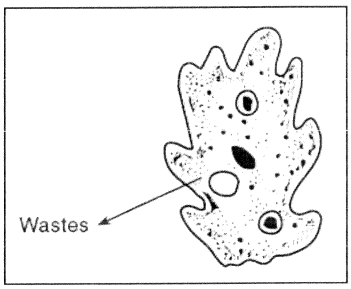
   b. 2 and D

   c. 3 and A

   d. 4 and B

7. A single-celled organism is represented in the diagram below. An activity is indicated by the arrow.

   If this activity requires the use of energy, which substance would be the source of this energy?



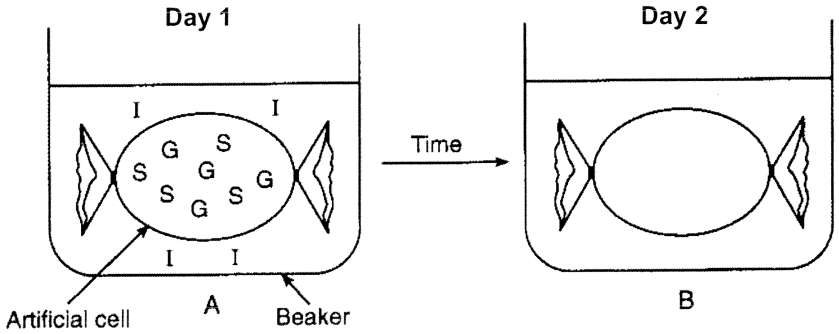
   a. DNA

   b. ATP

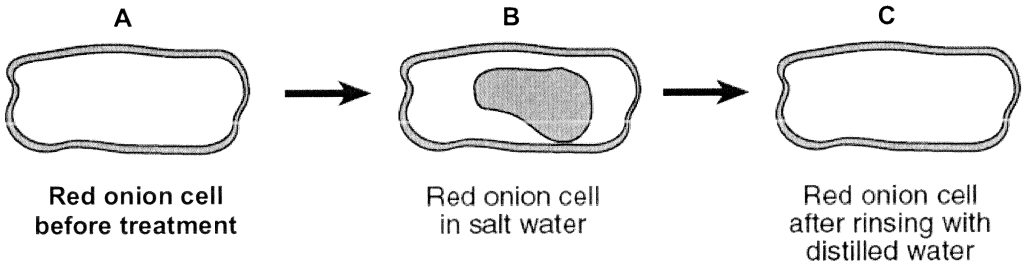
   c. a hormone

   d. an antibody

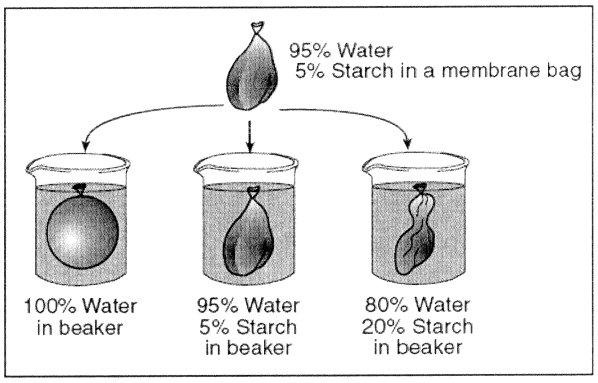
8. Complete the diagram based on the results from the Osmosis and Diffusion Lab we completed this year.



9. A student prepared a wet-mount slide of some red onion cells and then added some salt water to the slide. The student observed the slide using a compound light microscope. Diagram *B* is typical of what the student observed after adding salt water. Complete diagram *A* to show how the contents of the red onion cells should appear ***before*** the salt water treatment. Complete diagram *C* to show how the contents of the red onion cells should appear if the cell were then ***rinsed with distilled water*** for several minutes.



10. An investigation was set up to study the movement of water through a membrane. The results are shown in the diagram at the right.



Based on these results, which statement correctly predicts what will happen to red blood cells when they are placed in a beaker containing a water solution in which the salt concentration is much higher than the salt concentration in the red blood cells?

a. The red blood cells will absorb water and increase in size.

b. The red blood cells will lose water and decrease in size.

c. The red blood cells will first absorb water, then lose water and maintain their normal size.

d. The red blood cells will first lose water, then absorb water, and finally double in size.

Mitosis Review

Used in all forms of asexual reproduction

One division of a cell- two identical diploid cell (2N)

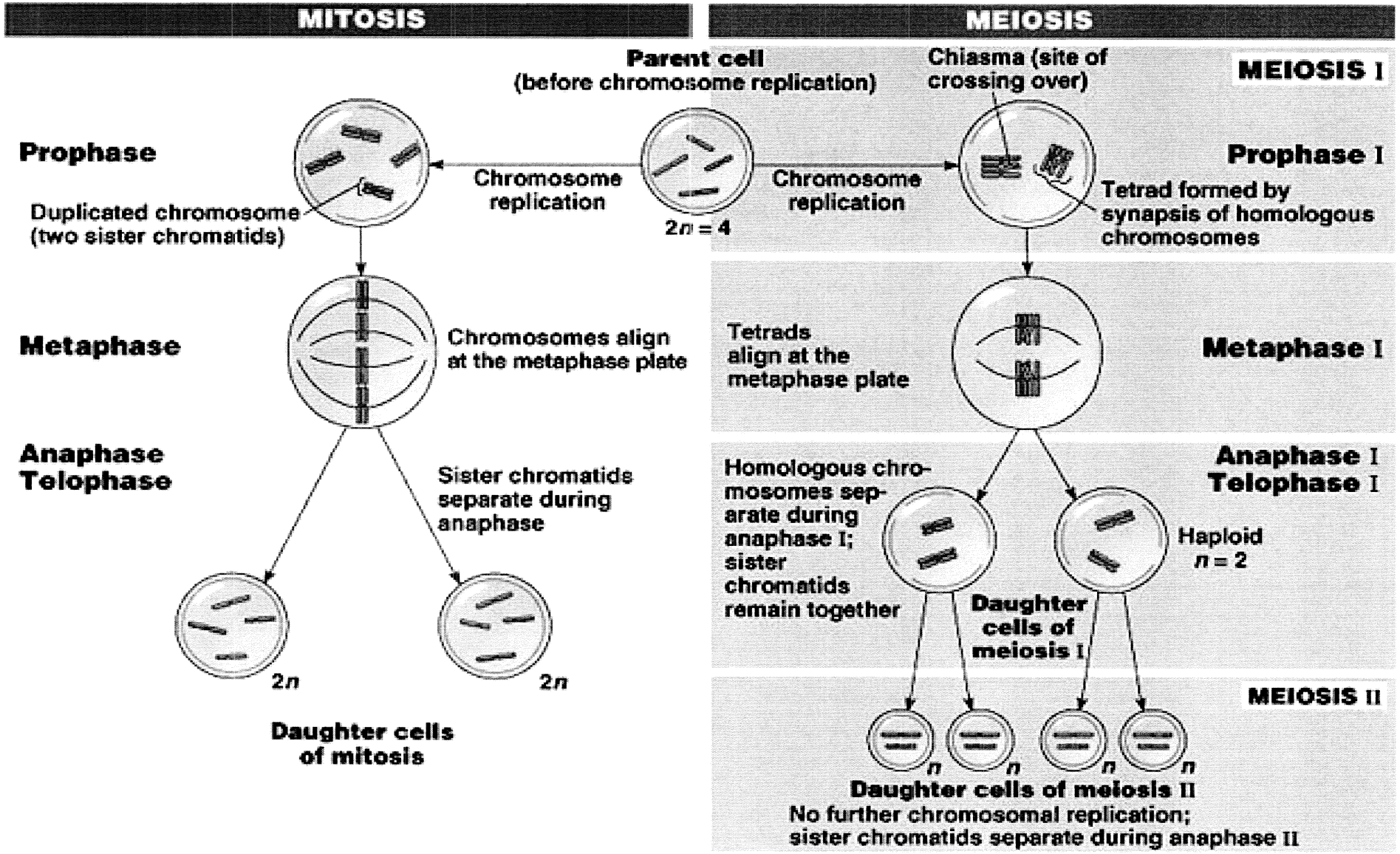
The number and types of chromosomes are the same in daughter and parent cell

Large organisms use mitosis for growth and healing.

Simple organisms use it to reproduce

Comparison	Mitosis (somatic/body)	Meiosis (gamete/sex cell)
Number of cell divisions	One	Two
Exchange of genetic material between chromosomes	No	Yes
Number functioning cells produced from original	Two	Four sperm (male) One Egg (female)
Genetic makeup of functioning cells produced	Same as original	Variable-gametes produced from two parents
Functioning of cells produced in multicellular organisms	Growth or replacement of body cells	Combine to form the zygote for reproduction

Compare Mitosis and Meiosis



1. All of the following are true regarding cells except?

   A) All cells have genetic material
   B) All cells have cell walls
   C) All cells have plasma membranes
   D) All cells can divide to form new cells

2. What is common to all cells?

   A) All cells have a cell wall
   B) All cells are photosynthetic
   C) All cells divide to form new cells
   D) All cells have a nucleus

3. What is a similarity between all bacteria and plants?

   A) They both have a nucleus
   B) They are both composed of cells
   C) They both have chloroplasts
   D) They both lack a cell wall

4. A deletion of a DNA segment alters a gene in a single skin cell of an individual. Which statement best describes a result of this mutation?

   A) Any cell produced from this skin cell will have the same mutation.
   B) All offspring of the individual will have a skin cell mutation.
   C) The mutation will spread into other types of cells.
   D) The gametes of this individual will have the same mutation.

5. Which statement is *not* a part of the cell theory?

   A) Cells are the basic unit of structure of living things.
   B) Cells are the basic unit of function of living things.
   C) Cell parts such as chloroplasts are self-replicating.
   D) Cells come from preexisting cells.

6. Which structure is best observed using a compound light microscope?

   A) a cell
   B) a virus
   C) a DNA sequence
   D) the inner surface of a mitochondrion

7. It was once thought that decaying meat turned into maggots (fly larvae). Careful experimentation by scientists demonstrated that maggots actually come from fly eggs and not meat. These experiments illustrate that new individuals result only from

   A) genetic engineering
   B) reproduction and development
   C) nutrition and replication
   D) metabolic homeostasis

8. The invention of the compound light microscope enabled scientists to observe cells, helping them to

   A) determine the number of atoms in a molecule
   B) discover a basic similarity among organisms
   C) study the behavior of chordates
   D) develop techniques for growing plants in a laboratory

9. Which instrument was used in the 18th and 19th centuries and helped scientists develop the cell theory?

   A) electron microscope
   B) light microscope
   C) microdissecting apparatus
   D) ultracentrifuge

10. During an experiment you want to view the nucleus of a cell. How would you most easily view this organelle?

    A) With a microscope
    B) With the naked eye
    C) Using a magnifying glass
    D) You could not see the nucleus with any of this instruments

11. Which is the correct sequence of historical developments leading to our present knowledge of cells?

    A) electron microscope ® cell theory ® compound light microscope
    B) compound light microscope ® cell theory ® electron microscope
    C) cell theory ® electron microscope ® compound light microscope
    D) electron microscope ® compound light microscope ® cell theory

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Which statement best describes the technique used to obtain these results?

A) A compound light microscope was used to show that the organelles in region 1 weigh less than those in region 2.
B) An electron microscope was used to show that the organelles in region 3 are the most complex.
C) Chromatography was used to determine that the organelles in region 1 are more soluble than those in region 2.
D) An ultracentrifuge was used to separate the organelles with varying densities into regions 1 through 4.

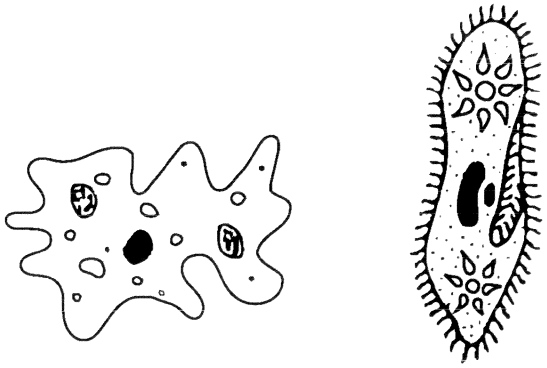
13. Cell organelles may be separated according to their densities by the use of

A) a compound light microscope
B) an ultracentrifuge
C) an electron microscope
D) a microdissection instrument

14. The development of the cell theory was most directly related to the

A) improvement of the microscope and microscopic techniques
B) use of a five-kingdom classification system
C) development of the gene-chromosome theory
D) discovery of bacteria and viruses

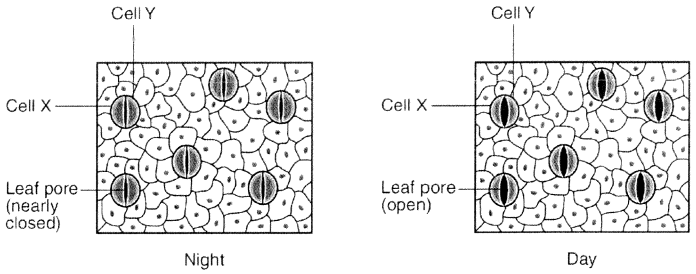
15. Base your answer to the following question on The diagram below represents two single-celled organisms.



These organisms carry out the activities needed to maintain homeostasis by using specialized internal

A) tissues B) organelles
C) systems D) organs

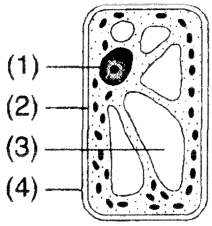
16. The diagram below represents changes in the sizes of openings present in leaves as a result of the actions of cells *X* and *Y*.



The actions of cells *X* and *Y* help the plant to

A) maintain homeostasis by controlling water loss
B) store excess heat during the day and remove the heat at night
C) absorb light energy necessary for cellular respiration
D) detect changes in the biotic factors present in the environmen

17. Which cell structure contains information needed for protein synthesis?



A) 1 B) 2 C) 3 D) 4

18. In a multicellular organism, organs carry out a variety of life functions. In a single-celled organism, these functions are performed by

A) tissues B) organelles
C) organ systems D) organs

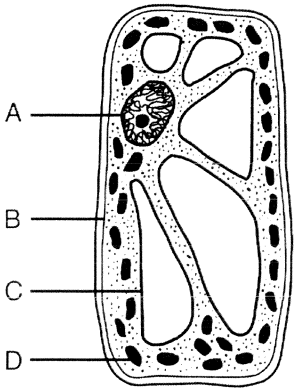
19. In a cell, information that controls the production of proteins must pass from the nucleus to which organelle?

A) cell membrane B) chloroplasts
C) mitochondria D) ribosomes

20. Which organelle is correctly paired with its function?

A) nucleus — provides carbohydrates for fermentation
B) chloroplast — serves as a site for photosynthesis
C) centriole — synthesizes digestive enzymes
D) lysosome — packages cellular products

21. The diagram below represents a cell of a green plant.



Solar energy is used to produce energy-rich compounds in structure

A) A B) B C) C D) D

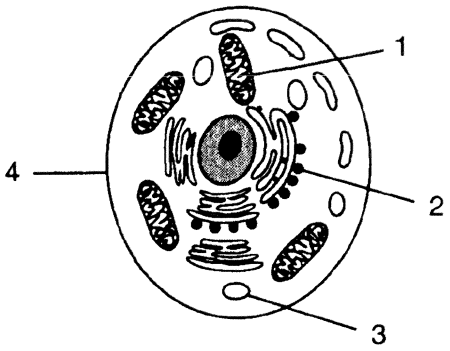
22. Which cell organelle is composed of a series of channels throughout the cytoplasm that functions in the transport of molecules?

A) lysosome
B) chloroplast
C) cell wall
D) endoplasmic reticulum

23. What organelle releases energy for metabolic activity in cells?

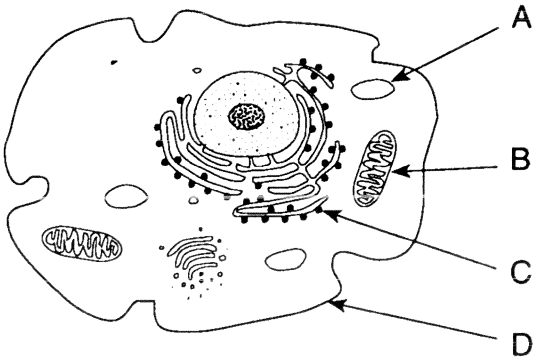
A) chloroplast B) ribosome
C) mitochondrion D) vacuole

24. Within which structure shown in the diagram below are energy-rich organic compounds used to produce ATP?



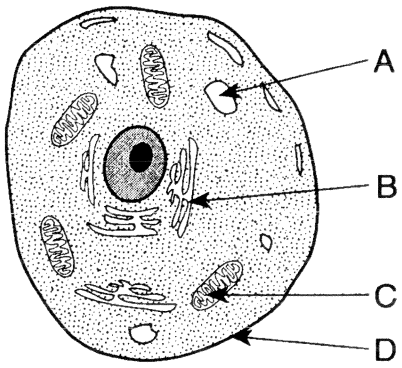
A) 1 B) 2 C) 3 D) 4

25. Base your answer to the following question on Which letter in the diagram below indicates an organelle that functions primarily in the synthesis of long chains of amino acids?



A) *A* B) *B* C) *C* D) *D*

26. Base your answer to the following question on Which organelle in the diagram below represents an exception to the cell theory because it contains genetic material and can reproduce within the cell?



A) *A* B) *B* C) *C* D) *D*

27. The largest amount of DNA in a plant cell is contained in

A) a nucleus
B) a chromosome
C) a protein molecule
D) an enzyme molecule

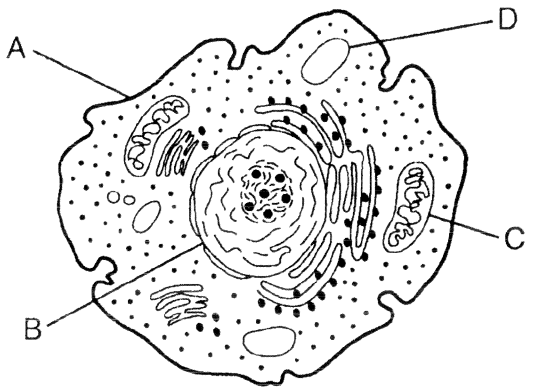
28. If the ribosomes of a cell were destroyed, what effect would this most likely have on the cell?

A) It would stimulate mitotic cell division.
B) The cell would be unable to synthesize proteins.
C) Development of abnormal hereditary features would occur in the cell.
D) Increased protein absorption would occur through the cell membrane.

29. Which organelles outside the cell nucleus contain genetic material?

A) lysosomes and cell walls
B) chloroplasts and mitochondria
C) endoplasmic reticula and cell membranes
D) vacuoles and Golgi complex

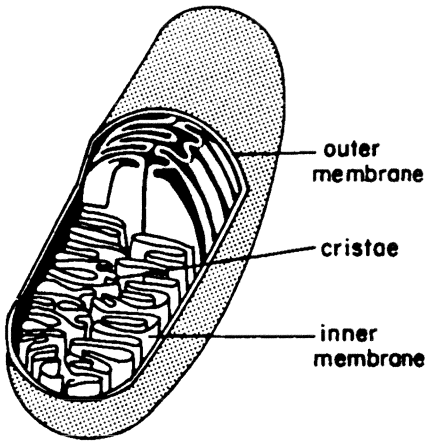
30. The diagram below represents a cell.



Which statement concerning ATP and activity within the cell is correct?

A) The absorption of ATP occurs at structure *A*.
B) The synthesis of ATP occurs within structure *B*.
C) ATP is produced most efficiently by structure *C*.
D) The template for ATP is found in structure *D*.

31. Base your answer to the following question on Which metabolic process is most closely associated with the organelle represented in the diagram below?



A) intracellular digestion
B) aerobic respiration
C) synthesis of glycogen
D) hydrolysis of lipids

32. One difference between plant and animal cells is that animal cells do *not* have

A) a nucleus
B) chloroplasts
C) a cell membrane
D) centrioles

33. Which two cell structures work together in the process of protein synthesis?

A) nucleus and chloroplast
B) ribosome and vacuole
C) nucleus and ribosome
D) mitochondrion and cell membrane

34. Centrioles are cell structures involved primarily in

A) cell division
B) storage of fats
C) enzyme production
D) cellular respiration

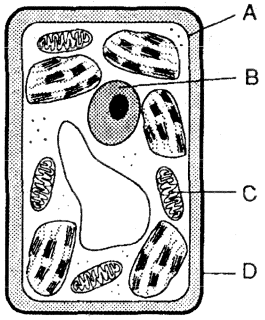
35. Which cell structures are correctly paired with their functions?

A) The mitochondria produce enzymes, and ribosomes transport them.
B) The ribosomes make proteins, and the nucleus stores genetic information.
C) The cell membrane make enzymes, and cytoplasm transports them.
D) The vacuole stores genetic information, and chloroplasts make proteins.

36. Muscle cells in athletes often have more mitochondria than muscle cells in nonathletes. Based on this observation, it can be inferred that the muscle cells in athletes

A) have a smaller demand for cell proteins than the muscle cells of nonathletes
B) reproduce less frequently than the muscle cells of nonathletes
C) have nuclei containing more DNA than nuclei in the muscle cells of nonathletes
D) have a greater demand for energy than the muscle cells of nonathletes

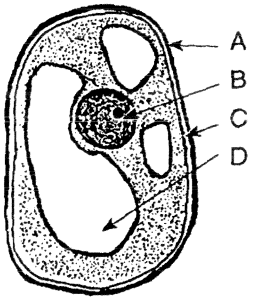
37. Base your answer to the following question on the diagram below which represents a typical green plant cell and on your knowledge of biology.



The chemical reactions involved in the synthesis of ATP occur in structure

A) *A* B) *B* C) *C* D) *D*

38. Which cell organelle indicated in the diagram below controls the synthesis of enzymes?

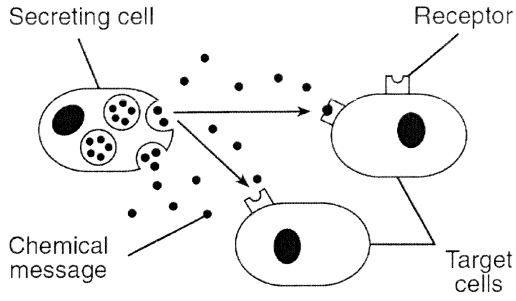


A) *A* B) *B* C) *C* D) *D*

39. Which organelle is correctly paired with its specific function?

A) cell membrane—storage of hereditary information
B) chloroplast—transport of materials
C) ribosome—synthesis of proteins
D) vacuole—production of ATP

40. The diagram below shows how a chemical message produced by one cell is received by other cells.



If these chemical messages are destroyed, the target cells will

A) produce their own chemical messages
B) not respond with appropriate actions
C) develop different receptors
D) no longer be produced in the organism

41. What determines the ability of certain hormones to attach to a cell?

A) receptor molecules in the cell membrane
B) proteins in the cytoplasm of the cell
C) amount of DNA in the cell
D) concentration of salts outside the cell

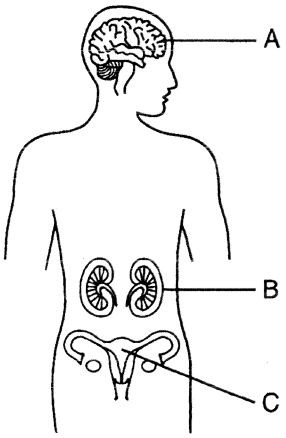
42. The diagram below represents an incomplete sequence of levels of organization.

organelles → tissues → organs → organ systems → organism

This sequence can be completed correctly by inserting

A) "cells" → between organelles and tissues
B) "proteins" → between tissues and organs
C) "populations" → between organs and organ systems
D) "molecules" → between organ systems and organisms

43. Base your answer to the following question on the diagram below and on your knowledge of biology.



Structure *B* represents

A) cells, only
B) cells and tissues, only
C) an organ with cells and tissues
D) a complete system with organs, tissues, and cells

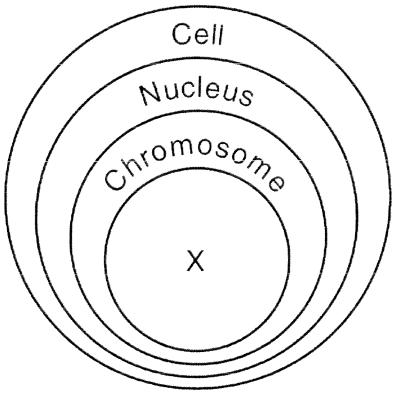
44. A liver cell can make enzymes that a heart cell can *not* make because liver cells

A) digest large, complex molecules
B) contain more DNA than heart cells
C) use different genes than the heart cells use
D) remove carbon &oxide from blood

45. Specialized cells and organs are necessary in multicellular organisms because in these organisms

A) fewer cells are in direct contact with the external environment
B) all cells are in direct contact with the external environment
C) a body type evolved that relied on fewer body cells
D) a body type evolved that required larger sized cells

46. The diagram below represents levels of organization within a cell of a multicellular organism.



Which statement is correct regarding the structure represented by *X*?

A) Structure *X* is composed of many different amino acids that determine the type of cell it will become in the organism.
B) Structure *X* has the same base sequence in all the body cells of the organism.
C) Structure *X* is a folded chain arrangement of carbohydrate found in all the body cells of the organism.
D) Structure *X* contains 20 different kinds of subunits that are present in all the cells of the organism.

47. Humans require organ systems to carry out life processes. Single-celled organisms do not have organ systems and yet they are able to carry out life processes. This is because

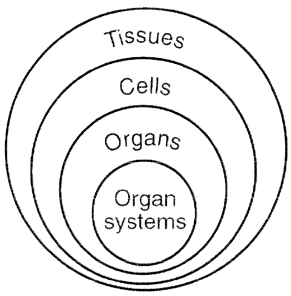
A) human organ systems lack the organelles found in single-celled organisms
B) a human cell is more efficient than the cell of a single-celled organism
C) it is not necessary for single-celled organisms to maintain homeostasis
D) organelles present in single-celled organisms act in a manner similar to organ systems

48. Which structures are listed in order from the ***least*** complex to the ***most*** complex?

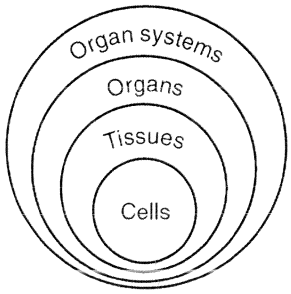
A) plant cell, leaf, chloroplast, rose bush
B) chloroplast, plant cell, leaf, rose bush
C) chloroplast, leaf, plant cell, rose bush
D) rose bush, leaf, plant cell, chloroplast

49. Which diagram *best* represents the levels of organization in the human body?

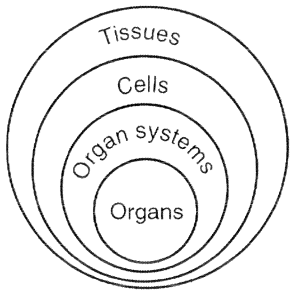
A)



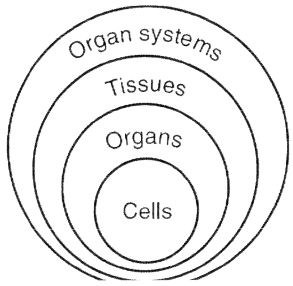
B)



C)



D)



50. Some levels of organization in a multicellular organism are shown in the sequence below.

A → *cells* → *tissues* → *B* → *organ systems* → *organism*

Which terms represented by letters A and B would complete the sequence?

A) *A*–gametes; *B*–zygote
B) *A*–zygote; *B*–gametes
C) *A*–organs; *B*–organelles
D) *A*–organelles; *B*–organs

Base your answers to questions **51** through **54** on the information below and on your knowledge of biology.

Where is the Beef? Out Being Irradiated

E. *coli* bacteria in food cause an estimated 73,000 cases of infection leading to some deaths in the United States each year. Until recently, the only way to guarantee meat free of E. *coli* was to heat it to 160°F, which kills E. *coli.* The rare hamburgers preferred by many people are not heated to this temperature, and just a few E. *coli* may cause severe illness.

Recently, ground beef has been decontaminated by irradiation using electron beam technology. The packaged ground beef is scanned by an electron beam that disrupts the genetic structure of the pathogens. This kills them or leaves them unable to reproduce.

This process is considered safe and has been endorsed by various governmental groups in this country as well as the World Health Organization. Irradiation is effective in preserving only certain foods, such as herbs, wheat flour, fresh fruits, vegetables, and some meats. Although some methods of irradiation can change the taste of some foods, this is not an effect of electron beam technology on ground beef.

Opponents of irradiating food are concerned that the process may result in the formation of chemicals that may be harmful or result in a loss of vitamins. Supporters claim that irradiation is safe and should be considered as just another technique for preservation of food.

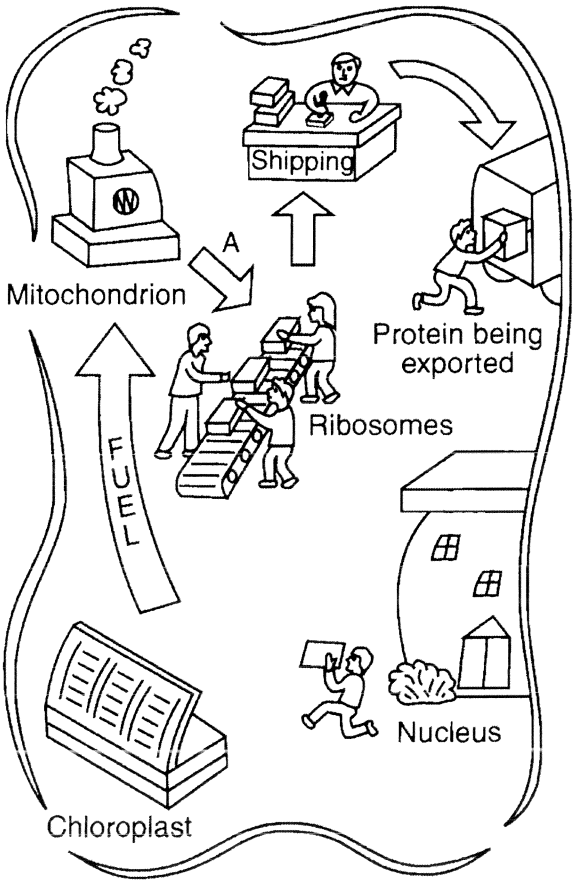
51. Explain how irradiation could interfere with the process of reproduction in bacteria that survive the irradiation.

52. Explain how irradiation helps preserve meat.

53. Identify the specific group of molecules in bacteria whose function would be interfered with by heating them to 160°F.

54. Identify *one* specific pathogen found in ground beef.

Base your answers to questions **55** through **57** on the diagram below and on your knowledge of biology. The diagram compares cell functions with jobs in a factory.



55. Which cell structure synthesized the "Protein being exported"?

_____

_____

_____

56. What chemical substance produced by the mitochondrion is represented by arrow *A*?

_____

_____

_____

57. Which *two* chemical waste products are most likely represented by the smoke above the mitochondrion?

_____ and _____

_____

_____

_____

58. The chart below contains characteristics that can be used to classify organisms *A*, *B*, and *C*.

Characteristics	Organism A	Organism B	Organism C
Number of Cells	single celled	multicellular	single celled
Type of Nutrition	autotrophic	autotrophic	heterotrophic
Nuclear Membrane	absent	present	absent
Ribosomes	present	present	present

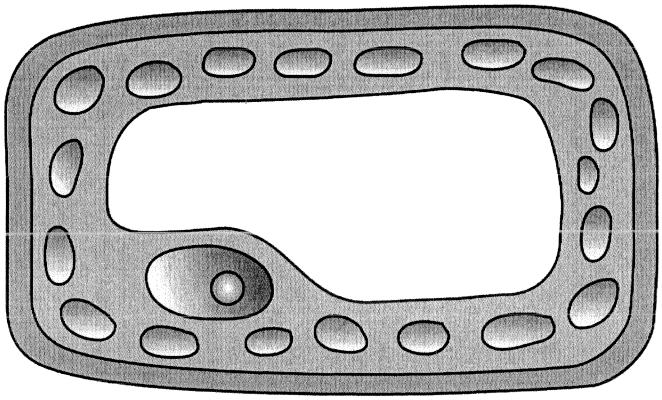
State *one* reason why organism *A* and organism *C* might be placed into two different classification groups, even though they are both single celled.

_____

_____

_____

59. Draw an arrow to indicate, *one* part of the plant cell below that would *not* be found in an animal cell. The tip of the arrow must touch the part being identified.



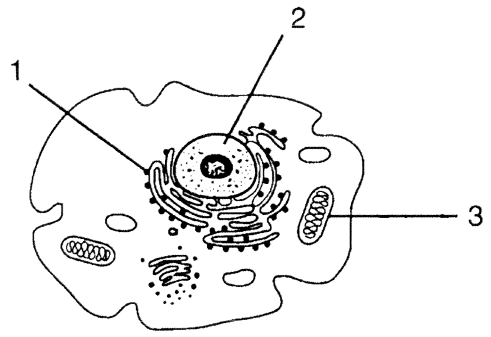
_____

_____

_____

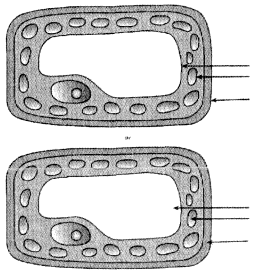
60. Base your answer to question on the diagram below and on your knowledge of biology.

In a cell, a variety of structures perform specific functions and interact to maintain homeostasis. The diagram below represents a typical cell with three cell structures labeled 1, 2, and 3.



Select *one* cell structure labeled in the diagram and write its number in the space below. Explain how the cell structure you selected helps maintain homeostasis in a cell.
In your answer, be sure to:• identify the cell structure you selected
- state *one* function of this cell structure
- identify *one* substance that is often associated with the cell structure you selected and state how that substance is associated with the cell structure
- identify *one* other cell structure and explain how it interacts with the cell structure you selected to maintain homeostasis in the cell

Cell Review-cip

1. **B**
2. **C**
3. **B**
4. **A**
5. **C**
6. **A**
7. **B**
8. **B**
9. **B**
10. **A**
11. **B**
12. **D**
13. **B**
14. **A**
15. **B**
16. **A**
17. **A**
18. **B**
19. **D**
20. **B**
21. **D**
22. **D**
23. **C**
24. **A**
25. **C**
26. **C**
27. **A**
28. **B**
29. **B**
30. **C**
31. **B**
32. **B**
33. **C**
34. **A**
35. **B**
36. **D**
37. **C**
38. **B**
39. **C**
40. **B**
41. **A**
42. **A**
43. **C**
44. **C**
45. **A**
46. **B**
47. **D**
48. **B**
49. **B**
50. **D**
51. Acceptable responses include, but are not limited to:
— It causes mutations.
— Essential enzymes are destroyed.
— Irradiation disrupts the structure of bacterial DNA so that it cannot replicate properly.
52. Acceptable responses include, but are not limited to:
— Irradiation kills the bacteria that cause the meat to spoil.
— disrupts the structure of bacteria that cause the meat to spoil
53. Acceptable responses include, but are not limited to:
— enzymes
— proteins
54. Acceptable responses include, but are not limited to:
— E. coli.
— bacteria
55. ribosome
56. ATP
57. carbon dioxide *and* water.
58. – They have different nutritional requirements. – *A* is an autotroph and *C* is a heterotroph. – They have at least one very different characteristics.
59. 
60. (essay)

60. **Structure 1**

• ribosome • site of protein synthesis • amino acid — used to make proteins • nucleus — the ribosome gets instructions from the nucleus determining which proteins are produced by the cell

Structure 2

• nucleus • control of cell processes • DNA — makes up the chromosomes in the nucleus
• ribosome — nucleus sends instructions to ribosomes for protein synthesis

Structure 3

• mitochondrion • site of energy release/cell respiration • ATP — produced in the mitochondrion
• cell membrane — allows glucose to enter cell and be used by the mitochondrion for energy release