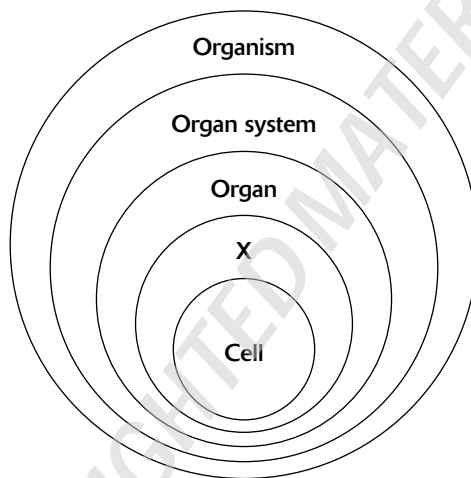


# Organization of Life

**Directions:** For each statement or question, choose the *number* of the word or expression that best completes the statement or answers the question. Then check your answer against the one that immediately follows the question. Try not to look at the answer before making your selection.

1. The diagram below represents levels of organization in living things.



Which term would best represent X?

- (1) human
- (2) tissue
- (3) stomach
- (4) organelle

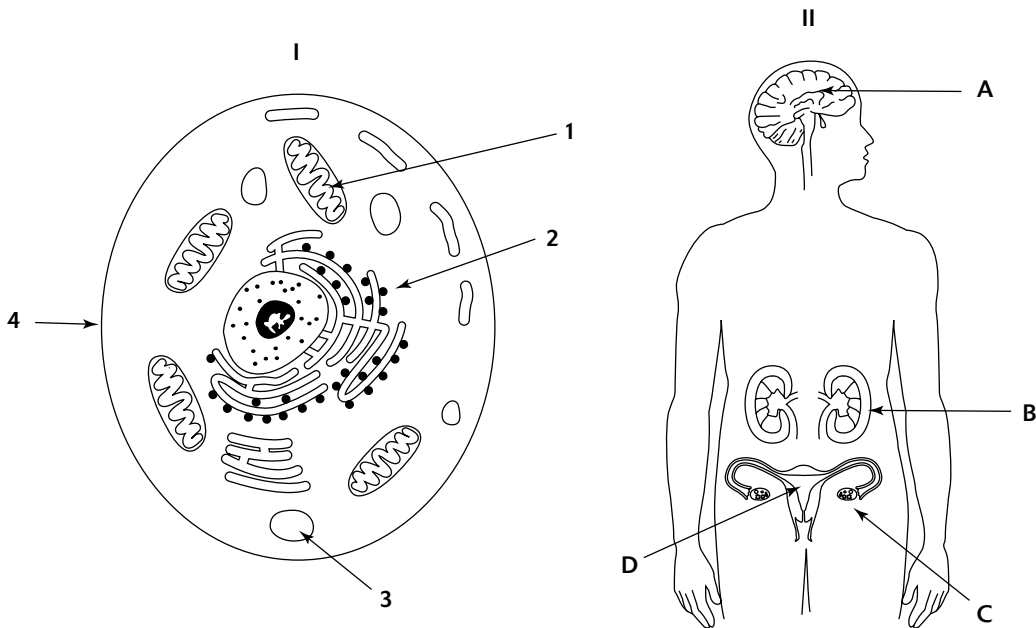
**Correct Answer: (2)** Cells are the basic unit of life. In other words, all living things are made of cells. A group of cells that work together to perform a function are called tissues. Tissues that work together to perform a function are called an organ. Several organs that work together to perform a function are called a system. All together these make the whole organism. So, for example, in a human (organism), there are many systems (digestive, circulatory, reproductive, and so on). Within each system, there are several organs (the digestive system is made up of a stomach, small intestine, colon, pancreas, and so on). The colon is made of tissue, which is made of cells. (*Single-Cell and Multicellular Organisms*)

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

- (1) organelle → cell → tissue → organ → organ system → organism
- (2) cell → organelle → tissue → organ → organ system → organism
- (3) organelle → tissue → cell → organ → organ system → organism
- (4) cell → organism → organ system → organ → tissue → organelle

**Correct Answer: (1)** This is the correct order for placing the terms in an increasing level of complexity. Most times you can answer this kind of question if you know what the first and last terms should be. Using this strategy you can get rid of choices (2) and (4), leaving you with (1) and (3). The only difference between (1) and (3) is with the second and third terms of each choice. To answer the question correctly, you need to know the order of how living things become more complex. (*The Characteristics of Life*)

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



- (1) 1 and C
- (2) 2 and D
- (3) 3 and A
- (4) 4 and B

**Correct Answer: (4)** In choice (1), 1 is the mitochondrion, noted as the site of cellular respiration and the production of energy. Its match, C, is an ovary, which produces eggs and female hormones—not a match. In choice (2), organelle 2 is the rough ER, which is used to transport materials through the cytoplasm. It is paired with D, the uterus. The uterus is where the embryo develops—not a match. In choice (3), organelle 3 is the vacuole, a storage site for food, water, and wastes. It is paired with A, the brain—not a match. The

best answer is choice (4), the cell membrane, which is paired with B, the kidney. The cell membrane performs several important functions: It provides the cell with shape and some protection; it has protein receptors in it to receive information and cell identity, and it is paired with B, the kidney, because of the cell membranes' ability to regulate or filter what passes into and out of the cell, a characteristic known as *selective permeability*. The kidneys perform a similar function by filtering the blood, removing impurities that need to be excreted, and reabsorbing water and essential molecules. (*The Characteristics of Life*)

**4.** Which sequence represents the correct order of organization in complex organisms?

- (1) tissues → organs → systems → cells
- (2) organs → tissues → systems → cells
- (3) systems → organs → cells → tissues
- (4) cells → tissues → organs → systems

**Correct Answer: (4)** Cells are the smallest unit of life. In complex organisms, cells of the same type make up tissue, which helps the organ to function in each system. Muscle cells combine to form muscle tissue. Muscle tissue makes the heart, which is an organ in the circulatory system. (*Single-Cell and Multicellular Organisms*)

**5.** Which sequence of terms represents a *decrease* from the greatest number of structures to the least number of structures present in a cell?

- (1) nucleus → gene → chromosome
- (2) gene → nucleus → chromosome
- (3) gene → chromosome → nucleus
- (4) chromosome → gene → nucleus

**Correct Answer: (3)** Most students would answer this question based on size of the structure, with nucleus being the largest then decreasing in size to the gene. You have to know the level of organization (genes make up chromosomes, which are found in the nucleus), and you must read the question and answers carefully. In cells, there is only one nucleus. In humans, there are 46 chromosomes. There are about 40,000 genes. (*Cell Structure*)

**6.** Plants inherit genes that enable them to produce chlorophyll, but this pigment is not produced unless the plants are exposed to light. This is an example of how the environment can

- (1) cause mutations to occur
- (2) influence the expression of a genetic trait
- (3) result in the appearance of a new species
- (4) affect one plant species, but not another

**Correct Answer: (2)** Genes can be affected by the environment. What makes this question hard are the words *the expression of a genetic trait*. You probably know that genes control what traits you have, but you may not be sure what *the expression of a genetic trait* means. Most of the time, *the expression of a genetic trait* means what we see on or about an organism: hair color, eye color, attached ear lobes, and so on. Even though we can't see chlorophyll, it is still a trait that is "expressed." (*Cells and Their Environment*)

**7.** Which organelle is correctly paired with its specific function?

- (1) cell membrane—storage of hereditary information
- (2) chloroplast—transport of materials
- (3) ribosome—synthesis of proteins
- (4) vacuole—production of ATP

**Correct Answer: (3)** Ribosomes are the sites of protein synthesis. mRNA brings the information from the DNA code to the ribosome, where a protein is produced. (*Cell Structure*)

**8.** Hereditary information is stored inside the

- (1) ribosomes, which have chromosomes that contain many genes
- (2) ribosomes, which have genes that contain many chromosomes
- (3) nucleus, which has chromosomes that contain many genes
- (4) nucleus, which has genes that contain many chromosomes

**Correct Answer: (3)** DNA makes up chromosomes. A section of DNA that codes for a particular trait is known as a gene. There are many genes found on each chromosome. The chromosomes hold the genetic information of the cell. Chromosomes are found in the nucleus. Ribosomes are used by the cell to help translate the DNA and build proteins that the cell can use. (*Cell Structure*)

**9.** Which statements best describe the relationship between the terms *chromosomes*, *genes*, and *nuclei*?

- (1) Chromosomes are found on genes. Genes are found in nuclei.
- (2) Chromosomes are found in nuclei. Nuclei are found in genes.
- (3) Genes are found on chromosomes. Chromosomes are found in nuclei.
- (4) Genes are found in nuclei. Nuclei are found in chromosomes.

**Correct Answer: (3)** Genes are segments of chromosomes and chromosomes are found in the nuclei of cells. (*Cell Structure*)

**10.** Homeostasis in unicellular organisms depends on the proper functioning of

- (1) organelles
- (2) insulin
- (3) guard cells
- (4) antibodies

**Correct Answer: (1)** Homeostasis is the ability to maintain a stable internal environment (equilibrium). The organelles are the working parts of a cell the way the organs are the working parts of a body system. Because a unicellular organism doesn't have systems, the organelles are responsible for maintaining homeostasis in the cell. (*Single-Cell and Multicellular Organisms*)

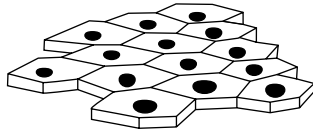
- 11.** A human liver cell is very different in structure and function from a nerve cell in the same person. This is best explained by the fact that
- (1) different genes function in each type of cell
  - (2) liver cells can reproduce while the nerve cells cannot
  - (3) liver cells contain fewer chromosomes than nerve cells
  - (4) different DNA is present in each type of cell

**Correct Answer: (1)** Each cell in a human body has a complete set of identical DNA (except for the gametes). Each cell, however, uses only a portion of the DNA in order to function. An analogy is an instruction manual for a video gaming system. The manual may contain the complete instruction manual in different languages. You ignore the instructions in Japanese or French, because you don't use those languages. Similarly, a liver cell would ignore the portion of DNA that pertains to a nerve cell, and vice versa. (*Single-Cell and Multicellular Organisms*)

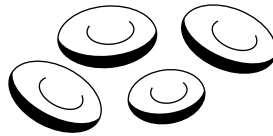
- 12.** Which statement best compares a multicellular organism to a single-celled organism?
- (1) A multicellular organism has organ systems that interact to carry out life functions, while a single-celled organism carries out life functions without using organ systems.
  - (2) A single-celled organism carries out fewer life functions than each cell of a multicellular organism.
  - (3) A multicellular organism always obtains energy through a process that is different from that used by a single-celled organism.
  - (4) The cell of a single-celled organism is always much larger than an individual cell of a multicellular organism.

**Correct Answer: (1)** All cells are relatively small because diffusion must occur efficiently in order for the cell to stay alive. All cells utilize cellular respiration to obtain energy from their food source. All organisms carry out the same life functions. However, multicellular organisms have organ systems to carry out life functions, while single-cell organisms accomplish the same goal without using organ systems. (*Single-Cell and Multicellular Organisms*)

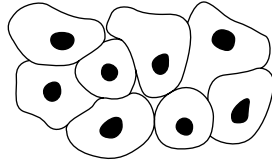
13. Some human body cells are shown in the diagrams below.



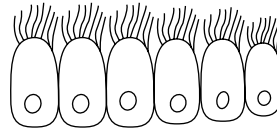
Cells from skin



Blood cells



Cells from lining of bladder



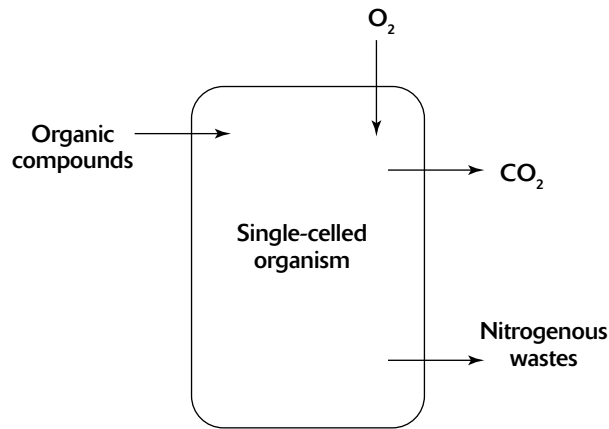
Cells from lining of trachea

These groups of cells represent different

- (1) tissues in which similar cells function together
- (2) organs that help to carry out a specific life activity
- (3) systems that are responsible for a specific life activity
- (4) organelles that carry out different functions

**Correct Answer: (1)** By definition, tissue is a group of similar cells that work together to perform one function. So, in the diagram, a group of skin cells act together to form a barrier. Red blood cells work together to carry oxygen. Bladder cells line the bladder and the trachea cells trap foreign particles like dust, pollen, and so on from entering the lungs. The rest of the choices are all true statements, but they are not represented in the diagram. (*Single-Cell and Multicellular Organisms*)

14. The arrows in the diagram below indicate the movement of materials into and out of a single-celled organism.



The movements indicated by all the arrows are directly involved in

- (1) the maintenance of homeostasis
- (2) photosynthesis only
- (3) excretion only
- (4) the digestion of minerals

**Correct Answer: (1)** The cell membrane is selectively permeable—it allows some substances to pass through it in either direction and does not allow other substances to do the same. Cells take in materials needed to perform life functions, and release materials that are considered waste products and potentially dangerous to maintain homeostasis—a stable internal environment. (*Cells and Their Environment*)

15. In the human pancreas, acinar cells produce digestive enzymes and beta cells produce insulin. The best explanation for this is that

- (1) a mutation occurs in the beta cells to produce insulin when the sugar level increases in the blood
- (2) different parts of an individual's DNA are used to direct the synthesis of different proteins in different types of cells
- (3) lowered sugar levels cause the production of insulin in acinar cells to help maintain homeostasis
- (4) the genes in acinar cells came from one parent while the genes in beta cells came from the other parent

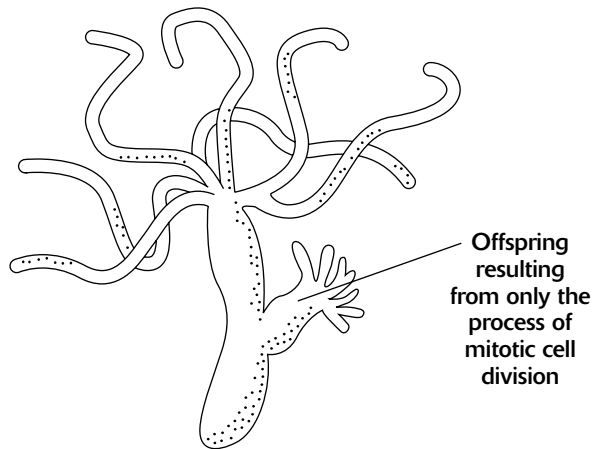
**Correct Answer: (2)** In multicellular organisms, groups of cells that perform the same functions make up tissues, and groups of tissues make up organs. Although every cell in these tissues and organs has the same genetic information, different cells perform different functions and produce different proteins because only some of the genes are expressed, or “turned on,” at a given time. In this case, the human pancreas is an organ made up of different tissues. Some of those tissues contain acinar cells in which

the genes that produce digestive enzymes are “turned on” and some tissues contain beta cells in which the genes that produce insulin are “turned on.” (*Single-Cell and Multicellular Organisms*)

- 16.** The cells that make up the skin of an individual have some functions different from the cells that make up the liver because
- (1) all cells have a common ancestor
  - (2) different cells have different genetic material
  - (3) environment and past history have no influence on cell function
  - (4) different parts of genetic instructions are used in different types of cells

**Correct Answer: (4)** Every cell in an organism has the same genetic information, but different cells perform different functions. Genes, which are responsible for the production of particular proteins, are turned “on” or “off” depending on the needs of the particular cell. (*Single-Cell and Multicellular Organisms*)

- 17.** The organism represented below is multicellular, heterotrophic, and completely aquatic.



Which other characteristics could be used to describe this organism?

- (1) carries out photosynthesis and needs oxygen
- (2) deposits cellular wastes on land and decomposes dead organisms
- (3) reproduces asexually and is a consumer
- (4) reproduces in a water habitat and is a producer

**Correct Answer: (3)** The description of the organism provides a lot of information. It tells you that the organism is made up of more than one cell (multicellular), it relies on other organisms for its nutrition (heterotrophic), and it lives in the water (aquatic). Choice (3) tells you that the organism is a consumer. This meshes with the information given that it is a heterotroph. The diagram shows a new offspring budding off from the organism, and the diagram states that it is going through mitotic cell division, which is

another way to say it is asexual. The organism cannot be a heterotroph and carry on photosynthesis at the same time, as in choice (1). If it lives in the water, it cannot deposit wastes on land, as in choice (2). And it cannot be a producer (which is the realm of plants) if it is described as a heterotroph, as in choice (4). (*Single-Cell and Multicellular Organisms*)

**18.** Which group contains only molecules that are each assembled from smaller organic compounds?

- (1) proteins, water, DNA, fats
- (2) proteins, starch, carbon dioxide, water
- (3) proteins, DNA, fats, starch
- (4) proteins, carbon dioxide, DNA, starch

**Correct Answer: (3)** The key here is knowing that, in this choice, all the compounds are organic and that if you're going to assemble molecules from smaller organic compounds, then the compound you make must also be organic. So, even if you don't know what smaller organic compounds the compounds in this choice are made from, you can eliminate the other choice on the basis that each one has an inorganic compound among them: In choice (1), the inorganic compound is water; in choice (2), there are two inorganic compounds, water and carbon dioxide; and in choice (4), the inorganic compound is carbon dioxide. (*The Characteristics of Life*)

**19.** Plants in areas with short growing seasons often have more chloroplasts in their cells than plants in areas with longer growing seasons. Compared to plants in areas with longer growing seasons, plants in areas with shorter growing seasons most likely

- (1) make and store food more quickly
- (2) have a higher rate of protein metabolism
- (3) grow taller
- (4) have a different method of respiration

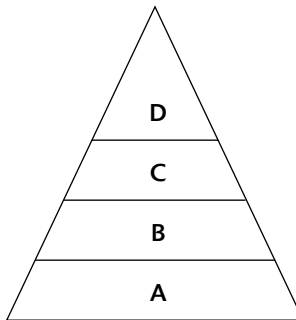
**Correct Answer: (1)** Chloroplasts are the site of photosynthesis, and photosynthesis is the process of making food. In areas with shorter growing seasons, plants have more chloroplasts to make the food they need to survive the shorter season. (*The Characteristics of Life*)

**20.** An enzyme known as rubisco enables plants to use large amounts of carbon dioxide. This enzyme is most likely active in the

- (1) nucleus
- (2) vacuoles
- (3) mitochondria
- (4) chloroplasts

**Correct Answer: (4)** Plants use carbon dioxide during photosynthesis to produce sugar. Photosynthesis occurs within the chloroplasts, so this is where the carbon dioxide is used. The enzyme rubisco is involved in photosynthesis and would be active in the chloroplast. (*Cell Structure*)

21. Which process provides the initial energy to support all the levels in the energy pyramid shown below?



- (1) circulation
- (2) photosynthesis
- (3) active transport
- (4) digestion

**Correct Answer: (2)** Photosynthesis in plants and algae provides energy in the form of glucose that all other forms of life depend on. Choice (1), circulation, is not an energy-producing process. Choice (3), active transport, is a process that needs energy—it does not supply it. Choice (4), digestion, does provide energy, but it does not begin in the bottom level, A—it only takes place above level A by consumers. (*The Characteristics of Life*)

22. Starch molecules present in a maple tree are made from materials that originally entered the tree from the external environment as

- (1) enzymes
- (2) simple sugars
- (3) amino acids
- (4) inorganic compounds

**Correct Answer: (4)** Starch is an organic molecule that contains carbon and hydrogen. The molecules that enter the plant that are involved in producing the starch during photosynthesis are water and carbon dioxide. Both water and carbon dioxide are considered inorganic compounds because neither contains carbon and hydrogen together. (*Cell Structure*)

23. Which statement best describes cellular respiration?

- (1) It occurs in animal cells but not in plant cells.
- (2) It converts energy in food into a more usable form.
- (3) It uses carbon dioxide and produces oxygen.
- (4) It stores energy in food molecules.

**Correct Answer: (2)** Whenever you see the words *respiration, oxygen, energy, glucose, and mitochondria*, you must realize that they are connected to each other. You may not know exactly how they are connected, but you should realize that they are. The mitochondria takes food in the form of glucose and uses oxygen to “burn it,” to release the energy stored in the bonds of the glucose molecule. When you burn a piece of wood and get heat (and light) that is stored in the bonds of the wood, you know that in order to burn anything you need oxygen. The same is true with respiration and glucose: You need oxygen to burn to release the energy. (*The Characteristics of Life*)

Base your answer to question 24 on the chart below and on your knowledge of biology.

<b>A</b>	<b>B</b>	<b>C</b>
The diversity of multicellular organisms increases.	Simple, single-celled organisms appear.	Multicellular organisms begin to evolve.

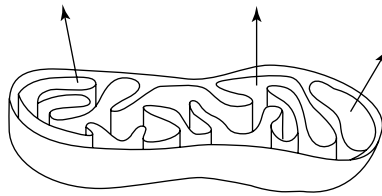
- 24.** According to most scientists, which sequence best represents the order of biological evolution on Earth?
- (1) A → B → C
  - (2) B → C → A
  - (3) B → A → C
  - (4) C → A → B

**Correct Answer: (2)** Because the atmosphere of early Earth contained little or no oxygen, the first organisms thought to have appeared on Earth were single-celled anaerobic prokaryotes, most likely taking in organic molecules from their environment. Over time, complex autotrophic and heterotrophic multicellular organisms began to develop as oxygen was added to the environment. Finally, organisms would continue to grow and develop until many different species existed on Earth. (*Single-Cell and Multicellular Organisms*)

- 25.** Which change in a sample of pond water could indicate that heterotrophic microbes were active?
- (1) increase in ozone level
  - (2) increase in glucose level
  - (3) decrease in oxygen level
  - (4) decrease in carbon dioxide level

**Correct Answer: (3)** Heterotrophic organisms are those that do not produce their own food. Heterotrophs, also known as consumers, utilize oxygen while producing carbon dioxide during cellular respiration. A water sample in which heterotrophs were present would have a decrease in oxygen levels over time because these organisms were using oxygen for cellular respiration. (*Cell Structure*)

- 26.** The diagram below represents a cell organelle involved in the transfer of energy from organic compounds.



The arrows in the diagram could represent the release of

- (1) ATP from a chloroplast carrying out photosynthesis
- (2) oxygen from a mitochondrion carrying out photosynthesis
- (3) glucose from a chloroplast carrying out respiration
- (4) carbon dioxide from a mitochondrion carrying out respiration

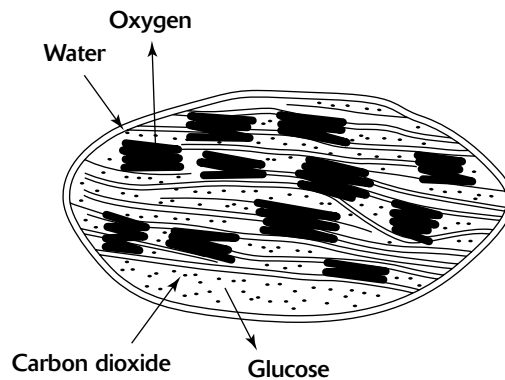
**Correct Answer: (4)** The diagram shows a mitochondrion, the organelle in which cell respiration occurs. Cell respiration uses oxygen and glucose to produce ATP, an energy-rich molecule that the cell utilizes, and carbon dioxide a waste product. (*Cell Structure*)

- 27.** Antibody molecules and receptor molecules are similar in that they both

- (1) control transport through the cell membrane
- (2) have a specific shape related to their specific function
- (3) remove wastes from the body
- (4) speed up chemical reactions in cells

**Correct Answer: (2)** Antibodies and receptor molecules (the latter of which are found in the cell membrane) function because of their unique shape. They have a unique shape because they are proteins, and all proteins (including all different kinds of molecules) have a three-dimensional shape. Each one is different from the next. This unique shape is key to the function of a protein. If the molecules are antibodies, their shape must match up with the antigens that they are made to fight. If the molecules are receptor molecules, they must match up to receive the correct molecules. (*The Characteristics of Life*)

**28.** The diagram below illustrates the movement of materials involved in a process that is vital for the energy needs of an organism.

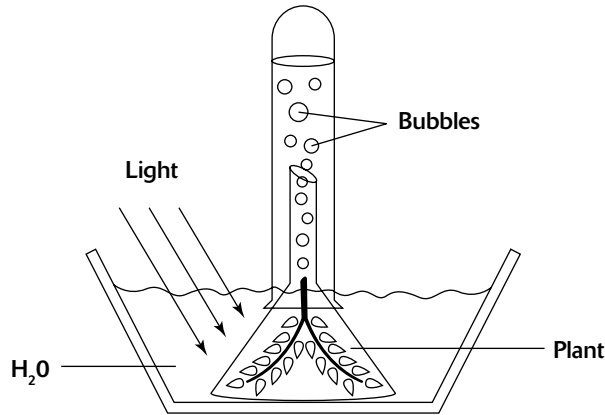


The process illustrated occurs within

- (1) chloroplasts
- (2) mitochondria
- (3) ribosomes
- (4) vacuoles

**Correct Answer: (1)** Everything in the diagram is involved in both respiration and photosynthesis. This is one of the few times when you need to be able to tell the difference between a mitochondrion and a chloroplast based solely on what they look like. This is a diagram of a chloroplast. The inside of a chloroplast has those small stacks that look a little bit like a small stack of coins. The inside of a mitochondrion—choice (2)—has a wavy appearance. If it were a ribosome—choice (3)—you would expect to find amino acids and proteins inside. *Remember:* The ribosome is the site of protein synthesis. Inside a vacuole—choice (4)—you would most likely find water or wastes, not essential molecules like those in the diagram. (*Cell Structure*)

**29.** The green aquatic plant represented in the diagram below was exposed to light for several hours.



Which gas would most likely be found in the greatest amount in the bubbles?

- (1) oxygen
- (2) nitrogen
- (3) ozone
- (4) carbon dioxide

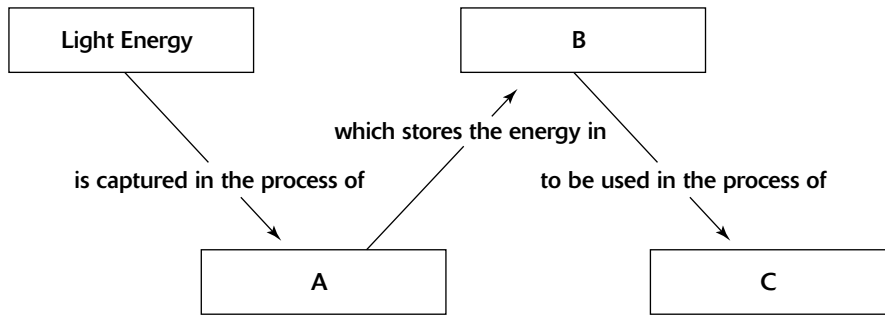
**Correct Answer: (1)** The key to this question is the light. It means that the plant is going to be going through photosynthesis, and photosynthesis produces oxygen. (*Cells and Their Environment*)

**30.** Which process usually uses carbon dioxide molecules?

- (1) cellular respiration
- (2) asexual reproduction
- (3) active transport
- (4) autotrophic nutrition

**Correct Answer: (4)** The process of photosynthesis carried out by autotrophs requires carbon dioxide, water, and solar energy. Oxygen gas is a product of photosynthesis and is used in the process of aerobic cellular respiration. (*The Characteristics of Life*)

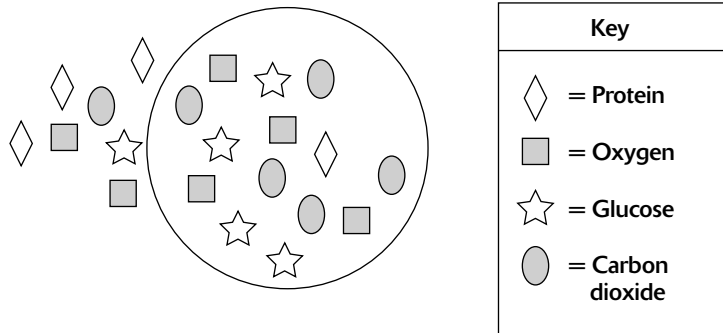
31. Which set of terms best identifies the letters in the diagram below?



	<b>A</b>	<b>B</b>	<b>C</b>
(1)	photosynthesis	inorganic molecules	decomposition
(2)	respiration	organic molecules	digestion
(3)	photosynthesis	organic molecules	respiration
(4)	respiration	inorganic molecules	photosynthesis

**Correct Answer: (3)** Light energy is captured by plants in the process of photosynthesis. Photosynthesis is the process by which plants use the energy from the sun to convert inorganic molecules, such as water and carbon dioxide, into organic molecules, such as sugars. Those sugars are then used by the plant for respiration to fuel activities such as growth and reproduction. (*Cell Structure*)

32. The diagram below shows the relative concentration of molecules inside and outside of a cell.

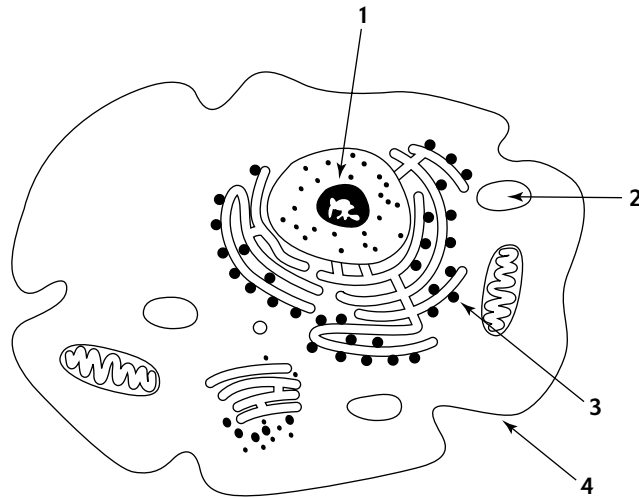


Which statement best describes the general direction of diffusion across the membrane of this cell?

- (1) Glucose would diffuse into the cell.
- (2) Protein would diffuse out of the cell.
- (3) Carbon dioxide would diffuse out of the cell.
- (4) Oxygen would diffuse into the cell.

**Correct Answer: (3)** Diffusion describes passive transport. Molecules will move from higher concentration to lower concentration. There are four carbon dioxide molecules inside the cell and only two carbon dioxide molecules outside of the cell. Movement will be from the inside (higher concentration) to the outside (lower concentration). (*Cells and Their Environment*)

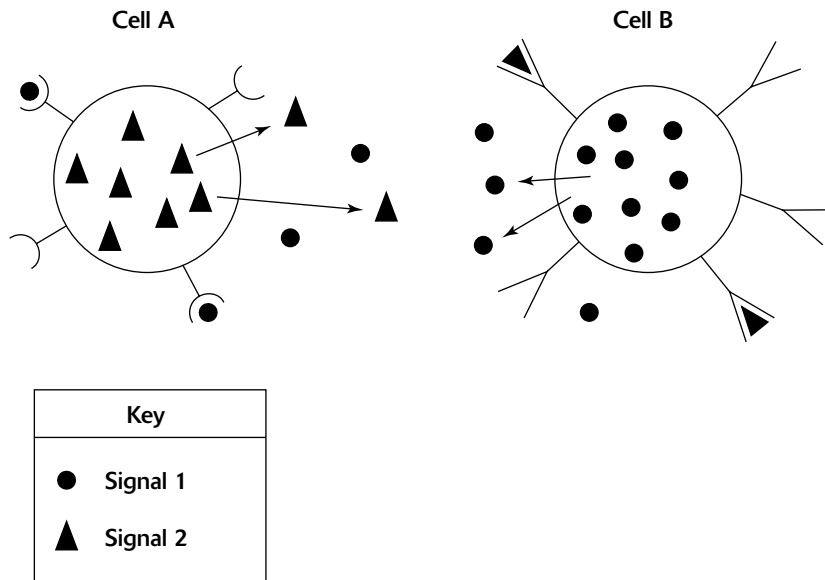
33. In the diagram below, which structure performs a function similar to a function of the human lungs?



- (1) 1
- (2) 2
- (3) 3
- (4) 4

**Correct Answer: (4)** Choice (4) is the cell membrane, which has many functions. The cell membrane is most similar to the lungs because it allows for the diffusion of material into and out of the cell. The alveoli of the lungs carry out a similar function; this is where gases, carbon dioxide, and oxygen diffuse into and out of the capillaries surrounding the alveoli, into the alveoli. Choice (1) is the nucleus, which is where the cell is controlled. Choice (2) is a vacuole used for storage. Choice (3) is the endoplasmic reticulum, which is involved in transport. (*Cell Structure*)

34. Cellular communication is illustrated in the diagram below.



Information can be sent from

- (1) Cell A to cell B because cell B is able to recognize signal 1
- (2) Cell A to cell B because cell A is able to recognize signal 2
- (3) Cell B to cell A because cell A is able to recognize signal 1
- (4) Cell B to cell A because cell B is able to recognize signal 2

**Correct Answer: (3)** Cell A produces signal 2 (triangles), which can be seen inside the cell. Cell A, however, can recognize signal 1 (circles), and some of the receptors (which look like antennae) on the outside of cell A have received the message (circles) from cell B. Cell B produces signal 1 (circles), which can be seen inside the cell. Cell B, however, can recognize signal 2 (triangles), and some of the receptors on the outside of cell B have received the message (circles) from cell A. (*Cells and Their Environment*)

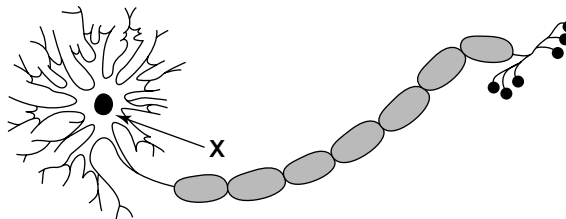
**35.** The chart below contains a number of characteristics for three different organisms. The characteristics can be used in classifying these organisms.

<b>Characteristics</b>	<b>Organism A</b>	<b>Organism B</b>	<b>Organism C</b>
Number of cells	Unicellular	Multicellular	Unicellular
Type of nutrition	Autotrophic	Autotrophic	Heterotrophic
Nuclear membrane	Absent	Present	Absent
DNA	Present	Present	Present

Which *two* organisms would be expected to have the most similar genetic material? Support your answer using information from the chart.

**Correct Answer: A and C** Organisms A and C would be expected to have the most similar genetic material because they have more characteristics in common than any other combination like A and B or B and C. Organisms A and C are both unicellular and the nuclear membrane is absent in both. (*The Characteristics of Life*)

Base your answers to questions 36 and 37 on the diagram below of a cell associated with coordination and on your knowledge of biology.



**36.** Structure X would be involved in the

- (1) storage of digestive enzymes
- (2) absorption of energy from the sun
- (3) development of pathogens
- (4) synthesis of proteins

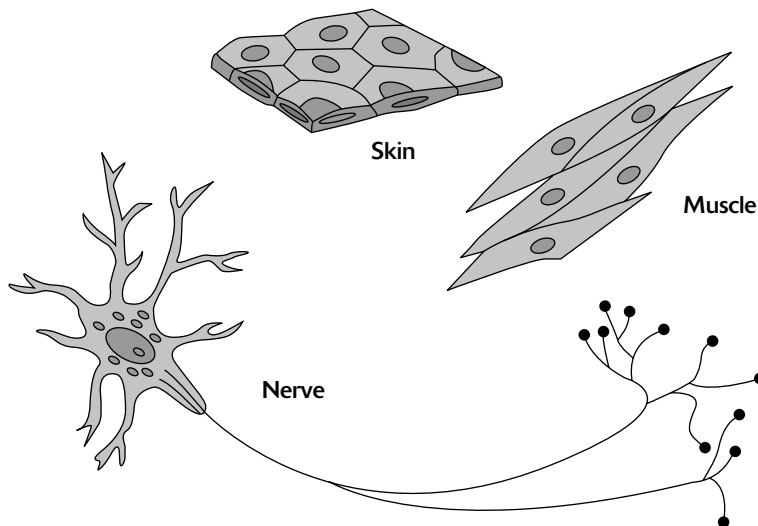
**Correct Answer: (4)** This diagram represents a neuron or nerve cell, which communicates with other neurons to send and receive messages (also known as impulses). The choices offered really don't have anything to do with this function, so you need to pick the next best thing and that is choice (4): synthesis of proteins. (*Cell Structure*)

**37.** Which statement best describes a function of the entire structure shown in the diagram?

- (1) It unites with an egg cell during fertilization.
- (2) It synthesizes a hormone involved in the control of blood sugar level.
- (3) It releases chemicals involved in cellular communication.
- (4) It controls the replication of genetic material.

**Correct Answer: (3)** This diagram represents a neuron or nerve cell, which communicates with other neurons to send and receive messages (also known as impulses). Only sperm cells unite with egg cells for fertilization—choice (1). Neurons are for communication, not making hormones—choice (2). Choice (4) does not describe the function of the entire structure. (*Cell Structure*)

**38.** The types of human cells shown below are different from one another, even though they all originated from the same fertilized egg and contain the same genetic information.



Explain why these genetically identical cells can differ in structure and function.

**Correct Answer:** Every cell of the human body is genetically identical, yet the cells do different jobs, as shown in the diagram. A skin cell will do the job of a skin cell for two reasons: First, a cell is judged by the company it keeps, its environment. If a cell is with other skin cells, it will act like a skin cell. If it is with muscle cells, it will act like a muscle cell. Second, different parts of the genetic information contained in all cells is used in different cells. It would not do a muscle cell any good to act like a nerve cell when it is surrounded by other muscle cells. The muscle cell will have the same information as the nerve cell, but it won't need it or use it.

So your answer should say something like: "Cells that are genetically alike can differ in structure and function because they are in different environments." (A skin cell is with other skin cells and so on.) Or, you could say: "Different parts of the genetic information is used by different cells." (*Cells and Their Environment*)

**39.** To determine which colors of light are best used by plants for photosynthesis, three types of underwater green plants of similar mass were subjected to the same intensity of light of different colors for the same amount of time. All other environmental conditions were kept the same. After 15 minutes, a video camera was used to record the number of bubbles of gas each plant gave off in a 30-second period of time. Each type of plant was tested six times. The average of the data for each plant type is shown in the table below.

**Average Number of Bubbles Given Off in 30 Seconds**

<i>Plant Type</i>	<i>Red Light</i>	<i>Yellow Light</i>	<i>Green Light</i>	<i>Blue Light</i>
<i>Elodea</i>	35	11	5	47
<i>Potamogeton</i>	48	8	2	63
<i>Utricularia</i>	28	9	6	39

Which statement is a valid inference based on the data?

- (1) Each plant carried on photosynthesis best in a different color of light.
- (2) Red light is better for photosynthesis than blue light.
- (3) These types of plants make food at the fastest rates with red and blue light.
- (4) Water must filter out red and green light.

**Correct Answer: (3)** The process of photosynthesis produces oxygen in the presence of light. The rate of photosynthesis and, therefore, oxygen production, is affected by the wavelengths (colors) of light absorbed by the plant. Green plants absorb red and blue light more than other wavelengths in the visible spectrum, causing the rate of photosynthesis to be much higher when exposed to these colors as opposed to green and yellow. (*The Characteristics of Life*)

Base your answers to questions 40 and 41 on the information below and on your knowledge of biology.

A biology student was given three unlabeled jars of pond water from the same source, each containing a different type of mobile unicellular organism: euglena, amoeba, and paramecium. The only information the student has is that the amoeba and paramecium are both heterotrophs and the euglena can be either heterotrophic or autotrophic, depending on its environment.

**40.** State *one* way the euglena’s two methods of nutrition provide a survival advantage the other unicellular organisms do *not* have.

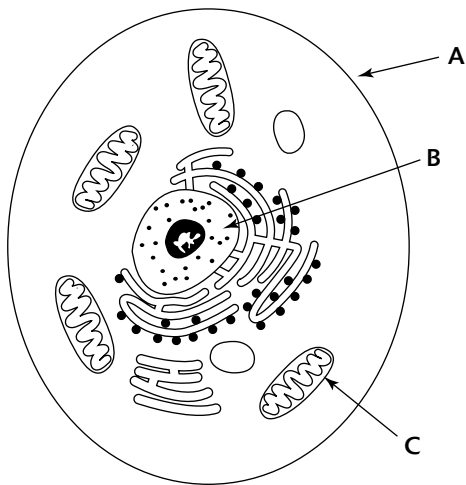
**Correct Answer:** The euglena has the advantage of being able to use either method, depending upon the materials that are available. If sunlight is available, the euglena can make its own food through the process of photosynthesis. If sunlight isn’t available, the euglena can consume food. (*Single-Cell and Multicellular Organisms*)

**41.** Which procedure and resulting observation would help identify the jar that contains the euglena?

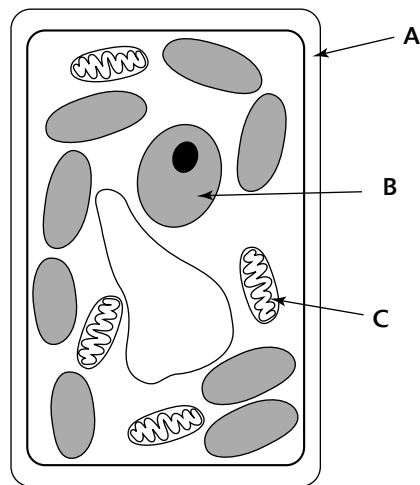
- (1) Expose only one side of each jar to light. After 24 hours, only in the jar containing euglena will most of organisms be seen on the darker side of the jar.
- (2) Expose all sides of each jar to light. After 48 hours, the jar with the highest dissolved carbon dioxide content will contain the euglena.
- (3) Over a period of one week, determine the method of reproduction used by each type of organism. If mitotic cell division is observed, the jar will contain euglena.
- (4) Prepare a wet-mount slide of specimens from each jar and observe each slide with a compound light microscope. Only the euglena will have chloroplasts.

**Correct Answer: (4)** Euglena have chloroplasts, the organelle where photosynthesis occurs. Amoeba and paramecia don't have chloroplasts, which is why they are considered heterotrophic—they must eat to stay alive. (*Single-Cell and Multicellular Organisms*)

Base your answers to questions 42 through 44 on the diagrams below of two cells, X and Y, and on your knowledge of biology.



Cell X



Cell Y

**42.** Select one lettered organelle and write the letter of that organelle in the space below.

\_\_\_\_\_

Identify the organelle you selected.

**Correct Answer:** All the letters in both cells X and Y are pointing to the same structures. A is pointing to the cell membrane; B is pointing to the nucleus; C is pointing to a mitochondrion. You will rarely be asked to identify other organelles like the endoplasmic reticulum, golgi bodies, or lysosomes. Your best bet is to play it safe and identify the nucleus—it's always recognizable in every cell (except in bacteria and mature red blood cells). (*Cell Structure*)

**43.** State one function of the organelle that you identified in question 43.

**Correct Answer:** Again, keep things simple, and go with the nucleus. The nucleus controls all cell activities. If you're feeling brave, you can state that the function of the cell membrane is to allow some things to pass into and out of the cell. Or, you could say that the function of the mitochondrion is to produce energy by carrying out cellular respiration. (*Cell Structure*)

**44.** Identify one process that is carried out in Cell Y that is *not* carried out in Cell X.

**Correct Answer:** In order to answer this question, you have to know the difference between Cell X and Cell Y. The animal cell is round and the plant cell is rectangular. Now that you've identified which cell is which, just remember that plant cells carry out photosynthesis and animal cells do not. (*The Characteristics of Life*)

**45.** Arrange the following structures from largest to smallest.

a chromosome

a nucleus

a gene

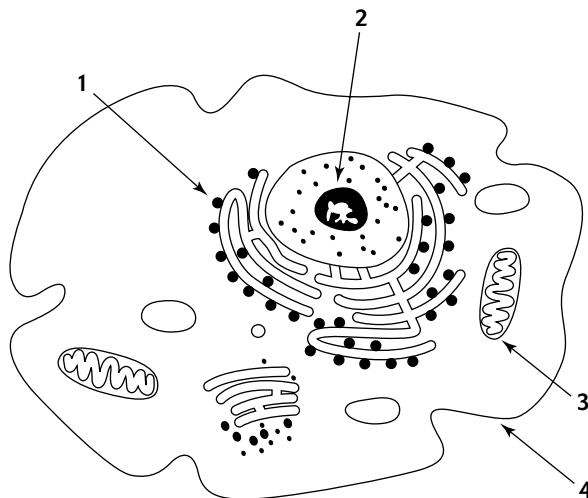
Largest \_\_\_\_\_

\_\_\_\_\_

Smallest \_\_\_\_\_

**Correct Answer:** The nucleus is the largest structure. It contains chromosomes (which should be in the second blank), and chromosomes are made up of sections of DNA called *genes*, which are the smallest structure. (*Cell Structure*)

Base your answers to question 46 on the diagram of a cell below.



**46.** Choose either structure 3 or structure 4, write the number of the structure on the line below, and describe how it aids the process of protein synthesis.

\_\_\_\_\_

**Correct Answer:** Structure 3 is a mitochondria, and structure 4 is the cell membrane. Mitochondria is the organelle that provides energy for cellular processes—in this case, protein manufacture. The cell membrane allows the components of proteins to enter the cell, and some of the proteins to leave the cell for use elsewhere. (*Cell Structure*)

Base your answers to questions 47 and 48 on the information below and on your knowledge of biology.

Carbon exists in a simple organic molecule in a leaf and in an inorganic molecule in the air humans exhale.

**47.** Identify the simple organic molecule formed in the leaf and the process that produces it.

**Correct Answer:** An organic molecule formed in a leaf is glucose, produced through the process of photosynthesis. A simple sugar, monosaccharide or  $C_6H_{12}O_6$ , may be used in place of glucose. (*The Characteristics of Life*)

**48.** Identify the carbon-containing molecule that humans exhale and the process that produces it.

**Correct Answer:** Humans exhale carbon dioxide, a byproduct of aerobic cellular respiration. (*The Characteristics of Life*)

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

mitochondrion  
 ribosome  
 cell membrane  
 nucleus  
 vacuole

In your answer be sure to:

- select *two* of these structures, write their names, and state *one* function of each
- describe how each structure you selected contributes to the functioning of the other

**Correct Answer:** Be sure to answer all the parts of the question:

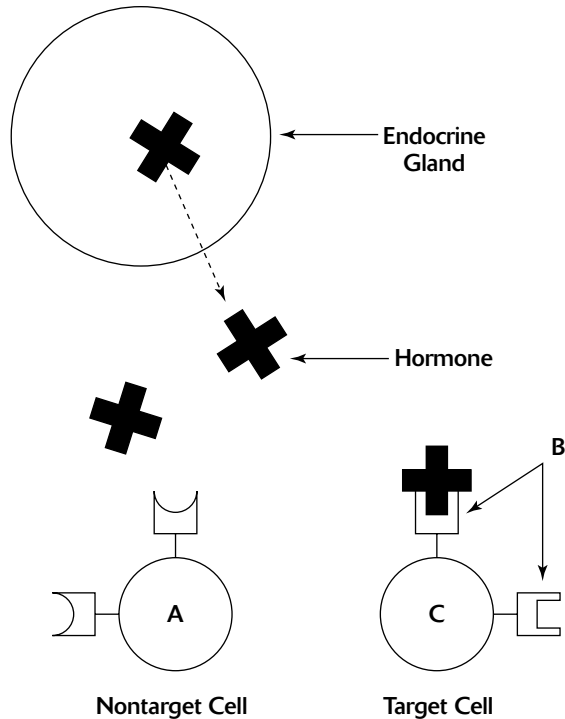
- Mitochondrion: Breaks down organic molecules, such as glucose, to release energy (ATP) for cell reactions
- Ribosome: Site where proteins are made from amino acids
- Cell membrane: Regulates which particles enter and leave the cell
- Nucleus: Contains the genetic material and thus regulates all the functions of the cell
- Vacuole: storage
- The cell membrane regulates what particles come into the cell and allows glucose to enter the cell. This glucose is used by the mitochondrion to produce ATP. The ATP provides the energy to allow active transport of some particles.

or

- The nucleus contains the genetic code that is used by the ribosome to produce proteins. The proteins produced by the ribosome are used to keep the cell alive.

(Cell Structure)

Base your answers to questions 50 and 51 on the diagram below, which illustrates a role of hormones.



**50.** Letter B indicates

- (1) ribosomes
- (2) receptor molecules
- (3) tissues
- (4) inorganic substances

**Correct Answer:** (2) Receptor molecules on the surface of a cell recognize and bind to only those molecules that fit the receptor's specific three-dimensional shape. (*Cell Structure*)

**51.** Explain why cell A is a nontarget cell for the hormone illustrated in the diagram.

**Correct Answer:** Cell A, the nontarget cell, does not possess the receptor molecule with the specific shape needed to bind to the indicated hormone. (*Cell Structure*)

Base your answer to question 52 on the information below and on your knowledge of biology.

It has been discovered that plants utilize chemical signals for communication. Some of these chemicals are released from leaves, fruits, and flowers and play various roles in plant development, survival, and gene expression. For example, bean plant leaves infested with spider mites release chemicals that result in an increase in the resistance to spider mites in uninfested leaves on the same plant and the expression of self-defense genes in uninfested bean plants nearby. Plants can also communicate with insects. For example, corn, cotton, and tobacco under attack by caterpillars release chemical signals that simultaneously attract parasitic wasps to destroy the caterpillars and discourage moths from laying their eggs on the plants.

**52.** Identify the specialized structures in the cell membrane that are involved in communication.

**Correct Answer: Receptors** Cells have membranes that are made up of a phospholipid bilayer and various protein molecules. Certain types of protein molecules known as receptors are involved in the communication between cells. (*Cell Structure*)

**53.** Organelles carry out specific processes involving chemical reactions. In the chart below, identify *two* organelles and, for each, identify a process involving chemical reactions that occurs there. Describe *one* specific way each process identified is important to the functioning of the organism.

<b>Organelle</b>	<b>Process Involving Chemical Reactions That Occur in the Organelle</b>	<b>How the Process Is Important to the Functioning of the Organism</b>
(1)		
(2)		

**Correct Answer:** The best organelles to choose for this question would be the mitochondrion, the chloroplast, or the ribosome, because you’ve probably learned about the chemical reactions that take place there and can state why those processes are important for the functioning of the organism.

<b>Organelle</b>	<b>Process Involving Chemical Reactions That Occur in the Organelle</b>	<b>How the Process Is Important to the Functioning of the Organism</b>
Mitochondrion	Cell respiration	Provides energy for life functions
Chloroplast	Photosynthesis	Provides food for plants
Ribosome	Protein synthesis	Proteins can be enzymes that control chemical reactions

(*Cell Structure*)

