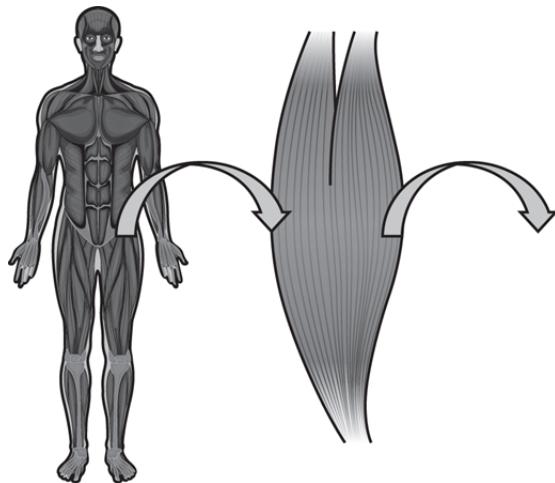


Unit Test: Living Systems

Read each question. Circle the letter of the correct answer.

1. The diagram shows a model of the hierarchical organization of the muscular system.



Which of these best explains the next level of organization in this model?

- A. muscle cells, because they contain protein
B. mitochondria, because they produce energy for movement
C. muscle cells, because they are the smallest living unit in the body
2. Scientists are developing a new class of vaccines, known as nanovaccines, which can be stored at room temperature for six to ten months. A study found evidence that nanovaccines boost the immune response in mice. The scientists reported their initial findings to other scientists. What is the most logical next step in the nanovaccine development process?
- A. determine the best way to ship large amounts of the vaccine
B. replicate the nanovaccine results in further animal studies
C. produce larger quantities of vaccine for distribution by medical professionals

3. The trachea has a layer of epithelial cells called the respiratory mucosa. It contains goblet cells that produce mucus. What is this an example of?

- A. Cells working together to maintain homeostasis.
B. Cells working together to produce energy for the body.
C. Organs working together to maintain homeostasis.

4. Engineers are working to develop a new kind of artificial knee, which is used to replace damaged knees. Which of these would be considered a trade off of the artificial knee?

- A. The artificial knee reduces pain in people who have the knee.
B. The artificial knee can lead to infection when the knee is implanted.
C. The new artificial knee is heavier than previous artificial knees to improve its lifespan.

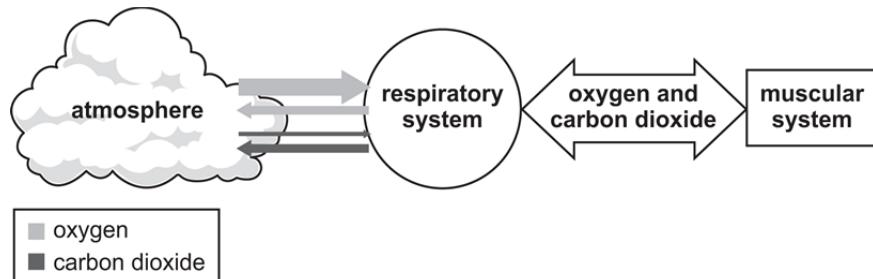
5. Most starfish turn their cardiac stomach to digest food. Which term applies to the cardiac stomach?

- A. cell
B. organ
C. system

- 6.** An engineer is developing a new prosthetic leg to help patients who have lost limbs to walk. The engineer is focused on making the best device possible to address this medical need. The current device design will cost \$10,000 to manufacture, but the cost of the item cannot exceed \$8,000. How should the engineer approach this problem using the engineering design process?
- The engineer should move forward in the design process even though the design does not meet the constraints of the problem.
 - The engineer should trade off some of the safety and reliability of the design to reduce costs and meet the cost constraint for the project.
 - The engineer should reconsider the materials, location of manufacture, and any elements of the design that can be simplified to reduce cost.

- 7.** A biologist discovers a new species of plant that grows in very wet climates. She studies the plants stoma, the pores in the leaf of a plant that allow for gas exchange, and hypothesizes that this species would not be able to regulate the size of its stoma. Which experiment can she perform to best test this hypothesis?
- She waters different plants with different volumes of water and measures the diameter of stoma in each leaf.
 - She grows the plant in greenhouses with various levels of humidity and measures the amount of oxygen produced by each plant.
 - She places leaves from the plant in solutions containing different amounts of salt and measures the time it takes the leaves to dry out.

- 8.** The model shows some of the inputs and outputs for the respiratory and circulatory systems.



Why are the arrows between the atmosphere and the respiratory system different sizes?

- The atmosphere contains more carbon dioxide than oxygen.
- The respiratory system uses more carbon dioxide than oxygen.
- The muscular system uses oxygen and produces carbon dioxide.

Read each question. Follow the instructions to answer the questions.

- 9.** Students in Ms. Choi's class are using models to represent aspects of bacterial cells. Write one letter in the correct box to classify each type of model.

Simulation	Physical Model	Conceptual Model

- A. Charlotte made a flow chart to illustrate the process of ATP production in bacteria.
B. Stella ran a computer program to predict the effects of a change in the shape of a bacterium.
C. Karen created a three-dimensional model of a bacteria cell showing its major structural features.

- 10.** Different parts of the cell system perform different functions. Match the function to its structure. Write the letter of each part of the cell with its function.

nucleus	
ribosomes	
mitochondria	

- A. produces cellular proteins
B. produces energy for cellular functions
C. stores genetic information for the cell

- 11.** Three options of water filtration are solar disinfection, ceramic filtration, and slow sand filtration. The Pugh chart compares the filtration options. A positive number represents an advantage and a negative number represents a disadvantage.

Pugh Chart of Water Filtration Systems

Criteria	Solar disinfection	Ceramic filtration	Slow sand filtration
Cost to manufacture and transport	0	-1	-2
Ease of production	0	-1	-2
Cost of maintenance	0	-1	-2
Elimination of bacteria and protozoa	1	2	2
Elimination of viruses	1	0	0
Elimination of turbidity (cloudiness)	0	1	1
Rate of purification	-3	-1	-1

Write one letter in each blank to correctly complete the sentence.

Ceramic filtration would be best for communities that have _____ or _____, while solar disinfection would be best for communities with _____.

A. viral outbreaks

B. highly turbid water

C. issues with bacteria

- 12.** Write one X for each row to show whether the action increases or decreases the rate of gas exchange.

Actions	Gas Exchange Increases	Gas Exchange Decreases
A. The carbon dioxide content in the blood increases.		
B. The leaf openings on the underside of a leaf increase in size.		
C. A plant is moved from a room with a lot of sun to a room with no light.		

13. Cochlear implants are devices that are often implanted in the ears of people who have trouble hearing.
Circle the letter of the sentences that describe a risk of cochlear implants.

- A.** Signaling from the device can cause dizziness.
- B.** Implantation of the device can cause infections.
- C.** Patients can hear other people speaking more accurately.
- D.** Patients can better determine the direction that sound comes from.

14. Arturo is examining soil to determine its components. Write the letters of each component in the correct box to correctly classify the source of the component.

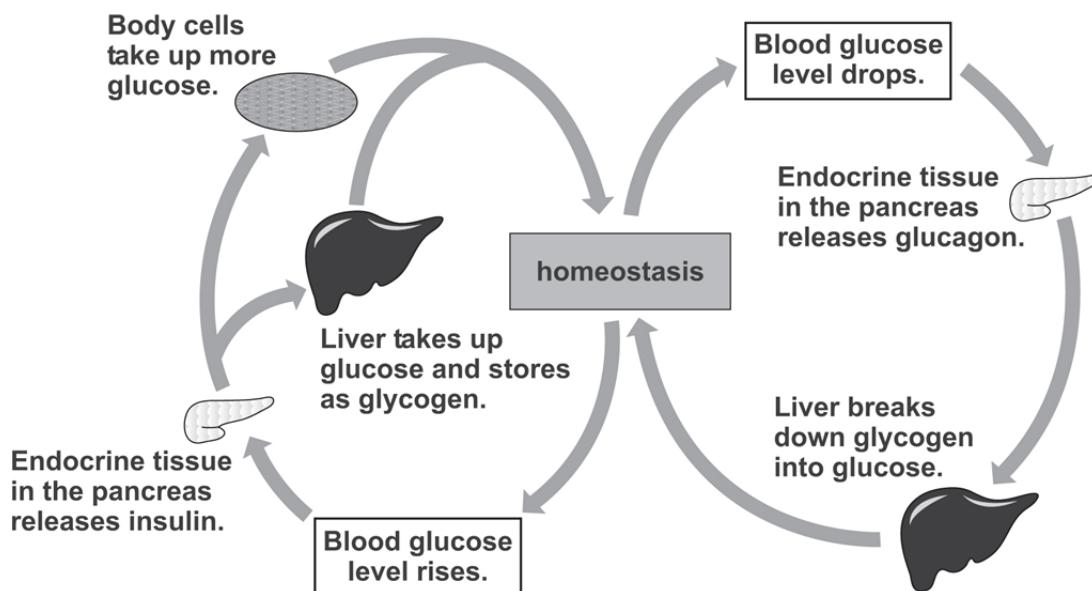
Atmosphere	Biosphere	Geosphere	Hydrosphere

- | | |
|--------------------|-----------------------|
| A. worm | C. moisture |
| B. minerals | D. air pockets |

15. Which steps will reduce the amount of an input to photosynthesis? Circle the letters of all the correct answers.

- A.** cover half of the plant's stomata
- B.** place the plant in a low-oxygen environment
- C.** increase the carbon dioxide levels of the plant
- D.** reduce the amount of sunlight that is available to the plant

- 16.** The amount of glucose in the bloodstream is regulated by a pathway, as shown in the diagram.



Write one X for each row to show whether each event would raise blood glucose, lower blood glucose, or would have no effect on blood glucose levels based on the diagram.

Event	Raises blood glucose	Lowers blood glucose	Neither raises nor lowers blood glucose
A. An individual eats a candy bar.			
B. Tissue in the pancreas is unable to make glucagon.			
C. As a result of an injury, an individual loses 5% of his liver.			

- 17.** A student is making a model to show the levels of organization of life systems on Earth. Number the levels from smallest to largest with 1 as the smallest and 4 as the largest.

- _____ the regions of Earth populated by living organisms
 _____ the collection of populations living in a certain area
 _____ an individual animal, plant, or single-celled life form
 _____ organisms of the same species that live in the same area

Read each statement. Write your answer on the lines.

18. Researchers are looking at different options for prosthetic limbs. The information in the table shows some of the costs, benefits, and tradeoffs of prosthetic options.

Prosthetic Options for Patients in Developing Country

Consideration	Type A	Type B	Type C
Cost	\$\$\$	\$	\$\$
Production	imported, but with local modifications needed	local, from recycled materials	local, using injection molding
Function	highest functionality	80–90% as functional as Type A	80–90% as functional as Type A
Lifespan	3–5 years	5–7 years	6–10 years

For each type of prosthetic limb, describe an advantage of that option.

Describe a way in which one of the options could be improved.

Describe a quality that is not in the table that could be a consideration when comparing types of prosthetic limbs. Explain why that should be considered.

- 19.** The Ebola virus enters a human through the openings in the body. The virus then attaches to a cell and inserts genetic material into it. The genetic material of the virus then uses the machinery of the cell to make more virus particles. The virus is not made of cells, but it has some components of cells such as proteins and genetic material.

Explain how the Ebola virus and human systems interact.

Explain whether viruses should be considered living or nonliving. Use at least two pieces of data to back up your explanation.

- 20.** A researcher studying how pneumonia affects alveoli, small sacs in the lungs responsible for gas exchange.

Identify one level above and below alveoli, and list the levels of organization in humans.

An individual has a pneumonia infection. Explain how this would likely affect the functioning of the circulatory system.

The researcher is developing a model for the alveoli.

Describe a possible model that the researcher could use. Explain how the model could be used to represent both healthy alveoli and alveoli that have been infected with pneumonia.

Name:

Date:

Unit 1

Unit Test B

- 21.** Doctors can kill cancer by reprogramming the T-cells of the immune system. Doctors harvest immune cells from the blood. Then they grow them in the lab and reprogram them to attack cancer cells. Finally, they inject them back into the patient. The technique is expensive. However, it can kill cancers that cannot be cured any other way.

Besides cost and effectiveness of killing the cancer cells, identify another criterion that a scientist can use to evaluate this technology.

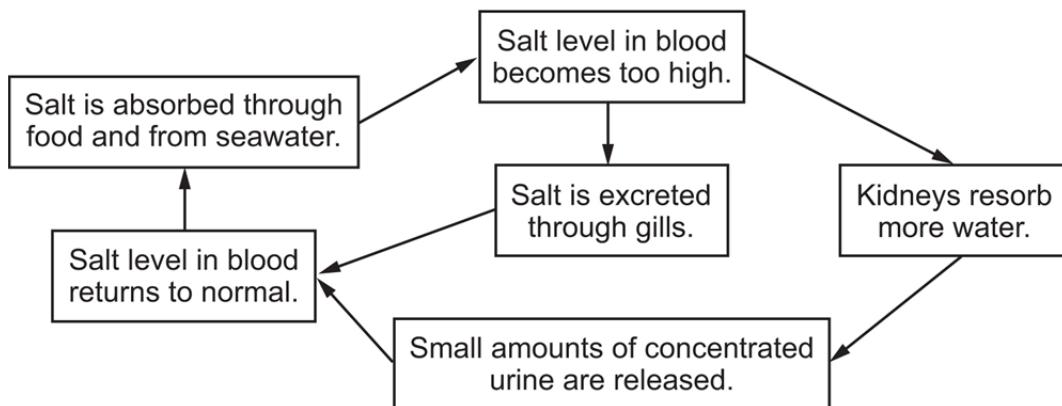
Describe an experiment that scientists can use to test whether the technology meets this criterion.

Directions: Read the passage, then answer the questions that follow.

Homeostasis in Fish

A scientist is studying the ways in which fish maintain an appropriate level of salt in their blood. She made this diagram to represent how fish that live in salt water maintain a correct salt level.

Osmoregulation in Marine Fish



- 22.** Some fish can live in both salt water and fresh water. Which of these would be expected of a fish that moves from fresh water to salt water? Circle the letter of the correct answer.
- A.** It would produce larger amounts of more dilute urine.
 - B.** It would produce larger amounts of more concentrated urine.
 - C.** It would produce smaller amounts of more concentrated urine.
- 23.** If osmoregulation fails in a fish, the fish will have difficulty maintaining homeostasis. For each disruption in homeostasis, write one letter in the correct box to indicate whether it would be more likely to be the result of an osmoregulation failure in freshwater or saltwater fish.

Disruption	Freshwater fish	Saltwater fish
A. excess amounts of salt excreted by kidney		
B. excess amounts of water excreted by kidney		
C. excess amounts of salt retained by cells in the fish		

Name:

Date:

Unit 1

Unit Test B

24. One type of fish is able to actively uptake salt through its gills. How would this ability help a fish to maintain homeostasis? Circle the letter of the correct answer.

- A. It would help prevent a fish in salt water from having too much salt in its blood.
- B. It would help prevent a fish in salt water from having not enough salt in its blood.
- C. It would help prevent a fish in fresh water from having not enough salt in its blood.

25. A scientist is investigating the ability of aquatic organisms to maintain homeostasis as salinity levels change. She is going to examine a jellyfish, which is normally found in the ocean.

Write your answer on the lines.

Describe an experiment that can help determine whether jellyfish can maintain constant salt levels under different external conditions. Include the variables that the scientist should measure.

Explain how the scientist can tell whether the jellyfish can maintain homeostasis by looking at the data.

Explain how not being able to maintain homeostasis under changing salt conditions could be harmful to the jellyfish.
