

Organization And Patterns In Life

- 1 Prions are proteins that act as an infectious agent. They cause a variety of diseases, including “Mad Cow” disease. Prions cannot produce more prions on their own, but cause the host organism to replicate more prions. Most scientists do not consider prions to be alive. A valid reason for accepting that prions are nonliving things is that
- (1) no living thing can cause a disease
 - (2) proteins are inorganic molecules
 - (3) prions contain all of the material needed to reproduce
 - (4) prions cannot carry out reproduction independently

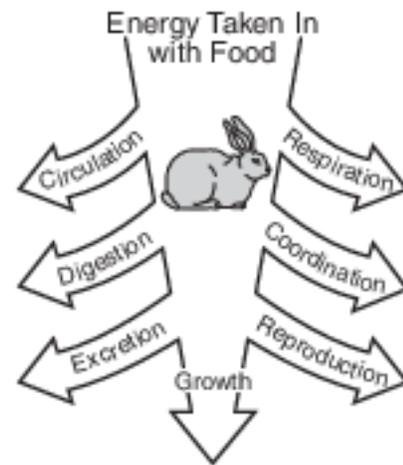
- 2 The diagram below represents an incomplete sequence of levels of organization.

organelles → tissues → organs → organ systems → organism

This sequence can be completed correctly by inserting

- (1) “cells →” between organelles and tissues
 - (2) “proteins →” between tissues and organs
 - (3) “populations →” between organs and organ systems
 - (4) “molecules →” between organ systems and organisms
- 3 Which sequence best represents increasing complexity?
- (1) tissues → cells → organelles → organs
 - (2) cells → organelles → organs → organism
 - (3) organelles → cells → tissues → organs
 - (4) organism → cells → tissues → organelles

- 4 Rabbits have evolved strategies that get them through periods of time when there is little food. The diagram below represents essential life functions that rabbits need to perform.



Which life function in the diagram could be eliminated without affecting an individual rabbit’s ability to survive when food is scarce?

- (1) digestion
 - (2) excretion
 - (3) circulation
 - (4) reproduction
- 5 Bacteria and humans are similar in that they both
- (1) contain genetic material
 - (2) are single-celled
 - (3) lack cell organelles
 - (4) carry out autotrophic nutrition
- 6 During gas exchange, the cell membrane of a single-celled organism has the same function as which organ system in humans?
- (1) nervous
 - (2) reproductive
 - (3) digestive
 - (4) respiratory

7 Which sequence represents structures organized from least complex to most complex?

- (1) nerve cell → nucleus → nervous system → brain
- (2) nucleus → nerve cell → brain → nervous system
- (3) brain → nervous system → nucleus → nerve cell
- (4) nervous system → brain → nerve cell → nucleus

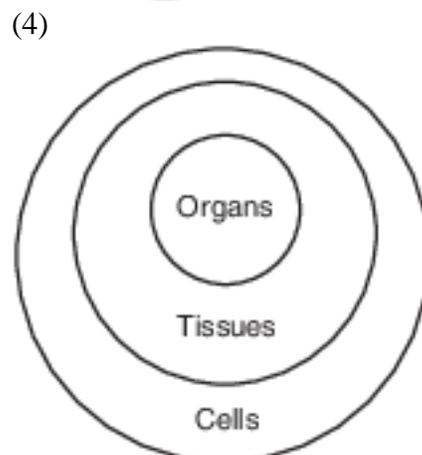
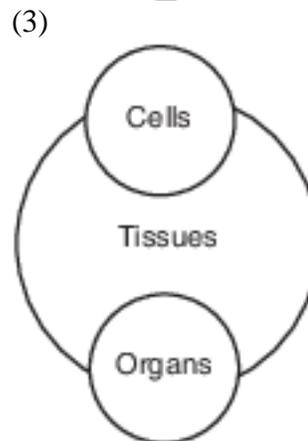
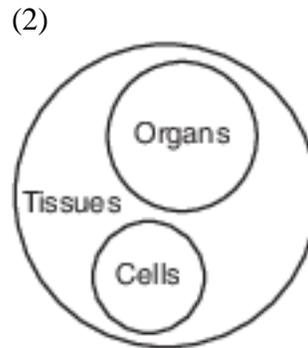
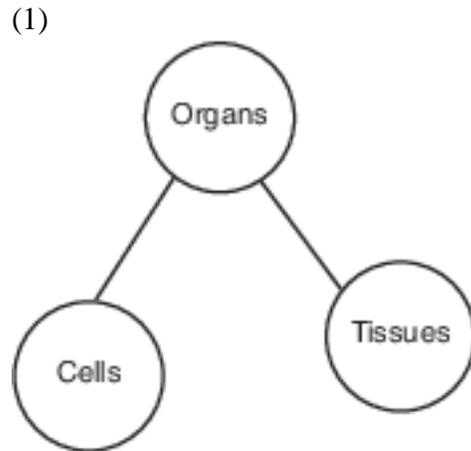
8 Scientists who study rock formations in caves describe some of the formations as “living rock” because, under certain conditions, they increase in size. Which statement would best dispute the claim that these rock formations are living?

- (1) Rocks are not composed of cells, while living organisms are.
- (2) Rocks perform complex metabolic processes, but cannot grow.
- (3) Rocks cannot reproduce sexually.
- (4) Rocks remain stable in a wide range of physical conditions.

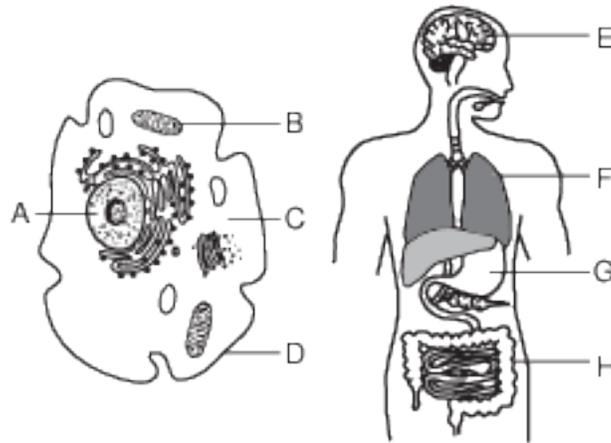
9 Fish absorb oxygen through the gills, earthworms absorb oxygen through the skin, amoebas take in oxygen through the cell membranes, and cows inhale oxygen through the nasal passages into their lungs. This statement demonstrates that living things

- (1) rely on similar or the same processes, but accomplish them in different ways
- (2) rely on different processes and accomplish them in different ways
- (3) rely on different processes, but perform them in the same or related ways
- (4) have no relationship to one another, and are all independent individuals

10 Which diagram best illustrates the relationship between the number of cells, tissues, and organs in a complex multicellular organism?



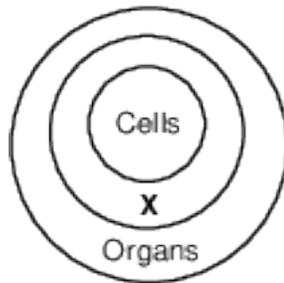
Base your answers to questions 11 on the diagrams below and on your knowledge of biology. The diagrams represent a single-celled organism and a multicellular organism.



11 Which statement correctly identifies the levels of organization for the structures indicated?

- | | |
|--|--|
| (1) A and B are tissues; E and G are organs. | (3) A and B are tissues; E and G are organelles. |
| (2) A and B are organs; E and G are systems. | (4) A and B are organelles; E and G are organs. |

12 The diagram below represents the organization of structures within an organism.



Which term best indicates the structures represented by the circle labeled X?

- | | |
|-----------------|-------------------|
| (1) organelles | (3) organ systems |
| (2) chromosomes | (4) tissues |

13 The sequence below represents different organizational levels within the human body, from the simplest to more complex. Complete the sequence by correctly filling in the missing levels. [1]
 organelles → _____ → tissues → _____ → organ systems → organism

Base your answer to question 14-18 on the information below and on your knowledge of biology.

A student has a sandwich for lunch. The bread contains starch molecules and various other molecules. After chewing and swallowing some of the sandwich, the starch moves along the digestive system and is digested. The sequence below represents what takes place next.

digested starch → bloodstream → cell → cell structure → ATP

14-18 Explain what occurs, beginning with the digestion of starch and ending with ATP production.

In your answer, be sure to:

- identify the molecules that are used to digest the starch [1]
- identify the molecules produced when starch is digested [1]
- explain why starch must be digested before its building block molecules can enter the bloodstream [1]
- identify the structure in the cell that will produce ATP from the starch building blocks [1]
- state why ATP is important to cells [1]

Base your answers to questions 19 on the passage below and on your knowledge of biology.

Our [Nitrogen] Fertilized World

It is the engine of agriculture, the key to plenty in our crowded, hungry world.Enter modern chemistry. Giant factories capture inert nitrogen gas from the vast stores in our atmosphere and force it into a chemical union with the hydrogen in natural gas, creating the reactive compounds that plants crave. That nitrogen fertilizer – more than a hundred million tons applied worldwide every year – fuels bountiful harvests. Without it, human civilization in its current form could not exist. Our planet's soil simply could not grow enough food to provide all seven billion of us our accustomed diet. In fact, almost half of the nitrogen found in our bodies' muscle and organ tissue started out in a fertilizer factory.

Source: National Geographic, May 2013

- 19 Nitrogen fertilizers are used by plants to synthesize amino acids. State one reason why a supply of amino acids is important for the survival of complex organisms. [1]

Answer Keys

1 4

2 1

3 3

4 4

5 1

6 4

7 2

8 1

9 1

10 4

11 4

12 4

13 Allow 1 credit for completing the diagram as shown below.

- organelles → cells → tissues → organs → organ systems → organism

14-18 The student's response to the bulleted items in the question need not appear in the following order.

- 14. Allow 1 credit for identifying the molecules that are used to digest the starch. Acceptable responses include, but are not limited to:
 - — enzymes
 - — biological catalysts
 - — amylase molecules
- 15. Allow 1 credit for identifying the molecules produced when starch is digested. Acceptable responses include, but are not limited to:
 - — glucose molecules
 - — simple sugars
 - — monosaccharides
 - — sugars
- 16. Allow 1 credit for explaining why starch must be digested before its building block molecules can enter the bloodstream. Acceptable responses include, but are not limited to:
 - — Starch molecules are too large.
 - — They are too big to get from the digestive tract into the blood.
 - — Large molecules cannot diffuse through cell membranes.
- 17. Allow 1 credit for identifying the structure in the cell that will produce ATP from the starch building blocks as the mitochondrion (mitochondria).
- 18. Allow 1 credit for stating why ATP is important to cells. Acceptable responses include, but are not limited to:
 - — ATP is the molecule that supplies usable energy for all the activities of a cell.
 - — ATP molecules provide energy for cells.

19 Allow 1 credit. Acceptable responses include, but are not limited to:

- — Amino acids are the building blocks of protein.
- — Amino acids are found in enzymes, which regulate chemical activity in complex organisms.
- — Amino acids are found in our bodies' muscle and organ tissue.