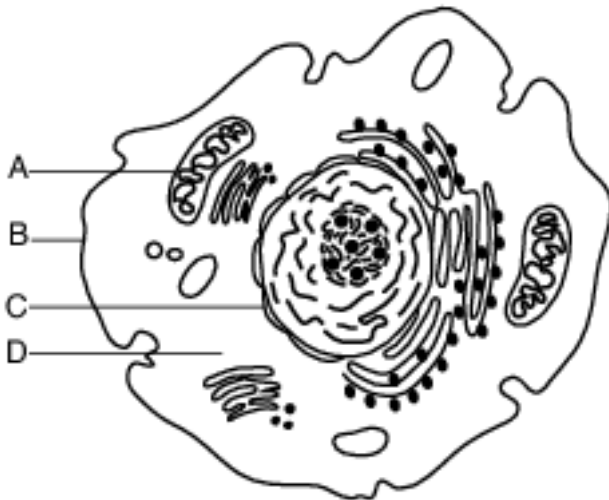


## Homeostasis And Immunity

1 In the diagram below, which letter indicates the part of the cell that carries out a function most similar to a function of the human excretory system?

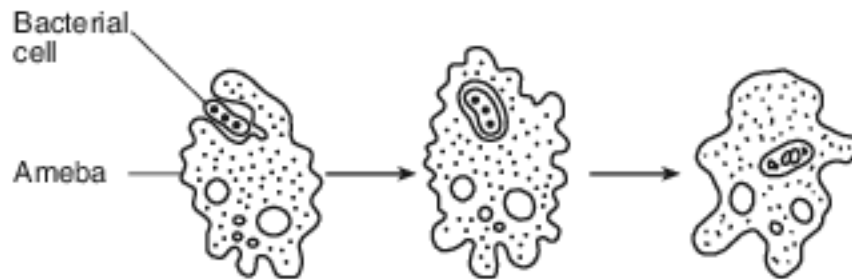


- (1) A  
(2) B  
(3) C  
(4) D

2 The nucleus of a cell coordinates processes and activities that take place in the cell. Which two systems perform a similar function in the human body?

- (1) nervous and endocrine  
(2) digestive and reproductive  
(3) circulatory and respiratory  
(4) skeletal and muscular

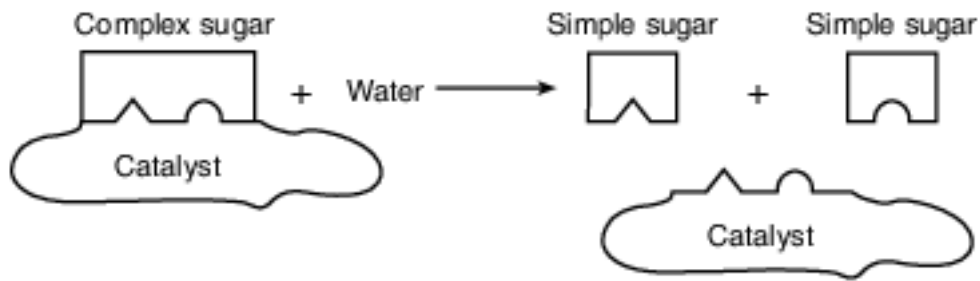
Base your answers to questions 3 on the diagram below and your knowledge of biology. The diagram represents an amoeba, a single-celled organism, carrying out an essential life process.



3 Which two body systems allow humans to carry out the same life process as the amoeba in the diagram?

- (1) endocrine and immune  
(2) respiratory and reproductive  
(3) digestive and circulatory  
(4) nervous and excretory

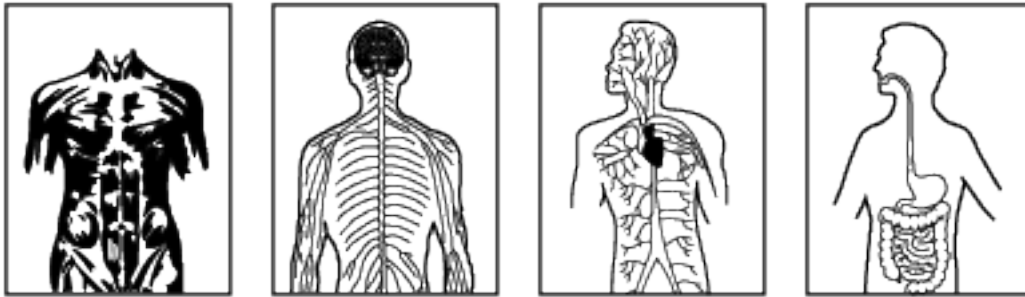
4 The diagram below represents a process that occurs in human systems.



This process is known as

- (1) excretion
- (2) respiration
- (3) circulation
- (4) digestion

Base your answers to questions 5 on the diagrams below and on your knowledge of biology. The diagrams represent some of the systems that make up the human body.



5 Which row in the chart below correctly identifies the main function of these systems?

Row	System A	System B	System C	System D
(1)	response	excretion	circulation	digestion
(2)	movement	response	circulation	digestion
(3)	response	circulation	excretion	digestion
(4)	movement	circulation	digestion	reproduction

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

6 An individual eats a hamburger. Which two systems must interact to transfer the nutrients in the hamburger to human muscle tissue?

- (1) respiratory and excretory
- (2) digestive and immune
- (3) digestive and circulatory
- (4) circulatory and respiratory

7 The kidney is an organ that collects wastes and excess water from the blood and sends them to the bladder where they are stored before being removed from the body. Which two systems work together to perform this function?

- (1) immune and respiratory
- (2) circulatory and excretory
- (3) skeletal and nervous
- (4) digestive and circulatory

8 The list below includes three organ systems that are directly used when a human runs.

circulatory system muscular system skeletal system

Which system should also be included in the list?

- (1) immune system            (3) digestive system
- (2) reproductive system    (4) nervous system

9 Although the digestive system is primarily responsible for the breakdown of food, this process can be disrupted if the circulatory system malfunctions. The best explanation for this disruption is that

- (1) human body systems interact with each other to perform life functions
- (2) the circulatory system is the control center of the body
- (3) the digestive system and the circulatory system have many organs in common
- (4) the circulatory system is responsible for the coordination of life functions, including the breakdown of food

10 Which life function is not necessary for an individual organism to stay alive?

- (1) nutrition                      (3) regulation
- (2) reproduction                (4) excretion

11 White blood cells are most closely associated with which two body systems?

- (1) circulatory and digestive
- (2) immune and circulatory
- (3) digestive and excretory
- (4) excretory and immune

12 Select one row in the chart below and explain how the systems in that row work together during exercise. [1]

	<b>System</b>	<b>System</b>	<b>System</b>
<b>Row 1</b>	Respiratory	Circulatory	Muscular
<b>Row 2</b>	Muscular	Circulatory	Excretory
<b>Row 3</b>	Digestive	Circulatory	Muscular

Row:

Base your answer to question 13-16 on the information below and on your knowledge of biology.

### Artificial Placenta

It is estimated that every year more than 15 million babies are born too early. The lungs of these premature infants are often immature and easily damaged. Premature births happen for a variety of reasons—some known and some unknown. Those that are known include infections and conditions such as diabetes and high blood pressure. Scientists are researching what causes premature births, in an attempt to develop solutions to prevent them.

Scientists are also working on the development of an artificial placenta. At the University of Michigan, five premature lambs were placed in artificial placentas and kept alive for weeks. During this time, each lamb's blood was circulated through its artificial placenta.

13-16 Discuss how the development of an artificial placenta is an important step in the study of premature births. In your answer, be sure to:

- explain why it would be harmful for a human mother's blood to pass across the placenta and into the fetus [1]
- state how an artificial placenta would be of benefit to the lungs of premature infants [1]
- explain why the lambs' blood must be filtered as it circulates through the artificial placenta [1]
- state one reason why premature lambs were likely used as model organisms in this study rather than mice [1]

Base your answers to questions 17 on the information below and on your knowledge of biology.

### Mitochondrial Replacement Therapy

Mutations in mitochondrial DNA (mtDNA) are associated with some severe human diseases and are inherited through the cytoplasm in the egg cell. These diseases vary, but often affect organs and tissues with the highest energy requirements, including the brain, heart, muscle, pancreas, and kidney.

Scientists have successfully used mitochondrial replacement therapy with monkeys. Scientists are considering using this technique to reduce the incidence of mitochondrial disease in children. The proposed treatment would involve removing the nucleus from an egg donated by a healthy woman and replacing it with an egg nucleus from a patient (mother) with mitochondrial disease. This would place the patient's egg nucleus into the cytoplasm of the donor's egg containing healthy mitochondria. The egg is then fertilized with the father's sperm externally using in vitro fertilization (IVF) to produce a zygote. The zygote is cultured for a few days to produce an embryo.

17 State one reason why muscle tissues are likely to be affected by mitochondrial diseases. [1]

Base your answers to questions 18 on the passage below and on your knowledge of biology.

### Smoking is Dumb

A study by Prof. Mark Weiner of Tel Aviv University's Department of Psychiatry and the Sheba Medical Center of Tel Hashomer Hospital has determined that young men who smoke are likely to have lower IQs than their nonsmoking peers. Tracking 18- to 21-year-old men enlisted in the Israeli army in the largest study of its kind, he has been able to demonstrate an important connection between the number of cigarettes young males smoke and their IQ.

The average IQ for a nonsmoker was about 101, while the smokers' average was more than seven IQ points lower at about 94, the study determined. The IQs of young men who smoked more than a pack a day were lower still, at about 90. An IQ score in a healthy population of such young men, with no mental disorders, falls within the range of 84 to 116.

Source: Science Daily April 2, 2010

18 Explain how chemicals present in cigarette smoke are able to enter the body and reach the brain. [1]

## Answer Keys

1 2

2 1

3 3

4 4

5 2

6 3

7 2

8 4

9 1

10 2

11 2

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

- Row 1:
  - — These systems work together to take in and move oxygenated blood to the muscles for use.
  - — The respiratory system takes in oxygen, which is passed into the circulatory system, which then takes it to the muscles.
  - — The respiratory and circulatory systems work together to remove carbon dioxide from the muscles.
- Row 2:
  - — Muscle cells produce wastes and circulatory transports wastes to excretory organs to be excreted.
- Row 3:
  - — Digestive breaks down food into nutrients and circulatory transports nutrients to muscle cells for energy.

- 13-16 The student's response to the bulleted items in the question need not appear in the following order.
- 13. Allow 1 credit for stating why it would be harmful for a human mother's blood to pass across the placenta and into the fetus. Acceptable responses include, but are not limited to:
    - — The mother's blood may be interpreted as a pathogen and attacked by the fetus's immune system.
    - — The mother's blood could contain chemicals and pathogens that could harm the fetus.
    - — It could cause an immune response.
    - — It could be a different blood type that could cause a reaction.
    - — It could harm the fetus's organs.
  - 14. Allow 1 credit for describing how an artificial placenta would be of benefit to the lungs of premature infants. Acceptable responses include, but are not limited to:
    - — The lungs would be able to continue to mature, and the premature infant would not have to breathe on its own too soon.
    - — The artificial placenta would perform the same processes as the natural placenta, allowing the lungs to continue to develop.
    - — The artificial placenta would supply oxygen until lungs developed.
    - — It would be of benefit because it prevents the accumulation of carbon dioxide.
    - — It would help lessen complications associated with the mother's high blood pressure/diabetes.
  - 15. Allow 1 credit for explaining why the lambs' blood must be filtered as it circulates through the artificial placenta. Acceptable responses include, but are not limited to:
    - — The blood contains waste products that need to be removed.
    - — Filtering removes wastes from the blood.
  - 16. Allow 1 credit for discussing why premature lambs were likely used as model organisms in this study rather than mice. Acceptable responses include, but are not limited to:
    - — Lambs are larger and more similar to human fetuses than mice are.
    - — The development of a premature lamb is more similar to that of a human.
- 17 Allow 1 credit. Acceptable responses include, but are not limited to:
- — The mitochondria supply muscles with energy/ATP.
  - — If the mitochondria are diseased, they can't supply the muscle with energy.
  - — The mitochondria carry out cell respiration which supplies the muscles with energy.
  - — They contain more mitochondria.
  - — Muscles have a high energy requirement.
- 18 Allow 1 credit. Acceptable responses include, but are not limited to:
- — Smoke enters the lungs. Chemicals diffuse into the blood and are transported to all parts of the body, including the brain.
  - — Chemicals reach the brain through the blood. They enter the body through the lungs.
  - — They inhaled the smoke and it was absorbed into the blood.