

Sample Test Items by Strand- Grade 7 Science

Science as Inquiry

The Abilities Necessary to Do Scientific Inquiry

GLE 2— *Identify problems, factors, and questions that must be considered in a scientific investigation (SI-M-A1)*

A scientist studied a species of fish. She found that when a certain nutrient was added to the diet of the fish just after hatching, the fish gained an average of 3 kilograms in the first year. What additional information is needed to determine whether the nutrient is affecting the growth of the fish?

- A. how much adult fish gained on average when the same nutrient was added to their diet
- B. how much newly hatched fish in this species gain in the first year without the nutrient in their diet
- C. how much of the nutrient is available for the fish species in their natural surroundings
- D. how much other species of fish gain in the first year when the nutrient is added to their diet

Correct Response: B

Science as Inquiry - The Abilities Necessary to Do Scientific Inquiry

GLE 4—*Design, predict outcomes, and conduct experiments to answer guiding questions*

Use this data chart to answer the question.

Plant Experiment

Plant	Fertilizer (milliliters)	Sunlight (hours/day)	Water (milliliters per day)	Height at beginning of experiment (cm)	Height at end of experiment (cm)
1	50	8	100	22.5	
2	50	10	100	21.7	
3	50	12	100	21.5	
4	50	14	100	22.0	

Which question is the experiment **most likely** designed to answer?

- A. What are the effects of water on plant growth?
- B. What amount of fertilizer is best to use for plants?
- C. How does the height of a plant affect how much sunlight it needs?
- D. How does the amount of sunlight a plant receives affect its growth?

Correct Response: D

Science as Inquiry - The Abilities Necessary to Do Scientific Inquiry

GLE 12—Use data and information gathered to develop an explanation of experimental results

Use the data table and picture to answer the question .

Breathing Experiment

Glass	Time for candle to go out (seconds)
1	12
2	9
3	15
4	7



To model an animal breathing in an enclosed environment, Jackie lit a candle and placed a glass over the candle with the open end down. She measured how long it took for the candle flame to go out. She repeated her experiment with three other glasses, each time using the same candle. Jackie's results are shown in the data table.

Based on the data, which statement is **most likely** true?

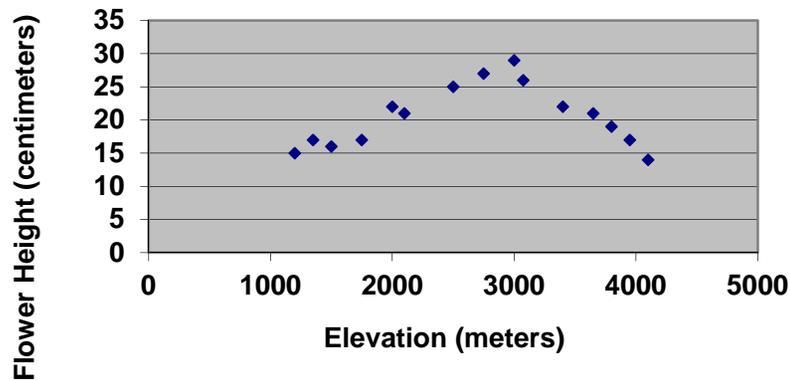
- A. Glass 3 is the largest glass.
- B. Glass 4 is the hottest glass.
- C. Glass 1 is the coldest glass.
- D. Glass 2 is the smallest glass.

Correct Response: A

Science as Inquiry - The Abilities Necessary to Do Scientific Inquiry
GLE 13—Identify patterns in data to explain natural events

Use this graph to answer the question .

Height of Flowers at Different Elevations



A scientist studying a species of flower that grows on the side of a mountain measured the height of many of the flowers at different elevations. His results are shown in the graph. Which statement **best** describes the pattern of growth for the flowers during this experiment?

- A. The flowers' heights are unaffected by elevation.
- B. The flowers cannot grow below elevations of 1,000 meters.
- C. The flowers grow taller at elevations of around 3,000 meters.
- D. The flowers' heights increase with higher elevation.

Correct Response: C

Science as Inquiry - The Abilities Necessary to Do Scientific Inquiry

GLE 18—Identify faulty reasoning and statements that misinterpret or are not supported by the evidence

Use the data table below to answer the question.

Snail Coloring

Sea Snail Species	Shell Color	Underside Color	Maximum Length
Red Foot Snail	Brown	Red	150 mm
White Foot Snail	Brown	White	180 mm

A scientist studied two species of sea snail and recorded the physical characteristics in the data table. Which conclusion about the data is based on **correct reasoning**?

- A. If a snail she studied had a brown shell, then it was a red foot snail.
- B. If a snail she studied had a brown shell, then it had a white underside.
- C. If a snail she studied was 125 millimeters long, then it was red foot snail.
- D. If a snail she studied was 175 millimeters long, then it had a white underside.

Correct Response: D

Science as Inquiry - The Abilities Necessary to Do Scientific Inquiry

GLE 22—*Use evidence and observations to explain and communicate the results of investigations*

A scientist discovers that a certain substance will be useful in treating nerve damage. What is the **best** way she can communicate her results to the scientific community?

- A. She can call other scientists who also work in nerve research.
- B. She can write a letter to hospitals that treat patients with nerve damage.
- C. She can put her conclusions on a Web site that focuses on the nervous system.
- D. She can publish her results in a scientific journal that covers issues relating to nerves.

Correct Response: D

Science as Inquiry - Understanding Scientific Inquiry

GLE 27—*Recognize that science uses processes that involve a logical and empirical, but flexible, approach to problem solving*

Leslie's science teacher told her she must take a flexible approach to solving problems. What did Leslie's teacher **most likely** mean?

- A. Leslie should not follow the experimental instructions exactly.
- B. Leslie should only write down lab results that seem to be correct.
- C. Leslie should accept all scientific theories even if they have been proven wrong.
- D. Leslie should be willing to consider many possible causes for her observations.

Correct Response: D

Science as Inquiry - Understanding Scientific Inquiry

GLE 28—*Recognize that investigations generally begin with a review of the work of others*

A scientist plans to investigate the nervous system of sea slugs. What should the scientist do first?

- A. Develop a theory about sea slugs that can be tested.
- B. Go to the ocean to observe the behavior of sea slugs.
- C. Obtain several sea slugs and conduct experiments with them.
- D. Review the research other scientists have done on sea slugs.

Correct Response: D

Science as Inquiry - Understanding Scientific Inquiry

GLE 30—*Describe why all questions cannot be answered with present technologies*

Researchers recently discovered a gene in humans that previously was unknown to science. Which statement **best** explains why the gene probably was not discovered much sooner?

- A. The gene only recently evolved in humans.
- B. The technology used to study genes is still being developed.
- C. Scientists were not interested in genes until a few years ago.
- D. Scientists were sure they had already discovered every possible gene.

Correct Response: B

Science as Inquiry - Understanding Scientific Inquiry

GLE 32—*Explain the use of statistical methods to confirm the significance of data (e.g., mean, median, mode, range)*

A scientist studied the number of eggs a species of bird lays each year. He found that the most common number of eggs laid in a year is three. Which statistical measurement did the scientist find?

- A. the mean number of eggs laid in a year
- B. the median number of eggs laid in a year
- C. the mode of the number of eggs laid in a year
- D. the range of the number of eggs laid in a year

Correct Response: C

Science as Inquiry

Understanding Scientific Inquiry

GLE 35—*Explain how skepticism about accepted scientific explanations (i.e., hypotheses and theories) leads to new understanding (SI-M-B5)*

Joanne's science teacher cautioned the class to be skeptical when learning about new scientific discoveries. Why is it important to be skeptical about new discoveries in science?

- A. because many scientific discoveries are not based on facts
- B. because most scientific discoveries have no scientific value
- C. because most scientists make errors when formulating scientific discoveries
- D. because all scientific discoveries must be examined critically before they can be accepted

Correct Response: D

Science as Inquiry - Understanding Scientific Inquiry

GLE 40—*Evaluate the impact of research on scientific thought, society, and the environment*

Louis Pasteur discovered that the bacteria in a substance can be killed by heating the substance for a short period of time. Which of these practices benefited **most** from Pasteur's discovery?

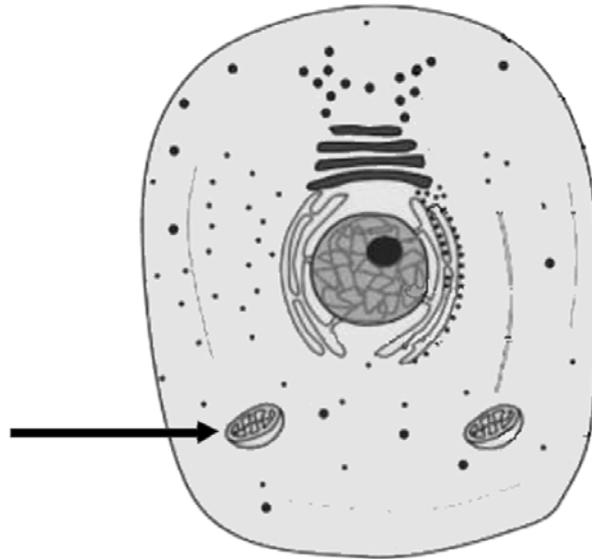
- A. storing foods for longer periods of time
- B. building ovens and other heating devices
- C. creating medicines that cure infections
- D. transporting living organisms without injuring them

Correct Response: A

Life Science - Structure and Function in Living Systems

GLE 2—Compare the basic structures and functions of different types of cells

Use this diagram to answer the question.



What is the main purpose of the mitochondria shown by the arrow?

- A. cell reproduction
- B. cellular digestion
- C. energy production
- D. protein manufacture

Correct Response: C

Life Science - Structure and Function in Living Systems

GLE 3—*Illustrate and demonstrate osmosis and diffusion in cells*

In which situation would osmosis **most likely** occur in cells?

- A. across a permeable membrane that separates solutions of the same concentration
- B. across a permeable membrane that separates solutions of different concentrations
- C. across a nonpermeable membrane that separates solutions of the same concentration
- D. across a nonpermeable membrane that separates solutions of different concentrations

Correct Response: B

Life Science - Structure and Function in Living Systems

GLE 7—*Construct a word equation that illustrates the processes of photosynthesis and respiration*

Which statement **best** describes the process of respiration?

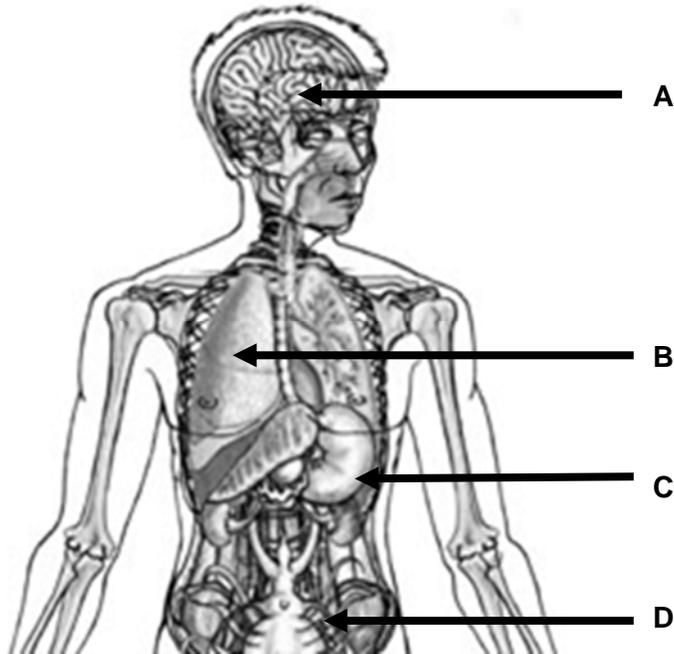
- A. Oxygen and sugar are used in the process that provides energy to cells; water and carbon dioxide are its waste products.
- B. Water and sugar are used in the process that provides energy to cells; oxygen and carbon dioxide are its waste products.
- C. Oxygen and carbon dioxide are used in the process that provides energy to cells; sugar and water are its waste products.
- D. Carbon dioxide and sugar are used in the process that provides energy to cells; water and oxygen are its waste products.

Correct Response: A

Life Science - Structure and Function in Living Systems

GLE 9—*Relate structural features of organs to their functions in major systems*

Use this diagram to answer the question.



Which arrow points to an organ directly involved in the exchange of gases between a human and his or her environment?

- A. arrow A
- B. arrow B
- C. arrow C
- D. arrow D

Correct Response: B

Life Science - Reproduction and Heredity

GLE 15—*Contrast the processes of mitosis and meiosis in relation to growth, repair, reproduction, and heredity*

What is a difference between mitosis and meiosis?

- A. Mitosis occurs in all the cells in animals and plants, while meiosis occurs in only in bacteria.
- B. In mitosis, the products are identical to the parent cell, while in meiosis the products are different from the parent cell.
- C. In mitosis, one cell divides into two cells, while in meiosis two cells combine to make one cell.
- D. Mitosis involves separating the chromosomes, while meiosis involves only the cytoplasm of the cell.

Correct Response: B

Life Science - Reproduction and Heredity

GLE 17—*Explain the relationship of genes to chromosomes and genotypes to phenotypes*

In humans, **B** is the allele for brown eyes and **b** is the allele for blue eyes. Two brothers both have brown eyes, but one of them has both the **B** and **b** alleles while the other only has **B** alleles. Which statement is true about the brothers?

- A. They have the same genotype and phenotype.
- B. They have different phenotypes and genotypes.
- C. They have the same phenotype but different genotypes.
- D. They have the same genotype but different phenotypes.

Correct Response: C

Life Science - Reproduction and Heredity

GLE 19—Apply the basic laws of Mendelian genetics to solve simple monohybrid crosses, using a Punnett square

Use this Punnett square to answer the question.

	W	W
w		
w		

In horses, the gene for white hair (**W**) is dominant to the gene for non-white hair (**w**). A horse with genotype (**WW**) was crossed with a horse with genotype (**ww**), as shown in the Punnett square.

What fraction of the offspring should be expected to have white hair?

- A. none
- B. one-half
- C. three-quarters
- D. all

Correct Response: D

Life Science - Populations and Ecosystems

GLE 23—Classify organisms based on structural characteristics, using a dichotomous key

Use this dichotomous key to answer the question.

Reptiles and Amphibians

1a.	Has external gills	Go to 6.
1b.	Does not have external gills	Go to 2.
2a.	Has scales	Go to 3.
2b.	Does not have scales	Go to 4.
3a.	Has a shell	turtle
3b.	Does not have a shell	Go to 5.
4a.	Has a tail as an adult	Go to 6.
4b.	Does not have a tail as an adult	frog
5a.	Has legs	lizard
5b.	Does not have legs	snake
6a.	Has coastal grooves along the side	salamander
6b.	Does not have coastal grooves along the side	newt

Trish constructed a dichotomous key to help identify the reptiles and amphibians living in a certain area. Which phrase describes a lizard?

- A. an animal with scaly skin and a shell but no external gills
- B. an animal with scaly skin and legs but no shell
- C. an animal with legs and coastal grooves but no tail
- D. an animal with external gills and a tail but no coastal grooves

Correct Response: B

Life Science - Populations and Ecosystems

GLE 26—Describe and compare the levels of organization of living things within an ecosystem

What do scientists mean when they refer to a *population*?

- A. all the organisms in an ecosystem
- B. all the species that share similar anatomical features
- C. all the animals that acquire resources through similar methods
- D. all the interbreeding members of a certain species in an ecosystem

Correct Response: D

Life Science - Populations and Ecosystems

GLE 27—Identify the various relationships among plants and animals (e.g., mutualistic, parasitic, producer/consumer)

Which relationship is mutualistic?

- A. an insect that lives and feeds on the body of an alligator
- B. an ant that lives on a plant and defends the plant from other insects
- C. a bird that migrates to follow the movements of the butterflies that it eats
- D. a deer that eats one kind of plant, which allows another kind of plant to grow in its place

Correct Response: B

Life Science - Adaptations of Organisms

GLE 30—*Differentiate between structural and behavioral adaptations in a variety of organisms*

Which example describes a behavioral adaptation?

- A. A bird builds its nest in the ash near a volcano.
- B. A whale has the ability to hold its breath for 20 minutes.
- C. A fox's hair is white in the winter and brown in the summer.
- D. A monkey has long arms that allow it to swing from one branch to another.

Correct Response: A

Life Science - Adaptations of Organisms

GLE 32—*Describe changes that can occur in various ecosystems and relate the changes to the ability of an organism to survive*

A forest is flooded when a natural dam breaks, leaving the forest floor under two meters of water. Which animal is **most** affected by the flooding?

- A. a crow
- B. a rabbit
- C. a squirrel
- D. a butterfly

Correct Response: B

Science and the Environment

GLE 35—*Identify resources humans derive from ecosystems*

Which resource is most likely found in large amounts in forest ecosystems?

- A. iron
- B. wood
- C. plastic
- D. petroleum

Correct Response: B

Science and the Environment

GLE 37—*Identify and describe the effects of limiting factors on a given population*

In a large forest with many animals, there are only a small number of bears. Which of these most likely limits the population of bears in the forest?

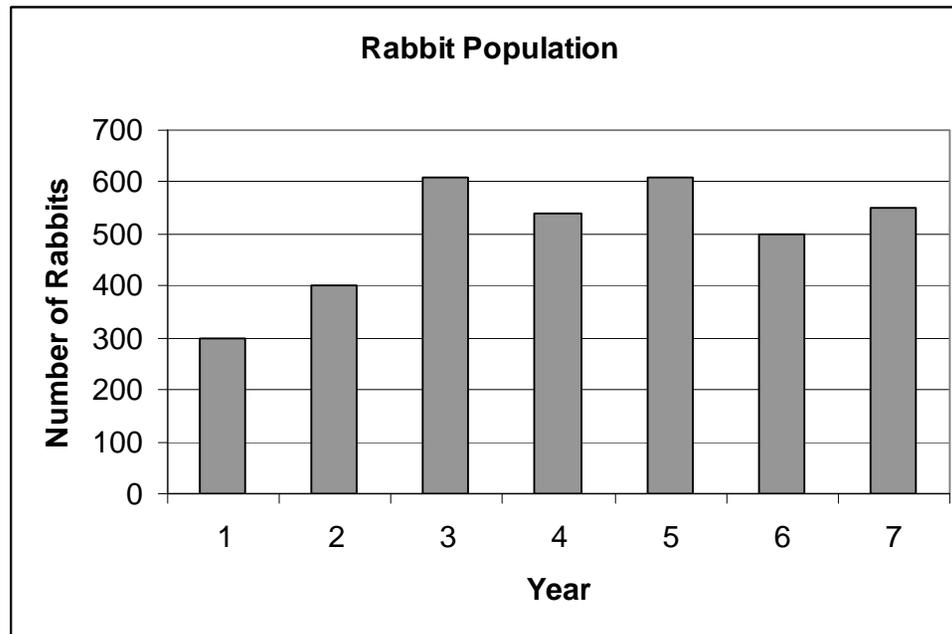
- A. supply of food
- B. type of tree
- C. predation by carnivores
- D. amount of suitable shelter

Correct Response: A

Science and the Environment

GLE 38—Evaluate the carrying capacity of an ecosystem

Use the graph below to answer the question.



The graph above shows the population of a rabbits in a field over a seven-year period. Based on the data, what is the approximate carrying capacity in the field for rabbits?

- A. 200
- B. 400
- C. 500
- D. 600

Correct Response: C

Science and the Environment

GLE 41—Describe the nitrogen cycle and explain why it is important for the survival of organisms

What is the **main** reason humans need nitrogen to survive?

- A. Nitrogen is used in respiration to generate energy.
- B. Nitrogen is used in making the proteins in the body.
- C. Nitrogen is used to help the body eliminate wastes.
- D. Nitrogen is used by nerve cells to conduct impulses.

Correct Response: B

Science and the Environment

GLE 42—Describe how photosynthesis and respiration relate to the carbon cycle

Which statement **best** describes the roles of photosynthesis and respiration in the carbon cycle?

- A. Respiration and photosynthesis both add carbon to the atmosphere.
- B. Respiration and photosynthesis both remove carbon from the atmosphere.
- C. Respiration adds carbon to the atmosphere, while photosynthesis removes carbon from the atmosphere.
- D. Photosynthesis adds carbon to the atmosphere, while respiration removes carbon from the atmosphere.

Correct Response: C

Science and the Environment

GLE 43—*Identify and analyze the environmental impact of humans' use of technology (e.g., energy production, agriculture, transportation, human habitation)*

Scientists have observed an increase in global temperatures over the past 100 years. Which phenomena do scientists believe contributes to the increase in temperatures?

- A. an increase in undersea volcanic activity
- B. a decrease in the distance between Earth and the Sun
- C. an increase in certain gases released during the use of fossil fuels
- D. a decrease in the amount of water on Earth due to overconsumption

Correct Response: C

Task

The human body is very complex. Below is information about how parts of the human body function to keep a person alive. Read the information and study the diagrams. Then answer questions 1 through 5.

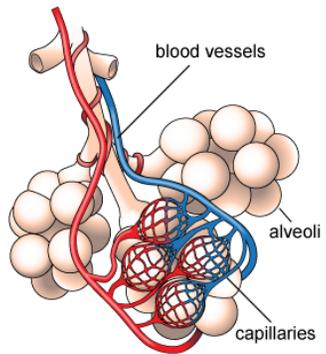
Materials Exchange from Blood

The blood has the job of moving materials such as food molecules, vitamins, water, gases, and waste products through the body. Cells throughout the body exchange many substances with blood. However, some organs also move materials into and out of the blood. Diagrams 1 and 2 below show parts of the lungs and small intestine. The main function of each of these organs is to move materials into or out of the blood.

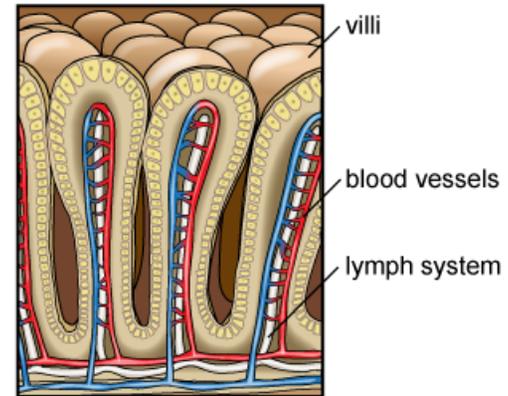
Some organs specialize in moving materials needed by the body into the blood. For example, molecules from digested food travel from the small intestine into the bloodstream. The blood then carries these food molecules throughout the body. This process enables cells in other parts of the body, like the brain, bones, muscles, and skin, to receive the nutrients they need to function.

Some organs specialize in helping the body get rid of waste products. Waste molecules are created by all cells in the body. The blood collects waste and carries it to organs that help the body get rid of the waste materials. These organs, such as the kidneys, have specialized structures that allow them to filter wastes out of the blood while keeping useful materials in. This ability to filter and remove wastes is important for all life.

1. Alveoli in Lungs



2. Villi in Small Intestine



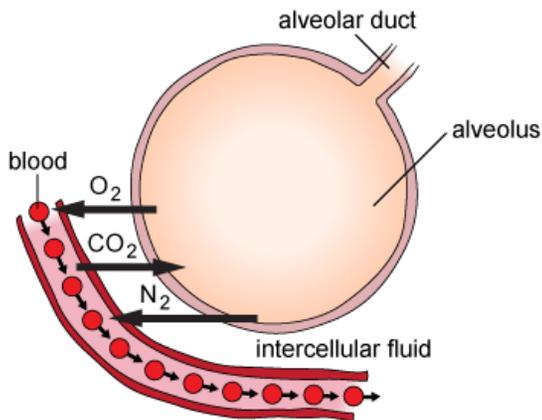
Study the information in the *Materials Exchange from Blood* before answering the questions.

- The table shows the percent of important gases in inhaled air and exhaled air.

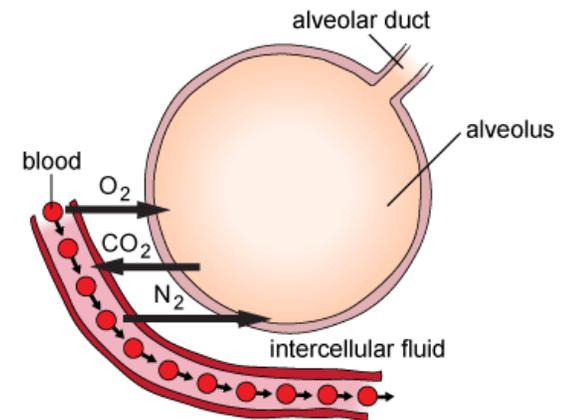
Gases in Inhaled and Exhaled Air

Gas	Inhaled Air	Exhaled Air
Nitrogen (N ₂)	79%	79%
Oxygen (O ₂)	21%	16%
Carbon Dioxide (CO ₂)	0.04%	4%

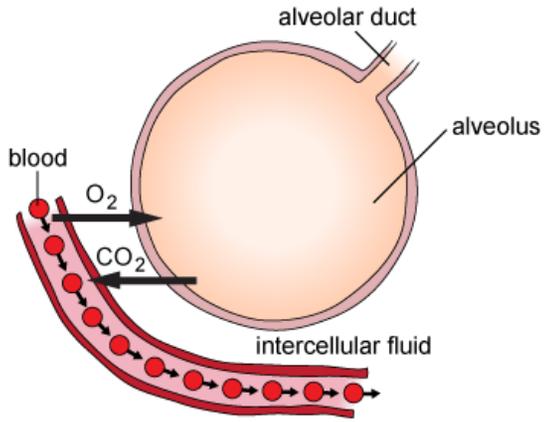
Which model shows how gases are exchanged in the alveoli in the lungs?



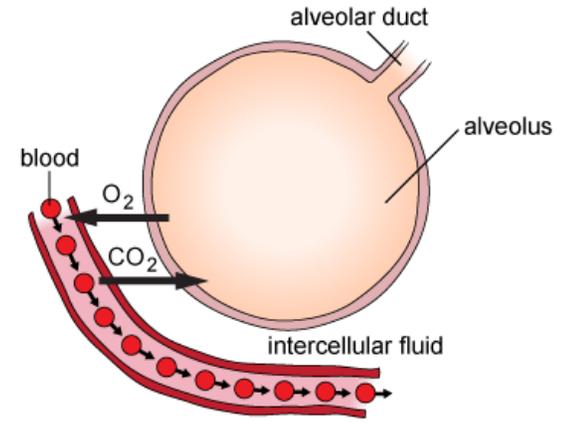
A.



B.



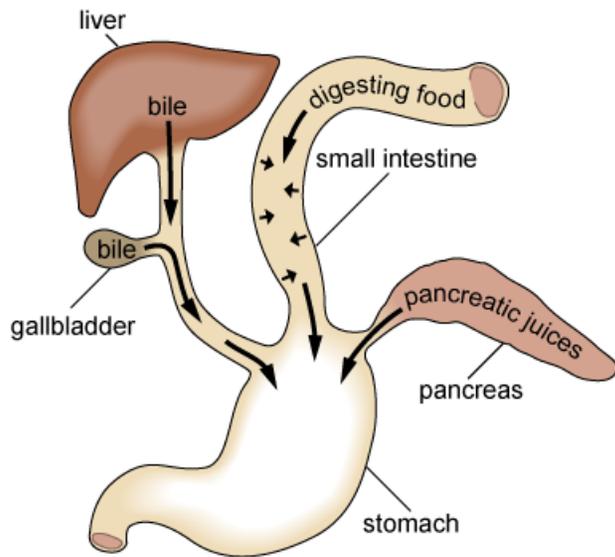
C.



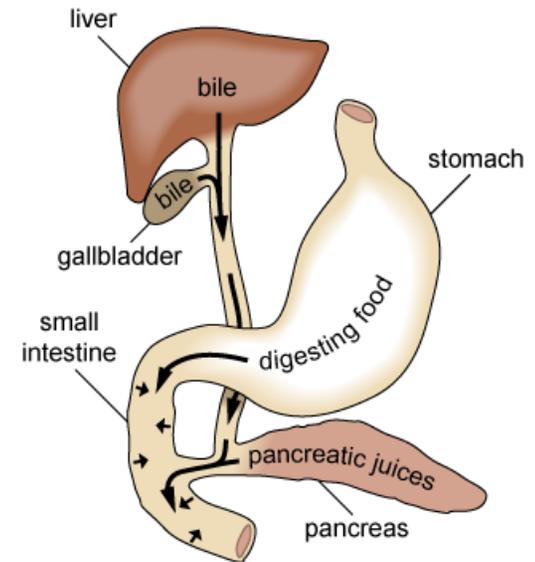
D.

2. Food that is being digested passes from the stomach to the small intestine. There, it mixes with digestive juices such as bile and pancreatic enzymes. Bile helps the body absorb fat while the pancreatic enzymes are capable of digesting carbohydrates, fats, and proteins. During digestion, these juices flow to the small intestine and combine with additional materials to further break down food. Afterwards, the molecules from the digested food are moved into the bloodstream.

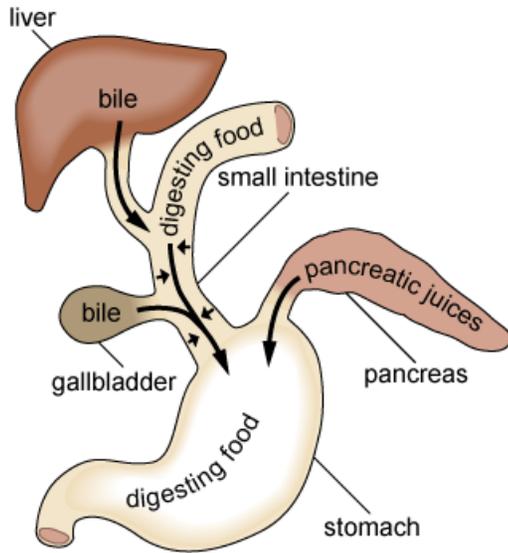
Which diagram shows how these structures work together to help digest food?



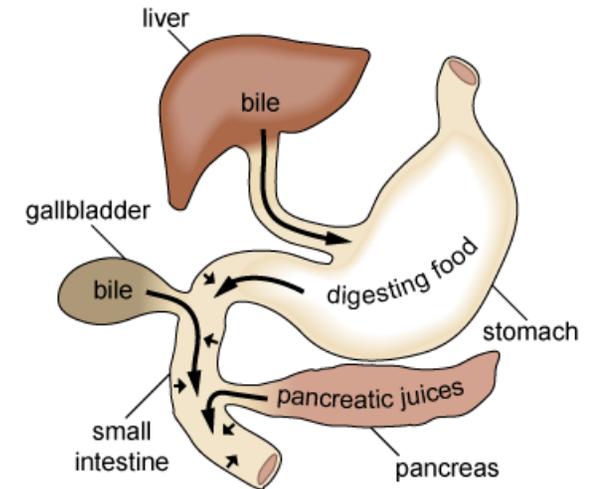
A.



B.



C.

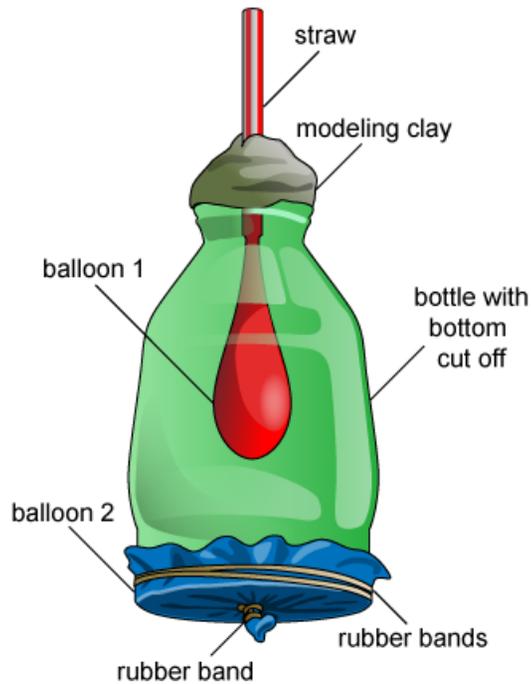


D.

3. Which flowchart shows a **likely** path of a waste molecule through the body?

- A. skin cell → blood → kidney → large intestine → rectum → out of body
- B. muscle cell → blood → liver → blood → lung → out of body
- C. bone cell → blood → liver → gallbladder → rectum → out of body
- D. brain cell → blood → kidney → urine → bladder → out of body

4. A student made this model of the human respiratory system from a plastic soda bottle.



Which sentences best explain how the model can be used to show how different parts of the respiratory system work together?

- A. Balloon 1 represents the lungs and balloon 2 represents the diaphragm. Pulling balloon 2 down shows how the diaphragm causes air to enter the lungs.
- B. Balloon 1 represents an alveolus and balloon 2 represents a capillary. The bottle shows that the alveolus and capillary must be close together for gases to move between them.
- C. The bottle represents the lungs and the straw represents the larynx. Squeezing and letting go of the bottle shows how the lungs push air into and out of themselves.
- D. The bottle represents the ribs and the straw represents the windpipe. Squeezing the bottle shows how the ribs help push air out of the lungs.

The following question requires you to write an extended response that combines information from the source with your knowledge of science.

To earn full credit you should:

- Read the question and then study the information in the *Materials Exchange from Blood*.
- Answer **all** parts of the question **and** support your ideas with examples, data, facts, or details.
- Write a response that is long enough to fully address the topic. You may need more than one paragraph. Responses with fewer than 25 words will not be scored.

5. The alveoli in the lungs and the villi in the small intestine contribute to the ability of the organs to efficiently exchange materials into and out of the blood.

Explain how the structures of the lungs and small intestine allow the circulatory system and other body systems to work together to accomplish their functions. In your response, be sure to:

- Describe similarities in the overall shape, size, and internal structure of the alveoli and the villi.
- Explain how these similarities help these structures perform their functions efficiently.
- Explain why there are so many alveoli in the lungs and villi in the small intestine.

Rubric

Exemplary Response

1. D
2. B
3. D
4. A
5. The alveoli in the lungs and the villi in the small intestine are shaped to allow for the efficient exchange of materials with the blood. Both of these structures contain many small capillaries. These capillaries allow for a large amount of contact between the organ surface (lung or small intestine) and the bloodstream. Because the many capillaries create a large surface area, materials can transfer between the organs and the bloodstream more easily. The capillaries also mean that a large supply of blood can flow through the alveoli and villi. This is helped by the fact that the capillaries regroup to form larger blood vessels after they have passed over the organ surface. The larger blood vessels can move more blood more quickly. Finally, there are many, many villi in the small intestine and many, many alveoli in the lungs. Having so many of these structures allows the body to take in plenty of food and oxygen.

Score	Rubric (Question #5)
4	<ul style="list-style-type: none"> ▪ The student’s response demonstrates an in-depth understanding of the parallel relationship between structure and function in the lung and small intestine. ▪ The student completes all key components of the task accurately and communicates ideas effectively. <ul style="list-style-type: none"> ○ Explains how the structure and number of the alveoli and villi maximize surface area in their respective organs. ○ Explains how the branching of blood vessels into capillaries in the alveoli support efficient transfer of gases to and from the blood. ○ Explains how the branching of blood vessels into capillaries in the villi support efficient transfer of nutrients to the blood. ▪ The student’s response is extensively supported by relevant evidence in the form of data and/or examples. ▪ Where appropriate, the student uses a higher level of reasoning skills that may include applications, procedures, etc. ▪ The response contains no errors.
3	<ul style="list-style-type: none"> ▪ The student’s response demonstrates a good understanding of the relationship between structure and function in the lung and small intestine, although less important ideas or details may be overlooked or misunderstood. ▪ The student completes most important aspects of the task accurately and communicates clearly. ▪ The student’s response is sufficiently supported by relevant evidence. ▪ The student’s logic and reasoning may contain minor flaws. ▪ The response contains minor errors.
2	<ul style="list-style-type: none"> ▪ The student’s response demonstrates a limited understanding of the relationship between structure and function in the lung and small intestine (gaps in conceptual understanding). ▪ The student completes some parts of the task successfully. ▪ The student’s response is not sufficiently supported by relevant evidence. ▪ The response contains errors.
1	<ul style="list-style-type: none"> ▪ The student’s response demonstrates a basic understanding of the relationship between structure and function in the lung and small intestine. ▪ The student completes only a small portion of the task. ▪ The student’s response contains little or no support of relevant evidence. ▪ The student’s response contains major errors.
0	<p>The response attempts to address the prompt, but is mostly or entirely incorrect or contains some correct work that is irrelevant to the skill or concept being measured.</p>