Name: _____ Date: _____

What Really Tells Your Lungs to Speed Up

Circle group

You do not choose to breathe the way you choose to wave. Day and night, awake or asleep, your body keeps air moving. You do not give orders. So who is in charge?

The control center is in the lower part of the brain. It is called the brainstem. It sends signals to the diaphragm. That is the big, dome-shaped muscle under the lungs. It also signals the muscles between the ribs. When they tighten, your chest gets bigger and air comes in. When they relax, air goes out.

What sets the pace? Many people guess it is a lack of oxygen. But it is mostly carbon dioxide. Every cell in your body makes carbon dioxide as waste while it uses oxygen. The waste goes in the blood to the lungs. Then you breathe it out. Sensors in the brain and in big blood vessels check how much carbon dioxide there is. When the level goes up, they tell the brainstem to speed up.

That is what happens when you run. Your working muscles make much more carbon dioxide. The level goes up. So you breathe deeper and faster until the extra is gone. When you rest, the level goes down, and your breathing calms.

It also shows why you can hold your breath for only a short time. Carbon dioxide builds up. The urge to breathe gets stronger. That strong urge protects you. This is one reason people should never push their limits when they swim.

Questions

1. Where is the control center for breathing?

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_____

2. What is the diaphragm?

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_____

3. What gas mostly sets the pace of breathing?

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_____

4. What happens to the carbon dioxide that cells make?

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_____

5. Why does your breathing speed up when you run?

_____

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6. Why does the urge to breathe get stronger when you hold your breath?

_____

_____

7. Why is the strong urge to breathe a protection?

_____

_____

Words to know

brainstem: the part of the brain that controls basic jobs like breathing
diaphragm: the big muscle under the lungs that helps you breathe
carbon dioxide: a gas that body cells make as waste
oxygen: a gas in the air that body cells need to make energy
sensors: tiny parts that notice changes and send messages

Talk together (every group has these)

1. Find one fact that every group read. How did your sheet say it?
2. What did your sheet tell you that you think another group's did not? Ask them.
3. What is one question about this topic that none of the sheets answered?

Name: _____ Date: _____

What Really Tells Your Lungs to Speed Up

Triangle group

You do not decide to breathe in the same way that you decide to wave. Day and night, awake or asleep, your body keeps the air moving without any orders from you. So who is in charge?

The control center sits in the lower part of the brain, in a region called the brainstem. It sends signals to the diaphragm, the large, dome-shaped muscle under the lungs, and to the muscles between the ribs. Each time they tighten, your chest expands and air flows in. When they relax, air flows out.

What sets the pace is mostly not a shortage of oxygen, as many people guess. It is carbon dioxide. Every cell in your body makes carbon dioxide as a waste product while it uses oxygen for energy. The waste travels in the blood to the lungs, where it is breathed out. Sensors in the brain and in large blood vessels keep track of how much carbon dioxide is present. When the level starts to rise, they tell the brainstem to speed up.

That explains what happens when you run. Working muscles produce much more carbon dioxide, the level climbs, and your breathing becomes deeper and faster until the extra is cleared away. After you rest, the level falls and your breathing settles down again.

It also explains why you can hold your breath for only a short time. As carbon dioxide builds up, the urge to breathe grows stronger and stronger. That strong signal is a protective feature, which is one reason people should never stretch their limits when they swim.

Questions

1. Where is the control center for breathing?

_____

_____

2. What is the diaphragm?

_____

_____

3. What gas mostly sets the pace of your breathing?

_____

_____

4. What happens to the carbon dioxide that the cells make?

_____

_____

5. Why does your breathing speed up when you run?

_____

_____

6. Why does the urge to breathe grow stronger when you hold your breath?

_____

_____

7. Why is the strong urge to breathe a protective feature?

_____

_____

Words to know

brainstem: the part of the brain that controls basic jobs like breathing
diaphragm: the big muscle under the lungs that helps you breathe
carbon dioxide: a gas that body cells make as waste
oxygen: a gas in the air that body cells need to make energy
sensors: tiny parts that notice changes and send messages

Talk together (every group has these)

1. Find one fact that every group read. How did your sheet say it?
2. What did your sheet tell you that you think another group's did not? Ask them.
3. What is one question about this topic that none of the sheets answered?

Name: _____ Date: _____

What Really Tells Your Lungs to Speed Up

Square group

You do not decide to breathe in the same deliberate way that you decide to wave to a friend. Day and night, whether you are awake or asleep, your body keeps the air moving without any instructions from you. So what, exactly, is in charge?

The control center is located in the lower part of the brain, in a region called the brainstem. It transmits signals to the diaphragm, the large, dome-shaped muscle beneath the lungs, and to the muscles between the ribs. Each time these muscles tighten, your chest expands and air rushes in. When they relax, air flows back out.

What determines the pace is generally not a shortage of oxygen, as many people suppose. It is carbon dioxide. Every cell in your body produces carbon dioxide as a waste product while it uses oxygen to release energy. That waste is carried by the blood to the lungs, where it is exhaled. Sensors in the brain and in large blood vessels continually monitor how much carbon dioxide is present. When the level begins to climb, they instruct the brainstem to accelerate.

This explains what happens when you run. Working muscles generate far more carbon dioxide, the level rises, and your breathing becomes deeper and faster until the surplus has been cleared away. Once you rest, the level falls and your breathing gradually settles.

It also explains why you can hold your breath for only a short time. As carbon dioxide accumulates, the urge to breathe grows steadily stronger. That powerful signal is a protective feature, which is one reason people should never try to stretch their limits when they swim.

Questions

1. Where is the control center for breathing located?

_____

_____

2. What is the diaphragm?

_____

_____

3. Which gas generally determines the pace of breathing?

_____

_____

4. What happens to the carbon dioxide that cells produce?

_____

_____

5. Why does your breathing accelerate when you run?

_____

_____

6. Why does the urge to breathe grow stronger when you hold your breath?

_____

_____

7. Why is the powerful urge to breathe a protective feature?

_____

_____

Words to know

brainstem: the part of the brain that controls basic jobs like breathing
diaphragm: the big muscle under the lungs that helps you breathe
carbon dioxide: a gas that body cells make as waste
oxygen: a gas in the air that body cells need to make energy
sensors: tiny parts that notice changes and send messages

Talk together (every group has these)

1. Find one fact that every group read. How did your sheet say it?
2. What did your sheet tell you that you think another group's did not? Ask them.
3. What is one question about this topic that none of the sheets answered?

For the teacher: What Really Tells Your Lungs to Speed Up

Each student sheet carries a shape, not a level. The same topic and facts, written three ways.

Circle: What Really Tells Your Lungs to Speed Up

Easier · 248 words · Flesch-Kincaid grade 3

1. In the brainstem, the lower part of the brain.
2. The big, dome-shaped muscle under the lungs.
3. Carbon dioxide.
4. It goes in the blood to the lungs and is breathed out.
5. Working muscles make more carbon dioxide, and the higher level tells the brainstem to speed up.
6. Carbon dioxide builds up in the body.
7. It pushes a person to breathe before there is trouble.

Triangle: What Really Tells Your Lungs to Speed Up

This passage · 263 words · Flesch-Kincaid grade 5.8

1. In the brainstem, the lower part of the brain.
2. The large, dome-shaped muscle under the lungs.
3. Carbon dioxide.
4. It travels in the blood to the lungs and is breathed out.
5. Working muscles make more carbon dioxide, and the rising level tells the brainstem to speed up.
6. Carbon dioxide builds up in the body.
7. It pushes a person to breathe before there is trouble.

Square: What Really Tells Your Lungs to Speed Up

Harder · 273 words · Flesch-Kincaid grade 7.6

1. In the brainstem, the lower part of the brain.
2. The large, dome-shaped muscle beneath the lungs.
3. Carbon dioxide.
4. The blood carries it to the lungs, where it is exhaled.
5. Working muscles generate more carbon dioxide, and the rising level instructs the brainstem to speed up.
6. Carbon dioxide accumulates in the body.
7. It pushes a person to breathe before trouble develops.