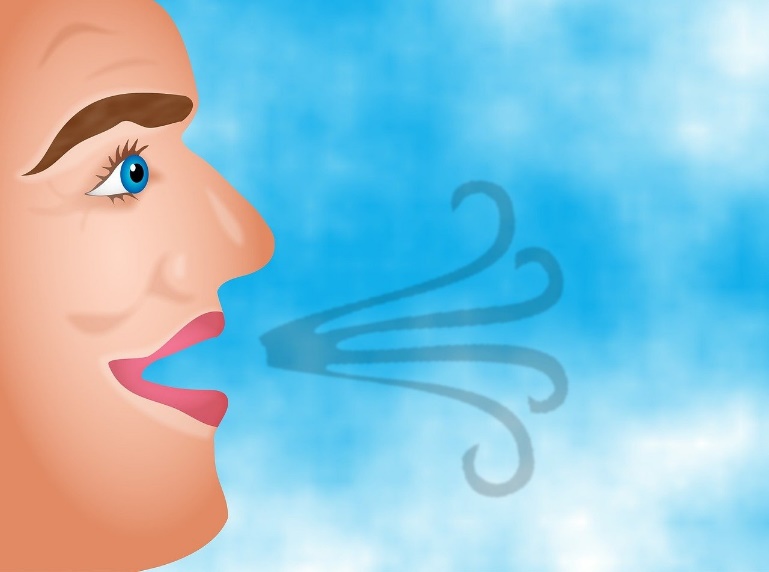
**What’s in the air?**



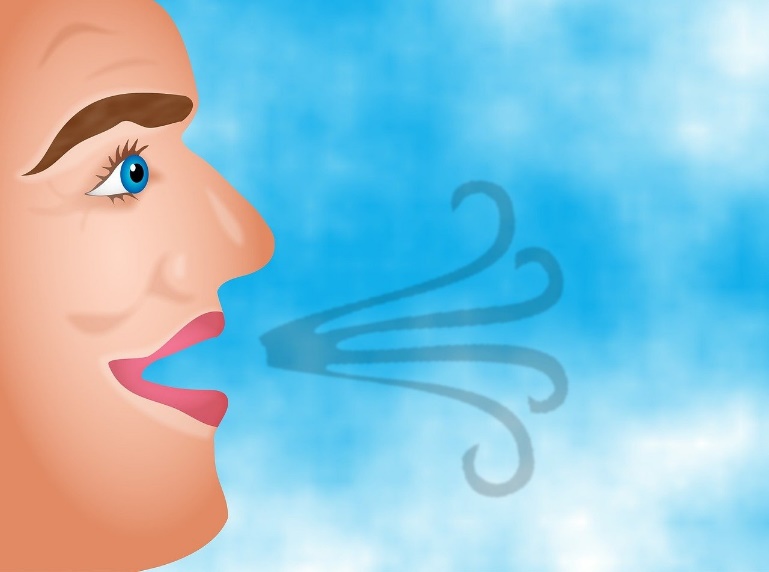
1. What is in the air we breathe in?

|  |  |
| --- | --- |
| **A** | Just oxygen. |
| **B** | Just carbon dioxide. |
| **C** | A mixture of oxygen and carbon dioxide. |
| **D** | A mixture of oxygen, carbon dioxide and other gasses. |

1. How would you explain your answer to question 1?

|  |  |
| --- | --- |
| **A** | That is what the body needs. |
| **B** | Air is not a substance, it is a mixture. |
| **C** | Air and oxygen are the same thing. |
| **D** | We breathe in oxygen and breathe out carbon dioxide. |

**What’s in the air?**



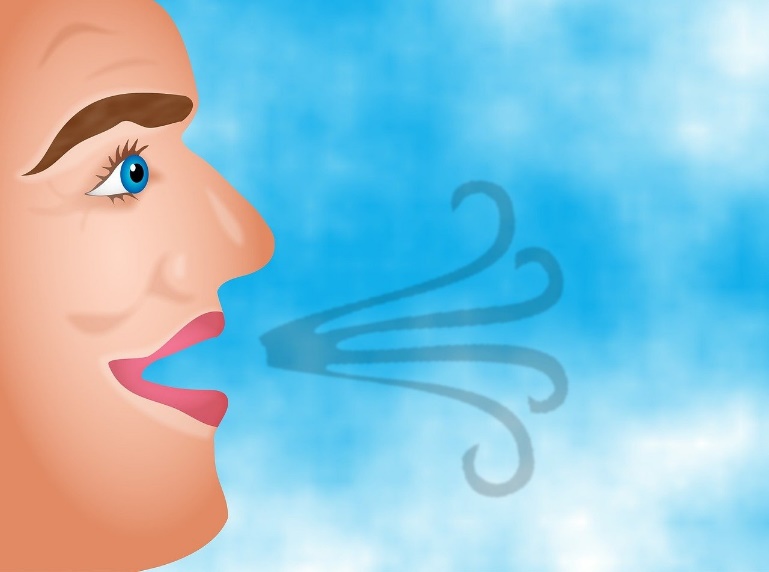
1. What is in the air we breathe out?

|  |  |
| --- | --- |
| **A** | Just oxygen. |
| **B** | Just carbon dioxide. |
| **C** | A mixture of oxygen and carbon dioxide. |
| **D** | A mixture of oxygen, carbon dioxide and other gasses. |

1. How would you explain your answer to question 3?

|  |  |
| --- | --- |
| **A** | That is what the body gets rid of. |
| **B** | We breathe in oxygen and breathe out carbon dioxide. |
| **C** | It is a waste product. |
| **D** | Not all of the oxygen from the air we breathed in has been absorbed by the body. |

**What’s in the air?**



1. How do the gases in the air we breathe out compare to the air we breathe in?

|  |  |
| --- | --- |
| **A** | The amount of oxygen has decreased. |
| **B** | The amount of carbon dioxide has increased. |
| **C** | The amount of oxygen has decreased and the amount of carbon dioxide has increased. |
| **D** | They are present in exactly the same amounts. |

1. How would you explain your answer to question 5?

|  |  |
| --- | --- |
| **A** | Some of the oxygen has been absorbed into our blood. |
| **B** | Some carbon dioxide has been released from our blood. |
| **C** | Some of the oxygen has been absorbed into our blood and some carbon dioxide has been released from our blood. |
| **D** | Only energy has been taken out of the air. |

*Biology> Big idea BCL: The cellular basis of life > Topic BCL2: From cells to organ systems > Key concept BCL2.2: Supplying cells – the human circulatory, digestive and gas exchange systems*

|  |
| --- |
| **Diagnostic question** |
| **What’s in the air?** |

**Overview**

|  |  |
| --- | --- |
| Learning focus: | Human life depends upon the tissues and organs of the circulatory, digestive and gas exchange systems working together to support the life processes of the cells from which we are made. |
| Observable learning outcome: | Describe simply the structures and functions of the human gas exchange system. |
| Question type: | Two-tier multiple choice |
| Key words: | gas exchange system |

**What does the research say?**

While most children at age 11 are aware that humans need air to survive, some think that air is breathed into the lungs (or, less commonly, just into the head) and is then breathed out unchanged. A related but contrasting misconception has also been reported, in which children think that inhaled air is all oxygen while exhaled air is all carbon dioxide (Yip, 1998; García-Barros, Martínez-Losada and Garrido, 2011; Allen, 2014).

Inhaled air is approximately 78% nitrogen, 21% oxygen and 0.04% carbon dioxide; it also contains water vapour, other gases and particulates. Not all of the oxygen is absorbed into the blood – only around one fifth. Exhaled air contains the same amount of nitrogen, and approximately 17% oxygen and 4% carbon dioxide.

**Ways to use this question**

Students should complete the questions individually. This could be a pencil and paper exercise, or you could use the presentation with an electronic voting system or mini white boards.

*Differentiation*

You may choose to read the questions to the class, so that everyone can focus on the science. In some situations it may be more appropriate for a teaching assistant to read for one or two students.

**Expected answers**

1. D - A mixture of oxygen, carbon dioxide and other gasses.
2. B - Air is not a substance, it is a mixture.
3. D - A mixture of oxygen, carbon dioxide and other gasses.
4. D - Not all of the oxygen from the air we breathed in has been absorbed by the body.
5. C - The amount of oxygen has decreased and the amount of carbon dioxide has increased.
6. C - Some of the oxygen has been absorbed into our blood and some carbon dioxide has been released from our blood.

**How to respond - what next?**

If there is a range of answers, you may choose to respond through structured class discussion. Ask one student to explain why they gave the answer they did; ask another student to explain why they agree with them; ask another to explain why they disagree, and so on. This sort of discussion gives students the opportunity to explore their thinking and for you to really understand their learning needs. Responses often work best when the activities involve paired or small group discussions, which encourage social construction of new ideas through dialogue.

If students have misunderstandings about the composition of the air we breathe in and out, the following BEST ‘response activity’ describes a predict-explain-observe-explain exercise that could be used in follow-up to this diagnostic question to build understanding:

* Response activity: PEOE – Flames

**Acknowledgments**

Developed by Alistair Moore (UYSEG).

Images: adapted by UYSEG from pixabay.com/Prawny (1316377)

**References**

Allen, M. (2014). *Misconceptions in Primary Science, Second* ednBerkshire, UK: Open University Press.

García-Barros, S., Martínez-Losada, C. and Garrido, M. (2011). What do children aged four to seven know about the digestive system and the respiratory system of the human being and of other animals? *International Journal of Science Education,* 33**,** 2095-2122.

Yip, D. (1998). Erroneous ideas about the composition of exhaled air. *School Science Review,* 80(290)**,** 55-62.