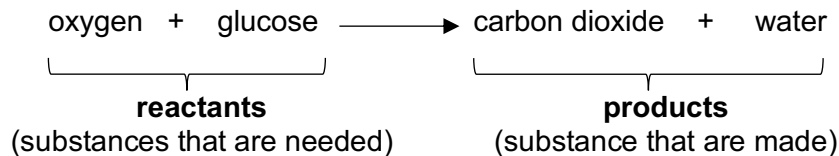


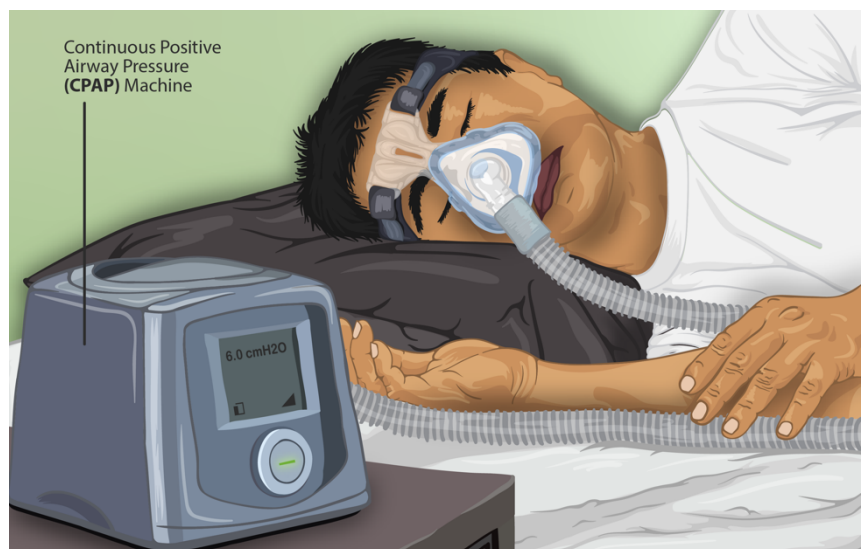
## Aerobic respiration

All the cells in your body need energy to stay alive. They can get energy using a chemical reaction called **aerobic respiration**. During the reaction, energy is released from a substance called glucose (which you obtain from food). The reaction also requires oxygen. Glucose and oxygen are carried to your cells in your blood. We can show aerobic respiration using a word equation:



Your **breathing** (or **gas exchange**) system gets oxygen into your blood and removes carbon dioxide. This swapping of gases between your blood and the air in your lungs is called **gas exchange**. When you breathe, muscles make your lungs increase and decrease in volume. This adds fresh air to your lungs (containing more oxygen) and removes air containing more carbon dioxide.

COVID-19 is a disease that can reduce gas exchange. People with serious COVID-19 may be given air containing 60 – 100% oxygen (to get more oxygen into the blood). If the person also finds it hard to breathe, they may be given a CPAP machine. This pumps the air into their lungs in a continuous stream. In the most serious cases, patients need a ventilator to breathe for them.



### Find out

1. Find out who developed the new CPAP machines to treat COVID-19 patients.

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2. In 1768, Joseph Wright of Derby painted *An Experiment on a Bird in the Air Pump*. This painting shows an experiment by Robert Boyle, in which air is pumped out of a jar containing a live bird. Find the painting at: [www.nationalgallery.org.uk](http://www.nationalgallery.org.uk)

- State one substance that is increasing in the jar. \_\_\_\_\_
- State what would happen if air were removed from the jar. \_\_\_\_\_
- Explain why this would happen. \_\_\_\_\_

3. Do some research to link each scientist with when they lived and what they thought.

Scientist	When they lived	What they thought
Antoine Lavoisier	384 BCE – 322 BCE	Organisms need oxygen.
Aristotle	1743 – 1794	Organisms need air to live.
John Mayow	1627 – 1691	Organisms only part of the air to live.
Joseph Priestley	1641 – 1679	Heat is produced in the heart.
Robert Boyle	1733 – 1804	Organisms need oxygen.

### Test yourself

- In the box:
  - underline the waste gas produced by aerobic respiration
  - circle the energy-storing substance that cells need.

glucose	water
oxygen	nitrogen
carbon dioxide	

5. b. Explain how extra oxygen *and* a CPAP machine help people with serious COVID-19.

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### Check-up

- Check your answers.
- CPAP machines need masks with good seals on the face and which stay in place. Design a mask for a CPAP machine. You could make your mask.



## Answers

### Note to home educators

The worksheet is designed to support understanding of aerobic respiration. You may wish to share these objectives with students:

- Explain why organisms need to respire.
- Recall what happens in aerobic respiration, gas exchange and breathing and the differences between each.
- Model aerobic respiration using a word equation.

Students need a basic knowledge of cells, tissues and organs to access this sheet.

It is suggested that students complete the worksheet independently, making use of secondary source materials (e.g. reference books and/or internet) to complete questions 1 and 2. Questions 3 – 5 should be completed without help from additional sources.

If you wish to check the answers, keep this part of the sheet away from the questions!

- I.
  1. University College London together with Mercedes AMG (F1)
  2.
    - a. carbon dioxide (from the respiration of the bird)
    - b. The bird dies. Note that in the picture, not all onlookers are happy with the experiment.
    - c. The bird needs oxygen from the air for respiration. (All cells need to respire to release energy from glucose to continue living.)
  - 3.

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4.
  - a. carbon dioxide, b. glucose
5. People with serious COVID-19:
  - have poor gas exchange; extra oxygen ensures that more oxygen gets into the blood.
  - find it difficult to breathe; pushing the air helps to keep air flowing into their lungs.
- II. You may be shown a design for a CPAP mask. Features that are important include:
  - a tight seal between the mask and the face
  - stays in place on the face
  - can be attached to a tube carrying air.

Some students may build a mask. Materials that could be used to make a seal include modelling clay and sticky tack. Elastic on the mask could ensure that it stays in place.