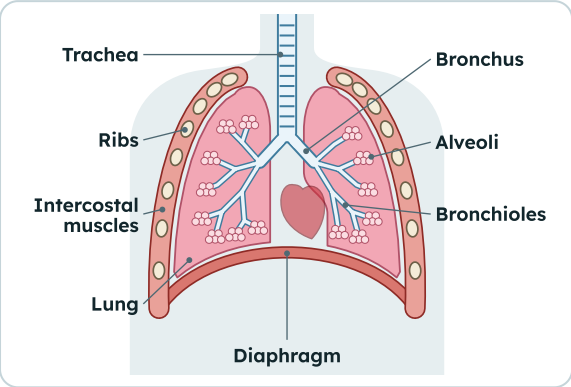
KS3 SCIENCE · BIOLOGY

Breathing and gas exchange revision sheet

Name _____

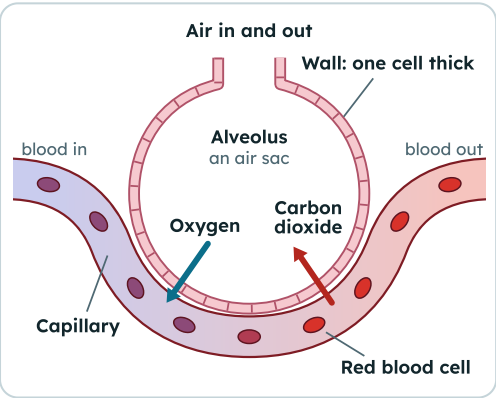
1. The gas exchange system



- Air goes in through the nose or mouth and down the **trachea** (windpipe).
- The trachea splits into two **bronchi**, one for each lung. Each bronchus branches into smaller tubes called **bronchioles**.
- Each bronchiole ends in a bunch of **alveoli**: tiny air sacs where gas exchange happens.
- The **ribs** make a cage that protects the lungs. The **intercostal muscles** lie between the ribs.
- The **diaphragm** is a sheet of muscle underneath the lungs.

The path of air: nose or mouth → trachea → bronchus → bronchioles → alveoli.

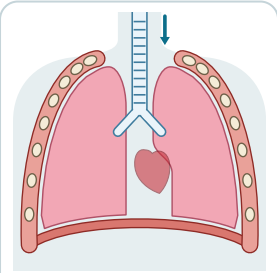
2. Alveoli

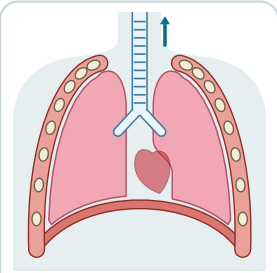


- **Oxygen** diffuses from the air in the alveoli into the blood.
- **Carbon dioxide** diffuses from the blood into the air in the alveoli. Then it is breathed out.

HOW ALVEOLI ARE ADAPTED	WHY IT HELPS
A very large surface area: there are millions of alveoli	There is a lot of wall for gases to cross
Walls only one cell thick	The gases have only a short way to diffuse
A good blood supply, in tiny capillaries	Blood carries the oxygen away, so more keeps diffusing in

3. Breathing in and out


Breathing in


Breathing out

	BREATHING IN	BREATHING OUT
Diaphragm	Contracts and flattens	Relaxes and domes up
Intercostal muscles	Contract: ribs move up and out	Relax: ribs move down and in
Volume of the chest	Gets bigger	Gets smaller
Pressure inside	Falls	Rises
Air	Is pushed in	Is pushed out

Breathing is not respiration. Breathing moves air in and out of the lungs. Respiration is a chemical reaction in every cell that releases energy.



4. Measuring lung volume

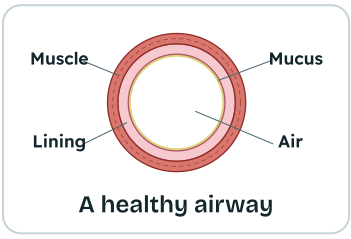
- **Lung volume** is a measure of the amount of air breathed in or out.
- Take the deepest breath you can. Breathe out as much as you can through a tube into an upturned bottle of water. Read the scale, in litres.
- To test a claim such as "taller people have bigger lung volumes", measure plenty of people.



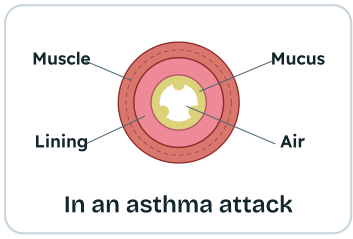
5. Exercise and breathing

- **Breathing rate** is the number of breaths in one minute.
- In exercise, muscle cells respire faster. They need more oxygen and make more carbon dioxide.
- So you breathe **faster** and **more deeply**.
- Afterwards, the rate falls slowly back to its resting value.

6. Asthma



A healthy airway



In an asthma attack

- In an attack, the **muscles** around the bronchioles tighten. The **lining** swells and makes extra **mucus**.
- The airways get narrower, so less air gets through. The person wheezes and is short of breath.
- Pollen, dust, smoke, cold air or exercise can trigger an attack.
- A **reliever inhaler** gives a medicine that relaxes the muscles, so the airways open up again.

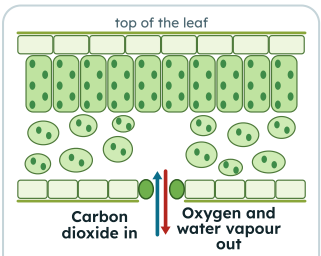


7. Smoking and the lungs

IN TOBACCO SMOKE	THE HARM IT DOES
Tar	Sticky. Coats the airways and alveoli. Causes lung cancer.
Nicotine	An addictive drug. Makes blood vessels narrower.
Carbon monoxide	A poisonous gas. Takes the place of oxygen in red blood cells, so the blood carries less oxygen.

- Smoke damages the **cilia**, the tiny hairs that sweep mucus and dirt out of the airways, so mucus builds up. It also damages the walls of the alveoli, leaving less surface area for gas exchange.

8. Stomata



A slice through a leaf

- Plants exchange gases too. **Stomata** are tiny pores in a leaf. One of them is called a stoma.
- Most stomata are on the **underside** of the leaf.
- In the light, **carbon dioxide** diffuses in through the stomata. The leaf needs it for photosynthesis.
- **Oxygen** and **water vapour** diffuse out.
- Two **guard cells**, one each side of the pore, open and close each stoma.

Key words

Breathing: moving air into and out of the lungs
Bronchi: two tubes that carry air from the trachea into the lungs
Diaphragm: a sheet of muscle underneath the lungs
Diffusion: particles spreading from a high concentration to a low concentration
Respiration: a chemical reaction in cells that releases energy
Nicotine: the addictive drug in tobacco smoke
Gas exchange: taking in one gas and giving out another
Bronchioles: small tubes inside the lungs
Ribs: bones that make a cage around the lungs
Lung volume: a measure of the amount of air breathed in or out
Asthma: a condition in which the airways sometimes get narrower
Carbon monoxide: a poisonous gas that takes the place of oxygen in the blood
Trachea: the windpipe: carries air from the nose and mouth towards the lungs
Alveoli: tiny air sacs at the ends of the bronchioles
Intercostal muscles: the muscles between the ribs
Breathing rate: the number of breaths taken in one minute
Tar: the sticky substance in tobacco smoke that causes cancer
Stomata: tiny pores in a leaf that let gases in and out

The pictures are illustrations made for this sheet, not real photographs.