Your notes

GCSE Biology: revision notes

Gas exchange in humans and plants

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Start here: oxygen in, carbon dioxide out

- Respiration uses oxygen and makes carbon dioxide, so cells need oxygen in and carbon dioxide out. Gases move across exchange surfaces by diffusion.
- Good gas exchange surfaces have a large surface area, a thin surface (a short diffusion distance), a good blood supply, and they are moist.

The lungs

- Air goes in through the nose and mouth, down the **trachea**, into two bronchi, then into smaller **bronchioles** that end in tiny air sacs called **alveoli**.
- The **trachea** and bronchi are held open by rings of cartilage. Cells lining them make mucus to trap dust and microbes, and cilia sweep the mucus up and out.
- **Alveoli** have walls one cell thick and are covered in capillaries. Oxygen diffuses from the air in the **alveoli** into the blood, and carbon dioxide diffuses from the blood into the **alveoli**.

Breathing

- Breathing in: the external **intercostal muscles** contract and move the ribcage up and out, and the **diaphragm** contracts and flattens. The volume of the chest increases, the pressure falls and air flows in.
- Breathing out: the **intercostal muscles** and the **diaphragm** relax. The volume of the chest decreases, the pressure rises and air is pushed out.
- During exercise, breathing gets faster and deeper to bring in more oxygen and remove more carbon dioxide.

Smoking

- Tar coats the airways and damages the cilia, so mucus builds up. Tar contains carcinogens that can cause lung cancer.
- Carbon monoxide combines with haemoglobin in red blood cells, so the blood carries less oxygen.
- Smoking can lead to bronchitis, emphysema (damaged **alveoli**, so less surface area) and heart disease.

Gas exchange in plants

- Gases enter and leave a leaf through **stomata**, mainly on the lower surface, and diffuse through the air spaces in the spongy mesophyll.
- In bright light, photosynthesis is faster than respiration, so a leaf takes in carbon dioxide and gives out oxygen. In the dark only respiration happens, so it takes in oxygen and gives out carbon dioxide.
- **Hydrogencarbonate indicator** shows this. It starts orange-red, turns yellow when carbon dioxide levels rise and purple when they fall.

Exam tip

- For "how are the **alveoli** adapted?", give each feature and why it helps: thin walls give a short diffusion distance, many **alveoli** give a large surface area, and a good blood supply keeps a steep concentration gradient.

Common mistakes

- Saying the **diaphragm** moves up when you breathe in. It contracts and flattens.
- Saying plants photosynthesise instead of respiring. Plants respire all the time; in the light they photosynthesise as well.

Key terms

Alveoli	Tiny air sacs in the lungs where gas exchange happens.
Diaphragm	A sheet of muscle below the lungs that contracts and flattens when you breathe in.
Intercostal muscles	Muscles between the ribs that move the ribcage during breathing.
Trachea	The windpipe, held open by rings of cartilage.
Bronchioles	The small tubes that branch from the bronchi and end in alveoli.
Stomata	Pores in a leaf, mainly on the lower surface, that let gases in and out.

Your notes

Hydrogencarbonate indicator	An indicator that turns yellow as carbon dioxide rises and purple as it falls.

Quick questions

Cover the answers and test yourself: remembering is what makes it stick.

1. Where does gas exchange happen in the lungs?
2. What happens to the diaphragm when you breathe in?
3. Why are the walls of the alveoli only one cell thick?
4. What does carbon monoxide in cigarette smoke do?
5. What holds the trachea open?
6. Through which part of a leaf do gases mainly enter and leave?
7. What colour does hydrogencarbonate indicator turn when carbon dioxide levels rise?
8. When you breathe out, what happens to the volume of your chest?

Answers

1. In the alveoli
2. It contracts and flattens
3. To give a short diffusion distance
4. Reduces how much oxygen the blood can carry
5. Rings of cartilage
6. Stomata
7. Yellow
8. It decreases

What to do next

Practise 10 questions on this topic

Try 3 exam questions, with mark schemes

Read the lesson, one step at a time

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