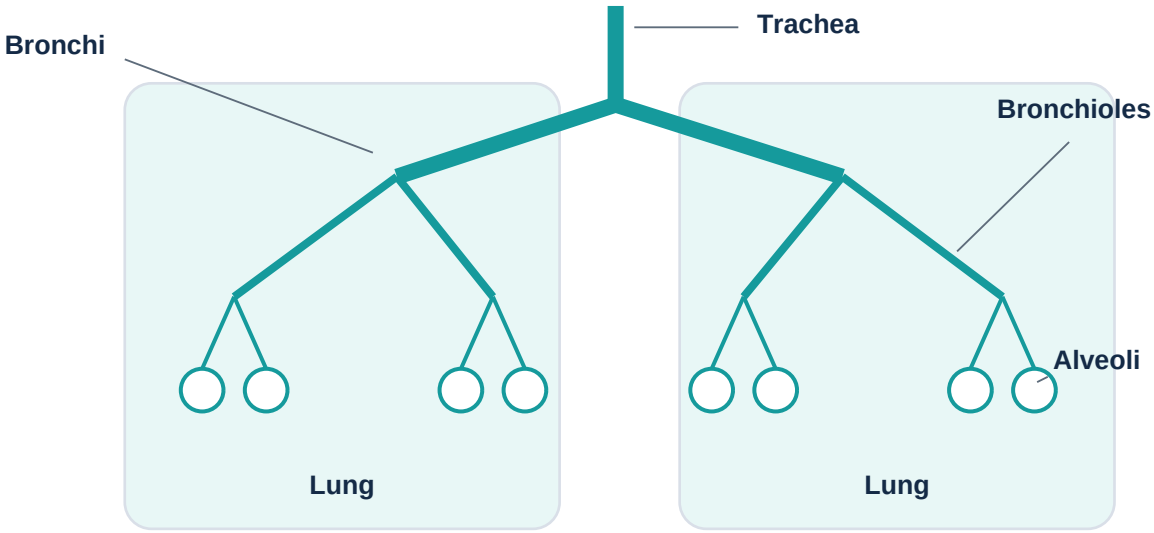
A branching route for air

The lungs contain branching airways, millions of small air sacs and a rich blood supply. Their arrangement brings air close to blood without mixing the two directly.

1. FROM ONE TRACHEA TO MANY EXCHANGE SURFACES



Branching map, not to scale; only a few airways and alveoli are shown.

2. TRACE THE AIR PATH

Air entering through the nose or mouth reaches the trachea, which divides into two main bronchi, one entering each lung. Repeated branching produces smaller bronchi and then bronchioles. The smallest respiratory passages lead to alveoli. Exhaled air returns along the airway system.

3. NAME THE LEVEL OF ORGANISATION

A lung is an organ, not one empty balloon. The trachea, bronchi and bronchioles form an airway tree within and leading into the lungs. Alveoli are microscopic air sacs at its exchange region; they are not another name for an entire lung.

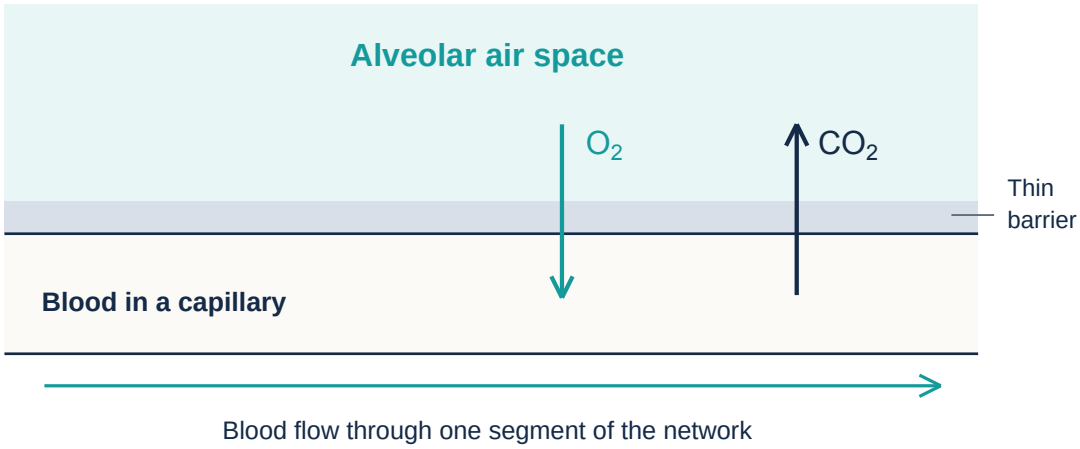
Airway structure and branching: OpenStax Anatomy & Physiology 2e, section 22.1.
Lungs and airways: NHLBI, The Respiratory System.

Scope: Cambridge Biology 9700 syllabus, section 9.1, outcome 1, p. 29.

Air and blood meet at a barrier

Alveoli lie beside a dense network of pulmonary capillaries. The air spaces and blood vessels remain separate: oxygen and carbon dioxide diffuse across their thin walls.

1. ZOOM IN: A SMALL PATCH OF AN ALVEOLUS



Flattened cross-section: the shaded barrier represents the alveolar and capillary walls. Thickness is exaggerated; most of the alveolus and capillary network is outside this view.

2. LINK EACH FEATURE TO EXCHANGE

Many alveoli provide a large total surface area. Their thin walls and the thin capillary walls create a short diffusion distance. A dense capillary network brings blood close to the air over a wide area. Ventilation renews alveolar air, while blood flow carries exchanged gases away.

3. FOLLOW THE GASES, NOT THE WHOLE AIR MIXTURE

In healthy lungs, oxygen moves from alveolar air into arriving blood; carbon dioxide moves in the opposite direction. Each gas diffuses down its own partial-pressure gradient. Blood stays inside capillaries: neither red blood cells nor a stream of air normally crosses into the other compartment.

Diffusion, partial pressures and exchange barrier: OpenStax, section 22.4.
Alveoli and the blood supply: NHLBI, The Lungs.

Scope: Cambridge Biology 9700 syllabus, section 9.1, outcome 1, p. 29.

Recognise the parts and their jobs

Identify the larger airway first, then trace progressively smaller branches to the exchange surface. Keep the air route distinct from the blood route around it.

1. SIX STRUCTURES TO RECOGNISE

Lungs	Paired organs containing airways, alveoli and vessels.
Trachea	Single main airway that divides into two main bronchi.
Bronchi	Large branches: one main bronchus enters each lung.
Bronchioles	Smaller airways branching throughout the lungs.
Alveoli	Tiny air sacs forming the main gas exchange surfaces.
Capillary network	Fine blood vessels closely surrounding alveoli.

2. THREE PROCESSES, NOT THREE SYNONYMS

Ventilation is the movement of air into and out of the lungs. Gas exchange is the diffusion of oxygen and carbon dioxide between air and blood. Cellular respiration consists of energy-releasing reactions in cells; aerobic respiration uses oxygen. Breathing supplies gas but is not itself cellular respiration.

3. USE THE CORRECT NAMES

One bronchus; two or more bronchi. One alveolus; many alveoli. A bronchiole is a smaller airway, not a blood vessel. A capillary carries blood, not inhaled air.

Structural overview: NHLBI, The Respiratory System.
Oxygen supply and cellular energy: NHLBI, The Lungs.

Scope: Cambridge Biology 9700 syllabus, section 9.1, outcome 1, p. 29.