# B3.1 Gas exchange

What the Cell · DP Biology · note-taking sheet · animal statements B3.1.1–6

**Name** _____ **Date** _____

**How to use this sheet:** go through the slides and videos with it, then close them and write from memory. Use your own words and add page numbers from the book where you want more detail.

**Guiding questions.** What adaptations let multicellular organisms exchange gases? How do flowering plants and mammals differ, and resemble each other, in gas exchange? (The plant half is in Plant Systems.)

## B3.1.1 Why every organism needs gas exchange

Textbook pp. 273–274

Why do cells need a constant supply of oxygen and removal of carbon dioxide?

Give two reasons why a large animal cannot rely on diffusion across its body surface.

## B3.1.2 What makes a good gas-exchange surface

Textbook p. 274

| Property | How it helps gases move |
|---|---|
| Permeable | |
| Thin | |
| Moist | |
| Large surface area | |

## B3.1.3 Keeping concentration gradients going

Textbook p. 275

Why would diffusion stop if the gradient were not maintained?

| Feature | How it maintains the gradient |
|---|---|
| Dense network of blood vessels | |
| Continuous blood flow | |
| Ventilation with air (lungs) | |
| Ventilation with water (gills) | |

## B3.1.4 How mammalian lungs are adapted

Textbook pp. 276–279

Draw two or three alveoli with their capillaries. Annotate: **one-cell-thick wall**, **moist lining**, **surfactant**, **capillary bed**, **bronchiole**, direction of **$O_2$** and **$CO_2$**.

| Adaptation | Why it matters |
|---|---|
| Surfactant | |
| Branched bronchioles | |
| Extensive capillary beds | |
| Many small alveoli | |

Why is it wrong to say that the round shape of alveoli gives the large surface area?

# B3.1.5 How the lungs are ventilated

Textbook pp. 279–281

| | **Inhalation** | **Exhalation** |
|---|---|---|
| Diaphragm | | |
| Abdominal muscles | | |
| External intercostals | | |
| Internal intercostals | | |
| Ribcage | | |
| Thorax volume | | |
| Pressure in the thorax | | |
| Air flow | | |

Why are different muscles needed to move the ribs in opposite directions?

## B3.1.6 Measuring lung volumes

Textbook pp. 281–283

Sketch a spirometer trace with normal breaths, one deepest breath in and one fullest breath out. Label **tidal volume**, **inspiratory reserve**, **expiratory reserve** and **vital capacity**.

Define each term, and write the equation for vital capacity.

Record your own results from the practical.

| **Tidal volume / $dm^3$** | **Vital capacity / $dm^3$** | **Ventilation rate / breaths per minute** |
|---|---|---|
| | | |

## Before you finish

Tick the ones you can explain without notes. Circle anything to ask about.

- ☐ Why size makes gas exchange harder
- ☐ The four properties of an exchange surface
- ☐ Three ways gradients are maintained
- ☐ Four adaptations of the lungs
- ☐ What surfactant does and why
- ☐ Muscle actions in inhalation
- ☐ Muscle actions in exhalation
- ☐ Cause and effect in ventilation
- ☐ Reading a spirometer trace
- ☐ The vital capacity equation