

PUPIL WORKBOOK

RESPIRATORY SYSTEM

Edexcel GCSE PE

COMPONENT 1: FITNESS AND BODY SYSTEMS



LEARN



UNDERSTAND



PRACTISE



APPLY

Name: _____

Class: _____



CLASSROOM 42

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1

LEARNING JOURNEY & CONFIDENCE CHECK

RESPIRATORY SYSTEM – EDEXCEL GCSE PE



In this workbook you will learn to identify the main parts of the respiratory system, compare inhaled and exhaled air, explain tidal volume and vital capacity, describe gaseous exchange at the alveoli, and explain how the respiratory and cardiovascular systems work together during exercise.



MY CONFIDENCE CHECK	Not yet	Almost	Secure
1 I can identify the lungs, bronchi, bronchioles, alveoli and diaphragm.	☐	☐	☐
2 I can compare inhaled and exhaled air.	☐	☐	☐
3 I can explain tidal volume and vital capacity.	☐	☐	☐
4 I can explain gaseous exchange at the alveoli.	☐	☐	☐
5 I can explain how the cardio-respiratory system works together during exercise.	☐	☐	☐



EDEXCEL SPECIFICATION LINKS

- **Component 1: Fitness and Body Systems**
- **Applied anatomy and physiology:** Know and understand the structure and function of the respiratory system.
- **Gaseous exchange:** Understand gaseous exchange at the alveoli.
- **Tidal volume:** Understand tidal volume.
- **Vital capacity:** Understand vital capacity.
- **Cardio-respiratory function:** Understand how the respiratory and cardiovascular systems work together during exercise.



THE RESPIRATORY SYSTEM

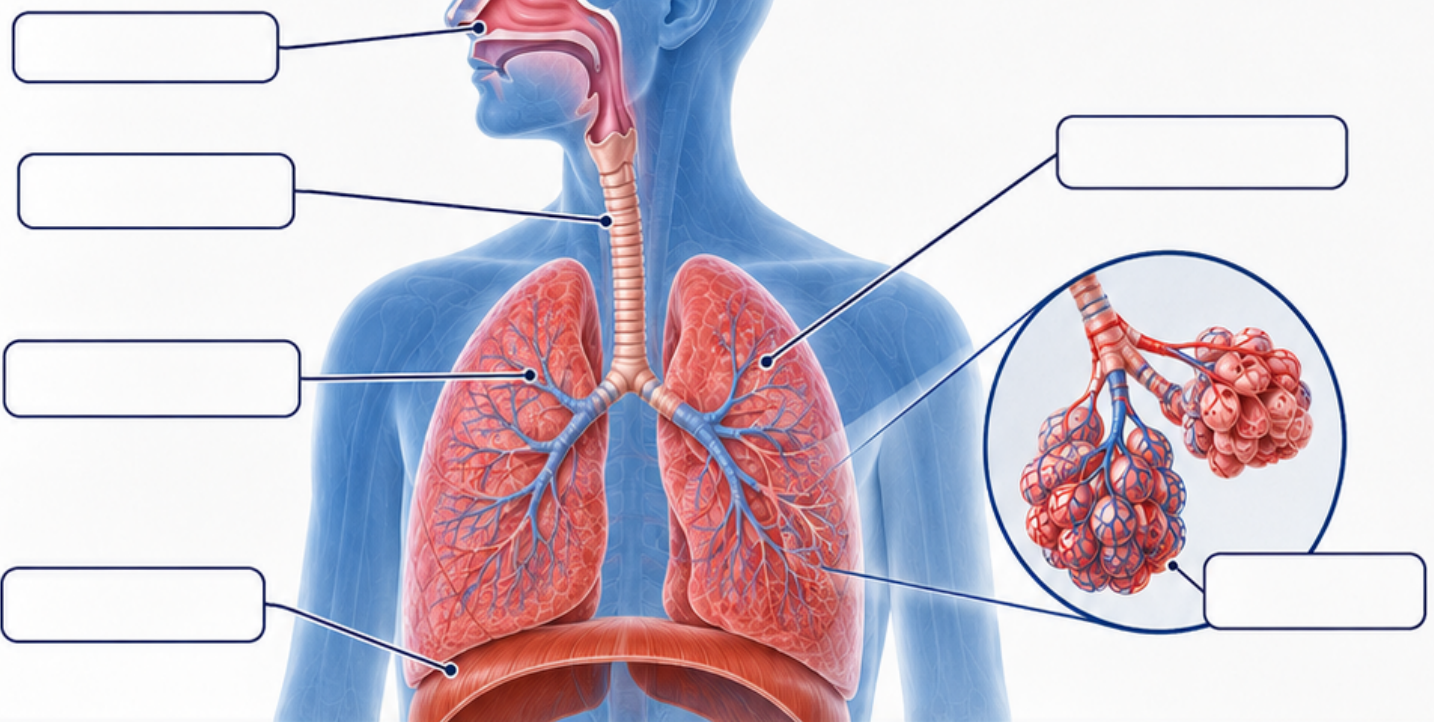
MAIN STRUCTURES AND PATHWAY OF AIR

1 LABEL THE DIAGRAM

Use the word bank to label the main structures.

WORD BANK

mouth/nose trachea lungs bronchi
bronchioles alveoli diaphragm



2 PATHWAY OF AIR

Put the structures below in the correct order that air travels through the respiratory system.

- | | | |
|----------------------|----------|----------------------|
| A nose/mouth | 1 | <input type="text"/> |
| B trachea | 2 | <input type="text"/> |
| C bronchi | 3 | <input type="text"/> |
| D bronchioles | 4 | <input type="text"/> |
| E alveoli | 5 | <input type="text"/> |



3 APPLY



Which structure is the main site of gaseous exchange?
Explain your answer.



INHALED AND EXHALED AIR

What changes as air moves through the body?



ACTIVITY 1: Complete the table.

Component	Inhaled air (Air in)	Exhaled air (Air out)	What happens? (Explain the change)
O₂ OXYGEN (O ₂)	High	Lower	_____
CO₂ CARBON DIOXIDE (CO ₂)	Low	Higher	_____
N₂ NITROGEN (N ₂)	About the same		_____
WATER VAPOUR (H ₂ O)	Lower		_____

ACTIVITY 2: Answer the questions.

1 Why does exhaled air contain less oxygen than inhaled air?

2 Why does exhaled air contain more carbon dioxide, especially during exercise?

ACTIVITY 3: Applied sport.

A hockey player is working hard in a match.

Explain why the changes in inhaled and exhaled air are important.



TIDAL VOLUME AND VITAL CAPACITY

UNDERSTANDING BREATHING VOLUMES



Tidal volume = the amount of air inhaled or exhaled in one normal breath.

Vital capacity = the maximum amount of air that can be exhaled after a maximal inhalation.



1 ACTIVITY 1: MATCH IT!

Match the key term to the correct definition.

Tidal volume

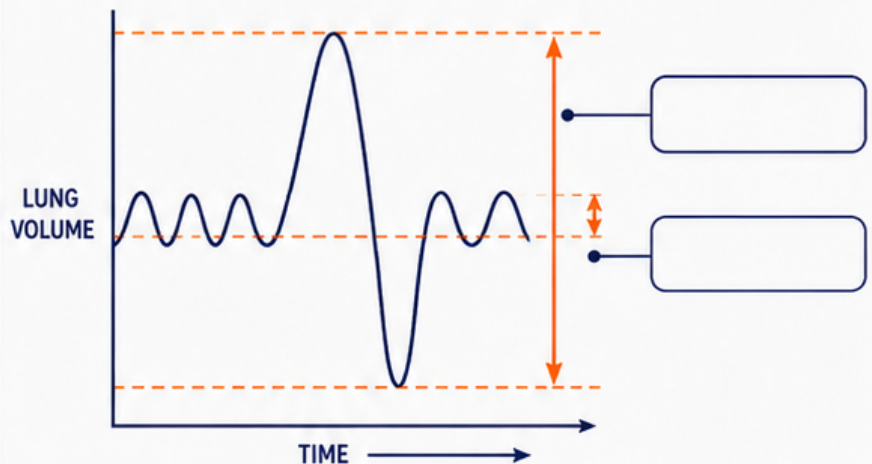
The maximum amount of air that can be exhaled after a maximal inhalation.

Vital capacity

The amount of air inhaled or exhaled in one normal breath.

2 ACTIVITY 2: LABEL THE GRAPH

Write the correct term in each box on the breathing trace.



3 ACTIVITY 3: COMPARE

How does tidal volume change during exercise?

4 ACTIVITY 4: THINK

Why is a large vital capacity useful for an endurance athlete?

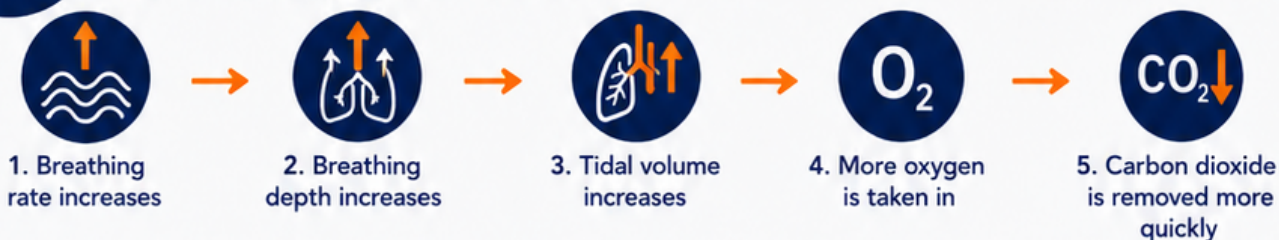
BREATHING DURING EXERCISE

WHY BREATHING RATE AND DEPTH INCREASE



When you start exercising, your body needs more oxygen to release energy for working muscles. At the same time, more carbon dioxide is produced and must be removed.

Short-term response to exercise:



AT REST



DURING EXERCISE



ACTIVITY 1: COMPLETE THE SENTENCES

Use the information on this page to complete the sentences below.

- 1 Breathing rate increases during exercise because ...

- 2 Breathing depth increases because ...

- 3 This helps the performer by ...



ACTIVITY 2: COMPARE

Look at the breathing traces above.

Identify two differences between breathing at rest and during exercise.

1. _____

2. _____

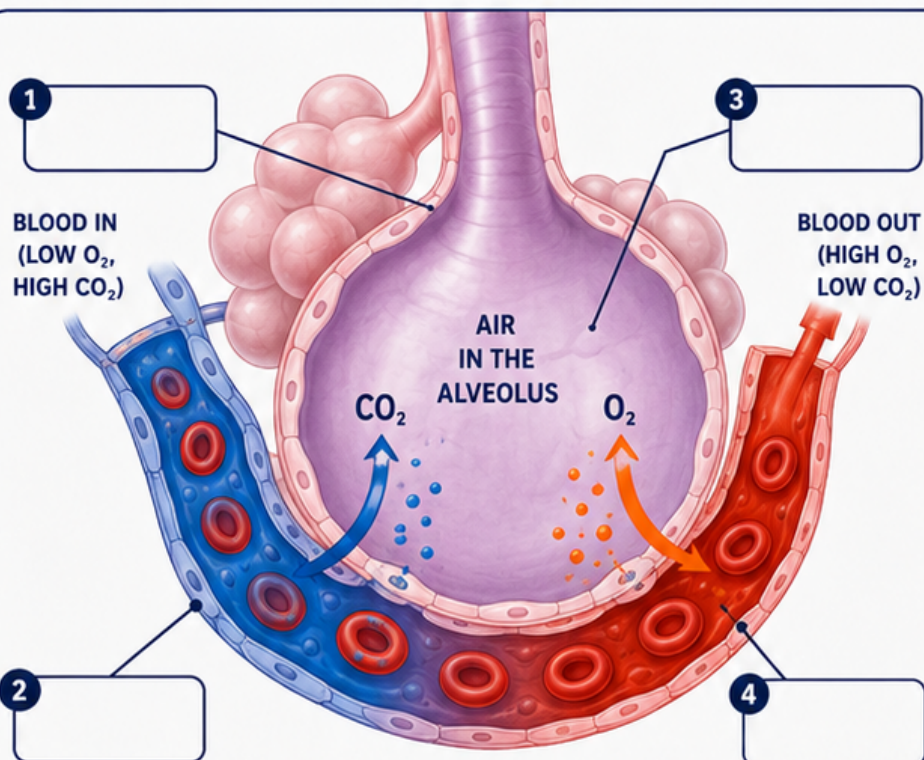
ACTIVITY 3: APPLIED QUESTION (3 MARKS)

Explain why a 1500 m runner needs a higher breathing rate and depth during a race.

**3
MARKS**

GASEOUS EXCHANGE AT THE ALVEOLI

How oxygen enters the blood and carbon dioxide leaves it.



GASEOUS EXCHANGE HAPPENS BY DIFFUSION ACROSS THE THIN ALVEOLI AND CAPILLARY WALLS.

WHY ALVEOLI ARE WELL ADAPTED



Large surface area
Lots of space for gas exchange to take place.



Thin walls
A very short distance for gases to diffuse across.



Moist lining
Gases dissolve in the moisture, helping them diffuse.



Rich blood supply / many capillaries
Brings blood close to the alveoli and carries gases away quickly.

ACTIVITY 1

Label the diagram using the word bank.

WORD BANK

alveolus oxygen
capillary carbon dioxide

Write the correct word next to each number (1–4).

- 1 _____
- 2 _____
- 3 _____
- 4 _____

ACTIVITY 2

Match each adaptation to how it helps gas exchange.

- | | |
|--|--|
| 1 Large surface area | A Shorter distance for diffusion. |
| 2 Thin walls | B Gases dissolve, making diffusion easier. |
| 3 Moist lining | C More blood close by to bring and remove gases quickly. |
| 4 Rich blood supply / many capillaries | D More space for gases to diffuse. |

Write the correct letter (A–D) in the box next to each number.

1	2	3	4

ACTIVITY 3

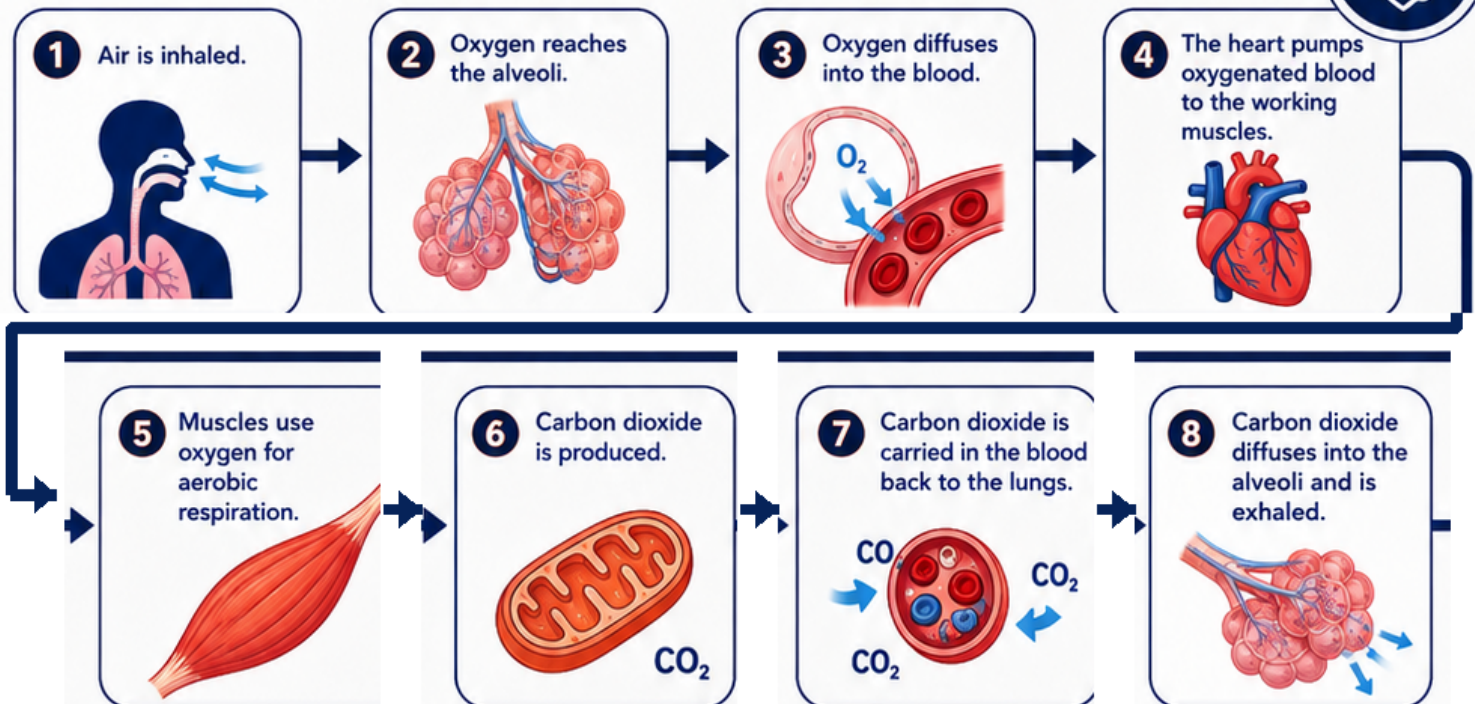
Why is diffusion at the alveoli so important during exercise?

Write 2–4 sentences.

WORKING TOGETHER DURING EXERCISE



HOW THE RESPIRATORY AND CARDIOVASCULAR SYSTEMS WORK TOGETHER



ACTIVITY 1: ORDER THE STEPS

Write the numbers 1–8 to put the steps in the correct order.

- ☐ Carbon dioxide is produced.
- ☐ Carbon dioxide is carried in the blood back to the lungs.
- ☐ Air is inhaled.
- ☐ The heart pumps oxygenated blood to the working muscles.
- ☐ Muscles use oxygen for aerobic respiration.
- ☐ Oxygen diffuses into the blood.
- ☐ Oxygen reaches the alveoli.
- ☐ Carbon dioxide diffuses into the alveoli and is exhaled.



ACTIVITY 2: CONNECT THE SYSTEMS

Explain how the respiratory and cardiovascular systems work together to support a performer during exercise.

How does the respiratory system help?

How does the cardiovascular system help?

Why is it important that both systems work together?



ACTIVITY 3: SPORTING EXAMPLE

Use a **footballer** or **rower** to explain why these systems must work together during exercise.



APPLY IT TO SPORT

RESPIRATORY DEMANDS AT DIFFERENT EXERCISE INTENSITIES

LOW / MODERATE INTENSITY



Steady jogging



Lower oxygen demand



Controlled breathing

VS

HIGH INTENSITY



Sprinting



High oxygen demand



Rapid, deep breathing



1 ACTIVITY 1: COMPLETE THE COMPARISON TABLE

Fill in the table to show how the respiratory system responds at different exercise intensities.

RESPIRATORY RESPONSE	LOW / MODERATE INTENSITY	HIGH INTENSITY
 At higher intensity, muscles need more oxygen.		
 Breathing rate and tidal volume increase.		
 More carbon dioxide must be removed.		
 Faster gas exchange is needed at the alveoli.		

2 ACTIVITY 2: APPLIED SCENARIO

A 400 m runner moves from jogging in the warm-up to racing at full speed. Explain what happens to the respiratory system and why.



3 ACTIVITY 3: 4-MARK EXAM-STYLE QUESTION

Explain why efficient gaseous exchange is important for a performer working at high intensity.

(4 MARKS)



EXAM PRACTICE, MODEL ANSWERS & KEY TERMS

RESPIRATORY SYSTEM – EDEXCEL GCSE PE



1 EXAM PRACTICE

- 1 Identify **two** parts of the respiratory system involved in gaseous exchange. [2]

- 2 State **one** difference between inhaled air and exhaled air. [1]

- 3 Explain what happens to tidal volume during exercise. [2]

- 4 Explain **two** features of alveoli that make gas exchange efficient. [4]

- 5 Using a sporting example, explain how the respiratory and cardiovascular systems work together during exercise. [6]

2 MODEL ANSWER POINTS & KEY TERMS

MODEL ANSWER POINTS – Q4

- Very large surface area due to millions of alveoli.
- Very thin walls (one cell thick) for a short diffusion distance.
- Rich capillary supply to maintain a steep concentration gradient.
- Moist surface so gases can dissolve before diffusing.

MODEL ANSWER POINTS – Q5

- During exercise, muscles need more oxygen and produce more CO_2 .
- Respiratory system increases ventilation (rate and depth of breathing).
- More oxygen enters the lungs and diffuses into the blood.
- Cardiovascular system increases heart rate and stroke volume.
- Blood is pumped faster to working muscles.
- Oxygen is delivered to muscles; CO_2 is transported back to the lungs.
- Systems work together to maintain gas exchange and performance.

KEY TERMS

	lungs
	bronchi
	bronchioles
	alveoli
	diaphragm
O_2	oxygen
CO_2	carbon dioxide
	diffusion
	capillaries
	inhaled air
	exhaled air
	tidal volume
	vital capacity
	gaseous exchange
	cardio-respiratory system