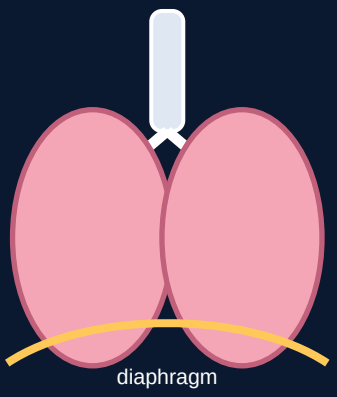
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YEAR 9 • BIOLOGY

Breathing and Gas Exchange

Lungs, ventilation and the alveoli
Homework Worksheet • KS3 • GCSE foundations



Name: _____

Class: _____

Date: _____

Time: about 40 minutes

Total: 45 marks

Score: _____ / 45

Key notes – read these first

- Air enters through the nose and mouth, travels down the **trachea**, into two **bronchi**, then smaller **bronchioles**, and ends in tiny air sacs called **alveoli**.
- **Breathing in:** the diaphragm and intercostal muscles contract, the ribs move up and out, chest volume increases and pressure falls, so air is pushed in.
- **Breathing out:** the muscles relax, the ribs move down and in, volume decreases and pressure rises, so air is pushed out.
- **Gas exchange** happens by **diffusion**: oxygen moves from the alveoli into the blood; carbon dioxide moves from the blood into the alveoli.
- Alveoli are adapted with a **large surface area**, **thin walls** (one cell thick), a **moist lining** and a **good blood supply**.
- Breathing (ventilation) is not the same as respiration. Respiration is the chemical reaction in cells that releases energy.

Instructions

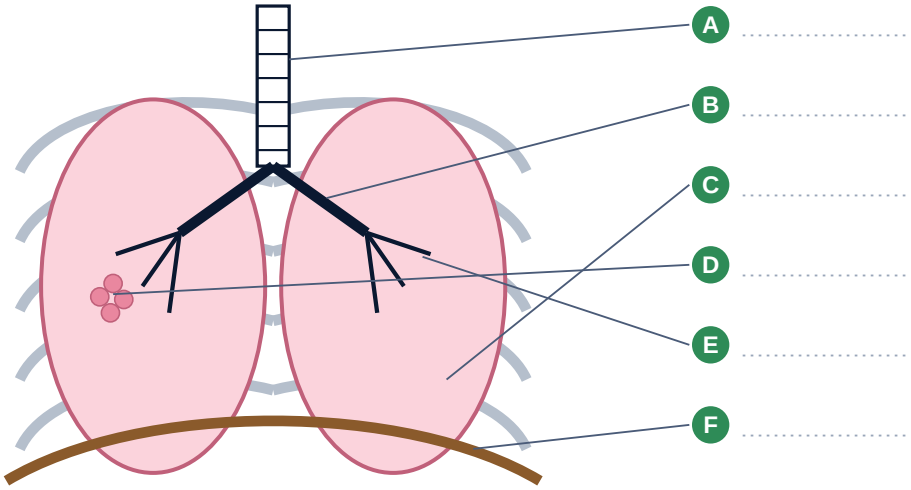
- Answer **all** questions in the spaces provided.
- Use a pencil and ruler for any diagrams.
- The marks for each question are shown in brackets, e.g. [2].
- Read the key notes above if you get stuck.
- Questions marked CHALLENGE stretch you towards GCSE.

Section	Topic	Marks
A	The gas exchange system	14
B	Breathing in and out	12
C	Gas exchange in the alveoli	14
D	Challenge: smoking and lung health	5
	Total	**45**

Section A – The gas exchange system 14 marks

1 The diagram shows the human gas exchange system. Label parts **A** to **F** using the words in the box. [6]

trachea • bronchus • bronchiole • alveoli • lung • diaphragm



2 Complete the sentences using words from the box. Each word is used once. One word is not needed. [4]

alveoli • bronchi • oesophagus • trachea • bronchioles

Air passes down the windpipe, also called the _____. This splits into two tubes called _____. These divide into many smaller tubes called _____, which end in tiny air sacs called _____.

3 The airways are lined with cells that make **mucus** and cells that have tiny hairs called **cilia**.

(a) The trachea has rings of cartilage. Suggest why. [1]

.....

(b) Explain how mucus and cilia help to protect the lungs. [2]

.....

.....

(c) Name the muscles found between the ribs. [1]

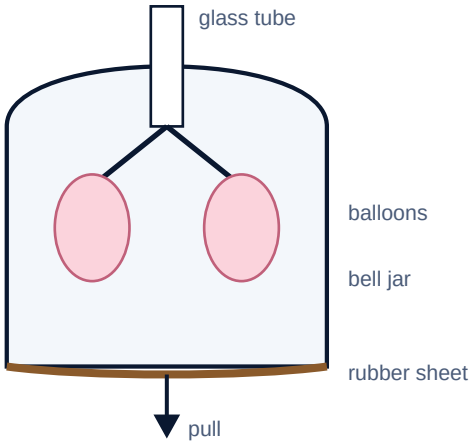
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Section B – Breathing in and out 12 marks

4 Complete the table to compare breathing in and breathing out. The first row has been done for you. [4]

	Breathing in (inhaling)	Breathing out (exhaling)
Diaphragm	*contracts and flattens*	*relaxes and moves up (dome shape)*
Intercostal muscles		
Ribs		
Volume of chest		
Pressure inside chest		

5 A teacher uses a **bell jar model** to show how breathing works.



(a) What do the **balloons** represent? [1]

.....

(b) What does the **rubber sheet** represent? [1]

.....

(c) The rubber sheet is pulled down. Describe and explain what happens to the balloons. Use the words **volume** and **pressure**. [3]

.....

.....

.....

(d) Give **one** way the model is different from a real chest. [1]

.....

6 Amir counted his breaths per minute. At rest he took **14** breaths per minute. After running he took **26** breaths per minute.

(a) Calculate the increase in his breathing rate. [1]

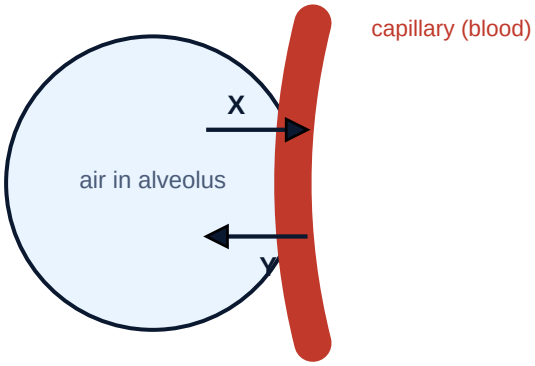
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(b) Explain why his breathing rate increased during exercise. [1]

.....

Section C – Gas exchange in the alveoli 14 marks

7 The diagram shows an alveolus next to a blood capillary. Arrows **X** and **Y** show two gases moving.



(a) Name gas **X**, which moves from the alveolus into the blood. [1]

.....

(b) Name gas **Y**, which moves from the blood into the alveolus. [1]

.....

(c) Name the process that moves these gases. [1]

.....

8 Give **three** ways the alveoli are adapted for gas exchange. For each one, explain how it helps. [6]

Adaptation 1:

.....

.....

Adaptation 2:

.....

.....

Adaptation 3:

.....

.....

9 The table compares inhaled air with exhaled air.

Gas	Inhaled air (%)	Exhaled air (%)
Nitrogen	78	78
Oxygen	21	16
Carbon dioxide	0.04	4
Water vapour	varies	more (saturated)

(a) Which gas shows the biggest **decrease** between inhaled and exhaled air? [1]

.....

(b) How many times more carbon dioxide is there in exhaled air than in inhaled air? [1]

.....

(c) Explain why exhaled air contains less oxygen and more carbon dioxide. [2]

.....

.....

(d) Limewater turns cloudy when carbon dioxide bubbles through it. Which turns limewater cloudy more quickly: inhaled air or exhaled air? [1]

.....

Section D – CHALLENGE: smoking and lung health — 5 marks

10 Cigarette smoke contains **tar**, **carbon monoxide** and **nicotine**.

(a) Tar damages the cilia. Explain why smokers often cough more than non-smokers. [2]

.....

.....

(b) Carbon monoxide stops red blood cells carrying as much oxygen. Suggest why a smoker gets out of breath more quickly when running. [2]

.....

.....

(c) In the disease **emphysema**, the walls of the alveoli break down, leaving fewer, larger air sacs. Explain why this makes gas exchange less efficient. [1]

.....

.....

End of worksheet. Check your answers, then ask your teacher for the mark scheme. Total: 45 marks.