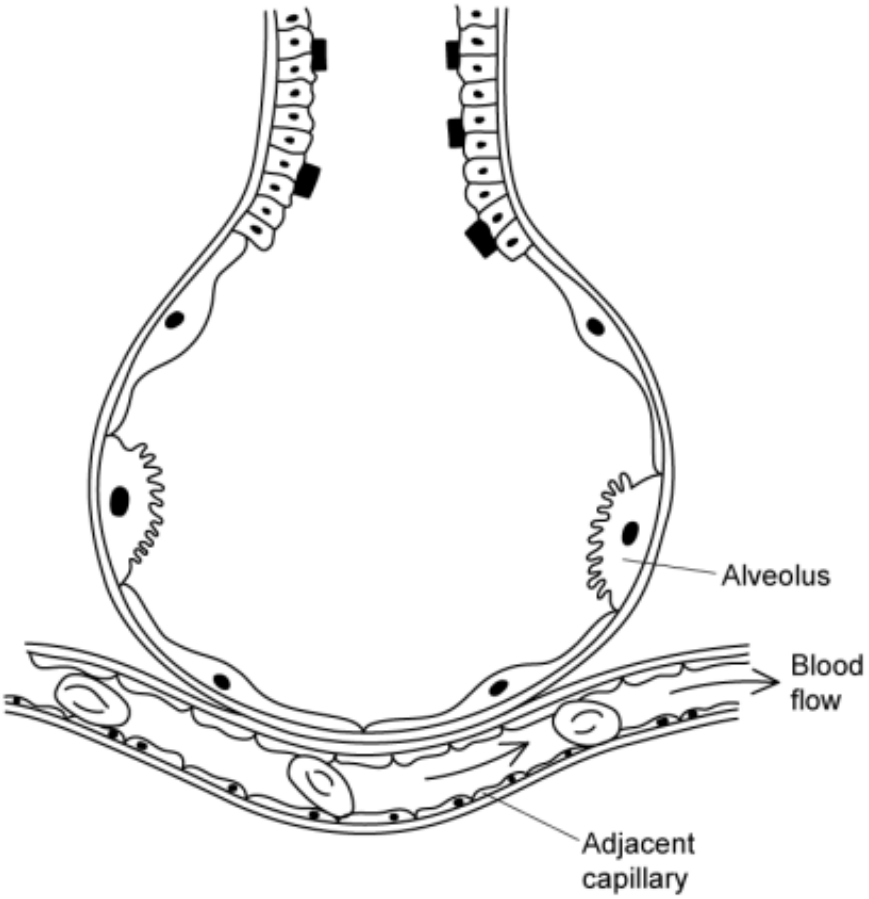
Rosary School – Marj Elhamam
Chapter3: Breathing and Gas Exchange
Past paper questions

Name: _____ Date: ___ / ___ / 2025

Grade: 9 (A, B, C, D) Subject: Biology IG

Question 1:

The diagram below shows an alveolus (plural alveoli).



1 (a) Explain one feature seen in the alveolus in the diagram which allows efficient gas exchange.

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(2 marks)

(b) Using an 'X' on the diagram in part (a), indicate where the oxygen content of the blood is the highest.

(c) The estimated surface area of the lung system of a new-born baby is 4.2 m^2; this is around one twentieth of the overall surface area of a typical adult's lungs.

Calculate the overall surface area of a typical adult's lungs.

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(2 marks)

(d) The following list contains structures found within the breathing system.

structure	order
bronchus	
nasal cavity	
alveolus	1
trachea	
bronchioles	

Complete the table by numbering the structures to show the sequence in which air passes through them during an **exhalation**. The first structure has been numbered for you.

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(1 mark)

(e) Describe the actions of the intercostal muscle and diaphragm during inhalation.

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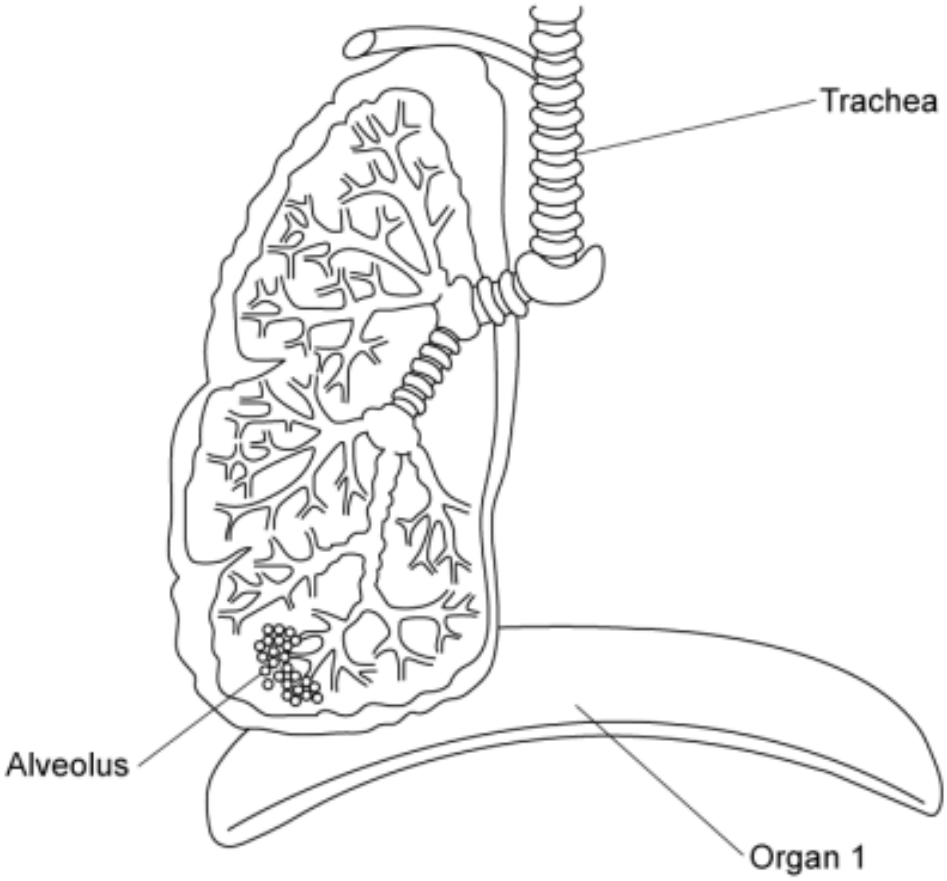
(2 marks)

Question 2:

(a) The diagram below shows some of the structures in the human body involved with the ventilation process.



Identify **Organ 1** in the diagram above.

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(1 mark)

Describe how the contraction of **Organ 1** in part (a) aids the inhalation process.

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(2 marks)

(b)

(c) Other than Organ 1, identify **one** set of muscles involved with ventilation.

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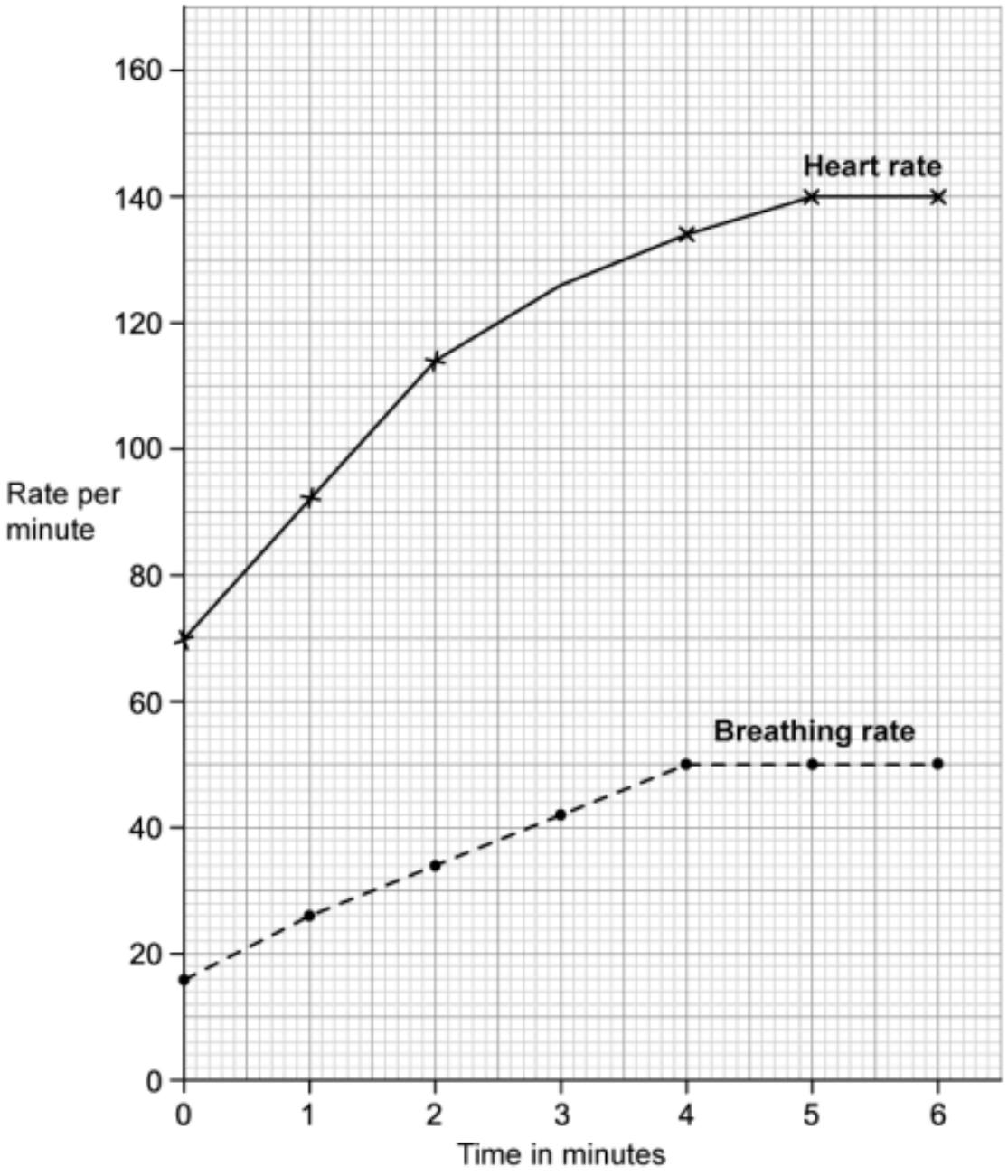
(d) The graph below shows the effect of exercise on heart rate and breathing, or ventilation, rate. Exercise started at 0 minutes during the investigation.



(i) Calculate the change in breathing rate between 0 and 4 minutes.

(2)

(i) Calculate the change in breathing rate between 0 and 4 minutes.

(2)

(ii) Explain the change in breathing rate that occurs during exercise.

(ii) Explain the change in breathing rate that occurs during exercise.

(2)

(iii) The individual in the investigation stopped exercising after 6 minutes.

Predict how this would affect the breathing rate line shown on the graph.

(2)

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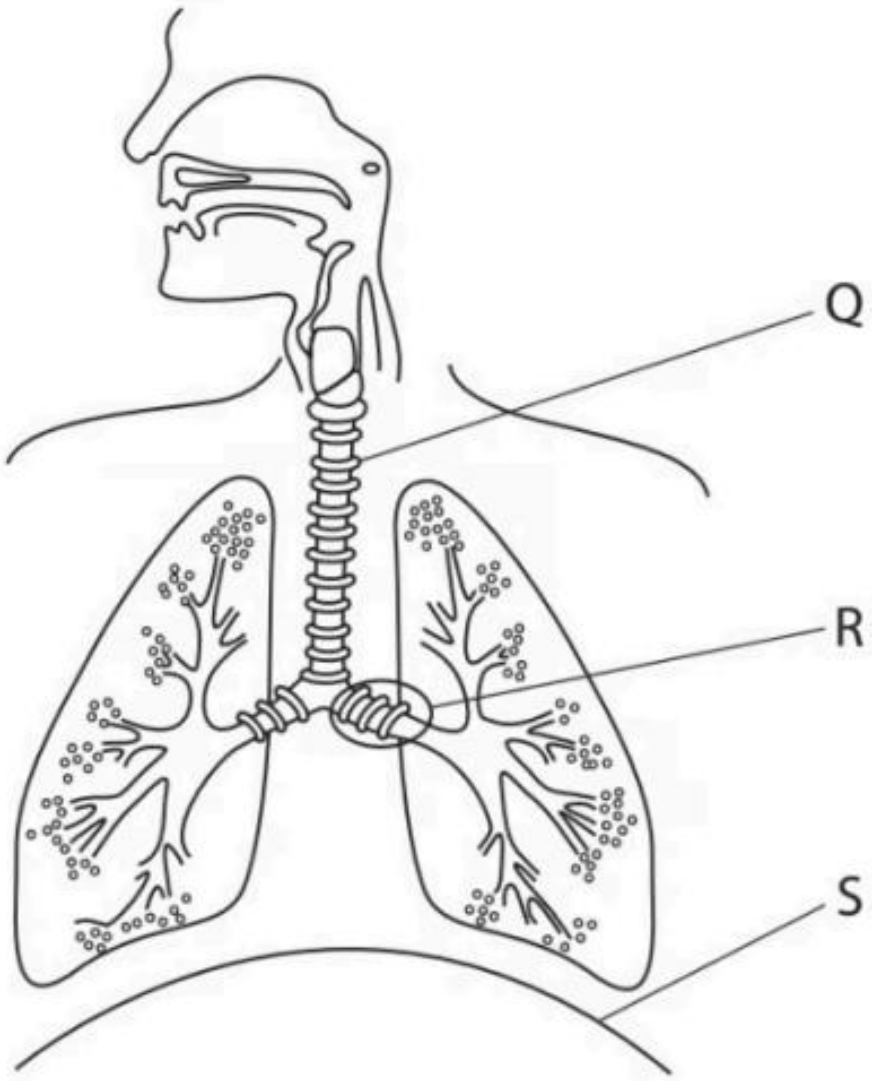
(6 marks)

Question 3:

(a) The diagram shows the human thorax.



(i) Which of these are structures Q and R?

(1)

		Q	R
☐	**A**	bronchiole	trachea
☐	**B**	bronchus	trachea
☐	**C**	trachea	bronchiole
☐	**D**	trachea	bronchus

(ii) Explain how structure S helps a person to exhale.

(3)

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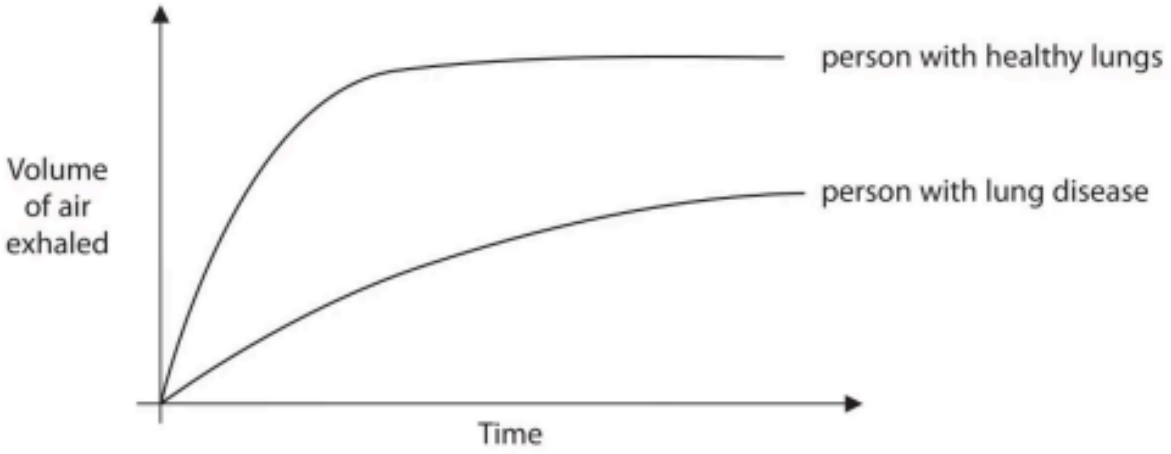
(4 marks)

(b) The graph shows how the volume of air exhaled varies with time during one breath.

This is shown for a person with lung disease and a person with healthy lungs.



Explain why a person with lung disease is often breathless and unable to exercise.

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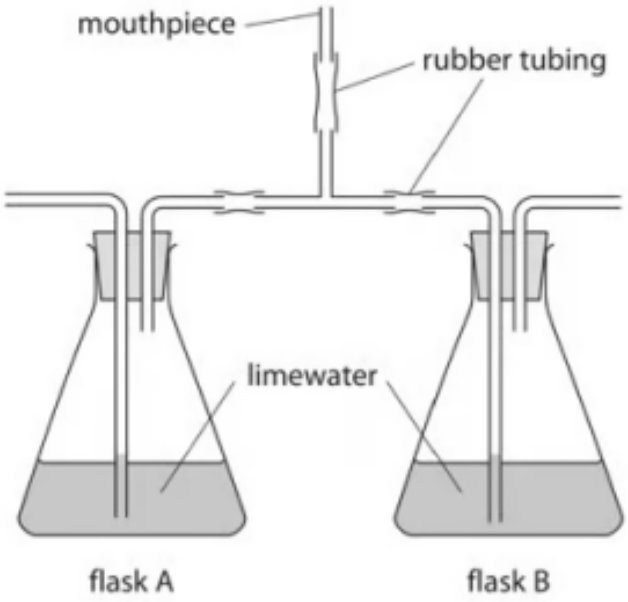
(3 marks)

Question 4:

(a) The diagram shows apparatus a student uses to compare inhaled and exhaled air.



The student breathes into and out of the mouthpiece for one minute.

(i) Explain which flask exhaled air passes through.

(2)

(ii) Explain the changes that will happen in the limewater in flask A and in flask B.

(2)

(iii) The student uses limewater to compare the composition of exhaled and inhaled air.

Suggest an alternative substance that they could use.

(1)

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(5 marks)

(b) Describe the role of the diaphragm and the intercostal muscles in inhalation.

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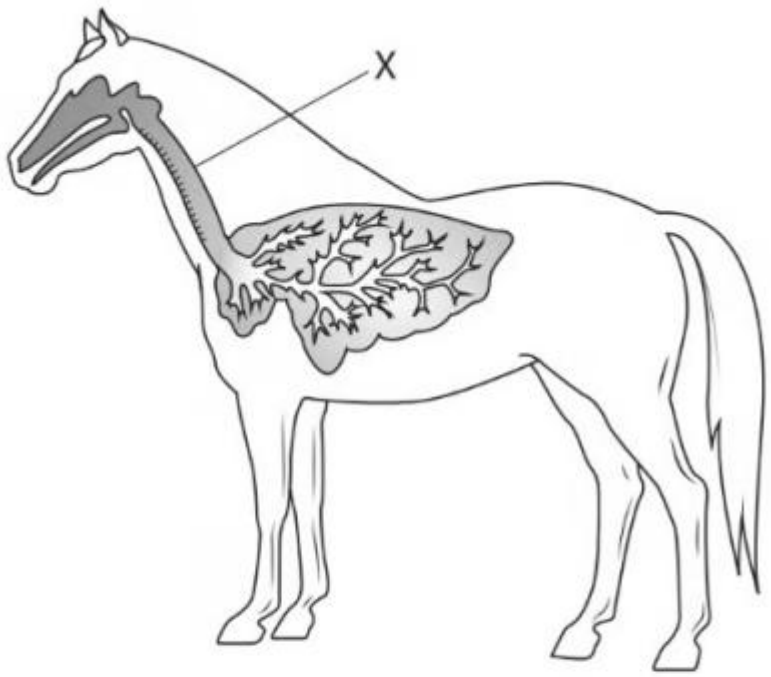
(4 marks)

Question 5:

(a) The diagram shows the location of the lungs in a horse.



(i) The part labelled **X** is the:

(1)

- ☐ **A** bronchiole
- ☐ **B** bronchus
- ☐ **C** oesophagus
- ☐ **D** trachea

(iii) Which row of the table describes what happens when the horse breathes in?

		Diaphragm	External intercostal muscles
☐	**A**	contracts	contract
☐	**B**	contracts	relax
☐	**C**	relaxes	contract
☐	**D**	relaxes	relax

(b) The table shows the percentage of total blood flow in different body parts of a horse at rest and when running.

Body part	Percentage of total blood flow (%)	
	At rest	When running
leg muscle	15	82
intestine	30	3

Comment on the changes in the percentage of total blood flow in these body parts.

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(4 marks)

(c) The horse breathes faster and deeper when running.

Explain why the horse continues to breathe faster and deeper for a period of time after it has stopped running.

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(2 marks)

Question 6:

(a) The data in the table were collected in Japan during a seven-year study.

Scientists collected data on the age of mothers and whether they smoked during pregnancy.

They also recorded the percentage of the babies that had a low birth mass.

Age of mother in years	Data for mothers who did not smoke during pregnancy		Data for mothers who did smoke during pregnancy	
	Number of mothers	Percentage of babies with low birth mass	Number of mothers	Percentage of babies with low birth mass
19 and under	1331	11.5	356	16.0
20-24	11243	9.8	1677	13.2
25-29	24099	9.0	2211	13.3
30-34	28695	9.2	1847	14.5
35-39	16537	10.5	934	21.1
40 and over	3242	12.3	181	22.1

(i) Calculate the percentage of mothers aged 19 years and under who smoked during pregnancy.

(2)

(ii) Determine the ratio of non-smokers to smokers used in the study.

Give the ratio as the nearest whole number (n) in the form n:1

(2)

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(b) A student examines this data and concludes that smoking is the main factor that causes low birth mass.

Use the data and your own biological knowledge to comment on this conclusion.

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(6 marks)