

Gas exchange in humans: practice questions

7 questions • 24 marks • mark scheme at the back

For Pearson Edexcel International GCSE Biology 4BI1 and Science (Double Award) 4SD0. **Biology only** is not in the Double Award and is only examined on Paper 2.

Name

Total / 24

1 What is the function of the pleural membranes? [1 mark]

- A. ☐ They make mucus to trap dust
- B. ☐ They allow the lungs to move with little friction
- C. ☐ They carry oxygen to the alveoli
- D. ☐ They keep the trachea open

2 Name the structure of the thorax that: (a) is a sheet of muscle under the lungs; (b) carries air from the trachea into each lung; (c) are the tiny air sacs where gas exchange takes place. [3 marks]

3 Explain how the intercostal muscles and the diaphragm cause air to enter the lungs. [4 marks]

4 Explain how two features of the alveoli make gas exchange efficient. [4 marks]

- 5** A student counts 15 breaths in one minute at rest. Straight after exercise she counts 42 breaths in two minutes. Calculate the percentage increase in her breathing rate after exercise. **[3 marks]**

Answer =

[illegible]

- 6** A student breathes out through limewater before and after exercise. The limewater turns cloudy faster after exercise. Explain this result. **[3 marks]**

[illegible]

- 7** Describe and explain the effects of smoking on the lungs and the circulatory system. **[6 marks]**

[illegible]

Mark scheme

One mark for each point unless a maximum is given. Words in brackets are not needed for the mark.

1. [1]

B B (1)

2. [3]

- (a) diaphragm (1)
- (b) bronchus / bronchi (1)
- (c) alveoli (1)

3. [4]

- intercostal muscles contract, so ribs move up and out (1)
- diaphragm contracts and flattens (1)
- volume of the thorax increases (1)
- pressure in the thorax decreases (below atmospheric pressure) so air moves in (1)

4. [4]

- walls one cell thick (1) giving a short diffusion distance (1)
- many alveoli (1) giving a large surface area (1)
- good blood supply / many capillaries (1) maintains a steep concentration gradient (1)
- moist lining (1) so gases can dissolve (1)
- Max 4

5. [3]

- breathing rate after exercise = $42 \div 2 = 21$ breaths per minute (1)
- increase = $21 - 15 = 6$ (1)
- percentage increase = $6 \div 15 \times 100 = 40\%$ (1)
- allow full marks for the correct answer with no working

6. [3]

- limewater turns cloudy when carbon dioxide is present (1)
- exercising muscles respire faster / more respiration (1)
- so more carbon dioxide is produced and breathed out (1)

7. [6]

Level 3 5-6	Describes and explains effects on both the lungs and the circulatory system, naming the harmful substances and linking each to its effect, including coronary heart disease.
Level 2 3-4	Describes effects on both systems with some explanation, or explains several effects on one system, with some named substances.
Level 1 1-2	Gives simple statements, such as smoking causes lung cancer or heart disease, with little explanation.

Indicative content

- tar damages / destroys cilia, so mucus and bacteria are not removed, causing infections and bronchitis
- tar contains carcinogens that cause lung cancer
- emphysema: alveoli walls break down, reducing the surface area for gas exchange, so breathlessness
- carbon monoxide combines with haemoglobin, so red blood cells carry less oxygen
- heart has to work harder to deliver oxygen
- nicotine increases heart rate and blood pressure
- chemicals in smoke damage artery walls, so fatty deposits build up / blood clots form more easily
- coronary arteries become narrowed by fatty deposits, so less blood to the heart muscle, causing coronary heart disease and heart attack