CLASS 11 BIOLOGY EXTRA QUESTIONS

Class 11 Biology Chapter 14 Breathing and Exchange of Gases – Extra Questions with Answers

Extra practice questions for Class 11 Biology Chapter 14 (Breathing and Exchange of Gases), beyond the textbook. These Class 11 Biology Chapter 14 important questions are handy for last-minute exam practice.

Contents

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Very Short Answer Questions (1 mark)

Q1. What is the main muscle involved in breathing?
Ans: Diaphragm.

Q2. What percentage of CO_2 is transported as bicarbonate ions?
Ans: About 70%.

Q3. What law governs the pressure-volume relationship during breathing?
Ans: Boyle's Law.

Q4. Where is the respiratory rhythm centre located?
Ans: Medulla oblongata.

Q5. What is tidal volume?
Ans: The volume of air inspired or expired during a normal (quiet) breath, approximately 500 mL.

Short Answer Questions (2–3 marks)

Q6. Describe the process of inspiration.
Ans: The diaphragm contracts and flattens, external intercostal muscles contract, increasing thoracic cavity volume, which decreases pulmonary pressure below atmospheric pressure, causing air to flow into the lungs.

Q7. Explain how oxygen and carbon dioxide are exchanged at the alveoli.
Ans: Gases diffuse across the thin alveolar membrane along their partial pressure gradients: O_2 moves from the alveoli (higher pO_2) into the blood (lower pO_2), and CO_2 moves from the blood (higher pCO_2) into the alveoli (lower pCO_2).

Q8. What is the main factor that stimulates the respiratory rhythm centre to increase breathing rate?
Ans: An increase in blood CO_2 concentration (and associated decrease in pH), rather than a decrease in O_2 levels.

Higher-Order Thinking / Application Questions

Q9. Explain why the respiratory centre in the medulla oblongata is primarily sensitive to blood CO_2 levels rather than O_2 levels, discussing the physiological advantage of this arrangement.
Ans: Under normal physiological conditions, the human body maintains a relatively large reserve of oxygen bound to haemoglobin (oxyhaemoglobin saturation typically remains high, around 95-98%, even during moderate exertion), meaning blood O_2 levels tend to change relatively little and relatively slowly under most everyday circumstances. In contrast, CO_2 is produced continuously as a metabolic byproduct of cellular respiration, and even small changes in metabolic rate (such as during exercise) cause proportionally much larger and more immediate changes in blood CO_2 concentration, which also directly and rapidly affects blood pH (since CO_2 combines with water to form carbonic acid, which dissociates into H^+ and bicarbonate ions). Because CO_2/pH levels change more sensitively, rapidly, and proportionally with the body's actual metabolic and respiratory needs than O_2 levels do, using CO_2 (via pH-sensitive chemoreceptors) as the primary trigger for adjusting breathing rate and depth provides a much more responsive, fine-tuned, and

physiologically relevant regulatory mechanism for matching ventilation to the body's real-time metabolic demand, compared to relying on the comparatively sluggish and less sensitive changes in O_2 levels.

Q10. Explain why haemoglobin's oxygen-binding affinity changes with pH and CO_2 concentration (the Bohr effect), and describe why this is physiologically beneficial for oxygen delivery to actively respiring tissues.
Ans: The Bohr effect describes how haemoglobin's affinity for oxygen decreases as CO_2 concentration increases and/or pH decreases (becomes more acidic), which occurs because increased CO_2 and H^+ ions bind to haemoglobin at sites other than the oxygen-binding site, inducing a conformational change in the haemoglobin molecule that reduces its oxygen-binding affinity, promoting oxygen release. This is physiologically advantageous because actively respiring tissues (such as contracting muscles during exercise) have a high metabolic rate, producing large amounts of CO_2 as a byproduct of cellular respiration, which locally lowers the pH (more acidic) and raises CO_2 concentration in the surrounding blood capillaries. As blood passes through these metabolically active tissues, this local increase in CO_2/decrease in pH triggers the Bohr effect, reducing haemoglobin's oxygen affinity precisely at the tissues that need oxygen the most, causing haemoglobin to release more of its bound oxygen exactly where and when it is most urgently required. This elegant physiological feedback mechanism ensures that oxygen delivery is automatically enhanced in proportion to a tissue's actual metabolic activity and oxygen demand, without requiring any conscious or separate neural regulation for this fine-tuned, localized oxygen delivery adjustment.

Class 11 Biology Chapter 14 – Solutions and Notes

For complete step-by-step answers and a quick summary, check the Class 11 Biology Chapter 14 Solutions and Class 11 Biology Chapter 14 Revision Notes.

See also: Chapter 1 | Chapter 2 | Chapter 3 | Chapter 4 | Chapter 5 | Chapter 6 | Chapter 7 | Chapter 8 | Chapter 9 | Chapter 10 | Chapter 11 | Chapter 12 | Chapter 13 | Chapter 14

Practice more: Chapter 1 | Chapter 2 | Chapter 3 | Chapter 4 | Chapter 5 | Chapter 6 | Chapter 7 | Chapter 8 | Chapter 9 | Chapter 10 | Chapter 11 | Chapter 12 | Chapter 13

Quick revision: Chapter 1 | Chapter 2 | Chapter 3 | Chapter 4 | Chapter 5 | Chapter 6 | Chapter 7 | Chapter 8 | Chapter 9 | Chapter 10 | Chapter 11 | Chapter 12 | Chapter 13