



QUESTION WORKBOOK

Haemoglobin: an S-shaped curve and everything it explains

Animal transport and cardiovascular biology · Unit B09

AQA 3.3.4.1 · OCR A 3.1.2 (l)–(o) · Edexcel A Topic 1.6, 7.10 · CAIE 8.2

7 questions · 23 marks

NAVY SCREEN EDITION

SECTION A · Short, 1 to 2 marks

- A1** Name the prosthetic group carried by each polypeptide chain of haemoglobin, and state how many molecules of oxygen one haemoglobin molecule carries. [2]

SECTION B · Standard, 3 to 5 marks

- B1** Explain why the oxygen dissociation curve of haemoglobin is S-shaped rather than a straight line, and explain why that shape suits the job haemoglobin does. [4]

- B2** Explain how the Bohr shift increases the oxygen delivered to an exercising muscle, and explain why the same shift costs almost nothing at the lungs. [4]

- B3** Describe how carbon dioxide produced by a respiring tissue is carried in the blood, including the chloride shift. [4]

- B4** Blood arriving at a hard-working muscle is 97 per cent saturated with oxygen. Inside the muscle the partial pressure of oxygen falls to 2 kPa, where the dissociation curve gives a saturation of about 17 per cent. Given that 100 cm³ of fully saturated blood carries 20 cm³ of oxygen, calculate the volume of oxygen released to the muscle per 100 cm³ of blood. [3]

- B5** Compare the position of the foetal haemoglobin dissociation curve with that of adult haemoglobin, and compare what each one is adapted to do. [3]

B6 A lugworm lives in a burrow in mud, where the partial pressure of oxygen is low. Suggest where its oxygen dissociation curve lies relative to the human adult curve, and suggest why. [3]
