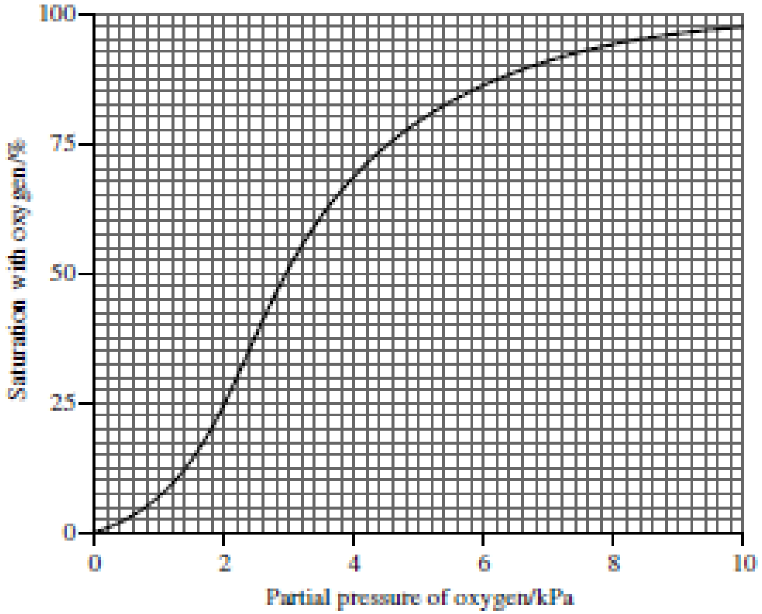
Try these circulation PPQs

3 The graph below shows the oxygen dissociation curve for human haemoglobin.



(a) Explain the factors that influence the percentage saturation of haemoglobin with oxygen.

(i) In the lungs ____

____ [1]

(ii) In exercising muscle tissue ______________________________

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____ [2]

(b) Describe and explain the affinity for oxygen of the haemoglobin of mammals living at high altitude.

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____ [2]

(c) Explain the role of myoglobin in mammals.

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____ [2]

June 08

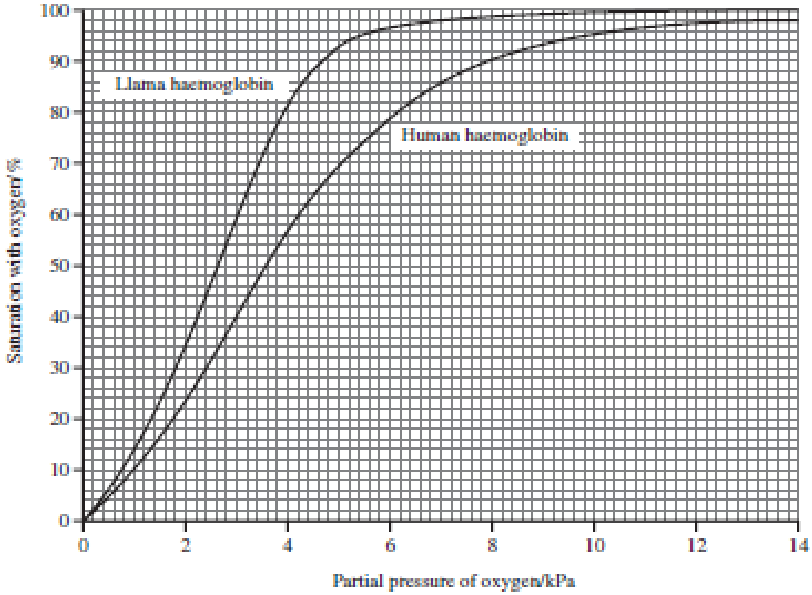
3 (a) (i) High percentage saturation due to the high partial pressure of oxygen/low partial pressure of carbon dioxide in the lungs; [1]

(ii) In exercising muscle tissue: low percentage saturation releases oxygen due to the low partial of oxygen in the tissues;
and also due to the high partial pressure of carbon dioxide (Bohr effect)/ higher temperature in exercising muscle/low pH; [2]

(b) Higher affinity for oxygen/curve lies to the left;
as air (at higher altitude) has a lower partial pressure of oxygen; [2]

(c) **Any two from**
- myoglobin is essentially an oxygen store within red muscle
- releasing extra oxygen/when the ppO_2 is lowered/during exercise/when haemoglobin is exhausted
- enabling aerobic respiration to continue for longer (and thereby sustained exercise)/delays the onset of anaerobic respiration in the muscle [2]

7 The graph below shows the oxygen dissociation curve for human haemoglobin and llama haemoglobin. The llama lives in the high Andes of South America, often above 5 000 m.



(a) With reference to the curve for human haemoglobin, and your own understanding, explain how haemoglobin

(i) takes up oxygen in the lungs;

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____ [2]

(ii) gives up oxygen to the tissues.

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____ [2]

Examiner Only	
Marks	Remark

(b) The loading tension is the partial tension of oxygen at which 95% of the haemoglobin is saturated with oxygen.

From the graph, determine the loading tensions for human and llama haemoglobin.

Human haemoglobin ____________________

Llama haemoglobin ____________________ [2]

(c) Explain how the oxygen dissociation curve for the llama haemoglobin differs from that for a human, and why this is an important adaptation in the llama.

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____ [3]

Jan 07

7 (a) (i) There is a higher ppO_2 in the lungs (since they are ventilated);
O_2 will therefore diffuse into red blood cells in the blood and attach to haemoglobin/haemoglobin has high affinity for O_2 at high ppO_2; [2]

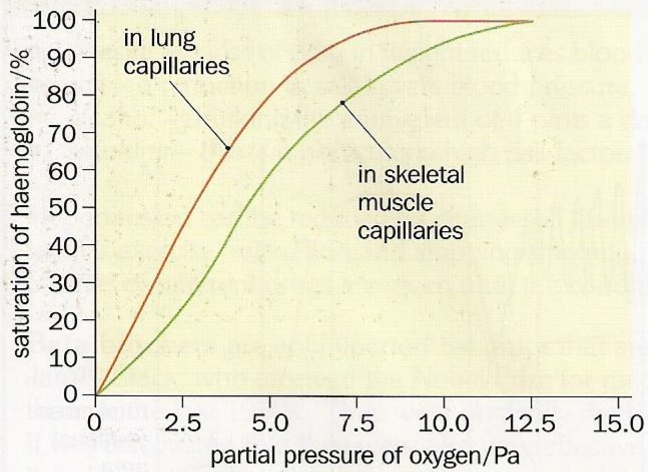
(ii) There is a lower ppO_2 in the tissues (since O_2 is used in respiration);
O_2 will therefore diffuse from the blood into the tissues/haemoglobin has low affinity for O_2 at low ppO_2; [2]

(b) Human haemoglobin: 9.8–10 kPa;
llama haemoglobin: 5.3–5.5 kPa; [2]

(c) The ppO_2 at high altitude is low;
the llama haemoglobin has a higher affinity for oxygen/loads at a lower ppO_2 than human haemoglobin;
therefore at low ppO_2 the llama haemoglobin is able to take up oxygen; [3]

4 a) Explain how increased haemoglobin concentration can lead to increased performance in endurance events.

b) The graph shows the oxygen dissociation curve for haemoglobin as blood passes through capillaries in the lungs and skeletal muscle of an athlete. Explain how features of the oxygen dissociation curves for haemoglobin in the lungs and skeletal muscle benefit the athlete.



a) More Hb (from high altitude training) allows for more oxygen loading and thus aerobic respiration can occur for a more sustained period of time

b) In respiring tissues, curve shifted to right due to Bohr shift – Hb has reduced affinity for oxygen in the respiring muscles. In the lung capillaries at high pO_2 the Hb has high affinity for O_2 and becomes loaded with O_2 and when it arrives at the muscle capillaries where pO_2 is low, the oxyhaemoglobin dissociates (has low affinity for O_2)and gives up its O_2 where it is needed for respiration.