

Answers to end-of-chapter questions

Chapter 11: Respiration and gas exchange

- 1 a anaerobic
b both
c aerobic only in humans; both in yeast
d both
- 2 a the part of the body where oxygen enters and carbon dioxide leaves
b any three of: large surface area; thin; good supply of air containing oxygen; good blood supply
c
- large surface area means that a lot of oxygen (and carbon dioxide) can diffuse across the surface simultaneously
 - being thin reduces the distance across which diffusion has to occur, so it takes place faster
 - having a good supply of air brings fresh oxygen to the surface and takes away carbon dioxide, maintaining diffusion gradients for these gases between the air and the blood
 - having a good blood supply brings carbon dioxide to the surface and takes away oxygen, maintaining diffusion gradients for these gases between the air and the blood

3

	Breathing in	Breathing out
External intercostal muscles	contract	relax
Diaphragm muscles	contract	relax
Volume of thorax	increases	decreases
Pressure in lungs	decreases	increases

- 4 The following sequence should be shown, in a diagram or words;
down trachea, bronchus, bronchiole, into alveolus (by mass flow of air)
across wall of alveolus into the blood, by diffusion

into a blood capillary
into a red blood cell, by diffusion
combines with haemoglobin
carried along the pulmonary vein
to the left atrium of the heart
then to the left ventricle
pumped out of the heart into the aorta
then to the subclavian artery
into a capillary in the arm muscle
diffuses out of the red blood cell
diffuses out of the capillary
diffuses into the tissue fluid
diffuses into the muscle cell

- 5 a 12; [1]
b 21; [1]
c 0.5 dm^3 ; [1]
d 1.1 dm^3 . [1]
e more rapid breathing brings fresh air into the lungs more often;
deeper breathing brings a larger volume of fresh air into the lungs;
more oxygen can diffuse into the blood more quickly;
supplying more oxygen to the muscles;
so they can respire faster;
releasing more energy from glucose; [max 4]
f brain senses the pH of blood;
pH decreases during exercise;
because more carbon dioxide is dissolved in the blood plasma;
brain responds by sending more frequent impulses to the breathing muscles;
so they contract harder and more frequently; [max 4]
6 a 12.5 breaths per minute at start, 25 breaths per minute during exercise;
so increase is 12.5 breaths per minute; [2]

- b** from just before 11 minutes to just before 16 minutes;
5 minutes; [2]
- c** during exercise not enough oxygen was supplied to muscles;
so they respired anaerobically (as well as aerobically);
producing lactic acid;
which was broken down by combining with oxygen (when exercise finished);
reference to paying back the oxygen debt; [max 4]

- d** would follow a pattern similar to that of breathing rate;
heart pumps oxygenated blood to the muscles;
more oxygen required by muscles as they exercise;
so that they can respire faster;
more carbon dioxide needs to be removed from the muscles;
continuing need for more oxygen after exercise to pay off oxygen debt; [max 4]