Complete the **self-assessment rubric** before submitting to Moodle. Avoid printing this if possible.

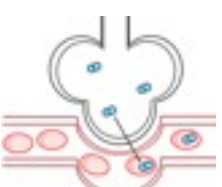
1. Define the following:

Ventilation	Movement of air into and out of the lungs. (1)
Gas exchange	
Cell respiration	
Deoxygenated	
Oxygenated	

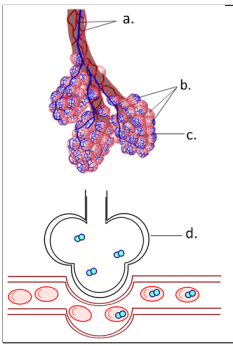
2. Explain the need for ventilation in humans.

Size	Humans are large, land-based organisms that cannot exchange gas sufficiently with the air through diffusion alone. A central ventilation system allows gases to be exchanged with the blood and carried around the body to the cells that require it.
Oxygen	
Carbon dioxide	
Concentration gradient	

3. Deduce the number of membranes an oxygen molecule must pass through in order to enter an erythrocyte.

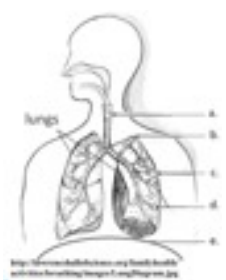


4. Label the features of the alveoli and describe how they are adapted for their function.



a.	
b.	Many invaginations and millions of alveoli – large surface area
c.	Moist membranes.
d.	Membranes only one cell thick.

5. Label this diagram of the human ventilation system.



a.Trachea

b.

c.

d.

e.

Also don't forget to be able to draw and label a magnified alveolus.

Practice these drawings on paper – you might need them in the exam!

6. Explain the method of ventilation of the lungs.

Feature	**Inhalation**	**Exhalation**
External intercostal muscles	*Contract, pulling ribcage up and out.*	
Internal intercostal muscles		
Diaphragm		
Abdominal muscles		
Lung volume		
Pressure in lungs	Decreases, sucking air into the lungs.	

Data-based question practice, from the IB Biology QuestionBank CDRom.

7. A major requirement of the body is to eliminate carbon dioxide (CO_2). In the body, carbon dioxide exists in three forms: dissolved CO_2, bound as the bicarbonate ion, and bound to proteins (e.g. haemoglobin in red blood cells or plasma proteins). The relative contribution of each of these forms to overall CO_2 transport varies considerably depending on activity, as shown in the table below.

CO_2 Transport in Blood Plasma at Rest and During Exercise			
		Rest	**Exercise**
Form of transport	Arterial	Venous	Venous
	mmol l^{-1} blood	mmol l^{-1} blood	mmol l^{-1} blood
dissolved CO_2	0.68	0.78	1.32
bicarbonate ion	13.52	14.51	14.66
CO_2 bound to protein	0.3	0.3	0.24
Total CO_2 in plasma	14.50	15.59	16.22
pH of blood	7.4	7.37	7.14

[Source: Geers and Gros, *Physiological Reviews* (2000), 80, pages 681–715]

(a) Calculate the percentage of CO_2 found as bicarbonate ions in the plasma of venous blood at rest.

(1)

(b) (i) Compare the changes in total CO_2 content in the venous plasma due to exercise.

(1)

8. (ii) Identify which form of CO_2 transport shows the greatest increase due to exercise.

(1)

9. (c) Explain the pH differences shown in the data.

(3)
(Total 6 marks)