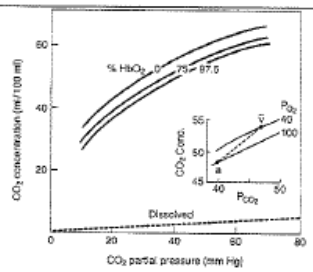
Physiology week 13 – Respiratory (gas transport) VIVAs

TOPIC: Carbon dioxide transport _____ **NUMBER:** _

OPENING QUESTION	How is carbon dioxide transported in the blood?	**PROMPTS**	
POINTS REQUIRED	1. CO2 is carried in the blood as dissolved, as bicarbonate, and in combination with proteins as carbamino compounds.	1	2
	2.	2	
SECOND QUESTION (if needed)	Draw and label the carbon dioxide dissociation curve.		
POINTS REQUIRED	1.	1	
	2.	2	

TOPIC: Oxygen & CO2 in the blood **NUMBER: 2**

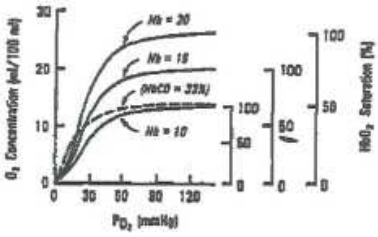
OPENING QUESTION	How is oxygen transported in the blood?	**PROMPTS**	**COMMENTS**
POINTS REQUIRED	O2 dissolved (0.0003ml/100mlblood/mmHg), Heme protein		Need to name both.
SECOND QUESTION (if needed)	Describe the oxygen dissociation curve.		
POINTS REQUIRED	Name the axis Hb saturation and pO2 & name 50% saturation (pO2= 27 mmHg) or p40 = 75% saturation.		
THIRD QUESTION (if needed)	In what forms are carbon dioxide transported in the blood?		
POINTS REQUIRED	CO2 dissolved 10%, Bicarbonate (60%) Carbamino compounds (30%) deoxygenated blood is better at carrying CO2 = Haldane effect		Need to say all 3 pass.

Question 2: Carbon Dioxide Transport West pp 80-3	i) How is carbon dioxide transported in the blood?	 Figure 6-6. CO_2 dissociation curves for blood of different O_2 saturations. Note that oxygenated blood carries less CO_2 for the same P_{CO_2}. The inset shows the "physiological" curve between arterial and mixed venous blood. • **Dissolved**. • As **carbamino compounds** with proteins, especially Hb. • Hydrated in red cells — H^+ buffered — HCO_3^- in plasma.	To pass: 2/3
	ii) How does venous blood carry more CO2 than arterial blood?	• Deoxygenated haemoglobin binds more H^+ and forms **more carbamino compounds** than oxyhemoglobin so venous blood carries more CO_2 than arterial blood. • This is known as the Haldane effect.	Does the curve move towards the left or the right, and why??

TOPIC: Carbon Dioxide Transport _____ **NUMBER:**

OPENING QUESTION	**How is carbon dioxide transported from the tissues to the lungs?**	**COMMEN**
POINTS REQUIRED	1. In plasma: • **Dissolved** • **Carbamino compounds with plasma protein.** • **Hydration - H^+ buffered - HCO_3^- in plasma.** 2. In red blood cells: • Dissolved. • Formation of carbamino–Hb. • Hydration - H^+ buffered - 70% of HCO_3^- enters plasma. 3. Of the approximately 49 mL of CO_2 in each decilitre of arterial blood, 2.6 mL (5%) is dissolved, 2.6 mL (5%) is in carbamino compounds, and 43.8 mL (90%) is in HCO_3- 4. In the tissues, 3.7 mL of CO_2 per decilitre of blood is added; 0.4 mL (10%) stays in solution, 0.8 mL (20%) forms carbamino compounds, and 2.5 mL (70%) forms HCO_3^-. The pH of the blood drops from 7.40 to 7.36.	Bolded
PROMPTS	Which is the most important? Anywhere else ? (other than plasma)	
SECOND QUESTION (if needed)	**What is meant by the term 'chloride shift'?**	
POINTS REQUIRED	1. **About 70% of the HCO_3^- formed in the red cells enters the plasma in exchange for Cl^-. The exchange is called the chloride shift.** 2. This process is mediated by Band 3, a major membrane protein and is essentially complete in 1 second. 3. Note that for each CO_2 molecule added to a red cell, there is an increase of one osmotically active particle–either an HCO_3^- or a Cl^-–in the red cell. Consequently, the red cells take up water and increase in size.	Bolded
PROMPTS		

2 a). What are the causes of hypoxaemia in a person breathing room air	Hypoventilation, diffusion limitation, shunt, V/Q inequality	Need 3/4
2 b). Explain why ventilation-perfusion inequality causes a reduced arterial P_{O_2} while arterial P_{CO_2} remains relatively normal	Basically due to the differences in their dissociation curves. If one could in isolation cause V/Q inequality then gas exchange would deteriorate with hypoxia and hypercapnia. But the chemoreceptors act to increase ventilation. P_{CO_2}- The **CO_2 dissociation curve is linear** at the working range. The increased ventilation is able to correct the P_{CO_2}.by increased CO_2 output, particularly in units with high V/Q ratios P_{O_2} –the **oxygen dissociation curve is not linear.** So high V/Q areas can only boost their P_{O_2} a little with increased ventilation. Conversely very low V/Q areas have proportionally lower P_{O_2} (close to mixed venous). Overall P_{O_2} is low.	Bold plus demonstrate understanding

Question 2:	**Please draw the curve demonstrating the relationship between O_2 concentration v pO2** **How does this change in anaemic and polycythaemic individual?** **What is the effect of carbon monoxide on these curves?**	 1) decrease in effective Hb per percentage 2) COHb shift to Left	Prompt if draws saturation dissociation curve