

Surface Area to Volume ratio		
<ul style="list-style-type: none"> This is the amount of SA to unit volume. The general rule is the smaller the object the bigger the SA is per unit volume. Eg: Lung alveoli or gill filaments are microscopic structures with a design that creates a larger SA per unit volume. Calculate SA and volume and present the ratio in the simplest form. 		
SA:V of 4:8 is expressed as 1:2 . Ratios do not have units.		

Gas exchange: Insect		
1	exoskeleton	outer skeleton made of chitin
2	Spiracles	openings in exoskeleton
3	trachea	tubes leading in from spiracles
4	tracheoles	smaller branches of trachea
5	haemolymph	similar to blood but no haemoglobin

Gas exchange: Fish		
1	operculum	the cover of the gill
2	gill arch	structure supporting the gill filaments
3	gill filament	short thread like proteins structures that make up the gill
4	gill lamellae	further surface ridge like structures on filaments that increase the SA for diffusion
5	counter current flow	Blood and water flowing in opposite directions to maximise oxygen diffusion into the blood

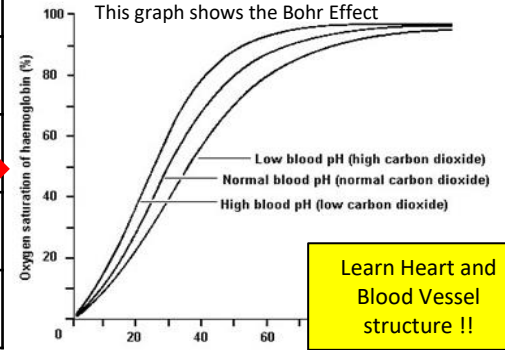
Gas exchange: Dicotyledonous Plant (these are simply flowering plants)		
1	Stomata and guard cells	Stomata are pores the opening and closing of which is controlled by the WP ^h of guard cells
2	Spongy mesophyll	Cells inside the leaf which are arranged to create many air spaces and increased SA for gaseous exchange.

Gas exchange: Lungs		
1	trachea	C shaped cartilage, smooth circular muscle, elastic tissue
2	bronchi	2 divided from base of trachea, tissues as above
3	bronchioles	Smaller divisions of bronchi, tissues as above but less
4	alveoli	Large SA:V and large capillary network blood supply, keeps steep diffusion gradients in place
5	Alveolar epithelium	Simple cells, one layer thick, shorter diffusion pathway so more rapid diffusion rate
6	Goblet cells	Specialised epithelium cells that secrete mucus
7	Ciliated epithelium	Hair like villi on surface waft mucus that has trapped dust, MO's etc up to throat.

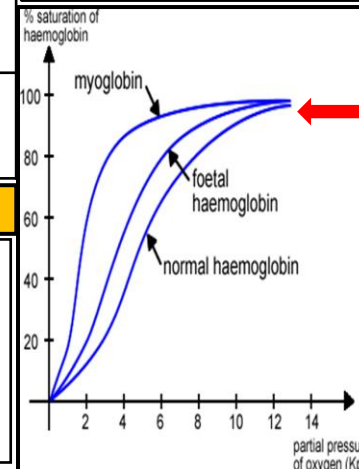
Breathing or Ventilation..... Breathing IN	
<ul style="list-style-type: none"> The internal intercostal muscles relax and the external intercostal muscles contract, pulling the ribcage upwards and outwards. the diaphragm contracts and flattens. lung volume increases and the air pressure inside decreases. air is pushed into the lungs. 	

Risk factors for Lung that reduce gas exchange			
1	Smoking & pollution	COPD, emphysema, chronic bronchitis	
2	Genetic predisposition	Increased likelihood of above or cancer	
3	Frequent chest infections	Increased likelihood of above	
4	Occupational hazards	Increased exposure to chemical that increase risk	

Mass transport of Oxygen in Blood		
1	Carbon dioxide made by cells diffuses into RBC	
2	Enzyme carbonic anhydrase converts the carbon dioxide into carbonic acid	
3	Carbonic acid dissociates into H ⁺ and HCO ₃ ⁻ ions in solution. High H ⁺ levels make the blood pH fall (see the graph)	
4	The H ⁺ ions interact with the Hb in the RBC and make it unload the oxygen and give it to the body cells	
5	More carbon dioxide = more H ⁺ ions = more O ₂ unloaded from the RBC	



Haemoglobin affinity is the relationship between Hb and O₂
Higher affinity means that Hb will get more highly saturated with O₂ when in environments where O₂ pressures are low. In high carbon dioxide environments the H⁺ interact with the Hb molecule, reduce the Hb affinity for O₂ so it unloads it.



Digestion and Absorption	1	Carbo - hydrates	<u>Digested by:</u> Membrane bound disaccharidases and amylase. Makes monosaccharides Absorbed into the blood by CO - TRANSPORT
	2	Lipids	<u>Digested</u> by lipase Bile salts emulsify droplets into micelles which are digested. Absorbed into the blood and reformed into chylomicrons .
	3	Proteins	<u>Digested by:</u> <u>Endo, exo</u> and <u>membrane bound</u> <u>dipeptidases</u> = amino acids Absorbed into the blood by CO - TRANSPORT

Mass transport of Water and Sugars in Plants		
1	Xylem	Water moves - roots to leaves by Cohesion Tension Theory , Transpiration Pull and Root Pressure
2	Phloem	Mass flow up and down the stem of dissolved sugars Tree ringing Radioactive tracers and aphids

