B8: Exchange and transport Knowledge Organiser

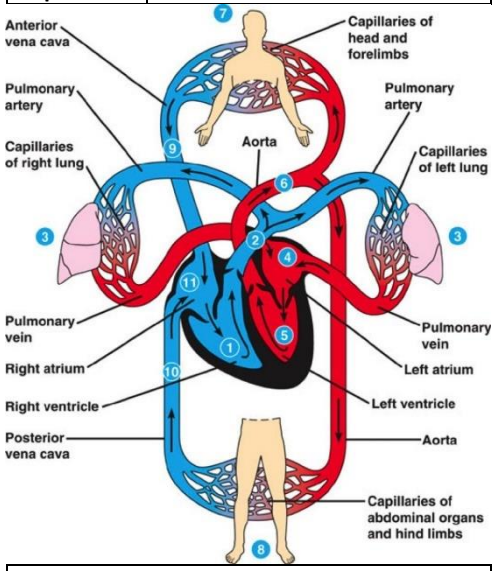
Lesson sequence

1. Efficient exchange and transport
2. The circulatory system
3. The heart
4. Respiration
5. Core practical – respiration rates

1. Efficient exchange and transport	
***Substances needed by body**	Oxygen, glucose, nutrients.
***Waste products**	Carbon dioxide, urea.
***Transport**	Moving substances around the body.
***Exchange**	Moving substances in and out of our cells.
****Diffusion**	The way substances move in and out of cells – they diffuse from high to low concentration.
****Increasing diffusion**	High surface area, thin surfaces
***Surface area:volume ratio**	Surface area / volume
****Importance of SA:volume ratio**	A higher ratio means there is more surface area, so substances can diffuse in and out of cells more quickly.
*****Alveoli**	**Role:** Air sacs in lungs where CO_2 and O_2 are exchanged **Adaptations:** millions of them gives a high surface area, good blood supply maintains a high concentration gradient, thin walls increases diffusion

2. Circulatory system	
***Circulatory system**	Your heart, arteries, capillaries and veins which work together to pump blood around the body.
***The role of blood**	To carry oxygen and nutrients to our cells and take waste products away.
***Arteries**	***Role:** Carry blood away from the heart ****Adaptations:** Thick muscle walls to withstand the high pressure, elastic fibres to stretch as pressure increases during a pulse.
***Capillaries**	***Role:** To exchange nutrients and waste between the blood and cells. ****Adaptations:** Thin walls to increase diffusion, many many of them to give a high surface area.
***Veins**	***Role:** To carry blood towards the heart ****Adaptations:** Thin walls because pressure is low, wide because blood is moving slowly, valves so blood flows right way.
***Components of blood**	Plasma, red blood cells, white blood cells, platelets.
****Plasma**	A straw-coloured liquid that carries the blood cells and dissolved substances such as urea, carbon dioxide and glucose.
****Red blood cells (erythrocytes)**	Contain haemoglobin to carry oxygen around the body.
****White blood cells**	Fight pathogens (infections). Many types including: **Phagocytes** – engulf ('eat' pathogens. **Lymphocytes** – produce antibodies to attack pathogens.
****Platelets**	Small fragments of cells that help the blood to clot when you are cut.

3. The heart	
***Heart**	A double pump that pumps blood: **Right side**: to lungs **Left side**: around the whole body
***Atria (atriums)**	The two chambers at the top of the heart. Right: receives blood from body Left: receives blood from lungs
***Ventricles**	The two chambers at the bottom of the heart Right: pumps blood to lungs Left: pumps blood to body
***Valves**	Prevent blood from flowing from the ventricles back to the atria
****Vena cava**	Carries blood from the body into the right atrium.
****Pulmonary artery**	Carries blood from the right ventricle to the lungs.
****Pulmonary vein**	Carries blood from the lungs to the left atrium.
****Aorta**	Carries blood from the left ventricle to the body.
***Cardiac output**	Cardiac output = stroke volume x heart rate
****Increasing cardiac output**	Stronger heart beats (higher stroke volume), higher heat rate.



4. Respiration

***Respiration**	An exothermic reaction carried out in all living cells to release energy from food molecules such as glucose.
***Aerobic respiration**	The main type of respiration, which takes place in mitochondria and uses oxygen.
***Aerobic equation**	glucose + oxygen → carbon dioxide + water
***Anaerobic respiration**	A form of respiration that releases less energy but extremely quickly. Takes place in the cytoplasm.
***Anaerobic equation**	Glucose → lactic acid
****Role of aerobic respiration**	To provide an energy boost during intense exercise when aerobic respiration alone isn't enough.
****Lactic acid**	A poison that builds up in muscles during anaerobic respiration leading to muscle tiredness and cramp.
*****Excess post-exercise oxygen consumption**	We continue to breath heavily and have a high heart rate after exercise to get lots of oxygen to the muscles to oxidise harmful lactic acid to CO_2 and H_2O.

5. Core practical – rate of respiration (CP5)	
***CP5 – Key question**	How does temperature affect the rate of respiration in small animals.
***CP5 - Set up the respirometer**	Place some soda lime (absorbs CO_2) into the test tube put a protective layer of cotton wool over it, add ten maggots, insert in bung with capillary tube and put in water bath to adjust for 5 mins.
***CP5 - Run the respiration experiment**	Dab the open end of the capillary tube with red food colouring and start the stopwatch.
***CP5 - Record results**	Every five minutes for fifteen minutes, measure the distance travelled by the food colouring.
***CP5 - Vary the temperature**	Repeat the experiment in water baths set to different temperatures.

***CP5 - Results**	The higher the temperature, the faster the animas respire.