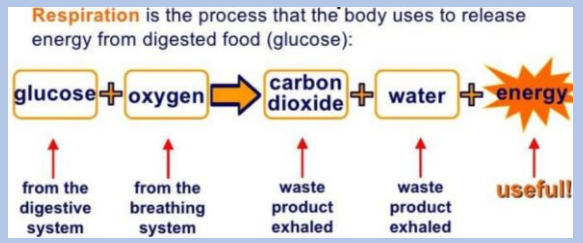
One – Respiration.

Aerobic

Requires oxygen

Makes more energy



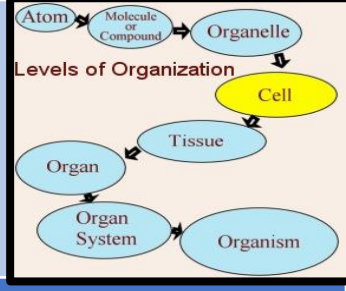
Anaerobic

Does not require oxygen

Respiration is an exothermic reaction. (It transfers energy to its surroundings)

Organisms need energy for:
- chemical reactions to build larger molecules
- movement
- keeping warm.

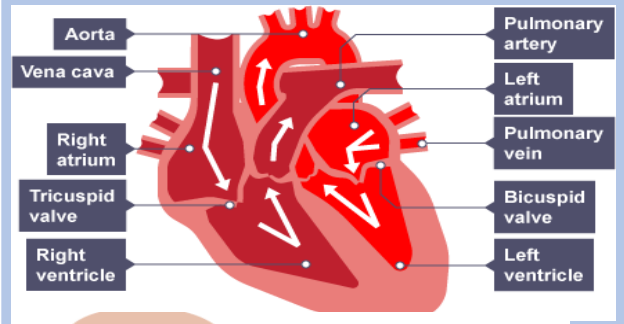
Two – Exchange surfaces



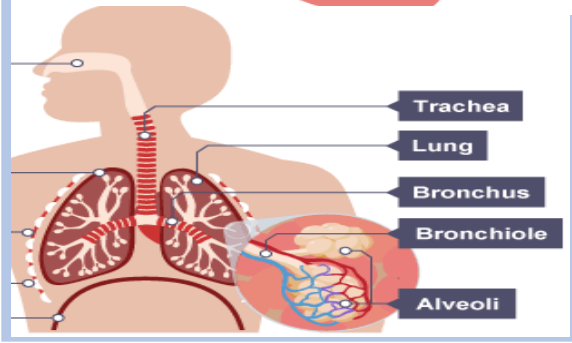
In multicellular organisms many organ systems are specialised for exchanging materials. The effectiveness of an exchange surface is increased by the following:

Specialisation	How it helps
large surface area	Increases the rate of exchange
Thin membrane	Shorter diffusion pathway
Effective blood supply	To maintain a concentration gradient (movement of gases).
Good ventilation	To maintain levels of oxygen entering the body and carbon dioxide leaving the body

Three - The human circulatory system



Heart	The heart is a muscular organ that pumps blood around the body in a dual circulatory system.
the lungs	Gas exchange takes place in the lungs.



The body contains three different types of blood vessel:

- **arteries** – from heart to body
- **veins** – from body to heart
- **capillaries** – between veins and arteries

Three - The human circulatory system

Blood is a tissue consisting of plasma, The blood plasma is responsible for Transporting carbon dioxide, digested food molecules, urea and hormones as well as distributing heat. It makes up around 55% of bodies total blood volume. Suspended in the plasma are the following:

Type of cell / fragment	Adaptations / function
Red blood cells	Contain haemoglobin, which allows them to carry oxygen to. No nucleus, so the whole it is full of haemoglobin. Have a thin outer membrane to let oxygen diffuse through easily. Its biconcave shape maximises the surface area.
White blood cells	they can change shape to squeeze out of blood vessels and get to the site of infection. Others have cytoplasm which can flow making it possible for the cell to change shape, surround and engulf bacteria.
Platelets	Platelets are tiny blood cells that help your body form clots to stop bleeding. If one of your blood vessels gets damaged, it sends out signals that are picked up by platelets. The platelets then rush to the site of damage and form a plug, or clot, to repair the damage.

Five – Human digestion.

The digestive system uses enzymes to break down large molecules in food into small soluble molecules that can be absorbed into the blood through the walls of the small intestine.

Name of enzyme	function and use of products
Carbohydrase	Breaks down carbohydrates (e.g starch) into sugars such as glucose molecules that are used for respiration.
Lipase	Breaks down Lipids (fats & oils) into glycerol and fatty acids. Fats are stored as a source of energy because cells can break them down and use them in respiration.
Protease	breaks down proteins to amino acids. Cells use amino acids to make new proteins.

The liver breaks down unwanted amino acids to urea, which is then carried by the blood to the kidneys that excrete the urea as urine. The liver also produces bile that helps the digestion of lipids

Six – Nervous system

Information from receptors passes along cells (neurones) as impulses to the central nervous system, or CNS (the brain or the spinal cord). The CNS coordinates the response of effectors which may be muscles contracting or glands secreting hormones.

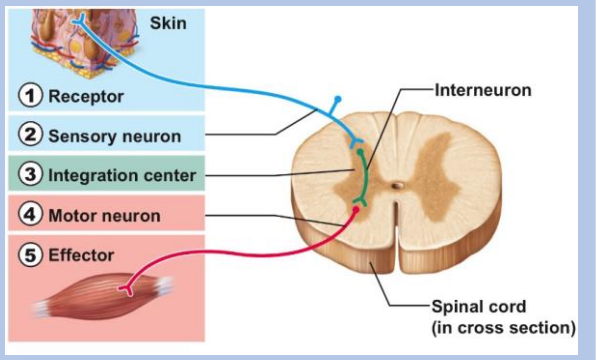
stimulus → receptor → coordinator → effector → response

Reflex actions are automatic and rapid; they do not involve the conscious part of the brain.

Reflex arc.

Sensory neurones carry impulses from receptors to the spinal cord and brain. Relay neurones carry impulses within the CNS (integration center). Motor neurones carry impulses from the CNS to effectors.

Where two neurones meet, there is a tiny gap called a synapse. Impulses cross this gap using diffusion of chemicals.

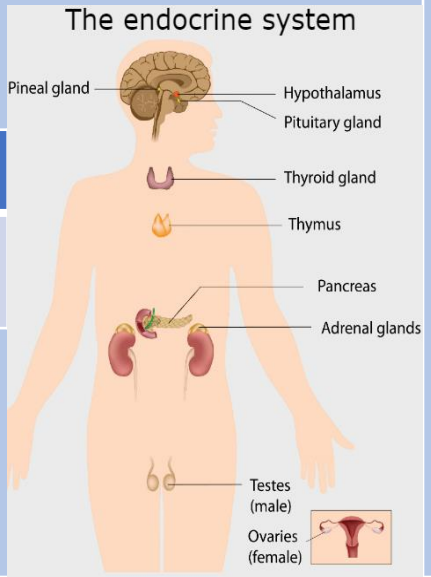


Seven - The endocrine system.

The endocrine system is composed of glands that secrete hormones directly into the bloodstream. Hormones are large molecules. The blood carries the hormone to a target organ where it produces an effect.

Compared to the nervous system the effects are slower but act for longer.

Gland	Something that secretes a hormone
Hormone	**A chemical messenger that produces an effect.**



Example

The pituitary gland in the brain is a ‘master gland’. It secretes several hormones that act on other glands to stimulate other hormones to be released.