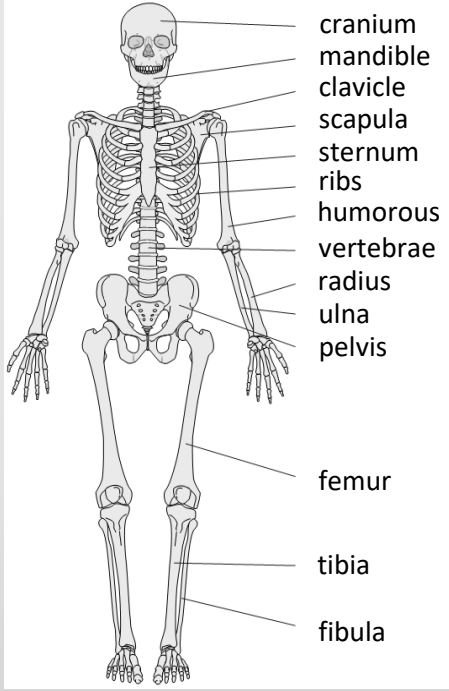


**1) The Skeletal System**

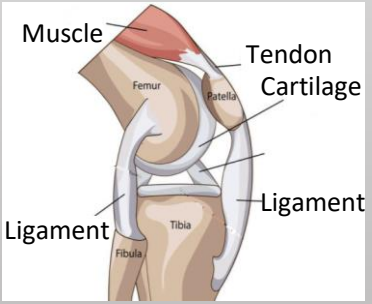
Functions of the skeleton:

- To **support** the body
- To **protect** vital organs
- To help the body **move**
- To make **blood cells**



**2) Joints**

- Joints are where bones join together
- **Ligaments** hold bones together in a joint.
- **Tendons** attach muscle to bones.
- **Cartilage** covers the end of bones and is smooth to stop bones rubbing together.

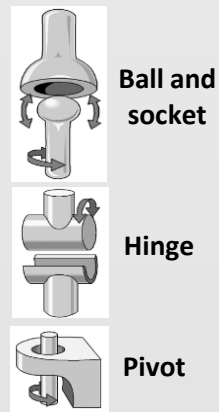


**3) Types of Joints**

- Some joints are **fixed** and can't move, e.g. bones of the cranium (skull) fuse together.
- Most joints are **synovial** and are freely movable.

**Synovial Joints**

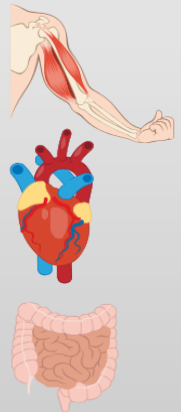
Type of Synovial Joint	Examples in Body	Movement
Ball and Socket	Shoulder, Hip	All directions
Hinge	Elbow, Knee, Ankle	One direction
Pivot	Neck	Rotational



**4) Muscles**

Three types of muscle:

1. **Skeletal** muscle – attached to bones and contracts voluntary to make the body move
2. **Cardiac** muscle – found in the heart and contracts involuntary to pump blood
3. **Smooth** muscle – found inside organs and contracts involuntary to move substances through the organ



**5) Strength of Muscles**

Different muscles have different strengths. The strength can be measured by how much **force** the muscle exerts. Force is measured in **Newtons (N)**.

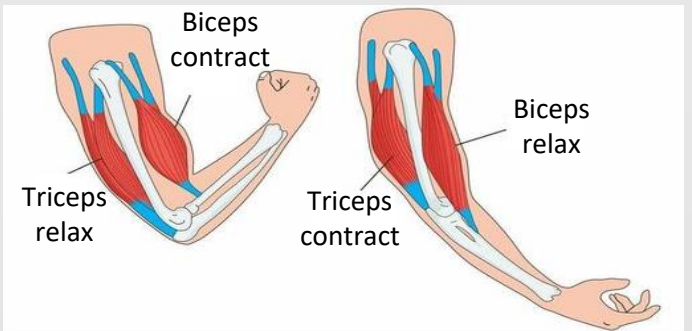
Force can be measured using a **dynamometer** or pushing on a set of scales.



**6) Antagonistic Pairs of Muscles**

- Muscles can only pull and cannot push so muscles have to work in pairs called antagonistic muscles.
- One muscle in the pair **contracts** whilst the other **relaxes**.

E.g. the bicep and triceps working to bend the elbow.



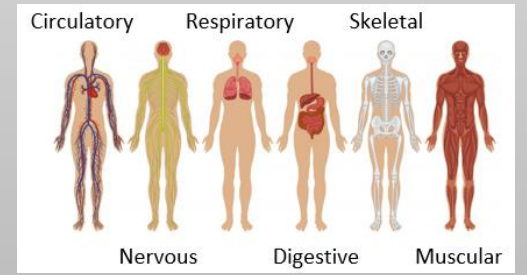
**7) Investigation Keywords**

- Independent variable – what you change
- Dependent variable – what you measure
- Control variables – what you keep the same

**8) Organisation of Organisms**

- **Organism** – a group of organ systems working together
- **Organ system** – a group of organs working together
- **Organ** – a group of different tissues working together
- **Tissue** – a group of the same type of cell working together
- **Cell** – the basic building block of all organisms

There are lots of organ systems in humans, some examples are:



## 1) Characteristics of Living Things

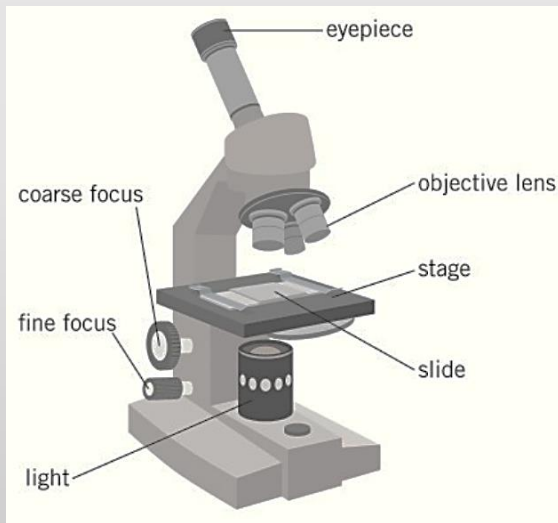
All living organisms can do the following:

- **Movement** - all living things move, even plants
- **Respiration** - getting energy from food
- **Sensitivity** - detecting changes in the surroundings
- **Growth** - all living things grow
- **Reproduction** - making more living things of the same type
- **Excretion** - getting rid of waste
- **Nutrition** - taking in and using food

## 2) Microscopes

All organisms are made up of **cells**. Cells are so small, you need a **light microscope** to see them.

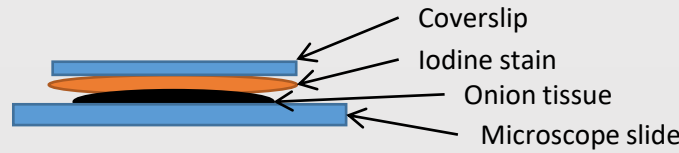
Light microscopes produce a magnified image of an object.



- The **lowest powered objective lens** should be used first to give a **large field of view**.
- The **coarse focus** is used to bring the object into view.
- The **fine focus** is used to add more detail and remove blurriness.

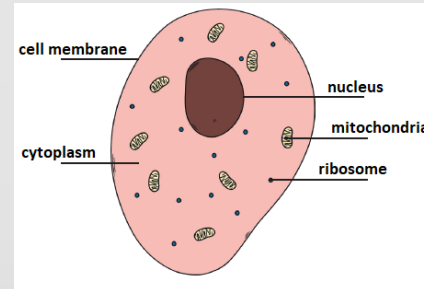
**Total magnification = eyepiece lens × objective lens**

## 3) Making Microscope Slides



**Stains are used to add contrast** to cells. Certain stains are used to stain specific cell structures. E.g. onion cells use **iodine stain** and cheek cells use **methylene blue**.

## 4) Animal Cell Organelles



**Nucleus:** carries genetic information and controls the cell.

**Cell membrane:** controls the movement of substances in and out of the cell

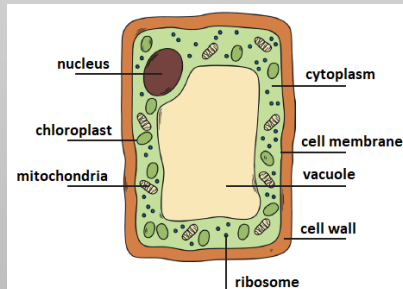
**Cytoplasm:** where chemical reactions take place

**Mitochondria:** where respiration takes place (energy)

**Ribosome:** where proteins are made

## 5) Plant Cell Organelles

Plant cells contain the same 5 organelles as an animal cell as well as:



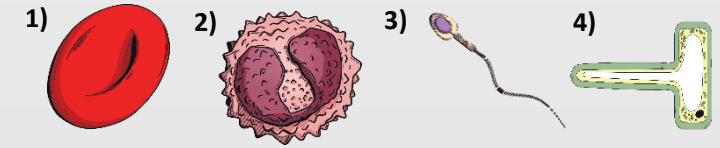
**Cell Wall:** made of cellulose, provides support

**Vacuole:** contains cell sap, which keeps the cell firm

**Chloroplasts:** where photosynthesis takes place

## 6) Specialised Cells

Specialised cells are ones with special features (adaptations) to help carry out their function (job).



**1) Red blood cell:** transports oxygen around the body, biconcave shape increases surface area, no nucleus

**2) White blood cell:** fights microorganisms which cause disease, can change shape, produces antibodies

**3) Sperm cell:** travel to and fuse with an egg cell, long tail for movement, lots of mitochondria to release energy for moving

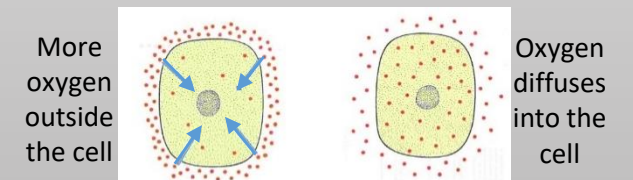
**4) Root hair cell:** absorbs water from the soil in plants, has a large surface area

## 7) Multicellular and Unicellular

- **Multicellular** organisms are those made up of **more than one cell**.
- Examples of multicellular organisms include animals and plants.
- **Unicellular** organisms are those made from **only one cell**.
- Examples of unicellular organisms are bacteria and Euglena

## 8) Movement of Substances in Cells

**Diffusion** is the movement of particles from higher to lower concentrations. Substances like **oxygen, carbon dioxide** and **glucose** move in and out of cells by diffusion.



More oxygen outside the cell

Oxygen diffuses into the cell