

Bonding Part 2

Threshold Concept

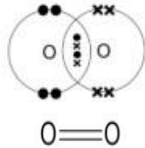
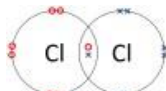
How do 100 elements make up everything in the universe?

Covalent bonds

Two nonmetals will form a covalent bond. The atoms share electrons to make themselves stable.



- 1 shared pair = a single bond
- 2 shared pairs = a double bond
- 3 shared pairs = a triple bond



Keywords

Electron - a subatomic particle with a negative charge

Electrostatic attraction - strong attraction between oppositely charged ions

Weak intermolecular forces - force of attraction between atoms, elements and molecules

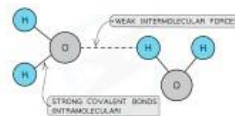
Delocalised electron - free moving electron that isn't a part of any atom

Ion - a charged particle

Simple Covalent compounds

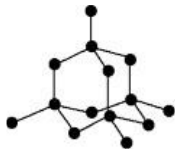
Simple covalent compounds have strong covalent bonds between atoms and weak intermolecular forces between molecules

Properties – low m.p and b.p
- cannot conduct electricity



Giant Covalent Structures

Diamond



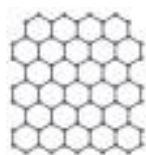
Graphite



Silicon dioxide



Graphene



Fullerenes



Metallic bonding

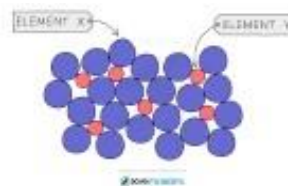
Metals consist of a giant metallic structure. They are positive metal ions surrounded by a sea of delocalised electrons



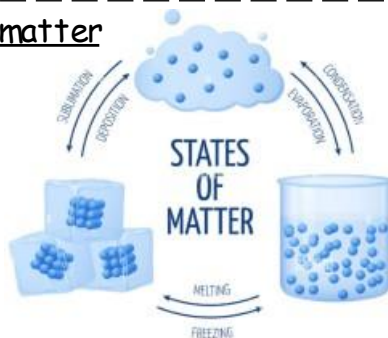
Alloys

Alloys are a mixture of metals and another element.

Alloys are stronger than metals as the different sized atoms distort the layers



States of matter



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Infection and response

Threshold Concept

Pathogens are microorganisms that cause disease

Communicable and non-communicable disease:

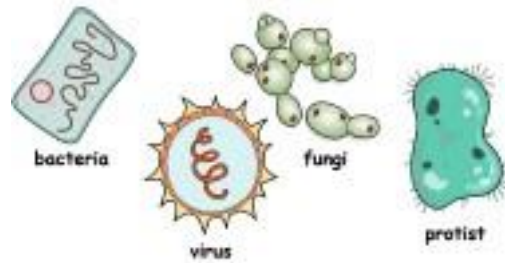
- Communicable, which can be transferred from one person to another, or from one organism to another, eg in humans, these include measles, food poisoning and malaria
- Non-communicable, which are not transferred between people or other organisms



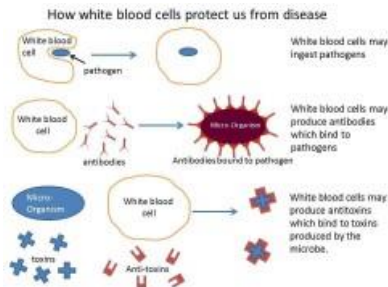
Keywords

- **Pathogens:** A microorganism that causes disease e.g. bacteria, virus, protist, fungus.
- **Microorganism:** Are so small they can only be seen using a microscope.
- **Virus:** A disease causing agent about 1/100th of the size of a bacterial cell. Can only replicate within host body cell/
- **Bacteria:** A single celled microorganism without a true nucleus, some cause disease.
- **Fungi:** A microorganism that can cause disease, and that produces spores that can spread to other organisms.

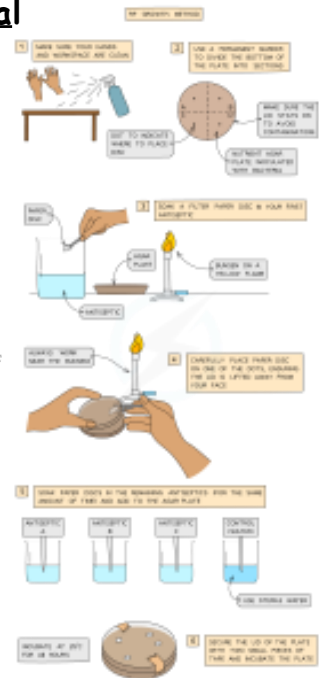
Pathogens



Fighting against disease



Required practical



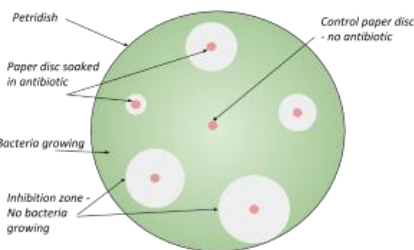
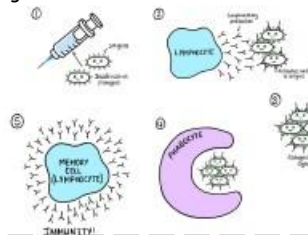
Antibiotics vs painkillers

- Antibiotics are substances that slow down or stop the growth of bacteria.
- Painkillers are chemicals that relieve the symptoms but do not kill the pathogens.



Vaccinations

Vaccines allow a dead or altered form of the disease causing pathogen to be introduced into the body, which contain a specific antigen.



Equations for this topic

Homeostasis

Threshold Concept

Homeostasis is organisms maintaining a constant internal environment

The nervous system:

- The central nervous system (CNS) - the brain and spinal cord.
- The peripheral nervous system - nerve cells that carry information to or from the CNS.



Keywords

- **Nerves:** Specialised cells which carry electrical impulses
- **Hormones:** Chemical messenger produced in glands and carried by the blood to specific organs in the body.
- **Organism:** Living things that are capable of reacting to stimuli, reproduction, growth, and homeostasis.
- **Regulate:** control or maintain the rate or speed of a process so that it operates properly.
- **Response:** as a result of the stimulus that is detected by the receptor a response is caused

Synapse:



Body controls:

Homeostasis maintains optimal conditions for enzyme action throughout the body, as well as all cell functions.

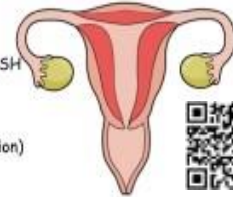
In the human body, these include the control of:

1. Blood glucose concentration
2. Body temperature
3. Water levels

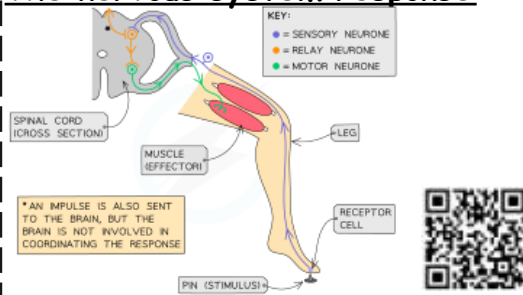


The menstrual cycle

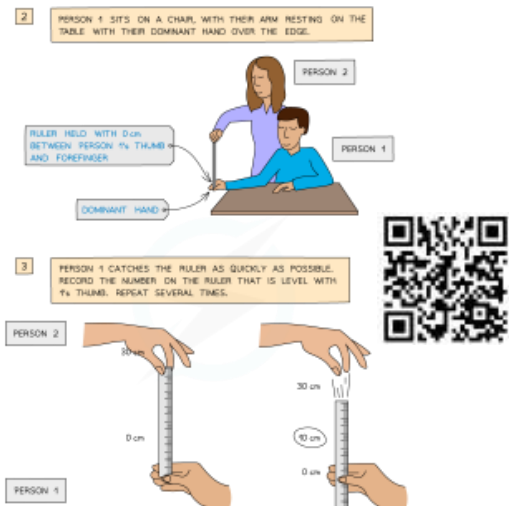
1. The menstrual cycle is the reproductive cycle in women, which starts with a period (menstruation), if the woman is not pregnant.
2. There are four hormones involved: follicle stimulating hormone, luteinising hormone, oestrogen & progesterone.
3. FSH (released by the pituitary gland) causes eggs to mature in the ovaries.
4. FSH stimulates ovaries to produce oestrogen.
5. Oestrogen inhibits further release of FSH and stimulates release of LH.
6. LH (released by the pituitary gland) stimulates the release of an egg (ovulation) from an ovary.
5. LH stimulates secretion of progesterone by the empty follicle.
6. Progesterone inhibits the release of LH and FSH.
7. Oestrogen and progesterone maintain the lining of the uterus.



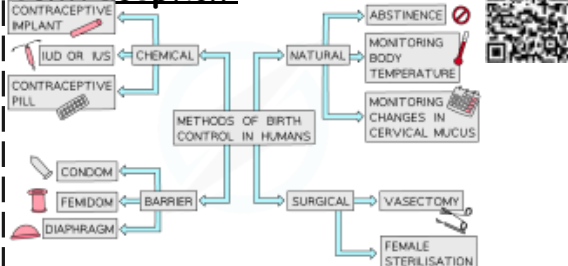
The nervous system response:



Required practical: Reaction time



Contraception:



Equations for this topic

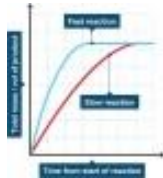
Rates of Reaction

Threshold Concept

All particles must collide with a minimum amount of energy in order to react

Rate of reaction

Rate of reaction is how fast reactants are changed into products



Collision theory and activation energy

The rate of reaction is directly proportional to the number of successful collisions.

- To react, particles must first **collide**
- with enough **activation energy** to be successful.

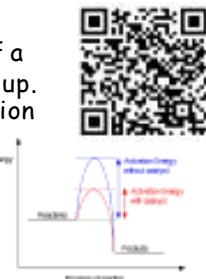


Keywords

- Particle** - A particle is the smallest possible unit of matter
- Energy** - Energy is what holds the atoms in a molecule together
- Collision** - If the two molecules A and B are to react, they must get close enough to break and make the new bonds that are needed in the products
- Reactant** - A substance put into a chemical reaction
- Product** - A substance made in a chemical reaction

Catalysts

- Catalysts: increase the rate of a reaction without getting used up.
- Catalysts decrease the activation energy required to begin the reaction.
- Catalysts are often used in industry to speed up chemical processes.



Factors affecting rate of reaction

Effect of Temperature:

- Increasing the temperature increases the speed that particles are moving
- This means there are more frequent collisions, and those collisions have more energy



Video of all

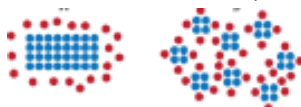
Effect of Concentration:

- Increasing concentration increases the number of reacting particles.
- This increases the frequency of collisions



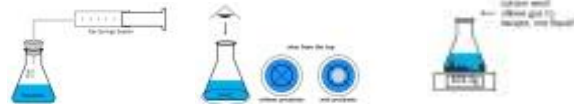
Effect of Surface Area:

- Increasing the surface area increases the proportion of (solid) particles available to react.
- This increases the frequency of collisions.



Measuring rate of reaction

- There are various ways to measure quantity of reactant used or quantity of product formed. Measuring the volume of gas collected can be the easiest way to measure.



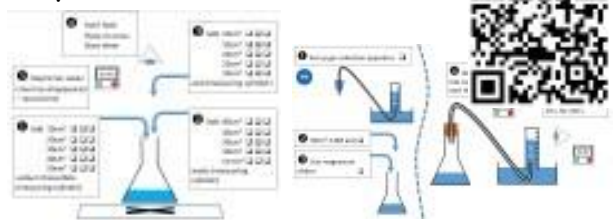
- The units of rate depend on what you are measuring. For example, when measuring gas in cm^3 you will end up with rate units of cm^3/s . When measuring the change in mass (g), you will end up with units of g/s

$$\text{mean rate of reaction} = \frac{\text{quantity of reactant used}}{\text{time taken}}$$

$$\text{mean rate of reaction} = \frac{\text{quantity of product formed}}{\text{time taken}}$$



Required Practical



Equations for this topic

Motion

Threshold Concept

Speed equals distance travelled in a given time

Speed, distance, time

- Speed is measured in metres per second (m/s)
- Distance is measured in metres (m)
- Time is measured in second (s)



Keywords

- **Speed:** Distance travelled in a certain time
- **Distance:** how far an object has travelled. It is a scalar quantity
- **Time:** how long something takes
- **Metres** a unit measurement of distance (m)
- **Seconds:** a unit measurement of time (s)

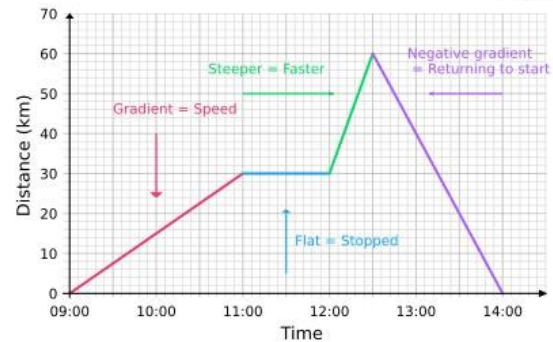
Scalar and vector quantities

Scalar - a measurement of something. They only have **MAGNITUDE** (size)

Vector - a measurement of something. They have **DIRECTION & MAGNITUDE** (size)



Distance - Time Graphs

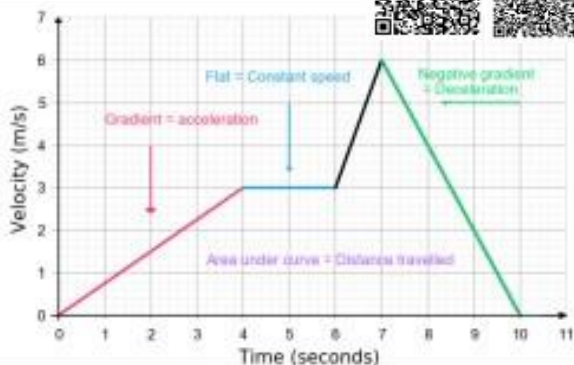


Terminal velocity

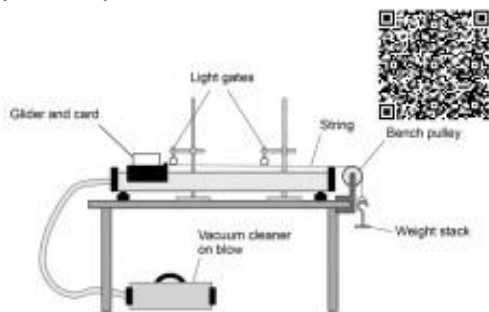
At terminal velocity, the object moves at a steady speed in a constant direction because the **resultant force** acting on it is zero



Velocity - Time graphs



Required practical - Acceleration



Equations for this topic

- Speed = Distance ÷ Time
- Change in Velocity = Acceleration x Time
- Force = Mass X Acceleration