Science—Cells— Respiration

Year 9 **Term 2**

Keywords

Mitochondria	Structure found in the cytoplasm of cells. Site of respiration.
ATP	Energy carrying molecule found in cells.
Aerobic	In the presence of oxygen.
Anaerobic	Without oxygen.
Lactic Acid	Molecule produced in anaerobic respiration in animals. Causes muscle cramp.
Metabolic Rate	The speed at which chemical reactions transfer energy from food.

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Respiration

Respiration takes place in the mitochondria of cells, it is an enzyme controlled reaction.
Respiration is used to release energy from glucose, this energy can be used for reactions and processes in an organism such as movement, digestion and reproduction.

Aerobic respiration	• Takes place in the presence of oxygen. • Produces 38 ATP molecules. **Word equation:** Glucose + Oxygen ->Water + Carbon Dioxide **Balanced Symbol Equation:** $C_6H_{12}O_6 + 6H_2O \rightarrow 6H_2O + 6CO_2$
Anaerobic Respiration in Animals	• Takes place during times with limited oxygen. Produces 2 ATP molecules. • Produces lactic acid which causes muscle cramps. Lactic acid can be broken down by oxygen. **Word equation:** Glucose -> Lactic Acid
Anaerobic Respiration in Plants and Microorganisms	• Takes place during times with limited oxygen. • Produces 2ATP molecules. • Produces ethanol which is an alcohol. This process is also known as fermentation, and is a process needed for making bread, beer and wine. **Word equation:** Glucose -> Ethanol + Carbon Dioxide

Biological Molecules

- Biological molecules are found in our diet.
- They are broken down by enzymes in the digestive system to form small molecules which can be absorbed into our blood.
- These molecules can be used in reactions such as respiration.
- All of the biological molecules contain carbon, hydrogen and oxygen.

Biological Molecule	Function
Lipid	Found in fats and oils. Used for insulation and as a source of energy.
Carbohydrate	Often made of smaller molecules such as sugars. Used as a sources of energy.
Protein	Made of amino acids. Used for growth and repair of cells in the body.

Practical

Test for starch:
1. Place a small amount of food on the spotting tile or in a test tube.
2. Add a few drops of iodine solution to the food.
3. Orange iodine solution turns blue–black if starch is present.

Test for sugar:
1. Place a small amount of food in a test tube.
2. Add enough Benedict's solution to cover the food.
3. Place the test tube in a warm water bath for 10 minutes.
4. Blue Benedict's solution turns orange–red on heating if a sugar such as glucose is present.

Test for lipids (fat):
1. Place a small amount of food in a test tube.
2. Add a few drops of ethanol to the test tube.
3. Shake the test tube and leave for 1 minute.
4. Pour the solution into a test tube of water.
5. Ethanol added to a solution gives a cloudy white layer if a lipid is present.

Test for protein:
1. Place a small amount of food in a test tube.
2. Add 1 cm^3 of sodium hydroxide solution and then add a few drops of copper sulfate solution. Alternatively add 1 cm^3 of Biuret reagent.
3. Pale blue colour turns purple if protein is present.

Positive result: starch

Positive result: sugar

Positive result: lipids

Positive result: protein

Science—Matter

Year 9 Term 2

Trinity Academy Bradford

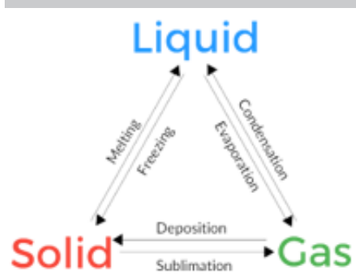
The Particle Model

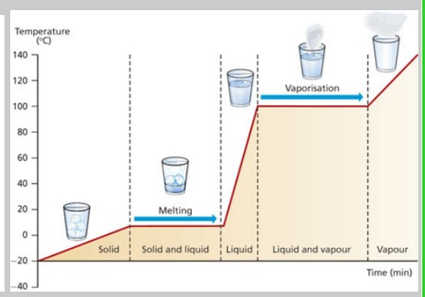
Solid		Most dense. Particles in fixed positions. Vibrations only
Liquid		Moderately dense. Particles still touch but move randomly past each other
Gas		Least dense. Particles move randomly and quickly

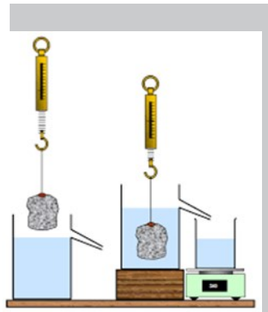
Atomic structure

Subatomic particle	Relative Mass	Relative Charge
Proton	1	+1
Neutron	1	0
Electron	0.0005	-1

Density and Change of State



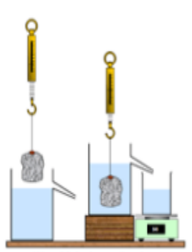




Investigating Density

To determine the volume of regular objects use a ruler to measure the length, width and depth. These need to be multiplied to find the volume. To find the volume of irregular objects use a eureka can and measuring cylinder to measure how much water is displaced, this water has the same VOLUME as the object.

The mass can be found using a mass balance. Apply the equation for density.



Changing State & Density

Atom	The smallest particle of a chemical element that retains its chemical properties.
Proton	The positively charged subatomic particle found within the atomic nucleus.
Neutron	The neutral subatomic particle found within the atomic nucleus.
Electron	The negatively charge subatomic particle found within the shells surrounding the atomic nucleus.
Density	Density tells us how much mass there is in a certain volume. Density = mass ÷ volume
Volume	The amount of space atoms in a substance/object take up.
Temperature	A measure of the average kinetic energy of the particles in a system. Measured with a thermometer using °C or K
Specific latent heat	The energy needed to change the state of 1kg of a material. The units are J/kg. Energy = mass x SLH
Specific heat capacity	The energy needed to change the temperature of 1kg of a material by 1°C. The units of measurement are J/kg°C. Energy = m x SHC x ΔT
Gas pressure	A force on a container caused by the collision of particles with the container walls. Higher temperatures lead to higher pressure.
Eureka can	Equipment used to measure the volume of an irregular objects.
Sublimation	A change of state from a solid to a gas.

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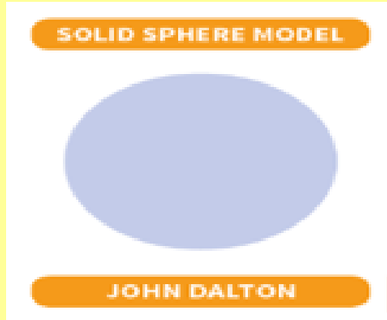
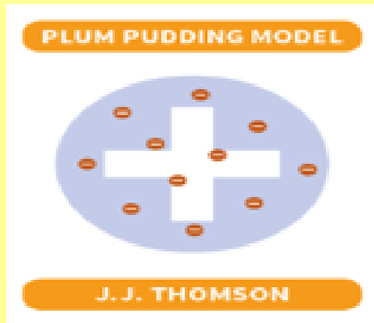
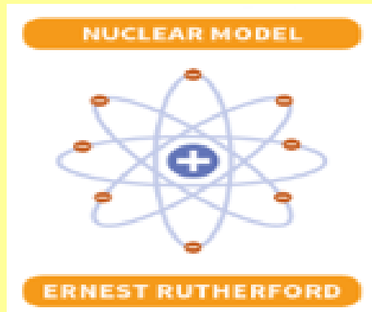
History of the Atomic Model



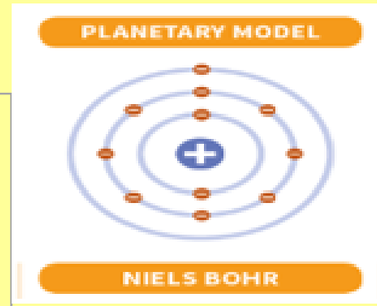
Dalton thought atoms were **small indestructible spheres.** All atoms of the same element are identical to each other.



Thomson discovered the **electron**. He created the **plum pudding model** which shows negative electrons equally spread through positive matter.



Rutherford fired positively charged alpha particles at **gold foil.** Most passed through, some were deflected at small angles and some at large angles. This shows that most of the atom is **empty space** with a **small positively charged dense nucleus.**



Bohr modified Rutherford's model by stating that electrons move around the nucleus in fixed orbits.

Science—Cells (Photosynthesis)

Year 9 Term 2

Keywords

Chloroplast	Found in the cytoplasm of plant cells. S ite of photosynthesis
Chlorophyll	Pigment found in leaves, absorbs light for photosynthesis
Limiting factor	A factor that limits the rate of a reaction
Starch	Polymer of glucose
Iodine	Stain used to detect starch. Turns blue/black if starch is present.

Photosynthesis

- Photosynthesis is an enzyme controlled reaction that takes place in the chloroplast of plants to form glucose, which is used in respiration to release energy and to form carbohydrates such as starch and cellulose.
- Plants use light as a source of energy for this reaction, chlorophyll (a pigment found in leaves) absorbs light.

Word equation:
Water + Carbon Dioxide -> Glucose + Oxygen

Balanced Symbol Equation:
$6H_2O + 6CO_2 \rightarrow C_6H_{12}O_6 + 6H_2O$

Inverse Square Law

When you double the distance from the light source, the light intensity falls by a factor of 4.

Relative light intensity = 1 ÷ distance from light source^2

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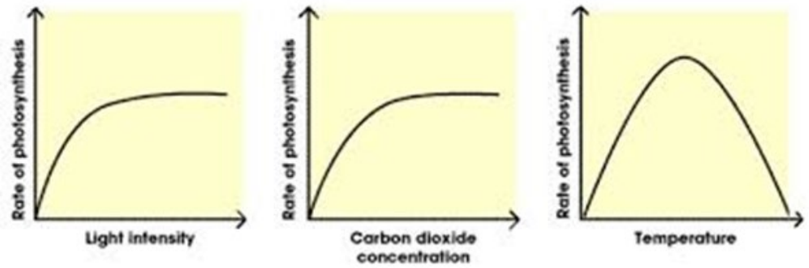
Rate limiting factors



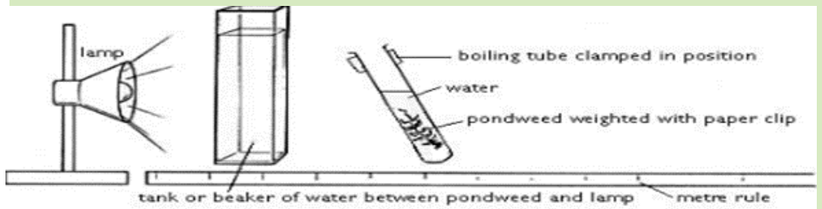
Light is the source of energy for the reaction.

CO_2 is a reactant of the reaction.

The reaction is controlled by enzymes that are denatured at high temperatures

Practical:

Investigating the factors that can affect the rate of photosynthesis (light intensity)

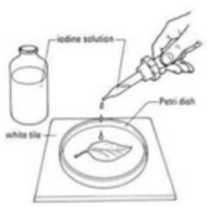


Method

1. Fix a ruler to your desk so that you can easily move your plugged-in lamp along it.
2. Place the boiling tube rack (and plant) at 0cm along the ruler
3. Place the lamp as close as you can to 0cm so that it's shining on the leaves.
4. Allow the plant to adjust to this light.
5. Count the number of bubbles escaping from the cut end in one minute.
6. Record your data and repeat until values are concurrent.
7. Repeat the experiment for all of the distances you decided, starting with the shortest distance and getting further away from the lamp

Practical: Testing for Starch

- Starch is a polymer of glucose.
- If a leaf contains starch, this means it contains glucose.
- This is how we investigate if photosynthesis has taken place in a plant.
- Iodine will turn blue/black in the presence of starch.

Method		Reason
Step 1: Put a leaf in boiling water for about 5 minute, until it is soft.		To break down the cell walls so chemicals can enter the cell.
Step 2: Put the leaf in a test tube with ethanol for a while.		To remove the green pigment (chlorophyl). This is for us, to more clearly see a colour change when we add iodine.
Step 3: Rinse the leaf in water.		To make it soft again.
Step 4: Spread the leaf out on a white tile/saucer/petri dish.		To stain any starch, if present. Turns blue/black if starch is present. Stays yellow/brown if no starch is present.
Step 5: Drop a few drops of iodine on the leaf		