Tuesday 12th April 2022

Biology 1 Easter Revision

Animal and Plant Cells

Plant and animal cells have similarities and differences:

Animals:

* Nucleus – Contains genetic information and controls the cell
* Cytoplasm – gel-like substance where the chemical reactions happen. Contains enzymes to control these reactions
* Cell Membrane – Holds the cell together, controlling what goes in and out
* Mitochondria – Site of aerobic respiration, releasing energy for the cell.
* Ribosomes – Where protein synthesis takes place, making the proteins needed in the cell.

Plants:

* All above, as well as…
* Cell Wall – Made of cellulose to support the cell
* Permanent Vacuole – Contains cell sap, a weak solution of sugar and salts
* Chloroplasts – Where photosynthesis occurs. Contains chlorophyll, a green pigment

Cell Cycle

Making new cells for growth, development, and repair. The stage of the cell cycle where the cell divides is called mitosis. The cell cycles produces two new cells identical to the original cell, with the same numbers of chromosomes.

1. Before the cell divides, the cell increases the number of sub-cellular structures, such as mitochondria and ribosomes.
2. It duplicated the DNA, so that there is one copy for each cell. The copied DNA forms X-shaped chromosomes, where each arm is a duplicate of the other.
3. The chromosomes line up at the centre of the cell, and cell fibres pull them apart. The chromosomes go to opposite ends of the cell.
4. Membranes form around each set of chromosomes, making them both nuclei
5. The cytoplasm and cell membrane divide, producing two daughter cells, with the same DNA.

Animal Tissues, Organs, and Organ Systems

Organisation:

* **Cells**
* **Tissues**
* **Organs**
* **Organ Systems**
* **Organism**

Similar cells form tissues. Similar cells are cells that work together to carry out a particular function. There are three main types of tissues:

* Muscular Tissues – Contracts (shortens) to move what it is attached to.
* Glandular Tissues - Makes and secrets chemicals
* Epithelial Tissues – Covers some part of the body.

An organ is a group of tissues which work together to perform a specific function. For example, the stomach is made up of these tissues:

* Muscular – Moves the stomach wall to churn up food
* Glandular – Secrete digestive juices to digest food
* Epithelial – Covers the inside and outside of the stomach

An organ system is a group of organs, for example the digestive system. For example, the digestive system:

* Glands – Produce digestive juices.
* Stomach and Small Intestine – Digests food.
* Liver – Produces bile.
* Small Intestine – Absorbs soluble food molecules.
* Large Intestine – Absorbs water from undigested food.

Required Practical – Food Tests

Preparing a Food Sample (do this for each test):

1. Break up a piece of food using a pestle and mortar.
2. Transfer the ground up food into a beaker and add some distilled water.
3. Stir the mixture with a glass/plastic rod, and filter with filter paper to remove any solids.

Iodine Solution – Starch

1. Add 5cm3 of your prepared food sample to a test tube.
2. Add a few drops of iodine and shake the tube to mix it.
3. If the sample changes to black or **blue**, starch is present.

Benedict’s Solution – Sugars

1. Add 5cm3 of the prepared food sample to a test tube.
2. Add some Benedict’s Solution to the food sample
3. Place the test tube in a water bath heated to 75°C and leave it there for 5 minutes. Ensure the test tube is not pointed towards you.
4. If the sample changes from **blue** to **green**, **yellow**, or **brick red**, sugars are present.

Biuret Test – Proteins

1. Add 2cm3 of a prepared sample to a test tube
2. Add 2cm3 of Biuret solution and mix by gently shaking
3. If the sample changes from **blue** to **pink** or **purple**, starch is present.

Sudan III Test – Lipids

1. Prepare a food sample without filtering, and place it into a test tube
2. Use a pipette to add 3 drops of Sudan III stain solution to the test tube and mix by gently shaking.
3. If the sample separates, forming two layers, and the top layer is **red**, lipids are present.

Emulsification Test – Lipids (Ethanol)

1. Prepare a sample and place it into a test tube.
2. Add 2cm3 of ethanol to the sample
3. Add 2cm3 of distilled water
4. If a cloudy white layer forms, lipids are present.

Photosynthesis

Photosynthesis uses energy to change carbon dioxide and water into glucose and oxygen:

Plants use glucose in 5 ways:

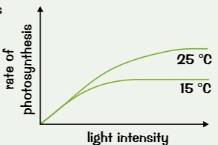
* For respiration
* Making cellulose
* Making Amino Acids
* Stored as Oils/Fats
* Stored as Starch

Limiting Factors:

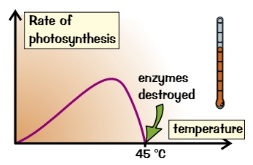
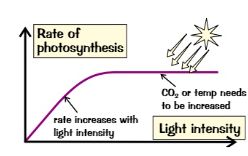
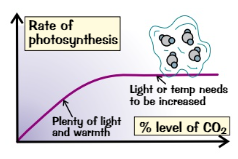
The rate of photosynthesis is affected by:

* Light Intensity – The higher the better, but only increases up to a certain point.
* Concentration of CO2 – The higher the better, but only increases up to a certain point.
* Temperature – High is good, but too hot (+45°C) denatures the enzymes
* Chloroplasts – They can be damaged by disease, or environmental factors, which means that little amounts of chlorophyll are produced. The rate is decreased as they cannot absorb enough light.

Multiple limiting factors can be shown on the same graph – the higher factor measured on the graph is the actual limiting factor.



Limiting Factors Graphs:



Artificially Creating Ideal Conditions

Low Heat – Greenhouse

Low Light – Artificial lamps

Low CO2 Concentration - Using a paraffin heater

Required Practical – Photosynthesis

Measuring the effect that light intensity has on the rate of photosynthesis. The rate of photosynthesis can be measured using the amount of oxygen produced in a given time.

1. Preparing pondweed sample – Place the pondweed in a test tube filled with water.
2. Whilst the pondweed is still in the water, cut the stem at an angle near the top to allow the oxygen bubbles to escape.
3. Place the light source 10cm away from the pondweed and count the number of bubbles produced in 1 minute.
4. Repeat step 3 with different distances between the pondweed and light source.
5. Do the experiment a second time and calculate a mean.

Effect of PH on Rates of Reactions – Enzymes

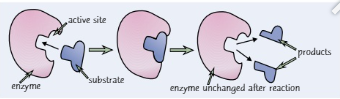
Enzymes

Enzymes are biological catylists – they speed up reaction without being used up or changed. The speed of reactions need to be controlled to produce the right amount of substances.

You can speed up the rates of reaction by increasing the temperature, however this speeds up all of the reactions, not just the wanted ones. There is also a limit to how high the temperature can go before the cells are damaged.

Lock and Key

Every enzyme has an active site, which is the area that fits onto the substances that are being reacted. The enzymes only speed up the reaction of substances that fit the active site.



PH and Temperature

Changing the temperature changes the rate of the reaction. As the temperature increases, so does the rate of the reaction. However, if the temperature becomes too high, some on the bonds in the enzyme break. This changes the shape of the active site, so the substrate will no longer fit. The enzymes is described as being denatured.

Changing the PH also affects the rate of the reaction. If the PH is too high or low, the enzyme becomes denatured. All enzymes have an optimum PH that they work at. This is mostly neutral (7), but not always.

Investigating the Rate of Reaction

1. Fill each spotting tile with a few drops of iodine
2. Add 1cm3 of amylase solution and 1cm3 buffer solution with a PH of 5 to a boiling tube.
3. Place the boiling tube in a water bath and leave it for 5 mins to come up to temperature.
4. Add 5cm3 starch solution to the boiling tube, mix, and start a stopwatch.
5. Use a pipette to take a sample every 30 seconds and add it to a well containing iodine.
6. When the iodine no longer changes colour, the amylase has been completely broken down. Stop the stopwatch and record the time along with the PH level.
7. Repeat steps 1-6 with a different PH buffer solution.

Calculating the Rate of Reactions

For example, it took 50 seconds to breakdown 24cm3 hydrogen peroxide. So the rate of reaction would be 24/50 = 0.48cm3 s-1