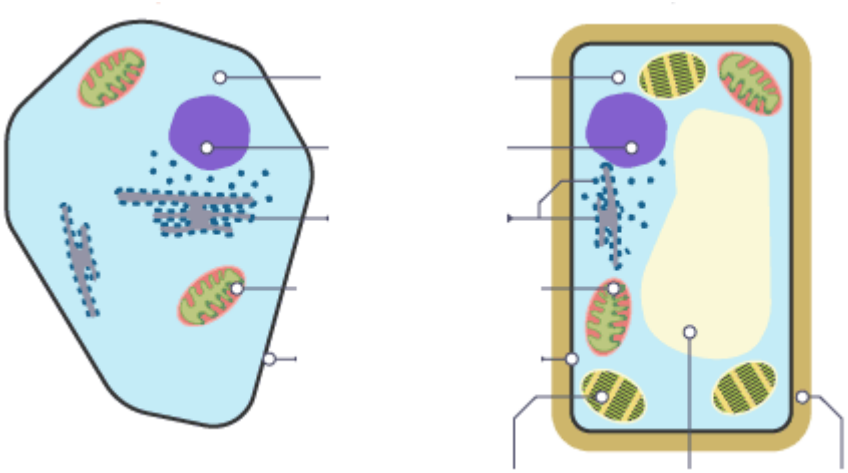
GCSE 9-1 Biology Revision Topic 1 – Key Concepts in Biology (cells, cell transport, enzymes, biomolecule testing)

Cells – *you need to be able to label a cell diagram and link structure to function*

Label the 2 cells and state if they are a plant or animal cell



Specialised cells (you must be able to identify them as well), link to their functions:

red blood cell	Produce antibody to destroy pathogens, part of the specific immune response
white blood cell - phagocyte	Conduct electrical impulses within the nervous system, long axon covered with insulating myelin
white blood cell - B cell	Haploid gamete (half the normal no. of chromosomes), long tail for motility, contain digestive enzymes in acrosome to allow fertilisation of female gamete
nerve (neurone) cell	Waft mucus using cell surface membrane extensions, found in trachea and fallopian tubes
ovum	Transport oxygen bound to haemoglobin, biconcave shape to increase SA, flexible to squeeze through capillaries
sperm cell	2 of these form a stomata, can swell up to open stomata, shrink to close stomata
guard cell	Haploid cell (half the normal no. of chromosomes), large gamete, produced in ovaries
ciliated epithelial cell	Digest pathogens using enzymes

Place a tick if the feature is present in the cell

	Plant cell	Animal cell	Bacterial cell
Cell membrane			
Cell wall			
Cytoplasm			
Nucleus			
Plasmid			
Mitochondria			
Flagellum			
Large vacuole			
Chloroplast			

Match the cell structure to its function:

Nucleus	Separates the contents of the cell and its surroundings. Controls the movement of substances such as oxygen, glucose and carbon dioxide into and out of the cell.
Mitochondria (1 mitochondrion)	Many chemical reactions needed to carry out life process take place here. It also contains **organelles**
Ribosome	Organelle that contains DNA. It controls the cells activities.
Cell Wall	Organelle that contains chlorophyll, a green pigment that absorbs light energy for photosynthesis.
Cell membrane	Made of tough cellulose to support the cell and allows it to keep its shape.
Large Vacuole	Organelles in which aerobic respiration occurs (oxygen and glucose react to release energy needed by the cell). Very small and cannot be seen easily through a light microscope
Chloroplasts	Membrane of the nucleus, allows molecules to enter/exit and messenger RNA to exit in protein synthesis
Cytoplasm	Space in the cytoplasm filled with cell sap (mainly water and ions), it is membrane bound, helping to support the plant by keeping the cell rigid.
Nuclear membrane	Site of the second stage of protein synthesis (translation).

Calculations on cells

Good youtube video 'science sauce 'how to calculate magnification'

You need to be able to change this formula and calculate any measurement (*don't forget to include the units*)

Magnification = Image size / Actual size *nb the units of the image size and actual must be the same*

1. The magnification on the microscope was x 400, the image size was 25mm, calculate the actual size of the cell

2. The magnification was x 200, actual size was 0.2mm, what was the image size?

Convert the following

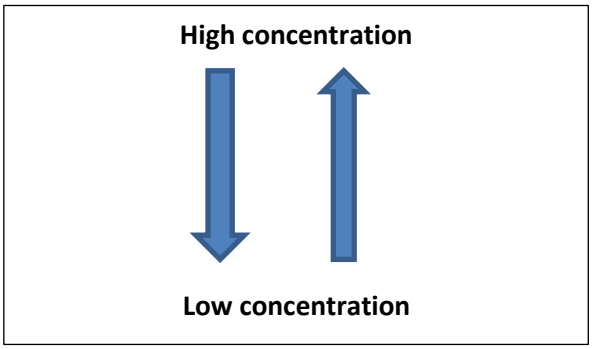
1. 15mm into µm
2. 333 µm into nm
3. 2500µm into mm
4. 375,000,00 nm into mm
5. Express 576,000 mm in standard form
6. Express 0.028 µm in standard form

Cell transport

Good youtube video ' science sauce 'osmosis and diffusion' and 'osmosis in potato strips – bio lab'

Method of cell transport	Definition	Example in plants	Example in animals
Diffusion	Movement of _____ from a _____ to a _____ concentration. This is passive and does not use _____		
Active transport	Movement of _____ from a _____ to a _____ concentration. This uses _____		
Osmosis	Movement of _____ form a _____ concentration to a _____ concentration through a _____ _____ _____		

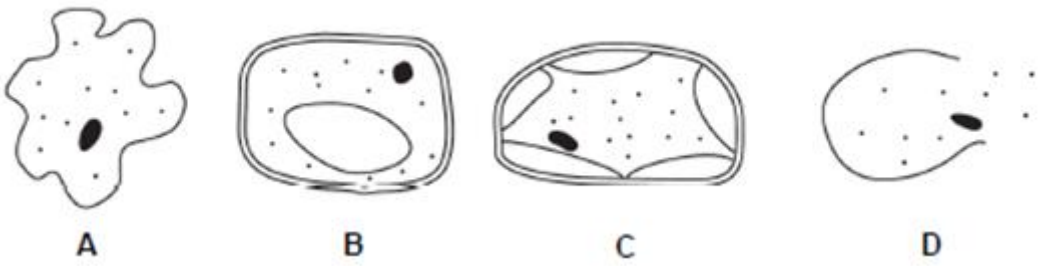
Add in which is diffusion
and which is active transport :



Effect of osmosis on animal and plant cells - core practical so you will get Qs on this

Plant cell in concentrated sucrose	Plant cell is pure water	Animal cell in concentrated sucrose	Animal cell in pure water
Water will move_____, making cells _____	Water will move_____ making cells _____	Water will move_____ making cells _____	Water will move_____ making cells _____

Match the image to the boxes above:



Questions

Carrot sections were created with a cork borer, initial mass recorded and then placed into different concentrations of sucrose solution, left for one hour, carrot sections removed, blotted gently and final mass recorded.

Concentration of sugar solution in mol dm^{-3}	Starting mass in g	Final mass in g	Change of mass in g	Percentage (%) change
0.0	1.30	1.51		
0.2	1.35	1.50		
0.4	1.30	1.35		
0.6	1.34	1.28		
0.8	1.22	1.11		

Water movement direction

1. Complete the end 2 columns of the table
2. Indicate which concentrations resulted in water moving out by osmosis and which ones where water moved in by osmosis
3. What should have been done to make the experiment valid?

Identifying Biomolecules – core practical so you will get Qs on this

Good youtube video, 'science sauce food tests' (but ignore DCPIP as not needed)

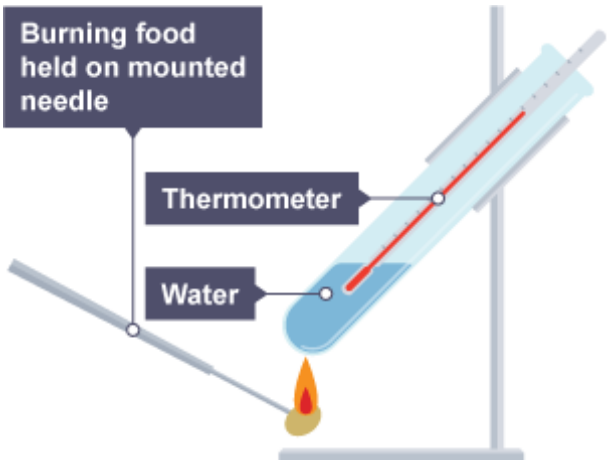
You need to be able to describe the method and a positive and negative result for each biomolecule, this could be set in the context of testing food, an enzyme reaction etc

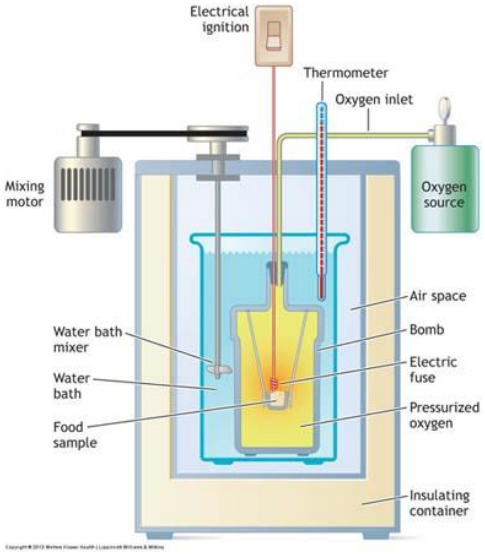
Biomolecule	Indicator	Conditions	Result
Starch	Benedict's solution	Add dropwise to liquid sample (if solid dissolve in water first)	Pos = blue to brick red precipitate (lower conc if green/yellow/orange) Neg = remains blue
Reducing sugar (eg glucose)	Ethanol, then water	Shake sample (solid or liquid) in ethanol for 30s, then add water	Pos = amber to blue/black Neg = remains amber
Protein	Iodine solution	Add equal volume to liquid sample (if solid dissolve in water first), heat for 2-3 min at $80^{o}C$	Pos = milky white emulsion (the greater the emulsion = more present)
Lipid	Biuret solution	Add dropwise to liquid or solid sample	Pos = blue to purple (the darker the purple = more present) Neg = remains blue

Safety points for biomolecule tests:

Energy content of food

Need to _____ sample of food using a _____. Heat released is transferred to _____ within the container. Record the change in temperature of the water and use equation to calculate energy content





Simple calorimeter

complex calorimeter (need to be able to state why the complex one will give more accurate results)

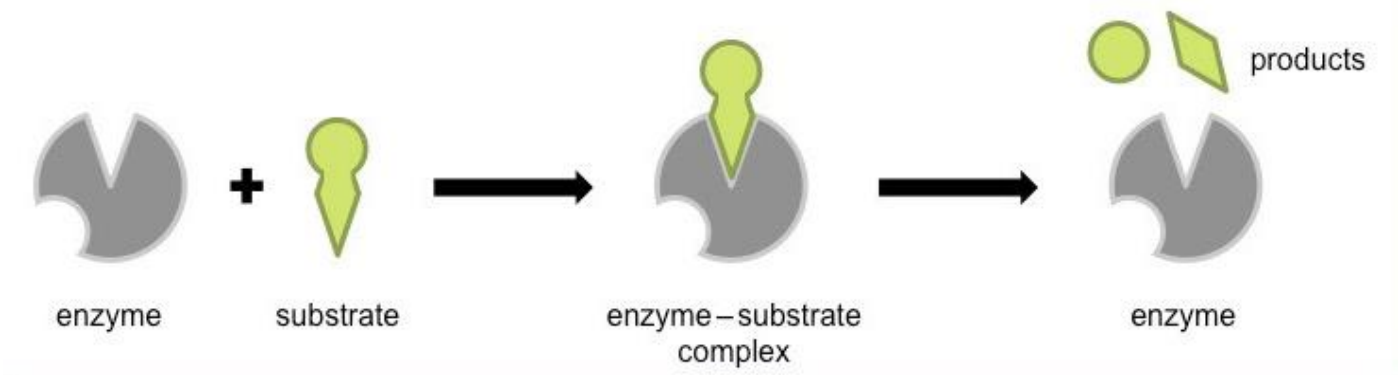
Question:

2g of cereal bar was burnt beneath a test tube of 20cm^3 water. The water initially was 16^{o}C and increased to 34^{o}C. It takes 4.2J of energy to raise the temperature of 1cm^3 water by 1^{o}C. Calculate the energy content of the 2g of cereal bar and what it would be for the whole bar of 125g. Give your answers in KJ

Enzymes – core practical (effect of pH on amylase) so you will get Qs on this

Good video to watch on enzymes from the amoeba sisters, google 'amoeba sisters enzymes'

Label the active site of the enzyme



Enzymes are _____ catalysts, speeding up a reaction and lower the _____ energy of a reaction. An enzyme is _____ to one substrate due to its shape of the _____ _____ which is complementary to the substrate, this is known as the _____ and _____ hypothesis. Enzymes are made of _____ . They remain _____ in a reaction and are not used up.

Enzymes can be _____ and break down large molecules eg protein into _____ _____

Or _____ and build up large molecules eg glucose into _____

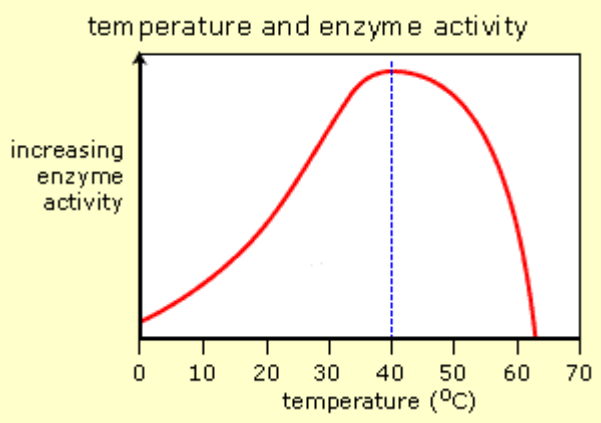
Match the digestive enzyme to its specific substrate and product and include where each enzyme is produced in the body:

Where enzyme produced	**Enzyme**
	Amylase
	Protease
	Lipase
	Maltase

Substrate
Lipid
Starch
Maltose
Protein

Product
Glucose
Fatty acids and glycerol
Amino acids
Maltose

Factors affecting enzymes include: _____, ____ and _____ or substrate or enzyme. High _____ and non-optimal ____ will cause an enzyme to _____ where the active site has lost its shape and is no longer complementary to its specific _____

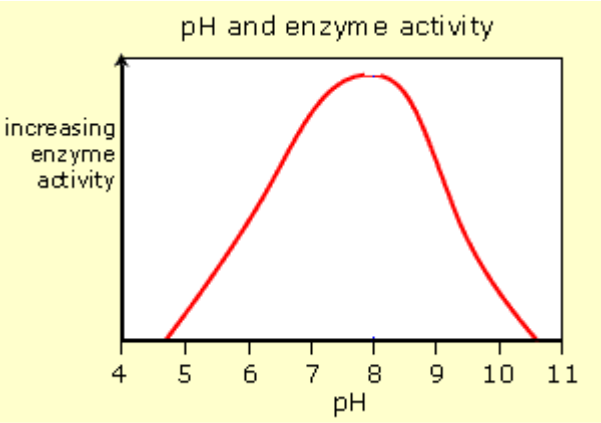


On the diagram indicate where there is increasing kinetic energy

The optimum temperature

Where the enzyme starts to denature

Where all enzymes are denatured

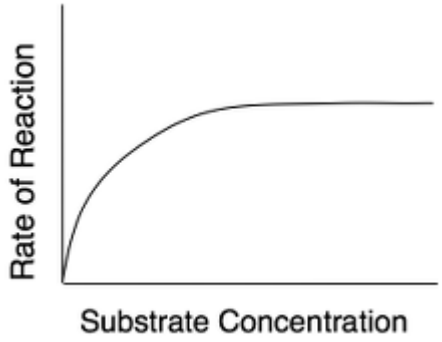


On the diagram indicate the optimum pH

Indicate where all the enzyme has denatured

Indicate where the active site starts to change shape

What enzyme would have an optimal pH of 1-2? Where is it found?



Indicate where the active sites are not full

Indicate when the active sites are full

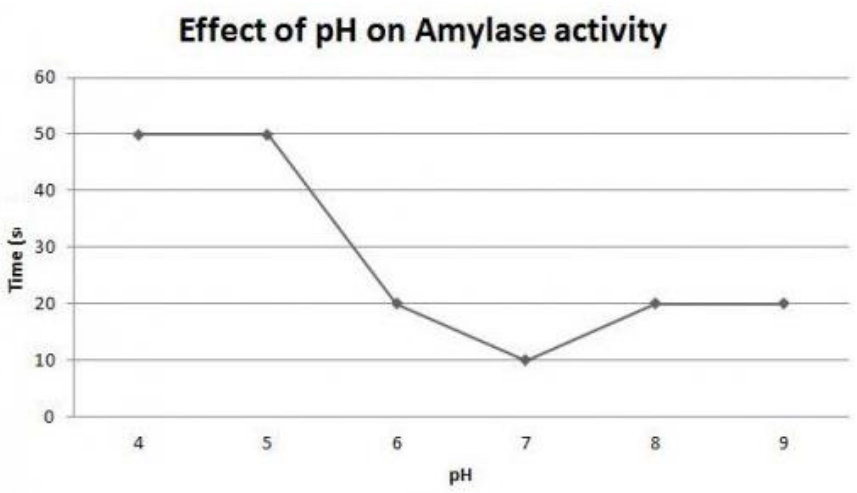
Indicate when the enzyme is the limiting factor

Amylase and effect of pH on rate of digestion of starch - core practical

Rate calculations – you need to be able to do this

Rate = how quickly a reaction is in relation to time, **calculate by 1 / time** – must include units

1. Amylase digested starch at pH 6 in 20s, what is the rate?
2. Amylase digested starch at pH4 in 50s, what is the rate
3. Amylase digested starch at pH 7 in 10s, what is the rate?



Using a different coloured pen, draw on top of this graph what the rate graph would like look for this data (so Y axis would be rate, x axis stays as pH)

1. How can you maintain the pH in a reaction, regardless of whether products are acidic/alkaline?
2. How could you find a more accurate value of the optimum pH for amylase?
3. For this experiment what will need to be controlled to ensure results are valid?

1. How can you test for presence of reactant?
2. How can you test for presence of product?

Exam questions – mark schemes on W drive

See practical booklet for enzyme questions, biomolecule testing questions and osmosis questions

B2 march 2013 Q5

*(c) Describe the roles of the enzymes involved in digestion.

(6)

B2 june 2015 Q6

*(d) Describe how named factors affect the rate of enzyme-catalysed reactions.

(6)