Year 11 summary notes
Biology

Year 11 revision: When looking at the following questions tick answer you are 100% sure you know, cross answer you need to get help with, and put a question mark beside answer you are unsure about.

Make use of the MY GCSE Science website
Bitesize
S-cool
Any other websites you use

Check the specification; http://filestore.aqa.org.uk/subjects/AQA-4405-W-SP-14.PDF

In the topics of cells can you??

1. Label a plant and animal cell, bacterial cell and yeast cell
2. Compare the above cells, similarities and differences
3. Know what an organelle is
4. Explain the job of the different parts of a cell
5. Learn the job of 2 new organelles, ribosome and mitochondria
6. Explain the term specialised cell
7. Explain how some cells are specialised (structures and the function of these structures for purpose)
8. Explain what a tissue is and give three examples (glandular, epithelial and muscle) and their jobs
9. Explain what an organ is (and explain how the stomach tissues that make up the organ enable it to do its job)
10. Explain the term diffusion and some factors that affect the speed of diffusion

Environment and sampling can you???

1. Suggest some factors that affect the distribution of organisms and explain why??
2. Explain how to randomly sample (quadrats) and systematically sample (transect)?

In the topics of enzymes can you??

1. Explain what enzymes are what they are made of, what they are sensitive to
2. Explain what the active site is and what a substrate is
3. Can you sketch a diagram for the lock and key model?
4. Suggest some of the jobs enzymes carry out in our bodies
5. Explain why enzymes are catalysts
6. Can you describe and explain the effect of temperature on rate of enzyme activity (sketch a graph too)
7. Can you explain how pH affects an enzymes activity and sketch a graph
8. Can you explain the term denaturing?
9. Can you name the key digestive enzymes, site of production, site of activity and products produced?
10. Could you write a detailed 5/6 mark answer to explain the complete digestion of fats, carbs and protein
11. Can you explain the role of bile, where it is produced and stored?
12. Could you label key organs in the digestive system?
13. Do you understand the term optimum conditions relating to enzymes?
14. Can you give as much detail as possible about the uses of enzymes in industry?
15. Can you give reasons for and against the use of enzyme sin industry?
16. Can you give some examples of uses of enzymes in medicine?
17. Give some examples of proteins in the body (beyond enzymes)

In the topic of respiration can you??

1. Explain aerobic and anaerobic
2. Write the equations for both aerobic and anaerobic respiration
3. Can you write the formula equations ($C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O$)
4. Explain where most steps of respiration occur and how the organelle is adapted for the process
5. Explain the purpose of respiration and name the storage sugar in the muscles and liver
6. Explain how the energy from respiration is used
7. Recognise that it is controlled by enzymes and thus is sensitive to temp and pH
8. Explain how the body changes during exercise (heart and lungs)
9. Explain why the heart and lungs change in the way they do
10. What characteristics would a fit person have compared to a less fit?
11. Can you compare and contrast aerobic and anaerobic respiration
12. What is oxygen debt?
13. Explain how the heart will change with exercise over a long period making it more efficient
14. Explain the term muscle fatigue

In the topic of speciation and fossils can you???

1. Explain what a fossil is
2. Explain how they provide evidence for evolution
3. Explain the limitations of the fossils as evidence for evolution
4. Explain how fossils are made
5. Give some reasons for extinction
6. Explain speciation
7. Define speciation
8. Define a species

In the topic of inheritance can you????

1. Explain mitosis and meiosis in 5 points each
2. Compare these two types of cell division
3. Explain the following terms, gene, DNA, chromosomes, allele, homozygous dominant, homozygous recessive, heterozygous, recessive, dominant, haploid, diploid, stem cell, gamete, mitosis, meiosis, clone, genotype, phenotype, pure breed, homologous chromosomes
4. Do you know the chromosomes for a male and female?
5. Explain how a gene controls the development of a protein
6. Do you know what polydactyly is and what allele causes it?
7. Do you know what causes cystic fibrosis and how it affects people?
8. Suggest some treatments for cystic fibrosis and reasons for them, why antibiotics are given and enzymes (problem with taking enzymes orally)
9. Do you know how many chromosomes a human has?
10. Where the chromosomes are found
11. How many pairs of chromosomes a human has
12. What is genetic fingerprint and how could you use one to match an unknown DNA sample with a known sample
13. What genetic screening may be used for
14. Give some positive and negative thoughts on genetic screening
15. Who was Mendel and what did he do and say
16. What are stem cells, how can they be used, pros and cons of using them
17. Explain why meiosis and mitosis are important
18. Can you show using a genetic cross how the inheritance of gender is 50% chance of boy or girl

In the topic of photosynthesis can you?????

1. Write the word and symbol equation for photosynthesis
2. Name three limiting factors for the process
3. Explain the uses of the glucose produced by the plant
4. Explain how the cross section of the leaf is adapted for photosynthesis
5. Explain how the palisade cells are adapted for photosynthesis
6. Label the different parts of the cross section of the leaf
7. Give examples of plant tissues
8. Recall that plants respire all the time but only photosynthesis in the presence of light
9. Name the storage sugar in plants
10. Explain how the leaf as an organ can function effectively in photosynthesis

Most human and animal cells have the following parts:

A **nucleus**, which controls the activities of the cell
Cytoplasm, in which most of the chemical reactions take place
A **cell membrane**, which controls the passage of substances into and out of the cell
Mitochondria, which are where most energy is released in respiration
Ribosomes, which are where protein synthesis occurs.

Plant cells have these and also
Chloroplast: which contain a green pigment Chlorophyll that absorbs light energy for photosynthesis
Cell wall: made of cellulose which strengthens the cell (supports the cell)
A permanent vacuole: This contains the cell sap

Bacterial cells: have a cell wall (though not made of cellulose), they do not have a nucleus but do have genetic material, they have a cytoplasm, cell membrane and contain smaller ribosomes (than plant or animal cells)

Yeast cells: have a nucleus, cytoplasm and membrane.

After fertilisation, an embryo forms through cell division (mitosis) and this contains stem cells (unspecialised/undifferentiated cells). Certain genes are switched on and cells will begin to specialise/differentiate, meaning that they take on unique shapes and characteristics to perform particular jobs.

Sperm cells are streamlined, have a tail to swim, the area around the tail is packed with mitochondria to release the energy for the tail to contract.
Red blood cells have no nucleus so they can carry more oxygen
Root hair cells have a large surface area to absorb more water
Palisade cells are packed with chloroplasts

Substances move in and out of cells by diffusion

Net movement of molecules from a high concentration to a low concentration

Rate of diffusion depends upon
Temperature: higher temperature = more kinetic energy = faster diffusion
Concentration gradient (difference between areas) = steeper = faster
Size of particles: smaller = faster

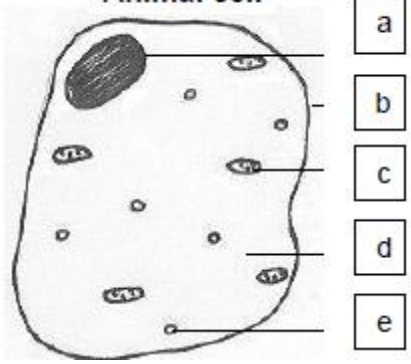
Oxygen diffuses into cells from the blood because……
Inside the cell oxygen is used in respiration and so is always at a low concentration compared to the blood (CO_2 moves the opposite way as it is produced in respiration)

Carbon Dioxide diffuses into a leaf as it is used in the leaf for photosynthesis so is lower than the surrounding atmosphere

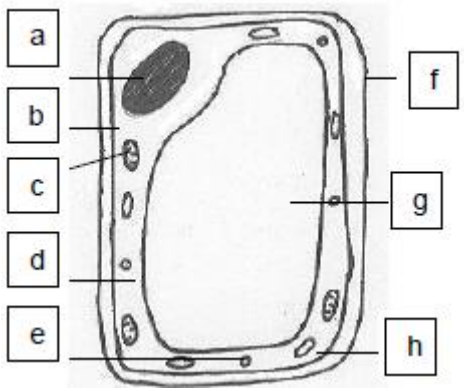
Cells: are the basic building blocks of life

Tissues: groups of similar cells with similar structure and function:
Muscle cells → muscle tissue → contracts
Glandular cells → glandular tissue → produce and secrete substances like hormones and enzymes
Epithelial cells → epithelial tissue → covers parts of the body
Palisade cells → palisade mesophyll → main site of photosynthesis
Epidermal cells → epidermal tissue → cover the leaf
Xylem and phloem tissue → transport water and sugar respectively
Organs*: *made of different tissues working for a common purpose
Stomach: muscle tissue (churn food and digestive juices), glandular tissue (to produce digestive juices), epithelial tissue (to cover the inside and outside of the stomach)
Leaf: mesophyll tissue where photosynthesis occurs, xylem and phloem for transport, epidermal tissue to cover the leaf

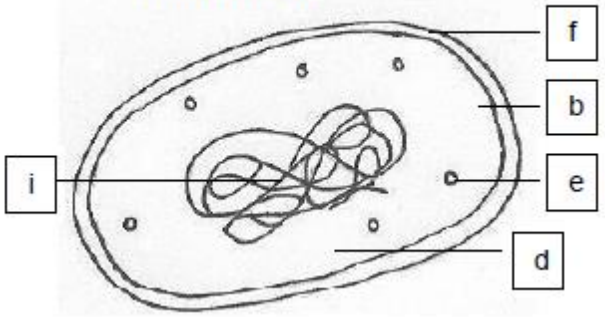
Animal cell



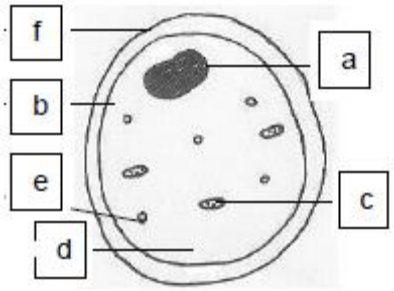
Plant cell



Bacterial cell



Yeast cell



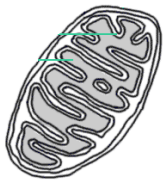
Label	Name of cell part	Function of the cell part
A		
B		
C		
D		
E		
F		
G		
H		
I		

What are the main differences between a plant and animal cell?
Animal cell has no chloroplasts, cell wall or permanent vacuole

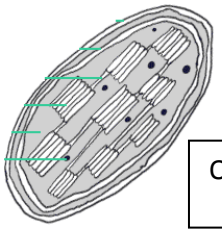
What are the main differences between an animal and bacterial cell?
Bacterial cell has no nucleus, no mitochondria, bacteria have a cell wall
Bacterial cells have a slime capsule (prevents them drying out), they have plasmids, that are circular pieces of DNA that usually carry genes for antibiotic resistance, they have flagella for movement.

What are the main differences between a plant and yeast cell?
Plant cell has a permanent vacuole, chloroplast. Yeast respire aerobically, using oxygen, but can respire anaerobically too, producing ethanol and CO2 (fermentation)

Tissues: a group of **similar cells** working together
Muscle tissue: a group of muscle cells. When these contract together they cause muscle to shorten and allow movement
Glandular tissue: group of cells that secrete substances like hormones and enzymes
Epithelial tissue: group of cells that form a covering for some parts of the body

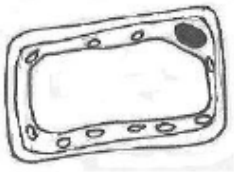


Organelle C, looks like this close up



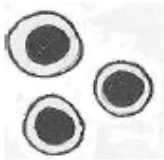
Organelle H, looks like this close up

Organs: made up of **different tissues** working together for a common purpose
Tissues found in the stomach, an organ involved in digestion are listed below
Epithelial tissue: covering the outside and more on the inside
Muscular tissue: helps churn the food up with the acid and enzymes
Glandular tissue: secreting, acid to kill bacteria, to create the optimum conditions for the enzymes. It secretes protease enzymes, and it secretes mucus
All these tissues have a different job, but work together to ensure digestion of food is effective



Palisade cell (from leaf)

Absorbs light for photosynthesis
Packed with chloroplasts which contain the pigment chlorophyll.



Red blood cell

Absorbs oxygen and transports it around the body

Contain no nucleus so more haemoglobin can be packed in.

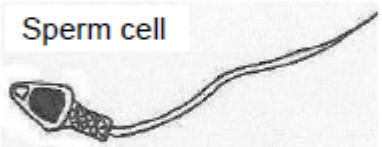
Has a biconcave shape so is flexible to squeeze through small capillaries.

Root hair cell

Absorbs water and mineral salts from the soil

Has a large surface area which enables the cell to absorb more water from the soil.

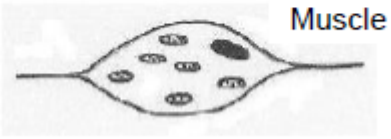
Sperm cell



Fertilises the female gamete (egg)

Has a tail to swim to the egg.

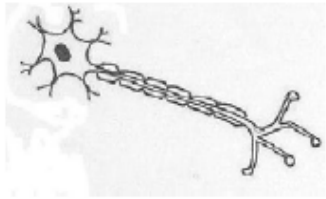
The mid piece is packed with mitochondria to provide energy for movement.



Muscle cell

Contracts (to provide muscle movement)

Contains mitochondria which provide the energy for contraction.

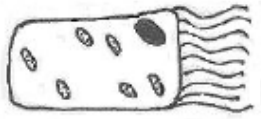


Nerve cell (motor neurone)

Transmits nerve impulses

Contains fibres (dendrites) which connect to other neurones.

The axon is surrounded by the myelin sheath which insulates it and speeds up the transmission of the nerve impulse.



Ciliated cell (in oviduct)

Moves the egg towards the uterus

Has cilia on the surface which beat regularly to move the egg down the oviduct.

Contains mitochondria which provide the energy needed to move the cilia.

Diffusion: the net movement of molecules from a high concentration to a low concentration.
It is faster when the **temperature is high** and the **concentration gradient is steep** (like high oxygen in the alveoli and low oxygen in the blood), the **diffusion distance is short**, the **molecules are small**, the **surface area** across which diffusion occurs **is large.**

Organ system: different organs working together. This division of labour improves efficiency.

The digestive system has a variety of organs doing different jobs

Organs for releasing digestive juices like……

1. Pancreas: releases digestive enzymes to the small intestine
2. Salivary glands: release s enzymes into the mouth
3. Liver: releases bile to neutralise stomach acid and help digest fat
4. Stomach: releases enzymes, acid

Organs for digestion like……
Stomach, mouth or small intestine. These all have glands to secrete enzymes, and these digestive secretions are mixed with the food by muscles or by the teeth

Organs for absorption of soluble products of digestion like…..
The small intestine, with its folded wall and microvilli to give it a large surface area
The epithelial cells are thin so the nutrients only have a short distance to diffuse
There is muscle tissue to keep the food moving and to mix it
There are blood vessels to carry away the nutrients and keep a steep concentration gradient
The large intestine, where water is absorbed

Each organ has a different job, structure and is made up of different tissues, but they work together to ensure effective digestion of food

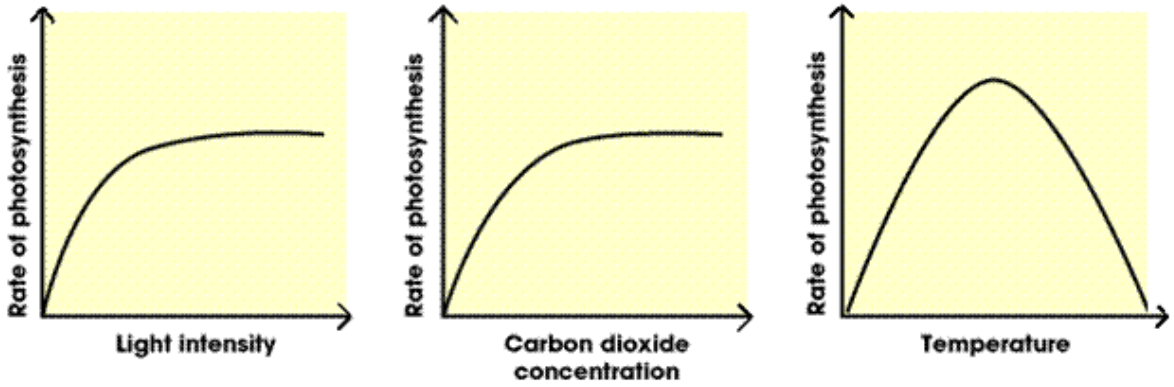
Photosynthesis: Carbon Dioxide + water → Oxygen + Glucose

$6CO_2$ $6H_2O$ $6O2$ $C_6H_{12}O_6$

Photosynthesis occurs in chloroplasts
Light energy is absorbed by chlorophyll: used to convert carbon dioxide and water in to sugar
Water enters through the root hair cells
Carbon dioxide diffuses in through the stomata
Oxygen is released as a by-product and diffuses out of the leaf

Plants use oxygen for respiration.
In the day Rate of photosynthesis > rate of respiration, so there is a net production in oxygen
At night: there is no photosynthesis so only respiration occurs and oxygen levels decrease

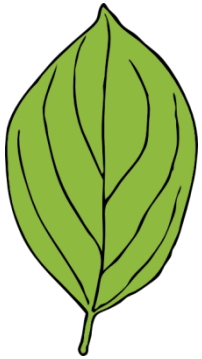
Limiting factors: factors that affect the rate of photosynthesis. The key factors are
Light intensity (energy), Carbon Dioxide (raw material) concentration and Temperature (affects enzymes)
Carbon dioxide levels are so low in the atmosphere (0.04%) it is often a limiting factor
Light and temperature will vary with season, CO2 does not vary as greatly

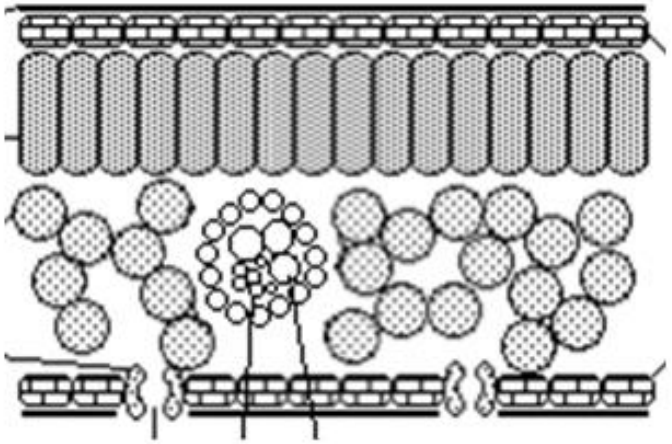


Greenhouse, polytunnels and hydroponics are ways to grow plants and try to minimise effect of limiting factors. But raising temp, CO2 and light intensity costs money and so must be balanced against the profit form increased growth.

Uses of glucose
Respiration: to release energy
Cellulose: for cell walls
Starch: insoluble storage sugar
Fats and Oils: energy store
Amino Acids: glucose is combined with nitrates to make amino acid that can be made into proteins

Plants need minerals for growth
Nitrates → to make amino acid for proteins → lack of nitrate = stunted growth
Magnesium → to make chlorophyll → lack of magnesium = yellow leaves





How a leaf is adapted for photosynthesis

Waxy layer reduces water loss, water is needed for photosynthesis

Palisade cells contain many chloroplasts and are close to the surface of the leaf to absorb most light. They have a thin cell wall so gases can diffuse in quicker.

Spongy layer has air spaces so gas diffusion is quick. Spongy cells have chloroplasts to absorb light

Vascular tissue to bring water and minerals and remove sugar

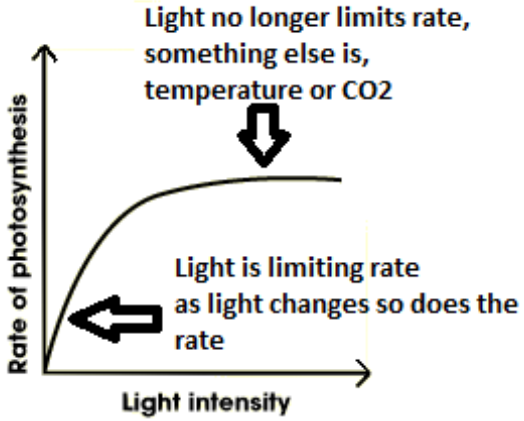
Guard cells can open and close the stomata to reduce water loss and regulate gas exchange. Guard cells have chloroplasts to absorb light for photosynthesis

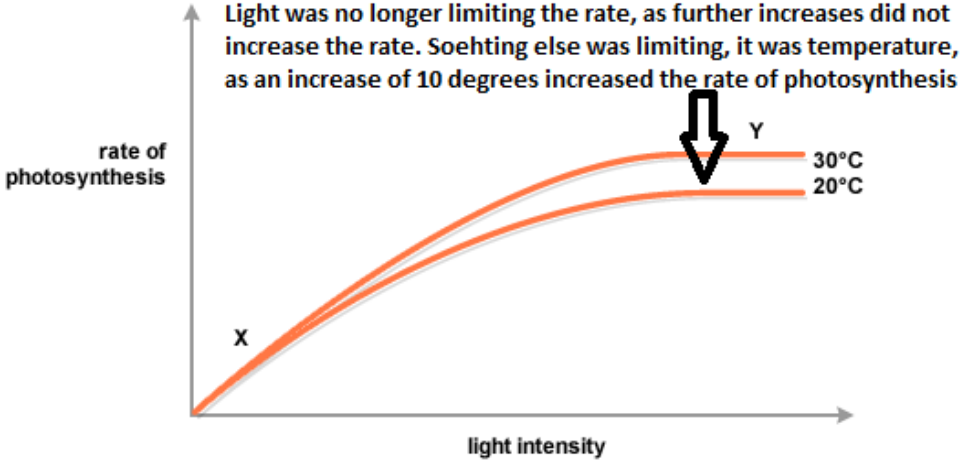
Mineral	Use in plant	deficiency
Nitrate	Making proteins	Stunted growth
Magnesium	Making chlorophyll	Yellow leaves

The uses of glucose:
Used in respiration to release energy, used to make starch an insoluble storage sugar, used to make cellulose for the cell wall, combined with nitrates to make amino acids for proteins, used to make fats and oils.

The three limiting factors are……..

Carbon dioxide concentration, light intensity and temperature



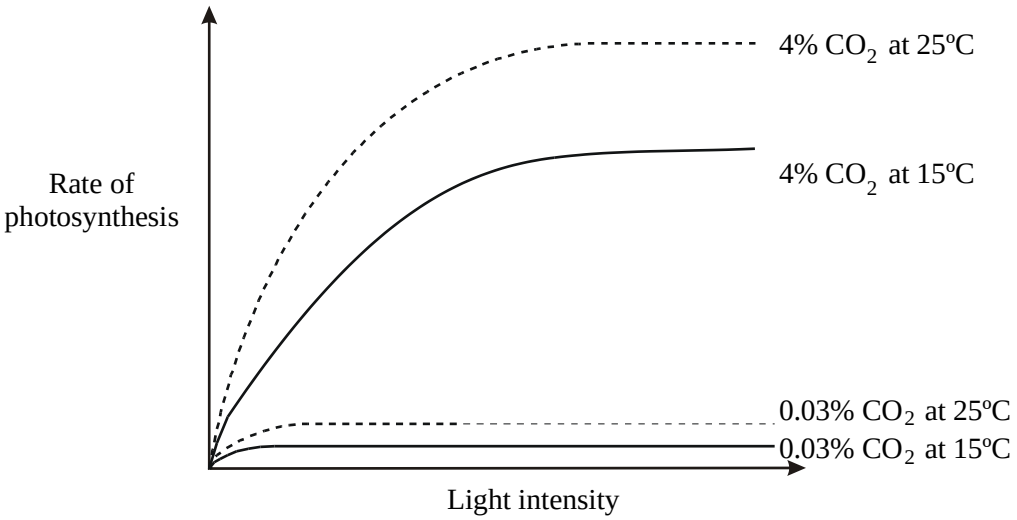


Plants can only photosynthesis in the day

Plants respire all the time; this is how they get energy for making new thing or absorbing minerals from the soil

In the day the rate of respiration is less than photosynthesis so more oxygen is released than used

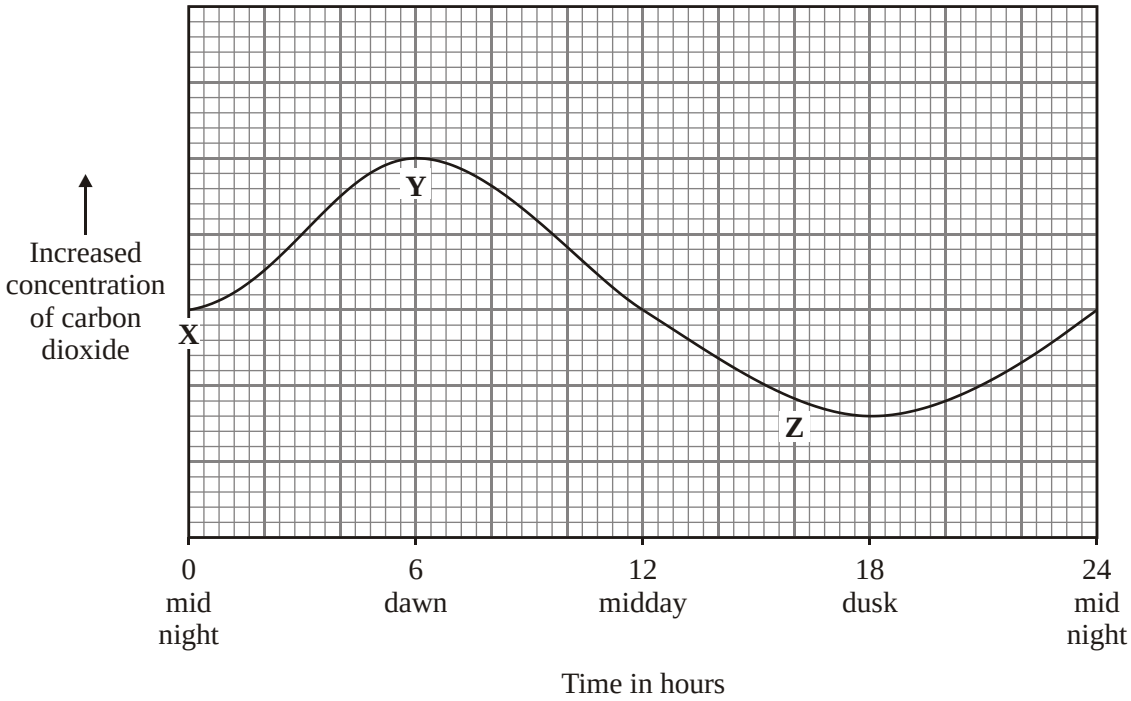
2. The graph shows how the rate of photosynthesis is affected by different conditions.



(a) What patterns can you find from this graph? (5)

(b) How useful could this information be to a grower using glasshouses? Give reasons for your answer. (2)

9. The graph shows the concentration of carbon dioxide in the air in a greenhouse full of tomato plants, measured over a period of 24 hours.



(a) Explain why the concentration of carbon dioxide in the air in the greenhouse increased between **X** and **Y**.(2)

(b) Explain why the concentration of carbon dioxide in the air in the greenhouse decreased between **Y** and **Z**. (2)

5. (a) Balance the following equation for photosynthesis.

..... CO_2 + ... H_2O → $C_6H_{I2}O_6$ + ... O_2 (1)

(b) Name two things necessary for photosynthesis apart from a suitable temperature range and the availability of water and carbon dioxide. (2)

(a) Plants have leaves which contain guard cells and palisade cells. Explain how **each** of these kinds of cell assists photosynthesis.

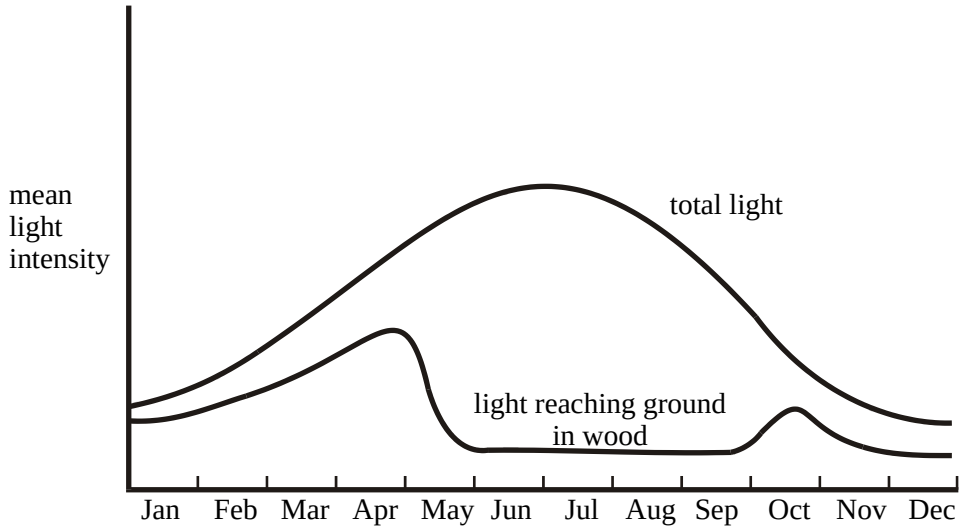
Guard cells (2)

Palisade cells (2)

(d) Glucose is a product of photosynthesis. Give **three** uses which green plants make of glucose. (3)

11. Algae are small green plants. Give **three** conditions needed by green plants to produce sugars. (3)

13. The graph shows the mean light intensity at different times of the year in an oak wood.



(a) (i) In which month would you expect the rate of photosynthesis in the oak trees to be greatest? (1)

(ii) There are plants living on the ground in the wood. In which month would you expect their rate of growth to be fastest? Explain your answer.. (3)

(b) Name **two** factors, other than light intensity, that would affect the rate of photosynthesis in the oak trees. (2)

2. (a) + light = + photosynthesis 5
+ light = + photosynthesis to a limit
limit depends on temp/CO_2 levels
+ CO_2 = + photosynthesis
+ temp = + photosynthesis

each for 1 mark

(b) need to raise optimum levels 2
when one other raised
to get max/economic yield

9. (a) respiration 1

no photosynthesis because no light 1

(b) photosynthesis rate greater than 1
respiration rate

reject no respiration / photosynthesis only

photosynthesis since light 1

. (a) 6 6 6

(b) any **two** of 2

- (presence of) chlorophyll **or** (amount of) chloroplasts

accept green leaves (or other green parts)

- (sufficient) light (intensity)

- (light) of **a** suitable wavelength

(c) **guard cells** 2

any **two** of

* control by osmosis
* the movement of gases

*accept movement of carbon dioxide **or** oxygen **or** water vapour beware movement of CO_2 out*

accept a diagram or description

* through the stoma

palisade cells 2

any **two** of

* near the upper surface
* contain (a great) <u>many</u> **or** <u>more</u> chloroplasts
* (so) contain the most chlorophyll

(d) any three of 3

* for respiration
* conversion to (insoluble) starch

or to food store **or** to (other)carbohydrates
* (conversion to) sucrose **or** to food store **or** to (other) carbohydrates

or polysaccharides

* (conversion to) lipids **or** fats **or** oils
* (conversion to) amino acids **or** (plant) proteins **or** auxins **or** (plant) hormones **or** enzymes

11. carbon dioxide
water
chlorophyll/chloroplasts
light

13. (a) (i) June 1

for 1 mark

(ii) April 3
max. light
photosynthesis makes sugars/substances needed for growth

for 1 mark each

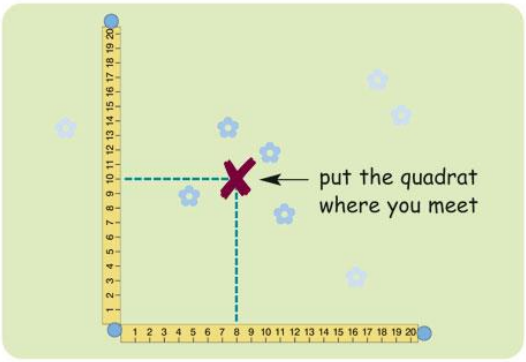
(b) 2 of: 2
temperature
carbon dioxide availability
water
chlorophyll

any 2 for 1 mark each

The distribution of organisms is affected by
Temperature: affects enzyme activity
Nutrients: like magnesium and nitrates for plant growth
Light: for photosynthesis
Water: raw material for photosynthesis, needed for chemical reactions, transport
Oxygen: needed for aerobic respiration, release energy
Carbon Dioxide: raw material for photosynthesis
pH: affects enzyme activity

Sampling the distribution of organisms can be done using

1) **Transects:**
   Use a tape measure to make transect
   Place quadrats at regular interval along transect
   Record the number of species in each quadrat
   Repeat with several transects at regular intervals



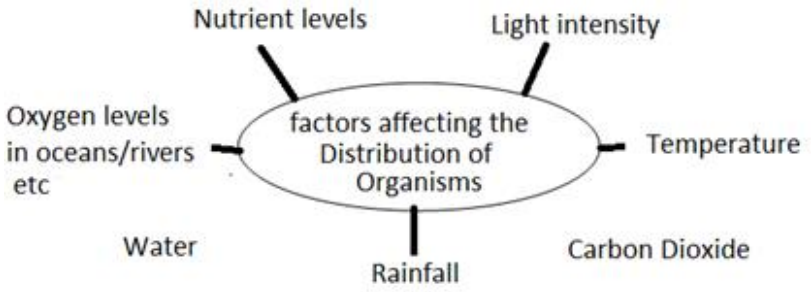
2) **Random sampling:**
   Divide the sample area into a grid
   Generate random numbers on a calculator and Use random numbers as co-ordinates (avoid bias)
   Place quadrats at coordinates
   Count number of species in each quadrat, repeating with a large number to be representative
   Proteins have many uses in organisms
   Hormones antibodies structural components like muscles **enzymes**

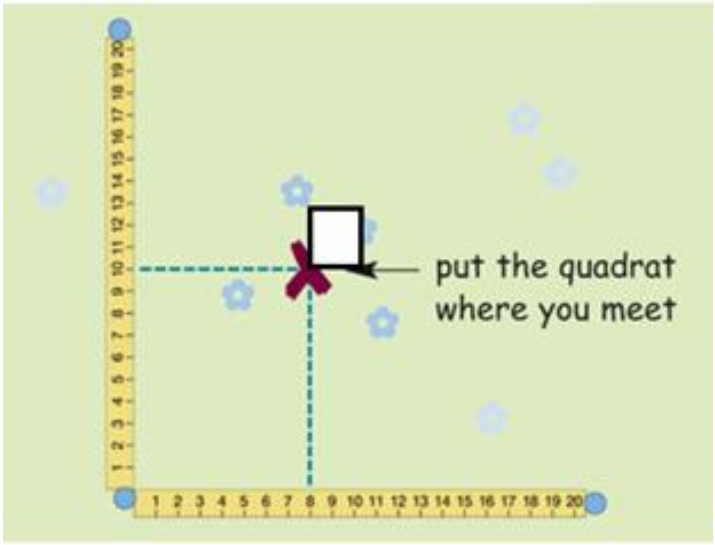
Why sample an area???

To estimate the number of different types of organisms in the habitat

To estimate the amount of each organism living in the habitat (population size)

How do you sample an area?
Randomly: using a quadrat
Using transects when there is an environmental gradient (the habitat changes from one place to the next)
Use a random process to avoid bias
Use a large sample to be representative of the population





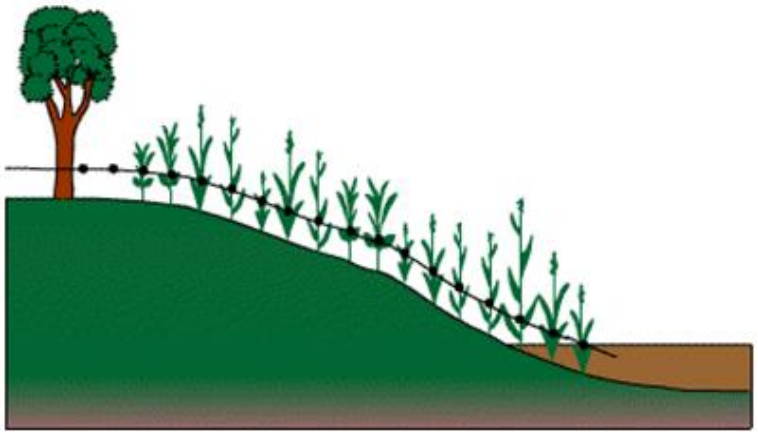
Using quadrats

Divide the area into a grid

Generate random number to use as coordinates (avoids bias)
Put the quadrat down and….

- Count the number of different species within
- The number of a particular species within
- Or the area covered by one/each species

Use a large sample to be representative of the area



Creating a transect
Use a **tape measure to create the transect**

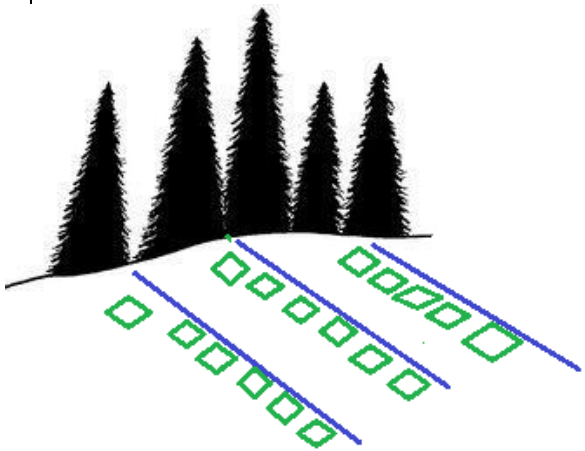
Place quadrats

At regular intervals along the transect

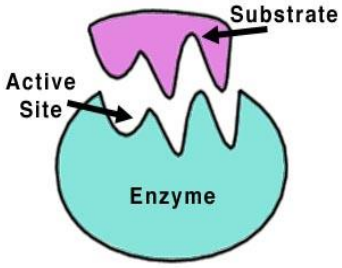
Record the number of different plants/number of each plant

Repeat the transect several times

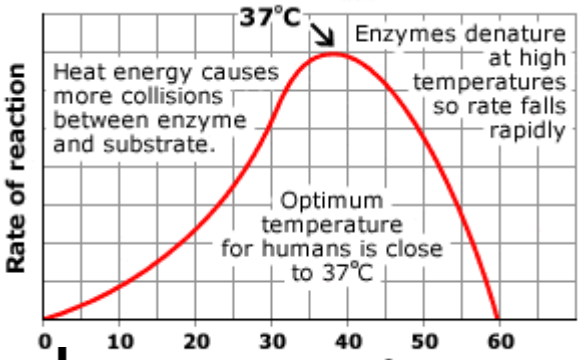
At random/regular intervals along the habitat



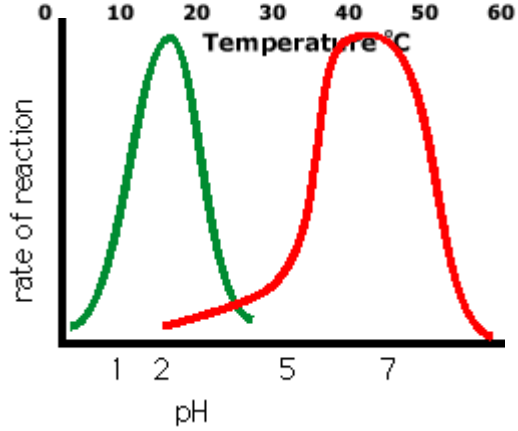
Proteins are polymers of amino acids that are folded into specific shapes



Enzymes have a specific region called an **active site**
They are **biological catalysts**: speed up chemical reactions by **lowering the activation energy**
They are sensitive to temperature and pH
As **temp increases**, the rate of reactions increase as the particles **gain Kinetic energy, collide more** frequently and forcefully, forming more enzyme substrate complexes.
Beyond the optimum temperature (temperature where enzyme works best)
The **enzyme denatures**, meaning that it active site changes shape and is no longer complementary to the substrate.



Extreme **pH beyond the optimum will also denature** the enzyme
Different enzymes work in different conditions; human enzymes have an optimum at 37 degrees. Enzymes in the stomach (protease) prefer acidic conditions (hydrochloric acid), and enzymes in the small intestine prefer alkaline conditions as their optimum.



Digestion is the breakdown of large molecules that cannot be absorbed into the blood, into small molecules that can be absorbed.

Digestion of carbohydrates
Amylase is produced in the salivary glands, pancreas and small intestine. It catalyses the breakdown of starch into simple sugars in the mouth and small intestine

Digestion of proteins
Protease is produced in the stomach, pancreas and small intestine. Protease catalyses the breakdown of proteins into amino acids in the small intestine and stomach.

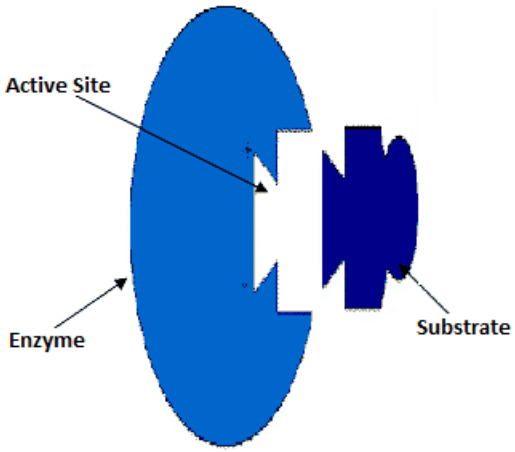
Digestion of lipids
Lipase enzymes are produced by the small intestine and pancreas. They catalyse the breakdown of lipids into fatty acids and glycerol in the small intestine.
Bile (from the liver which is stored in the gall bladder) aids fat digestion by **emulsifying lipids** to increase the surface area for lipase activity

Bile also neutralises stomach acid and creates the alkaline conditions for the enzymes in the small intestine

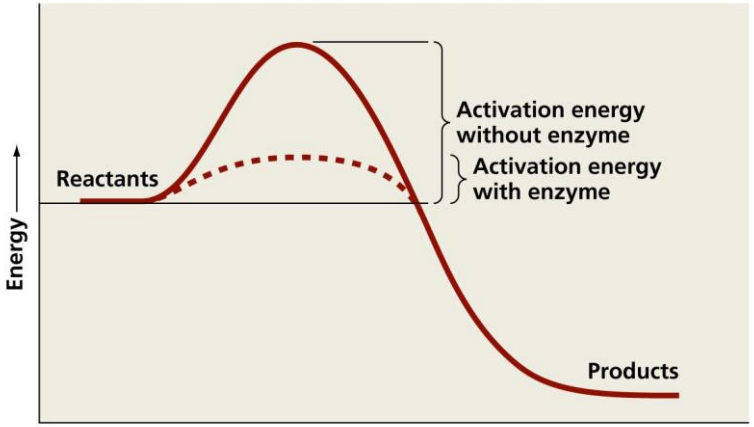
Enzymes in industry
They are usually sourced from microbes

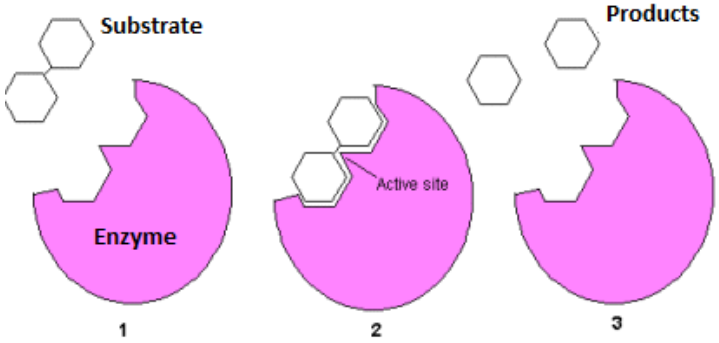
Used as they are reusable, and have a high turnover rate (rate at which they change substrate to product), so are effective in small quantities.
Work at <u>low temperatures</u> and <u>pressure</u> so reduce cost of manufacturing processes

Problems: water soluble so difficult to separate form products, activity is affected by temperature and pH, can be expensive to buy.
Applications (making cheese, yoghurt, beer, wine, genetic engineering)
Biological detergents: proteases and lipases, so wash clothes at lower temperatures and get cleaner clothes.
Proteases to pre-digest baby food
Carbohydrases to convert starch into glucose syrup
Isomerase: converts **glucose to a sweeter sugar fructose**. So is added in smaller quantities to slimming food making them less calorific.



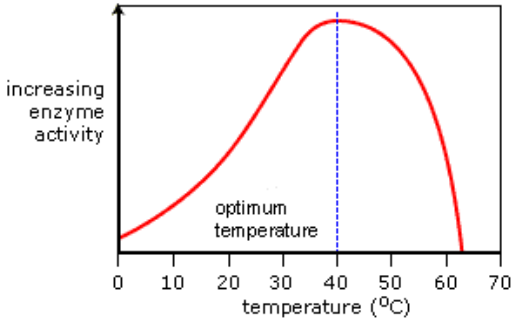
Enzyme Facts
They are organic/**biological catalysts** that speed up chemical reactions by providing an alternate pathway of lower activation energy (graph)
They are **proteins**
Proteins are **made up of long chains of amino acids**
The chains of amino acids are **folded in a specific way** to give a unique shape
Enzymes have a special region called an **active site** into which the substrate fits during a reaction
A substrate is the molecule the enzyme reacts with
Enzymes are not destroyed or used up in the reaction
Enzymes have an **optimum pH and temperature** at which they work fastest
The arte of enzyme catalysed reactions are affected by…pH, temperature, substrate concentration and enzyme concentration

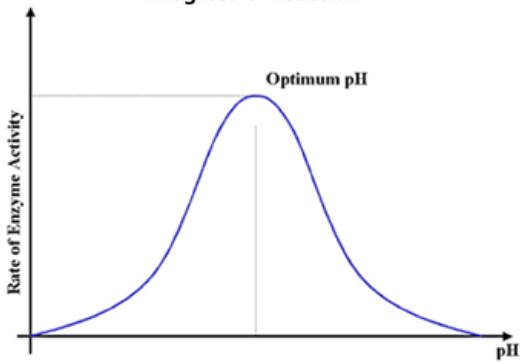




enzyme-substrate complex

enzyme ready to eract again as it is not used up in the recation



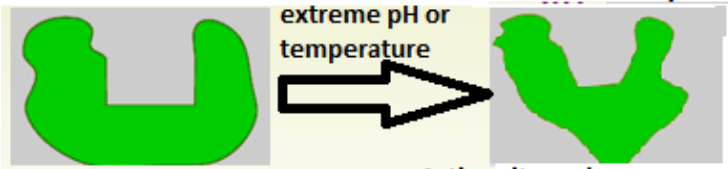


Describing effect of pH
As the pH moves away from its optimum the rate of the reaction changes
Large changes in the pH will denature the enzyme.

This model shows the lock and key hypothesis

1. The enzyme has a **specific active site** that is complementary to a particular substrate
2. The **substrate binds to the active site** and an enzyme substrate complex forms, and the reaction occurs
3. The new products no longer complement the active site and are released, the enzyme is ready to accept the next substrate molecule

Describing <u>and explaining</u> effect of temp on enzymes
As **temperature increases so does enzyme activity** up to a point (optimum) beyond which the rate of activity decreases
Increase in activity because
Enzyme and substrate have **more kinetic energy**, **Collide more** frequently, Collide with more energy, More successful **enzyme substrate complexes** form. **If temperature gets too high the enzyme denatures**, see diagram opposite explaining this term.



Normal enzyme active site

Active site no longer complimentary to substrate
Enzyme substrate complxes can not form

Digestion begins in the mouth. It is the breakdown of large molecules into smaller ones by enzymes. These small molecules can be absorbed in to the blood stream.

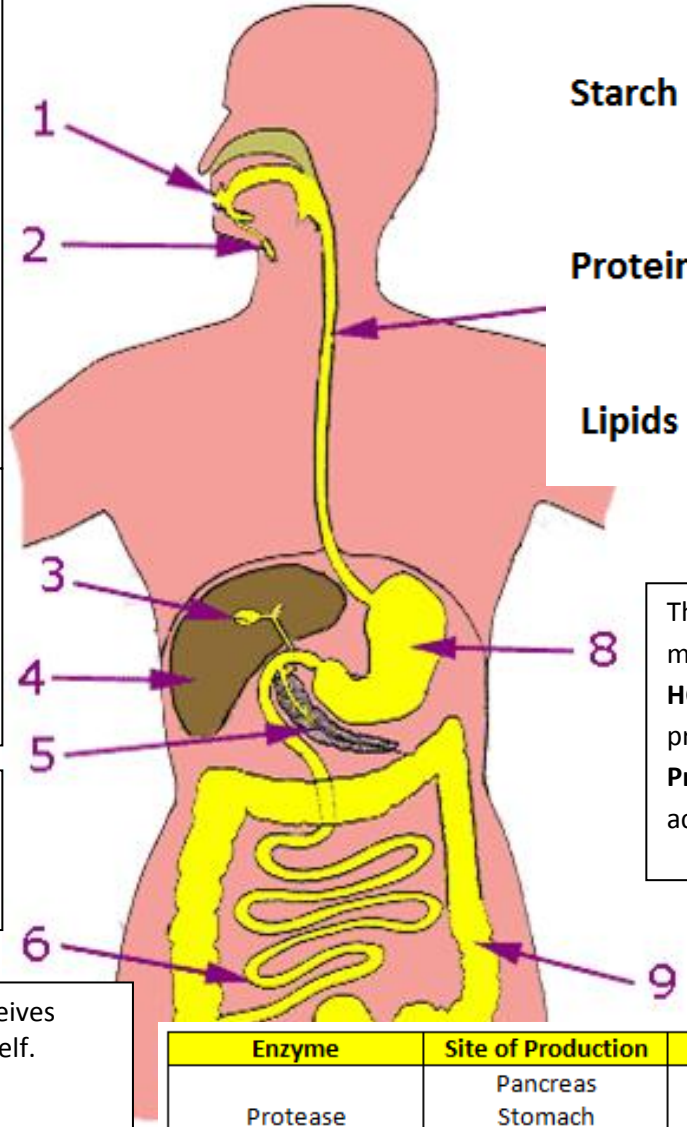
Mechanical digestion: is when the teeth grind up food to increase the surface area for enzymes

Chemical digestion: the action of **enzymes**

Salivary glands (2) produce and secrete **amylase**. This enzyme digests starch to simple sugars (maltose)

The **liver (4) produces bile** which is stored in the gall bladder (3). Bile **emulsifies lipids**, to increase the surface area for lipase enzymes, so fat digestion is faster. Bile **neutralises stomach acid** and creates optimum conditions for digestive enzymes in the small intestine

The **pancreas (5) produces enzymes** for the small intestine. Lipase, Protease and carbohydrases like amylase



Amylase: Starch → Maltose

Maltase: Maltose → Glucose

Protease: Protein → Amino Acids

Lipase: Lipids → Fatty Acids + Glycerol

The stomach stores food for 2-3 hours and churns it with the muscular wall to mix it with digestive juices containing **HCl: kills bacteria** and creates **optimum conditions** for protease enzyme

Protease: enzyme called pepsin digests proteins to amino acids

The large intestine absorbs water and minerals

The small intestine is the site of most digestion. It receives enzymes form the pancreas and produces enzymes itself. Here…

Lipids are digested by lipase

Lipids → fatty acids and glycerol

Proteins are digested by protease

Proteins → amino acids

Carbohydrates (starch), digested by carbohydrases (amylase)

Carbohydrates → simple sugars

Enzyme	Site of Production	Substrate	Products
Protease	Pancreas Stomach Small intestine	Protein	Amino Acids
Lipase	Pancreas Small intestine	Lipids	Fatty acids and glycerol
Carbohydrases: an example is Amylase is produced in the mouth	Pancreas Mouth Small intestine	Carbohydrates Starch is amylases substrate	Simple sugars Amylase produces maltose form starch. Maltase in the small intestine further digests starch to glucose

Temperature (ºC)	0	20	40	60	80	100
Rate of bubbling (per minute)	2	8	40	4	0	0

(i) Briefly describe how the rate of bubbling depends on the temperature. (3)

(ii) What does an enzyme do?.

(2)

(iii) Enzymes have many uses. For example they are used in some washing powders. Give **two** examples of other uses for which enzymes, or products containing enzymes, are sold. (2)

3. (a) Starch and protein are foods which have to be digested before they can be absorbed. For each, state the enzyme involved in the digestion process, where it occurs in the digestive system and what is formed and absorbed.

Food	**Enzyme**	**Where digestion occurs**	**What is formed and absorbed**
Starch	.....	.....	.....
Protein	.....	.....	..... (4)

Which enzyme is used:

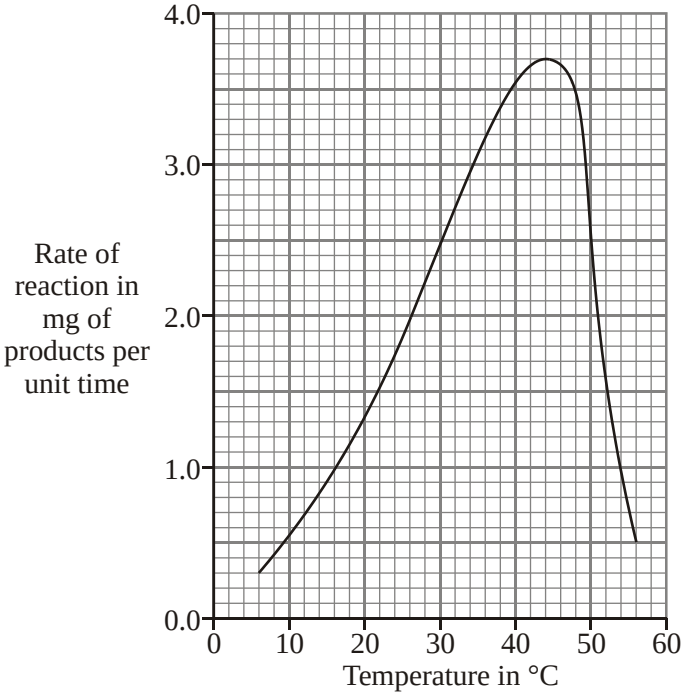
(i) to help to get greasy stains out of clothes?

(ii) in making slimming foods?

(iii) in making baby foods?..... (3)

Explain why enzymes are used in industry. (3)

12. (a) The graph shows how the rate of an enzyme-catalysed reaction changes with temperature.

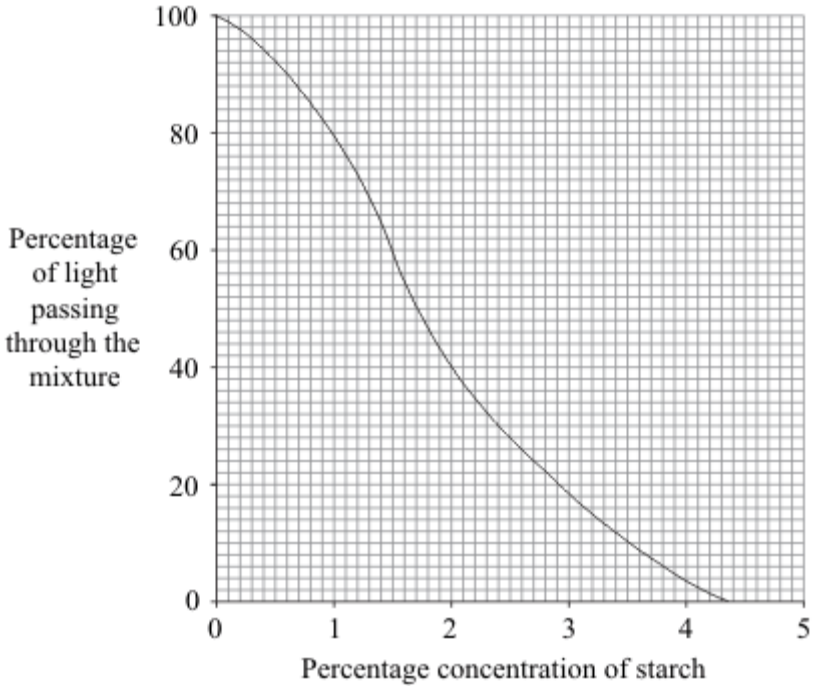


(i) Explain why, in terms of particles, the rate of most reactions increases as the temperature is increased. (3)

Q6. A manufacturer of slimming foods is investigating the effectiveness of carbohydrases from different microorganisms. Iodine solution is a pale golden brown, transparent solution. Starch reacts with iodine to form a dark blue mixture. Known concentrations of starch are added to iodine solution. The mixture is placed in a colorimeter which measures the percentage of light passing through the mixture.

Graph 1 shows the results.

Graph 1

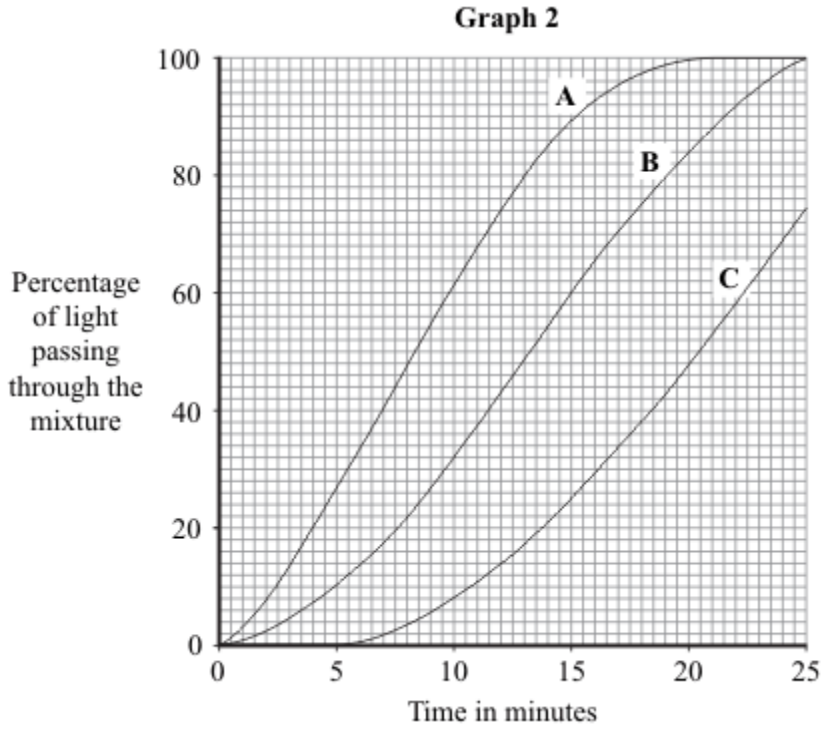


(a) Explain why less light passes through the mixture when the starch is more concentrated. **(1)**

(b) The manufacturer adds carbohydrase from each of three different microorganisms, **A**, **B** and **C**, to starch in flasks at 40 °C.

Every minute a sample of the mixture is added to iodine solution and placed in the colorimeter.

Graph 2 shows these results.



(i) When the concentration of starch reaches 2 %, digestion is considered to be sufficient for the next stage in the manufacture of the slimming food.

How long does this take for the most effective carbohydrase?

Show clearly how you work out your answer. ..... minutes **(2)**

(ii) Explain why the manufacturer carried out the investigation at 40 °C. **(2)**

(c) Carbohydrases convert starch into glucose. To complete the manufacture of the slimming food the glucose should be converted into fructose.

(i) Name the enzyme which would be used to convert glucose into fructose. (**1)**

(ii) Explain why fructose, rather than glucose, is used in slimming foods. **(2)**

- it/the rate is fastest at 40°C
- bubbling stops at 80°C/between 60°–80°C
- the rate is slower at lower temperatures/increases with temp
- (i)35 (ºC)
- (ii)<u>speeds up</u> **or** alters the rate of (chemical) reactions 1
- *do not credit speeds up things*

- *accept speeds up specific (1) reaction (1)*

- i
  n living things **or** body **or** material in 2
  or from living things
- *accept to act as a biological (1) catalyst (1)*

(a) amylase mouth **or small inetstine** sugar **or** maltose

protease small intestine **or stomach** amino acids **or** peptides

b) (i) lipase 1

(ii) isomerase 1

(iii) protease 1

(b) bring about reactions at lower temperatures 1

lower pressures 1

less expensive process

12. (a) (i) any **three** from: 3

- particles / they gain energy
- particles / they move faster
- collide more often **or** more collisions **or** more chance of collision
- have more energy when they collide **or** more energetic collisions **or** more collisions with activation energy

M6. (a) opaque / less transparent / blue

allow mixture becomes dark / black

ignore thicker

1

(b) (i) 7 (minutes) **or** in range 6.7 to 7

*award **2** marks for correct answer*

if answer is incorrect evidence of selection of 40(% light intensity) either in working **or** in graph 2 for **1** mark

2

(ii) any **two** from:

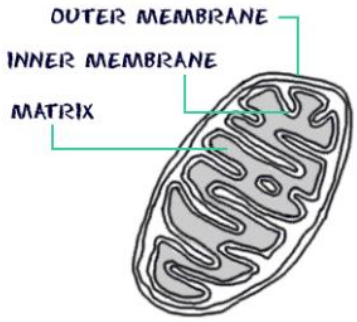
- slower / takes longer at lower temperatures
- (40^oC is) optimum / best temperature
  allow near to 37^oC / body
  temperature where enzymes work best
- enzyme denatured / destroyed / damaged at higher temperatures
  allow description of denaturation

2

(c) (i) isomerase

(ii) fructose is sweeter than glucose
needed in smallerquantities **or** less is needed

2

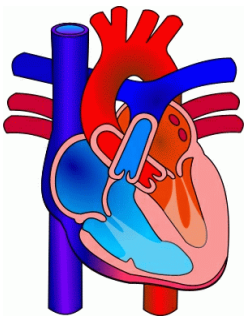


Respiration (occurs in all living organisms, plants and animals)
Aerobic (with oxygen): **Glucose + oxygen → carbon dioxide + water**
Most steps occur in the mitochondria (folded inner membrane to increase surface area for reaction)
Releases a lot of energy from each glucose molecule used

Energy is used for
Building large molecules from smaller (amino acids into proteins)
Enabling **muscle contraction**
Maintaining **body temperature** in mammals and birds
Building **sugars and nitrates into amino acids** in plants

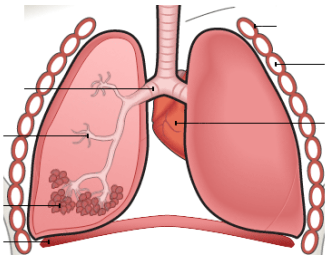
Anaerobic (without oxygen): **Glucose → lactic acid**
Occurs in the cytoplasm
Releases a little energy from each glucose molecule
Lactic acid: causes **muscle cramp/fatigue**, inability of the muscle to generate a full force
Anaerobic respiration creates an **oxygen debt**: oxygen is needed to break down lactic acid into carbon dioxide and water

Energy and Exercise
In exercise muscles contract more, so need more energy so respiration rate must increase



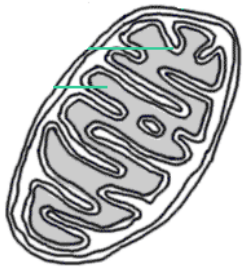
To achieve this…
1***) The heart rate increases:***
Delivers more oxygen and more glucose to the muscles for respiration
This also helps to remove more lactic acid, heat and carbon dioxide form the muscles

2) ***Breathing rate and depth increases***
More oxygen is taken in and more carbon dioxide is exhaled.



Muscles store glucose as insoluble glycogen. In exercise, glycogen levels decrease as it is converted back to glucose and used in respiration to release energy for muscle contraction.

Cellular respiration:
A series of enzyme controlled reactions that **release energy** from organic molecules, like glucose.
Animals store sugar as glycogen in the liver and muscles. This is broken down during exercise to release glucose
There are two types
Aerobic: With oxygen
Anaerobic: Without oxygen



The mitochondria are organelles in plant and animal cells. It has a folded inner membrane; this gives it a large surface area for the chemical reactions to take place so it can **release more energy**.

Aerobic respiration
Most steps take place in the mitochondria (an organelle found in plant and animal cells)
This releases a lot of energy. The energy is used in many ways

How aerobic respiration differs to anaerobic….
Aerobic uses oxygen
Aerobic does not produce lactic acid
Aerobic produces carbon dioxide and water
Aerobic respiration releases more energy

Exhaled air has
- Less oxygen (used in respiration)
- More CO2 (released in respiration)
- More water
- Is warmer

aerobic respiration

$C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O + energy$

Glucose, Oxygen, Carbon Dioxide, Water, energy out

Glucose comes from the breakdown of starch. Starch Digestion begins in the mouth, with amylase enzymes, this produces maltose. Maltose is then broken down by maltase enzymes in the small intestine to form glucose, which is soluble, and is absorbed into the blood stream.

Carried by red blood cells. Diffuses into the blood at the alveoli. There are many alveoli to give a large surface area for rapid diffusion, and they have thin wall to speed up diffusion. Ventilation and circulation keeps the concentration gradient steep so diffusion is fast. Red blood cells have no nucleus so they can carry more oxygen

This is carried in the blood to the lungs where it diffuses into the alveoli and is exhaled

Water levels in the body are maintained as part of homeostasis, this is the concept where the body keeps a constant internal environment

Used in many ways……
- Muscle contraction
- Building large molecules form smaller ones in animals, like amino acids into proteins, of simple sugars into large carbohydrates
- Building proteins form glucose and nitrates in plants
- Keeping a constant body temperature in mammals and birds.

A fit person
Has a low resting heart rate
During exercise their heart rate does not increase as much
They recover quickly to rest after exercise

Anaerobic Respiration

Glucose → Lactic Acid + ENERGY

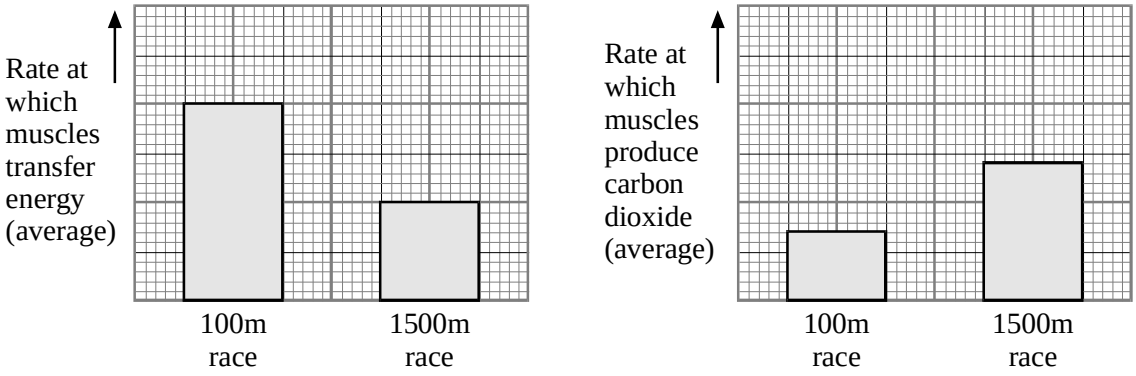
During exercise our heart rate and breathing rate and depth of breathing increase because….
Our muscles are contracting more, so they require more energy; so more respiration must take place. We breathe faster and deeper to take in more oxygen and to exhale the excess carbon dioxide, and our heart beats faster to deliver more oxygen and glucose to the muscles faster, the fast hear rate also removes lactic acid/carbon dioxide quicker

Anaerobic respiration: this occurs during sustained periods of exercise or short intervals of high intensity. The muscles cannot get sufficient energy from aerobic respiration and so use anaerobic respiration to **release energy without oxygen**. Lactic acid is produced and builds up causing muscle fatigue. After exercise the lactic acid is removed by the blood and broken down by oxygen to carbon dioxide and water. **So even after exercise we have a high oxygen demand to break down the lactic acid, this is called the oxygen debt.**

1. (i) What is the name of the process which takes place in living cells in your body and which releases energy from oxygen and glucose? (1)

(ii) Name the **two** products of the process in part (i).

(c) The bar charts show what happens in an athlete's muscles when running in two races of different distances.



(i) Compare what happens in the athlete's muscles when running in the two races. (3)

Use the information in the box to explain your answer to (4)

12. In an investigation four groups of athletes were studied. The maximum rate of oxygen consumption for each athlete was measured and the mean for each group was calculated. The athletes then ran 10 mile races and the mean of the best times was calculated for each group. The results are shown in the table below.

GROUP OF ATHLETES	MAXIMUM RATE OF OXYGEN CONSUMPTION (cm^3 per kg per min)	BEST TIME IN 10 MILE RACE (minutes)
A	78.6	48.9
B	67.5	55.1
C	63.0	58.7
D	57.4	64.6

(i) What is the relationship between maximum rate of oxygen consumption and time for a 10 mile race? (1)

(ii) Suggest an explanation for this relationship. (3)

16. Paula is training for a marathon. When she runs, her heart beats faster than it does when she is resting. Complete the sentences, using words from the box.

blood	**breathe**	**carbon dioxide**	**glucose**	**heat**	**nitrogen**	**oxygen respire**

When she is running, Paula's muscle activity increases. To do this, her muscle cells ..... at a faster rate to give her more energy. Her muscles need to be supplied with ..... and ..... more quickly. Her heart beats faster to increase the flow of..... which carries the products ..... and ..... away from her muscles. (Total 6 marks)

Questions

What is the immediate effect of extreme physical activity on the glycogen content of muscles? Describe how this effect occurs. (why does the glycogen change in the way you suggested above) **(3)**

Give **three** differences between aerobic and anaerobic respiration. (3)

Explain the advantage to the student's heart rates increasing during exercise. (4)

The breathing rate and the amount of oxygen used were still higher after exercise, even though the student sat down to rest. Why were they still higher?

(aerobic) respiration1

carbon dioxide and water (vapour)1

(c) (i) *ideas that* 2

- energy transferred <u>faster</u> in 100m race
- carbon dioxide produced faster during 1500m race / more
- carbon dioxide produced

for 1 mark each

correct reference to twice / half as fast in either / both cases 1

for a further mark

(ii)
- respiration during 100m race (mainly) anaerobic 2
- respiration during 1500m race (mainly) aerobic
- aerobic respiration produced carbon dioxide
- anaerobic respiration produced / lactic acid

for 1 mark each

12. (i) the higher the rate of oxygen consumption, the shorter the time taken to complete 1

for 1 mark

(ii) the faster oxygen is taken into the blood, 3
the faster energy can be released in the muscles,

and the faster the athlete can run

for 1 mark each

16. (a) respire 1

oxygen / glucose
glucose / oxygen } each once only 1

1

blood 1

carbon dioxide / heat
heat /carbon dioxide } each once only 1

1

answers

reduced sharply
Converted to glucose
Which is respired
to release energy

oxygen used in aerobic respiration
more energy from aerobic respiration
carbon dioxide and water are end products of aerobic respiration
lactic acid is end product of anaerobic respiration

when exercising the rate of respiration (in the muscles) is higher
(the increased heart rate delivers)
more oxygen to the (respiring) muscles
more glucose to the (respiring) muscles
and results in faster removal of carbon dioxide and lactic acid and heat

still need to remove extra carbon dioxide
still need to remove heat / to cool
(some) anaerobic respiration (in exercise)
lactic acid made (in exercise)
oxygen needed to break down lactic acid **or** suitable reference to oxygen debt
lactic acid broken down to CO_2 and water **or** lactic acid changed into glucose

Genetics

The nucleus contains 23 pairs (46) chromosomes. We inherit 1 of each pair from our parents when sperm and egg cells nuclei fuse in fertilisation. So are similar but not identical to them. Sexual reproduction produces variation as offspring inherit different combinations of their parent's alleles on the chromosomes.
Chromosomes are made of DNA
Short sections of DNA are genes
Genes determine our characteristics,
They are unique sequences of bases, that code for amino acid sequences which make proteins.
Alleles are alternate forms of genes

Alleles can be
Dominant: allele expressed in the heterozygous form, (shown as a capital letter)
Recessive: allele not expressed in the heterozygous form (shown as a lower case letter)

Phenotype: physical appearance of an organism
Genotype: the allele combination an organism contains

Genotypes can be described as the following
Homozygous = pure breed: same alleles
Homozygous dominant: two dominant alleles (AA)
Homozygous recessive: two recessive alleles (aa)
Heterozygous: 2 different alleles in the genotype (Aa)

Genetic disorders
Cystic fibrosis: caused by a recessive allele
To have condition must be homozygous recessive. Heterozygous people are carriers
A **disorder of the cell membranes** causing a thicker/sticky/viscous mucus; difficult breathing/trachea blocked; digestion difficult/glands blocked
Treated with antibiotics, physiotherapy and supplementation of digestive enzymes

Polydactyly: caused by a dominant allele
Results in additional fingers and toes

Cell division
Mitosis: growth, repair replacement, asexual reproduction. Occurs in most body cells
DNA is copied → one division→ 2 daughter cells → that are diploid → genetically identical to parent cell

Meiosis: gamete formation, sexual reproduction, occur in the testes and ovaries
DNA is copied → 2 divisions→ 4 daughter cells → that are haploid → genetically unique

Stem cells: unspecialised cells, with ability to differentiate into any other type of cell and divide.
Stem cell sources: embryos, umbilical cord, bone marrow
Uses: treatment of diseases
Stem cells: pros and cons

(A)Stem cells from an embryo can grow into any type of tissue.
(A)Stem cells may be used in medical research or to treat some human diseases.
(A)Large numbers of stem cells can be grown in the laboratory.
(D) Stem cells may grow out of control, to form cancers.
(D) Patients treated with stem cells need to take drugs for the rest of their life to prevent rejection.
(D) Collecting and growing stem cells is expensive.

Embryo screening

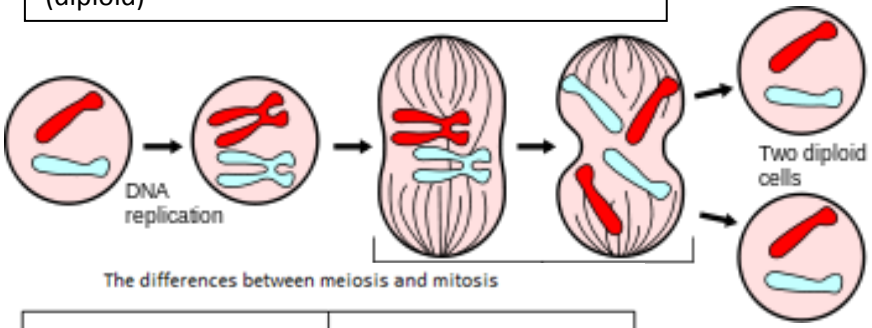
(embryos) checked for inherited / genetic disorders / conditions / specific allele

Embryo Screening: pros and cons

Reduce number of people with cystic fibrosis (in population)
Reduce health-care costs
Expensive to have baby with cystic fibrosis
allow decision / emotional preparation example: understand how to care for child better/allows abortion
Allows people to make choices about termination
Help to prepare financially / emotionally etc

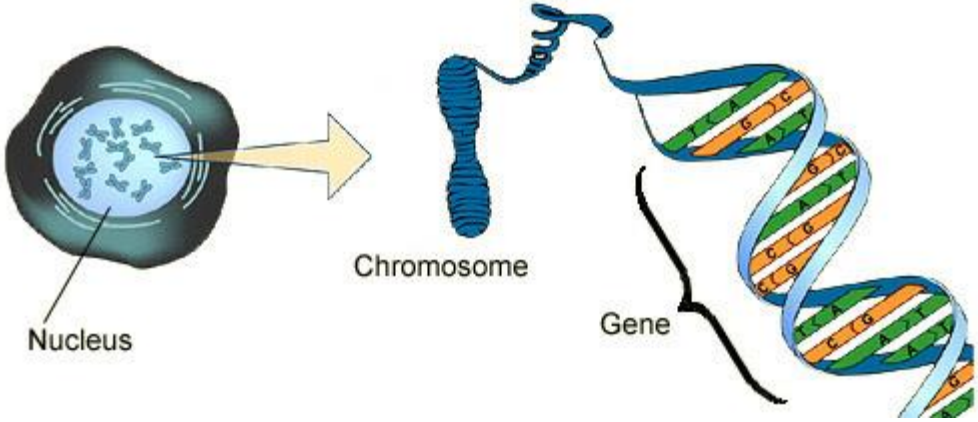
Possible damage / risk to embryo / foetus / baby
Allow possible harm / risk to mother
Screening / it is expensive
Have to make ethical / moral / religious decisions */ playing God / unethical / immoral /* right to life

Mitosis:
The DNA replicates
There is one cell division
2 daughter cells form
The daughter cells are genetically identical
Each daughter cell has a full set of chromosomes (diploid)

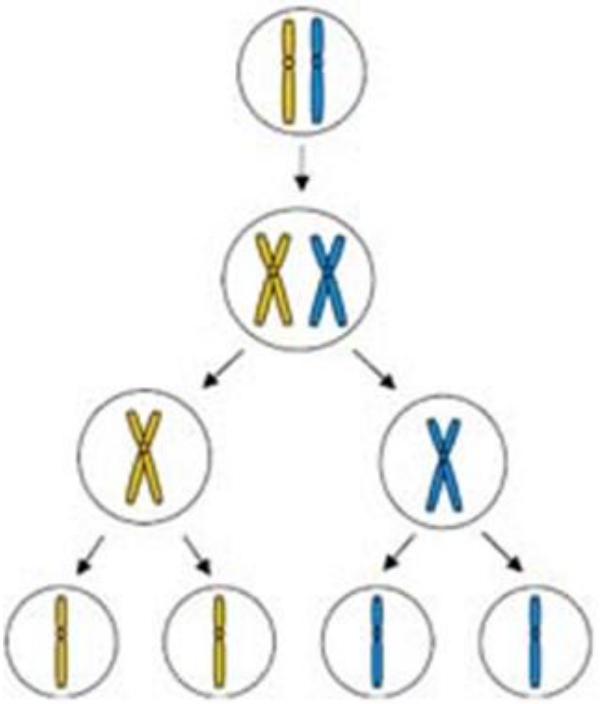


The differences between meiosis and mitosis

Mitosis	Meiosis
Asexual reproduction	For sexual reproduction
For growth	For gamete formation
Occurs in most cells	Occurs only in testes or ovaries
Daughter cells are diploid (46 chromosomes)	Daughter cells are haploid (23 Chromosomes)
Daughter cells are identical	Daughter cells are not identical
2 daughter cells produced	4 daughter cells produced
1 cell division occurs	2 cell divisions occur



Meiosis
The DNA replicates
There are two cell divisions
4 daughter cells form
These are genetically unique
They have half the genetic information (Haploid cells)



The **nucleus** controls the cells activities.
It contains **23 pairs of chromosomes** (46 in total)
Chromosomes are made up of **DNA**
A short section of DNA is called a **gene**
Genes determine our **characteristics** (eye colour, hair colour)
Alleles are the different forms of a gene (blue eyes, brown eyes)
Some alleles are **dominant**: always expressed when present
Some alleles are **recessive:** only expressed when present on both chromosomes

Genetic information is passed on from parents to offspring in the gametes/sex cells.
Males have sex chromosomes….XY
Females have sex chromosomes…XX
Diploid: cells that contain a full set of chromosomes
Haploid: cells that contain a half set of chromosomes

DNA determines our proteins because…..
DNA is a code, sequence of bases (A, T, C and G)
Every three letters codes for 1 amino acid
The order of the bases determines
The order of amino acids in proteins

1. (a) Complete the sentence.

Cystic fibrosis is a disorder of..... (1)

(b) Explain, as fully as you can, how a person usually inherits cystic fibrosis. (3)

(c) One effect of cystic fibrosis in some patients is that enzymes from the pancreas do not reach food in the intestine. Doctors now give capsules containing enzymes to these patients.

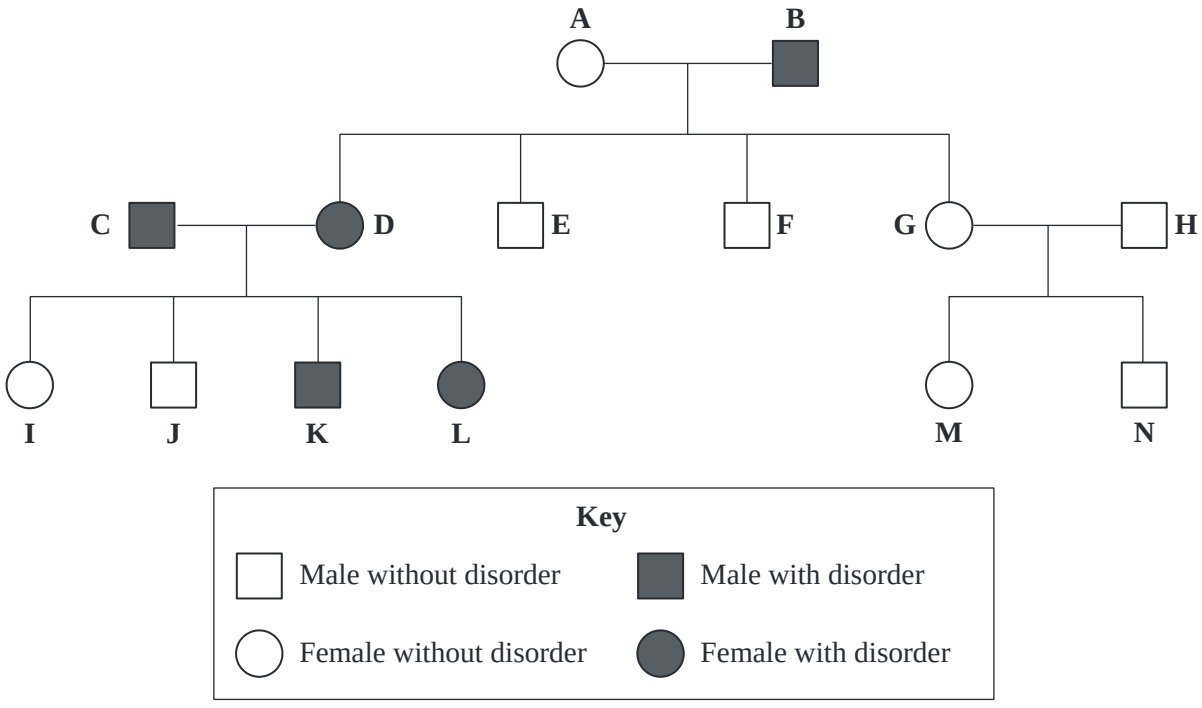
(i) Name **three** digestive enzymes produced by the pancreas. (3)

(ii) The first attempts at giving pancreatic enzymes involved giving a pill consisting of powdered pancreatic enzymes to the patient. The treatment failed. When scientists investigated why this happened, they found the enzymes from the pill in the stomach of the patient, but not in the intestine.

Suggest **two** possible reasons why the enzymes in the pill did not reach the small intestine.

(2)

3. The diagram shows a family tree in which some individuals have an inherited disorder, which may cause serious long-term health problems.



(a) What proportion of the children of **A** and **B** have the disorder? (1)

(b) Explain the evidence from the diagram which shows that the allele for the disorder is dominant. Use the appropriate letters to identify individuals in your answer.

You may use genetic diagrams in your explanation. There is space for you to draw a genetic diagram at the top of the facing page. (3)

Explain how DNA controls the structure of proteins. (3)

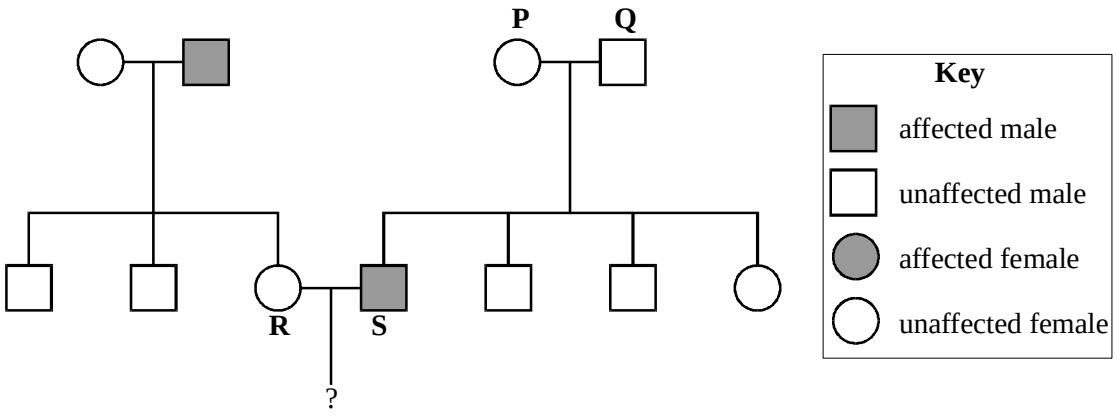
What are the symptoms of cystic fibrosis? (3)

The black pigment in human skin and eyes is called melanin.

A single gene controls the production of melanin.

A person who is homozygous for the recessive allele of the gene has no melanin and is said to be albino.

The diagram shows the inheritance of albinism in a family.



(a) Use a genetic diagram to explain the inheritance of the albino allele by children of parents **P** and **Q**. (3)

(b) **R** and **S** decide to have a child.

What is the chance that this child will be an albino? .....

Use a genetic diagram to explain your answer. (3)

1. (a) cell membranes 1

(b) caused by recessive allele 1

both parents carriers / do not have condition 1

receives one recessive allele from each 1

(c) (i) amylase 1
protease 1
lipase 1

(ii) acid destroys enzymes 1
enzymes digested by stomach enzymes 1

3. (a) 1 in 4 / 1/4 / 1: 3 / 25% / 0.25 1

*do **not** accept 3:1 / 1:4 / 2:6*

(b) **either** from C **and** D

accept synonyms for dominant / recessive eg Normal / faulty

accept genetic diagram if clearly referring to correct individuals or genotypes on family tree

allow 'gene' for 'allele'

any **three** from: 3

- C **and** D have disorder

  *ignore **'**C & D are carriers'*

- I/J don't have disorder

- C **and** D have dominant **and** recessive alleles

- recessive alleles from C **and** D passed to I/J **or** I/J have two recessive alleles

  *NB if allele was recessive then all offspring of C **and** D would have the disorder = **3** marks*

or from A **and** B

assume response refers to A+B unless contradicted

- A is homozygous recessive / rr, **and** B is heterozygous / Rr can be shown in words or symbols

  allow any symbol

- offspring can be rr **or** Rr described

  allow without key

(c) (i) (embryos) checked for inherited / genetic disorders / conditions 1

accept diseases for disorders

(ii) any **three** from: 3

- C/D have disorder / have dominant allele

  accept disease / condition

  accept 'gene' for 'allele'

  ignore reference to 'carriers'

- chance of embryo / foetus / child having disorder **or** may pass on alleles for disorder to their offspring

- C/D might want to decide on termination **or** prepare for child with disorder

- G **and** H don.t have disorder / both homozygous recessive / have no dominant alleles (for this disorder)
- so offspring (of G **and** H) cannot / don.t have disorder

order of bases acts as a code;
which controls the order;
in which amino acids are assembled into protein;
read in triplet 3

affects the cell membranes causing

thicker/sticky/viscous mucus;
difficult breathing/trachea blocked;
digestion difficult/glands blocked

19. (a) gametes A **or** a A **or** a 1

F_1 genotypes correctly derived 1

albino identified 1

OR

	A	a
A	AA	Aa
a	Aa	aa

gametes –1
boxes all correct –1
albino (aa) identified –1

(b) $\frac{1}{2}$ / half / 50% evens / 1in 2 1

*do **not** credit 1 to 2 or 50/50*

gametes A **or** a a **or** a or one parent heterozygous, one parent homozygous recessive 1

F_1 genotypes correctly derived 1

OR

(R)

(S)

	A	a
a	Aa	aa
a	Aa	aa

gametes correctly derived – 1
F_1 genotypes correctly derived – 1

[6]

Speciation and fossils

Fossils are the 'remains' of organisms from many years ago, and are found in rocks. Fossils may be formed in various ways:

- From the hard parts of animals that do not decay easily
- From parts of organisms that have not decayed because one or more of the conditions needed for decay are absent
- When parts of the organism are replaced by other materials as they decay
- As preserved traces of organisms, eg footprints, burrows and rootlet traces.

Many early forms of life were soft-bodied, which means that they have left few traces behind. What traces there were have been mainly destroyed by geological activity.

Fossils provide evidence that species alive today have evolved from simpler organisms

- fossil is (remains / impression of) organism that lived a long time ago
- fossils show changes over time **or** older fossils simpler **or** fossils simpler than present-day species
- fossils have similar features to present-day species

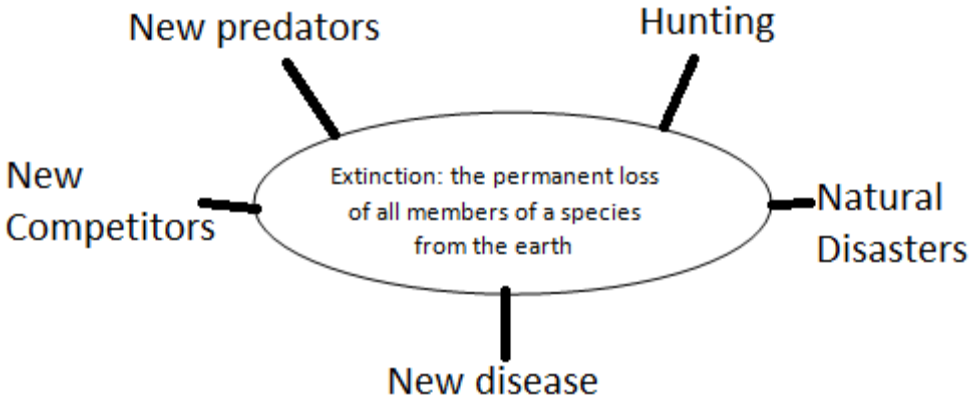
Extinction may be caused by:

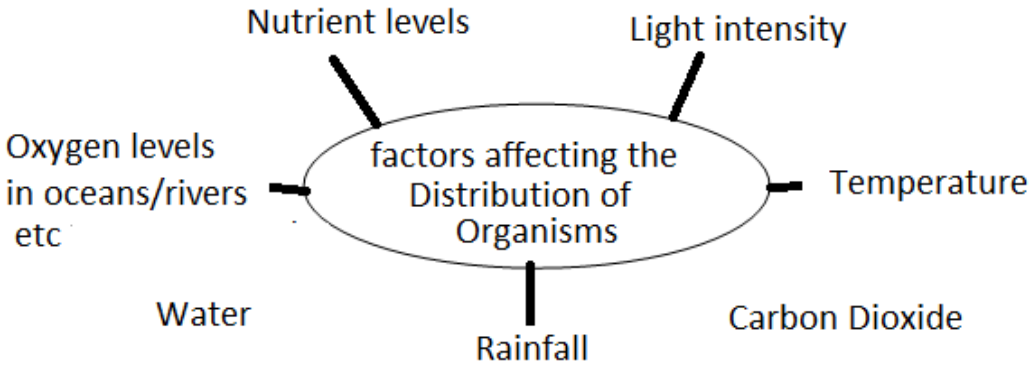
- changes to the environment over geological time
- New predators
- New diseases
- New, more successful, competitors
- A single catastrophic event, eg massive volcanic eruptions or collisions with asteroids
- Through the cyclical nature of speciation.

Species: organisms that can interbreed and produce fertile offspring

Speciation: development of a new species from an existing species

Explained by…..
Isolation of members of a population
By geographical barrier (example???)
Variation in isolated communities
Different selection pressures (examples??? temperature, food, body shape)
Natural selection (certain alleles passed on, certain alleles die out)
Over time population **no longer able to produce fertile offspring** if they interbreed





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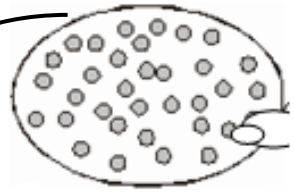
The fossil record is incomplete!!!

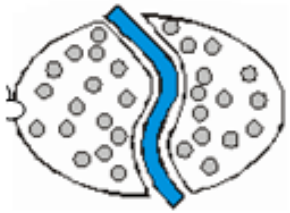
Speciation: the development of a new species from an existing one.

It occurs due to isolation of members of the species and exposure to different environmental conditions over many generations

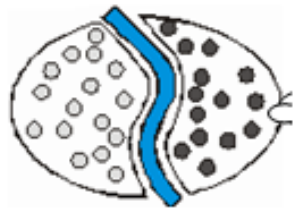
Species: organisms that can interbreed and have fertile off-spring



Variation exists within the population (different alleles)

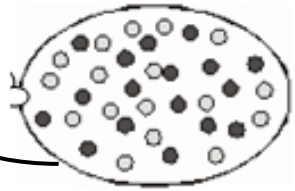


The population becomes Isolated/ separated by a geographical barrier.



Each isolated population is exposed to different environmental conditions (food, predators, climate)

Natural selection occurs and only certain alleles are passed on



Over many genertaions, interbreeding is no longer possible

Year 11 quiz

1. What is the job of the cell membrane?
2. What is the job of the nucleus?
3. What is the job of the cytoplasm?
4. What is the job of the chloroplast?
5. What is the job of the ribosomes?
6. What is the job of the mitochondria?
7. What is the job of the cell wall?
8. What is the job of the vacuole?
9. Define diffusion?
10. Suggest some factors that affect the rate of diffusion?
11. What is a tissue?
12. What is an organ?
13. What is the job of the epithelia tissue in the stomach?
14. What is the job of the muscular tissue in the stomach?
15. What is the job of the glandular tissue in the stomach?
16. What is the job of the epidermal tissue in a leaf?
17. What are the two types of mesophyll tissue?
18. How is each mesophyll layer adapted for its job?
19. What is the job of the xylem tissue?
20. What is the job of the phloem tissue?
21. What is the word and symbol equation for photosynthesis?
22. How does a plant use glucose?
23. What does a plant need nitrates for
24. What does plant need magnesium for
25. Name three limiting factors
26. What is the name of the insoluble sugar store in plants?
27. What is the name of the insoluble sugar store in muscles?
28. Name some factors that affect the distribution of organisms
29. What are enzymes made from?
30. Where are enzymes made?
31. What other terms can we use to describe enzymes?
32. What region of the enzyme is the site of activity?
33. How to enzymes work
34. What two key factors are enzymes sensitive too?
35. What does denature mean
36. Where is amylase produced?
37. Where does amylase do its digestion?
38. Where is protease produced?
39. Where does protease do its digestion?
40. Where is lipase produced?
41. Where does lipase do its digestion?
42. What is the substrate for amylase?
43. What is the substrate for lipase?
44. What is the substrate for protease?
45. Suggest some roles of proteins in the body other than enzymes?
46. Write an equation for digestion of fats, proteins and starch
47. What does bile do in digestion (2 things?)
48. Where is bile produced?
49. Where is bile stored?
50. What enzyme is used to convert glucose to fructose?
51. How does fructose differ to glucose?
52. Where is fructose used in industry?
53. What enzymes are used in production of baby food?
54. What enzymes are useful in biological detergents?
55. Where do many of the enzymes used in industry come from?
56. Why are enzymes used in industry?

1. What are the problems with using enzymes in industry?
2. What is respiration?
3. Where do most steps of aerobic respiration occur?
4. What does aerobic mean
5. What does anaerobic mean
6. What are the equations for aerobic and anaerobic respiration?
7. How is energy used in organisms?
8. What happens to glycogen in exercise?
9. How does aerobic respiration differ to anaerobic?
10. What is oxygen debt?
11. What is muscle fatigue?
12. Why does the heart beat faster during exercise?
13. Why do we breathe heavier during exercise?
14. Name two types of cell divisions
15. What is an allele?
16. What is a chromosome?
17. What is a gene
18. How many pairs of chromosomes are there in humans?
19. How many chromosomes do humans have in their cells?
20. Where in the cells are chromosomes found?
21. What are dominant alleles?
22. What are recessive alleles?
23. What does homozygous mean
24. What does heterozygous mean
25. What does pure breed mean?
26. What type of allele causes cystic fibrosis?
27. What other term is used for people who are heterozygous for cystic fibrosis
28. What type of allele causes polydactyly
29. What is the result of polydactyly
30. What is genotype
31. What is phenotype
32. What are the symptoms of cystic fibrosis
33. What are the male chromosomes
34. What are the female chromosomes
35. What did Mendel call chromosomes?
36. Why did people reject Mendel's ideas
37. What are stem cells
38. Where can stem cells come from
39. Why are people for and against stem cells
40. What is embryo screening
41. Why are people for and against embryo screening
42. Describe mitosis
43. Describe meiosis
44. Compare meiosis and mitosis
45. What are gametes
46. Where are gametes made
47. Why is variation produced by sexual reproduction important
48. Describe how a gene is responsible for the production of a protein
49. What are fossils
50. Explain how fossils can be made
51. What is extinction
52. Suggest some factors that cause extinction
53. Explain how speciation develops
54. Define a species
55. Describe complete digestion of fats, carbohydrates and proteins

1. Controls what enters and exits the cell
2. Contains genetic information/controls cells activities
3. Site of chemical reactions
4. Photosynthesis (has chlorophyll to absorb light energy)
5. Protein synthesis
6. Respiration
7. Support the cell
8. Contains cell sap
9. Net Movement form high to low concentration
10. Concentration/temperature/surface area/diffusion distance/size of molecules
11. A tissue is a group of cells with similar structure and function
12. Organs are made of different tissues doing common function
13. Cover the outside and inside
14. Churn the food and digestive juices
15. Secrete digestive juices, acid and protease
16. Cover the leaf
17. Palisade and spongy
18. Palisade = packed chloroplasts/ spongy = air spaces
19. Carry water and dissolved minerals
20. Carry sugar
21. ------
22. Respiration/starch/cellulose/fats/oils/amino acids
23. To make amino acids
24. Make chlorophyll
25. CO2/Light/Temp
26. Starch
27. Glycogen
28. Temp/O2/CO2/light/nutrients/water
29. Amino acids, linked as proteins/folded to specific shape
30. Ribosomes
31. Biological catalysts
32. Active site
33. Lower activation energy
34. Temp and pH
35. Active site changes shape
36. Salivary gland and pancreas
37. Mouth and small intestine
38. Stomach and pancreas
39. Stomach and small intestine
40. Pancreas
41. Small intestine
42. Starch
43. Lipids/fats
44. Protein
45. Antibodies/hormones/structural components of muscle
46. ----------
47. Emulsify fats, neutralise stomach acid
48. Liver
49. Gall bladder
50. Isomerase
51. Sweeter
52. Slimming foods
53. Proteases
54. Lipases and proteases
55. Microbes
56. Reactions at lower temps/pressure less expensive process/less likely to produce unwanted by-products

1. Expensive/affected by temp + pH/water soluble difficult to separate form products
2. Release of energy from glucose
3. Mitochondria
4. With O2
5. Without O2
6. ---------
7. Muscles contraction/build large molecules from smaller/keep body temp steady in birds and mammals/in plants to build sugar and nitrates into amino acids
8. Broken down to glucose/use din respiration/release energy
9. More energy/need oxygen/no lactic acid
10. O2 needed to break down lactic acid→ CO2 and water
11. Inability of muscle to contract with full force due to lactic acid
12. More oxygen and glucose to muscle for increased respiration to release more energy/remove heat/CO2 and Lactic acid
13. More O2 in more CO2 out
14. Mitosis and meiosis
15. Alternate form of a gene
16. Threat structure made from DNA
17. **Short section DNA/determines characteristics**
18. 23
19. 46
20. Nucleus
21. Allele expressed in heterozygote
22. Allele not expressed in heterozygote
23. Same allele in genotype
24. One of each allele
25. Homozygous
26. Recessive
27. Carriers
28. Dominant
29. Extra fingers and toes
30. Genetic constitution of organisms (allele combination)
31. Physical appearance
32. Damaged cell membrane, thick viscous mucus Difficult to breathe, difficult to digest
33. Xy
34. Xx
35. Units of inheritance
36. Not a scientist/chromosomes not discovered/different ideas
37. Unspecialised cells with potential to form any cell
38. Bone marrow, embryos, umbilical cord
39. Cure disease, grow tissues and organs/ large numbers grown/may cause cancer/destroy embryos/rejection of organs/expensive
40. Embryos are checked for a particular allele
41. Make informed choices, prepare mentally, financially, plan for treatments, may encourage abortion, screen for other things intelligence, gender
42. DNA copied, cell divides once, 2 daughter cell genetically identical, diploid
43. DNA copied, cell divides twice, 4 haploid cells with genetic variation
44. -------
45. Sex cell
46. Testes/sperm eggs/ovary
47. More likely for species to survive
48. Order DNA bases = Code for order of amino acids

49. Remains of an organism form a long time ago, show changes in species over time, can be compared to other organisms and thus look for similarities to present day species

50. from the hard parts of animals that do not decay easily
From parts of organisms that have not decayed because one or more of the conditions needed for decay are absent
When parts of the organism are replaced by other materials as they decay
As preserved traces of organisms, eg footprints, burrows and rootlet trace.

51. Permanent loss of a species form the earth

52. Changes to the environment over geological time/ new predators/ new diseases/ new, more successful, competitors/ a single catastrophic event, eg massive volcanic eruptions or collisions with asteroids/ through the cyclical nature of speciation.

53. Isolation/geographical barrier/ variation/different selection pressure in areas/natural selection/ no longer interbreed after a long time

54. Species = organisms that can interbreed and produce fertile offspring