Hormones

15 December 2016 10:40

Hormones are chemical messengers sent in the blood.

1. Hormones are chemicals released directly into the blood. They're carried in the blood plasma to other parts of the body, but only affect particular cell, (target cells) in particular places. Hormones control things in organs and cells that need constant adjustment.
2. Hormones are produced in various glands. They travel quite slowly and tent to have relatively long-lasting effects.

You need to know these key hormones and their roles in the body.

Hormone	Source	Role	Effects
ADH	Pituitary gland (In the brain)	Controls water content	Increases the permeability of the kidney tubules to water.
Adrenaline	Adrenal glands	Readies the body for a "fight or flight" response.	Increases heart rate, blood flow to muscles and blood sugar level.
Insulin	Pancreas	Helps control the blood sugar level	Stimulates the liver to turn glucose into glycogen for storage.
Testosterone	Testes	Main male sex hormone	Promotes male secondary sexual characteristics e.g. facial hair.
Progesterone	Ovaries	Supports pregnancy	Maintains the lining of the uterus.
Oestrogen	Ovaries	Main female sex hormone	Controls the menstrual cycle and promotes female secondary sexual characteristics, e.g. widening of the hips.

Preview from Notesale.co.uk
Page 7 of 113

Hormones and nerves do similar jobs but there are differences.

1. Nerves:
    a. Very fast message.
    b. Act for a very short time.
    c. Act on a very precise area.
2. Hormones:
    a. Slower message.
    b. Act for a long time.
    c. Act in a more subtle way.
3. If the response is really quick, it's probably nervous.
4. Some information needs to be passed to effectors really quickly.
5. It's no good using hormones to carry the message - they are too slow.
6. But if a response lasts for a long time, it's probably hormonal.
7. For example, when you get a shock, a hormone called adrenaline is released into the bloodstream. (hypes you up)
8. You can tell it’s a hormonal response (even though it kicks in pretty quickly) because you feel a bit wobbly for a while afterwards.

Homeostasis (Cont.)

15 December 2016 11:34

The skin plays an important role in maintaining body temperature.

1. When you are too hot:
    a. Lots of sweat is produced - when it evaporates it transfers heat from you to the environment, cooling you down.
    b. Blood vessels close to the surface of the skin widen - this is called vasodilation. It allows more blood to flow near the surface, so it can radiate more heat into the surroundings.
    c. Hairs on your skin lie flat.
2. When you are too cold:
    a. Very little sweat is produced.
    b. Blood vessels near the surface constrict (vasoconstriction) so that less heat can be transferred from the blood to the surroundings.
    c. You shiver, and the movement generates heat in the muscles. Exercise does the same.
    d. Hairs stand on end to trap and insulating lair on air which helps to keep you warm.

Smaller organisms can cool down quicker.

1. Smaller organisms have bigger surface area to volume ratios.
2. Organisms with bigger surface area to volume ratios can gain (or lose) heat faster because there is more area for heat to transfer across.
3. This allows small organisms to lose body heat more easily in hot climates and reduces the chance of them overheating. It also means that they are very vulnerable in cold environments.
4. Organisms with smaller surface area to volume ratios gain (or lose) heat more slowly because there is less area for the heat to transfer across.
5. This is why animals living in cold conditions have a compact (rounded) shape to keep their surface are to a minimum, reducing heat loss.

Preview from Notesale.co.uk
Page 9 of 113

The Digestive System

17 December 2016 19:39

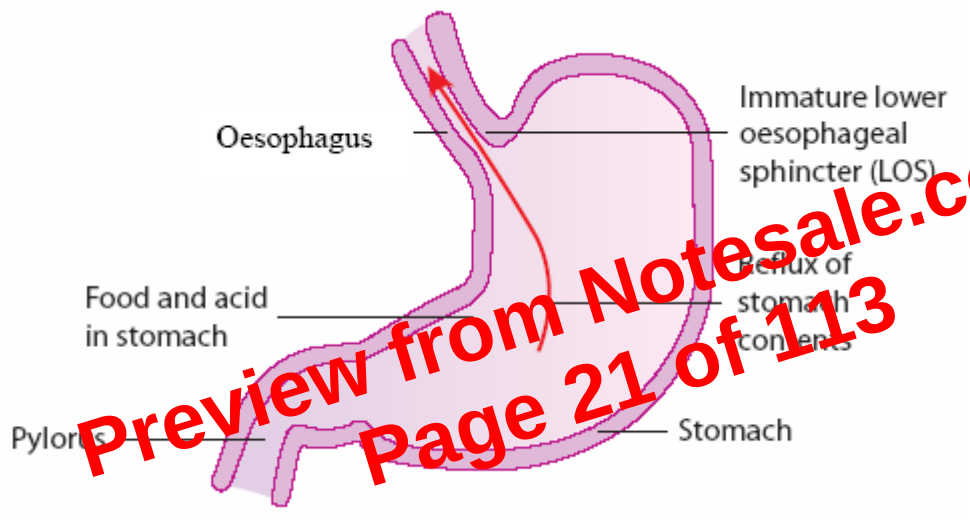
The Digestive System

A good definition would be: Digestion is the chemical and mechanical breakdown of food. It converts large insoluble molecules into small soluble molecules, which can be absorbed into the blood.

Ingestion

Digestion begins with the mouth. Food is taken into the mouth to our body. This stage is known as ingestion. A slippery liquid called saliva helps moisten the food and contains the enzyme amylase, which starts the breakdown of starch. This is known as chemical digestion, and when chemicals such as enzymes aid the digestion process. The food is also chewed, cutting the food down into smaller pieces to increase surface area, so enzymes can act on the food more quickly. This is an example of mechanical digestion, the physical breakdown of food.

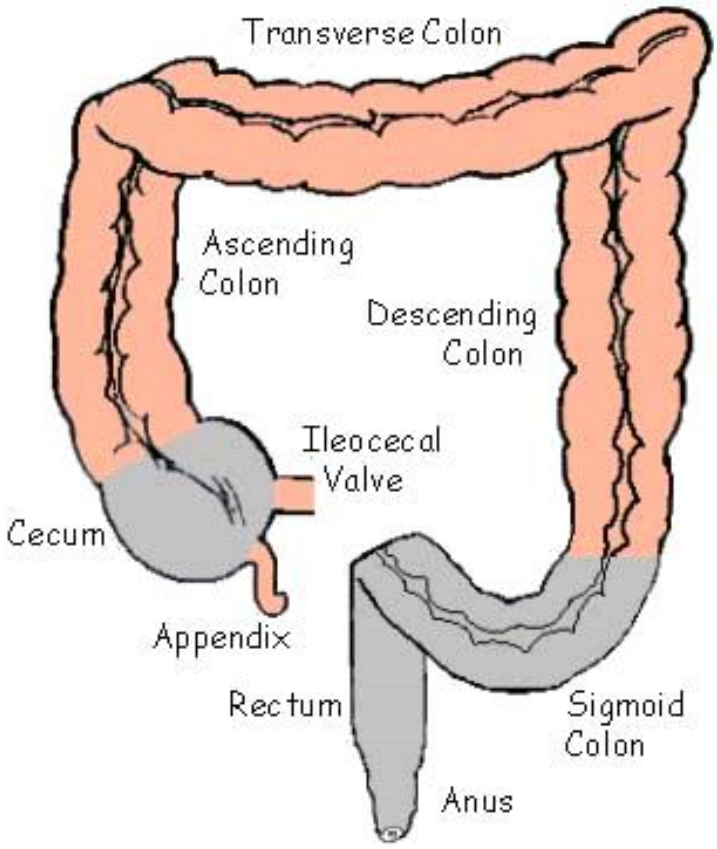
In the Stomach



Preview from Notesale.co.uk
Page 21 of 113

The lump of food, mixed with saliva, then passes along the oesophagus, to the stomach. The food is held in the stomach for several hours, while initial digestion of proteins takes place. The stomach wall secretes hydrochloric acid, so the stomach contents are strongly acidic. This is important as it kills bacteria that might have been taken into the gut along with the food, helping to protect us from pathogens. The protease enzyme that is made in the stomach, called pepsin, has to be able to work in these acidic conditions, and has an optimum pH of 2. The semi-digested food is held back in the stomach by a ring of muscle at the outlet of the stomach, called the sphincter muscle. When this relaxes, it releases the food into the first part of the small intestine, called the duodenum.

The Duodenum

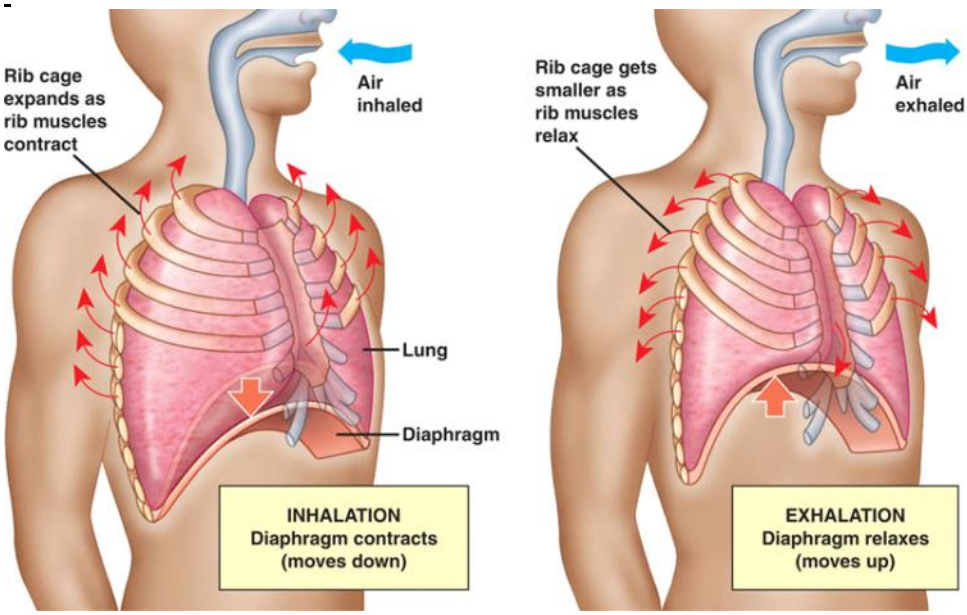


The Large Intestine – getting rid of the poo

This process is known as egestion (removal of faeces), NOT excretion. Excretion is the removal of the waste products of cells of the body. Once everything has been digested and absorbed into the bloodstream and the cells are all like "food!" the waste from the bloodstream, which consists mainly of cellulose fibre and other indigestible remains, water, dead and living bacteria and cells lost from the lining of the gut, will move on to the large intestine. The remaining water is absorbed by the first part of the intestine known as the colon, leaving a semi-solid waste material called faeces. This is stored in the rectum, until expelled out of the body through the anus.

Preview from Notesale.co.uk
Page 25 of 113

Ventilation – The Gruesome Details



Ventilation requires a difference in air pressure. When you inhale, the internal intercostals muscles move your ribs outwards. The external ones contract, pulling the ribs up. The muscles of the diaphragm contract, pulling it down to a more flattened shape. These movements increase the volume of the thorax. This decreases pressure, making the pressure inside the thorax less than the pressure outside. This causes air to enter the lungs.

The opposite happens when you exhale. The external intercostal muscles relax, and the internal intercostal muscles contract, pulling the ribs down and in. At the same time, the diaphragm muscles relax and goes back to its normal dome shape. This causes volume of thorax to decrease, making the pressure inside the thorax greater than outside. This forces air out of the lungs.

Preview from Notesale.co.uk
Page 28 of 113

Smoking and its Effects

17 December 2016 20:00

Smoking and Its Effects

Smoking can causes lots of things: lung cancer, bronchitis, emphysema etc. They are also a major contributing factor to other problems such as coronary heart diseases, stomach and duodenum ulcers. Pregnant smokers are more likely to give birth to underweight babies.

Tar in cigarettes destroys the cilia in airways. This means that mucus is not swept away from the lungs, but remains and clogs the air passages. This is made worse by the fact that the smoke irritates the lining of airways, stimulating cells to secrete more mucus. Irritation of the bronchial tree, along with infections from bacteria in the mucus can cause the bronchitis, which causes blocking in normal airflow, so the sufferer has difficulty breathing properly.

Emphysema is another lung disease. Smoke damages the walls of the alveoli, causing them to break down and fuse together. This greatly reduces the surface area for gas exchange. The blood of a person with emphysema carries less oxygen. There is no cure.

Lung cancer happens when cells mutate and divide uncontrollably, forming tumors. Smoking increases the chance of this; however, giving up the habit can soon improve your chances of survival.

But what makes it so addictive?

Cigarette smoke contains a strongly addictive drug known as nicotine, which eases stress. It also contains at least 17 chemicals that are known to cause cancer. These are called carcinogens.

Apart from tar, carbon monoxide is another harmful and poisonous gas found in cigarettes. When inhaled, the gas attaches itself to a chemical that carries oxygen in the body, known as haemoglobin. When combined with carbon monoxide, it forms carboxyhaemoglobin. When this happens, the blood carries less oxygen around the body. Carbon monoxide from smoking is a major cause of heart disease.

Preview from Notesale.co.uk
Page 31 of 113

Giving it Up

Smoking is hard to give up because of the addictive nicotine. Nicotine is actually harmless, and the brain secretes it to ease stress. Therefore, some smokers use nicotine patches or nicotine chewing up as a source of nicotine. Gradually, the nicotine dose reduces until the smoker is weaned off the habit. Other ways include acupuncture and hypnotism.

Blood Vessels and Composition Of Blood

17 December 2016 20:06

Blood Vessels

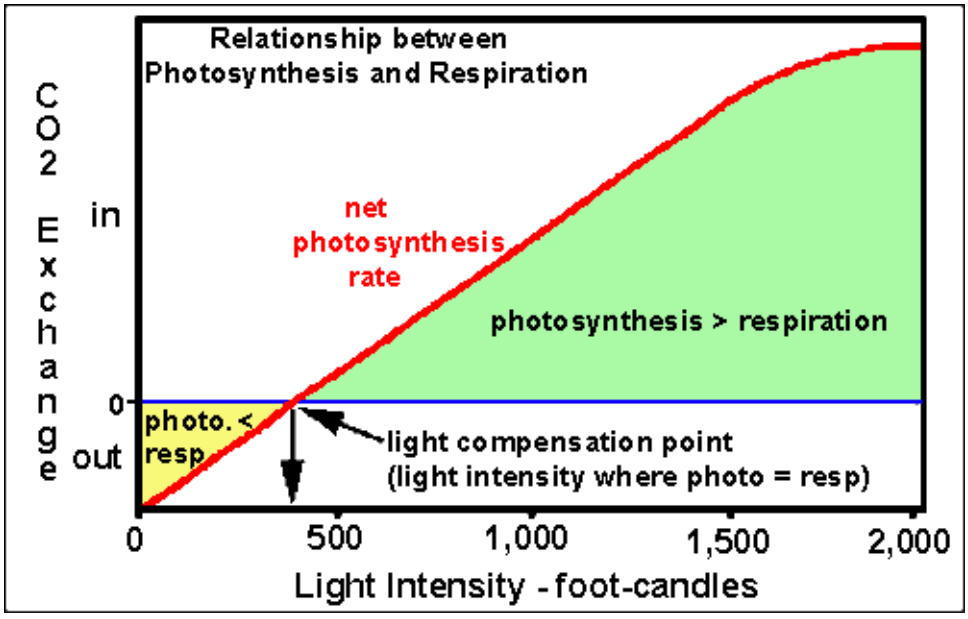
Blood vessel	Function	Adaptations
Artery	carry oxygenated blood away from heart at high pressure	Thick, elastic, muscular walls to withstand pressure and to exert force (pulse). It has a small lumen.
Capillary	allow exchange of materials between blood and tissues	Thin permeable walls
Vein	return low pressure deoxygenated blood to heart	Large diameter (lumen) to offer least flow resistance. Valves to prevent back flow.

Composition of Blood

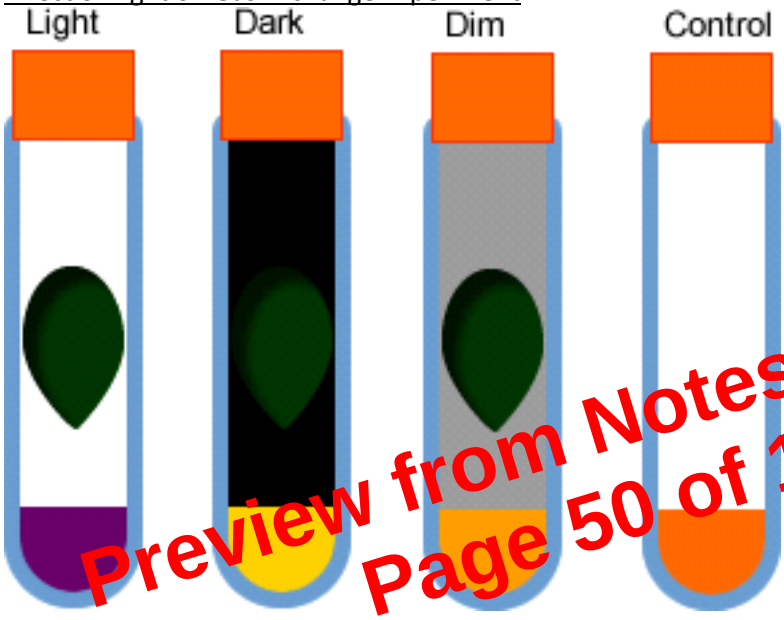
Component	Description	Function
Plasma	Straw coloured clear liquid. Makes up approx. 55% of the blood.	Transports CO_2, soluble nutrients, hormones and urea.
Red Blood Cells	Biconcave, no nucleus to fit more haemoglobin, makes up 45% of the blood, made in bone marrow	Packed with red haemoglobin which combines with oxygen to give oxyhaemoglobin – a reversible reaction so oxygen can be dropped off.
Lymphocytes	White blood cells about the same size as red cells with a large spherical nucleus, like an egg.	Produces antibodies, antitoxins. Made in bone marrow. They may cause bacteria to stick together, act as a 'label' on the pathogen, cause bacterial cells to burst open, neutralise poisons produced by the pathogen, or develop into memory cells.
Phagocytes	Much larger white blood cells with a large spherical nucleus. It's like an egg with a C-shaped yolk.	Digests and kills bacteria and other pathogens. Also made in bone marrow. (Engulfs)
Platelets	Small spiky cells – that are really just fragments of other cells	Releases chemicals to trap RBCs, resulting blood clots to stop us from bleeding.

Memory cells make you immune to a disease. When the same pathogen re-infects, the memory cells can produce antibodies at a faster rate and a higher quantity, killing the microbe before it would cause disease.

Preview from Notesale.co.uk
Page 36 of 113



Effect of Light on Gas Exchange Experiment



Preview from Notesale.co.uk
Page 50 of 113

Notes:

Hydrogen Carbonate Indicator Facts	
Orange	Normal CO_2 Concentration
Purple	Less CO_2 Concentration
Yellow	More CO_2 Concentration

Controlled variables:

- Species of leaf
- Mass of leaf
- Amount of indicator
- Temperature
- Starting CO_2 concentration

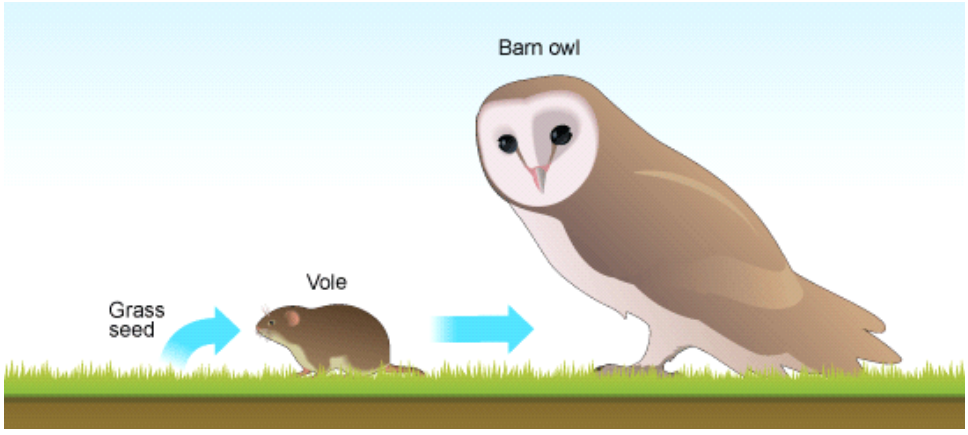
causes water to move into the very first of the root hair cells. This increases the water potential in the first cells. However, the cells behind the first ones have a lower water potential, which causes water to move from the first cells to the second ones. Continuing in this way, a water potential gradient is set up across the root cortex, kept going by water being taken up the xylem (or stele, in the picture) in the middle of the root.

Preview from Notesale.co.uk
Page 54 of 113

Feeding Relationships

18 December 2016 12:03

Feeding Relationships



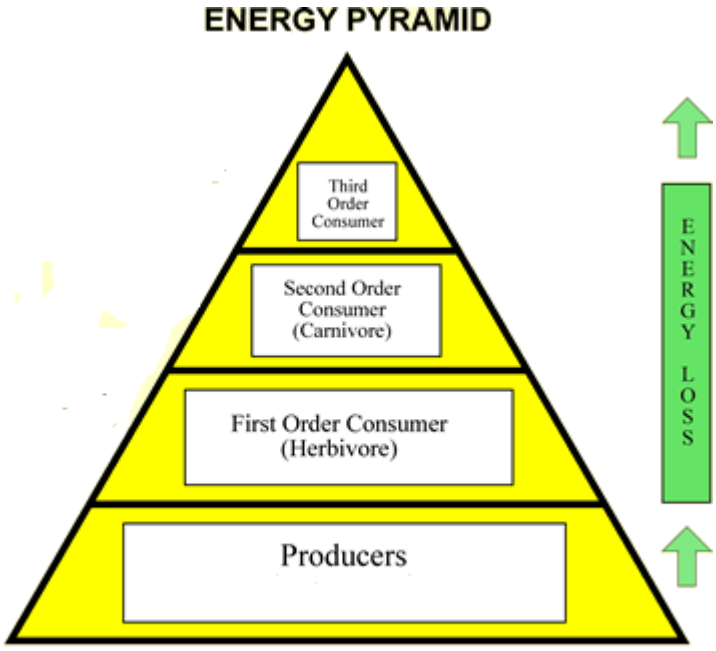
Food chains show the feeding relationships within an ecosystem. Arrows show the flow of energy as well as who eats what. 10% of total energy is passed down each food chain. The other 90% is used for waste, respiration, kinetic, chemical (poo), and heat energy.

In a food chain, there are stages, called trophic levels.

- ✓ Producers can convert inorganic elements into complex molecules (i.e. photosynthesize) and uses cellular respiration to release energy. They produce the food with the energy from the Sun. Consumers cannot make their own energy.
- ✓ Primary consumers are herbivores. They eat the producer.
- ✓ Secondary consumers eat the primary consumer and are also carnivores or herbivores, predators or scavengers.
- ✓ Tertiary consumers eat secondary consumer. These can be carnivores, herbivores or omnivores, predators or scavengers.

Preview from Notesale.co.uk
Page 57 of 113

- ✓

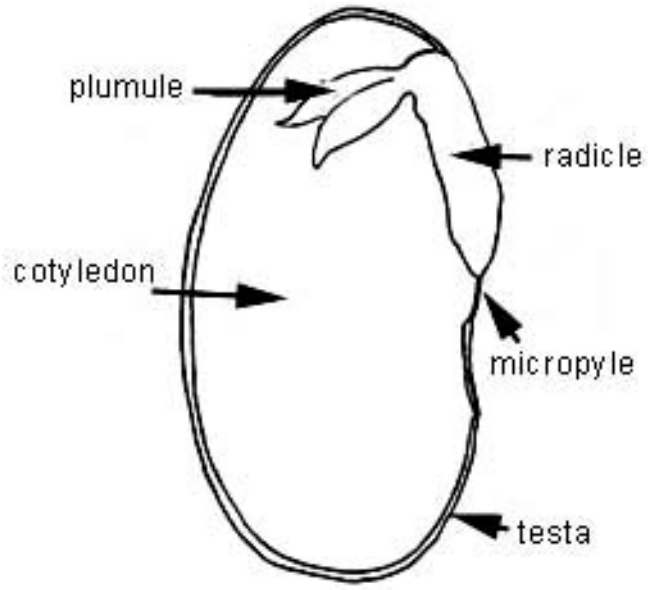


Decomposers can be in all three levels of consumers. These are bacteria, fungi or detrivores (worms…etc.).

Germination

18 December 2016 12:31

Germination



A seed contains a plant embryo, consisting of a radicle, plumule (shoot) and one or two seed leaves called cotyledons. Dicotyledonous plants or dicots have two cotyledons – examples being peas or beans. Monocotyledonous plants or monocots have one, examples being orchids and irises.

Anyways the radicle grows down into the soil and the plumule grows up towards the light where it can start to photosynthesise. Once the seedling is able to photosynthesise, germination is over.

Preview from Notesale.co.uk
Page 68 of 113

The conditions needed for germination are:

- ✓ Warm temperatures – for enzymes to work efficiently
- ✓ Water – for chemical reactions to take place
- ✓ Oxygen – for respiration

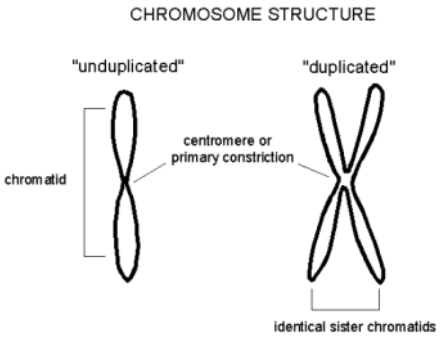
The food store gets used up during germination, but provides the nutrients needed to allow the radicle and plumule to grow. The food store in dicots is present in the cotyledons. Monocots have a separate food store. Dispersed seeds contain only about 10% water. This low water content restricts a seed's metabolism, so that it can remain alive but dormant for a long time.

Mitosis

18 December 2016 17:16

Mitosis

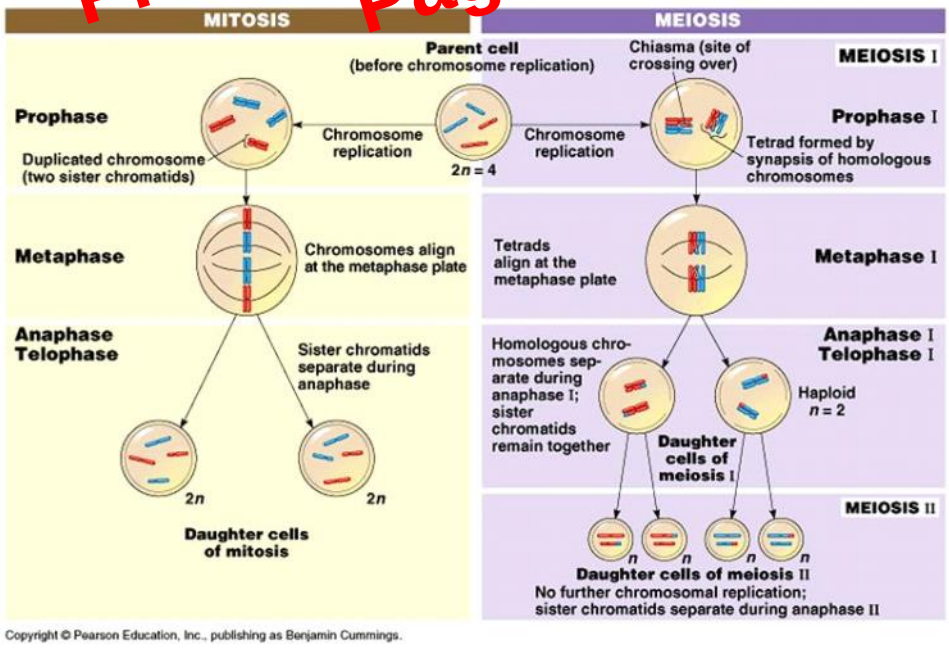
Diploid cells divide by mitosis and produce two cells which contain identical sets of chromosomes. When a parent cell divides it produces daughter cells. These are genetically identically to the parent cell. The stages of mitosis are as follows:

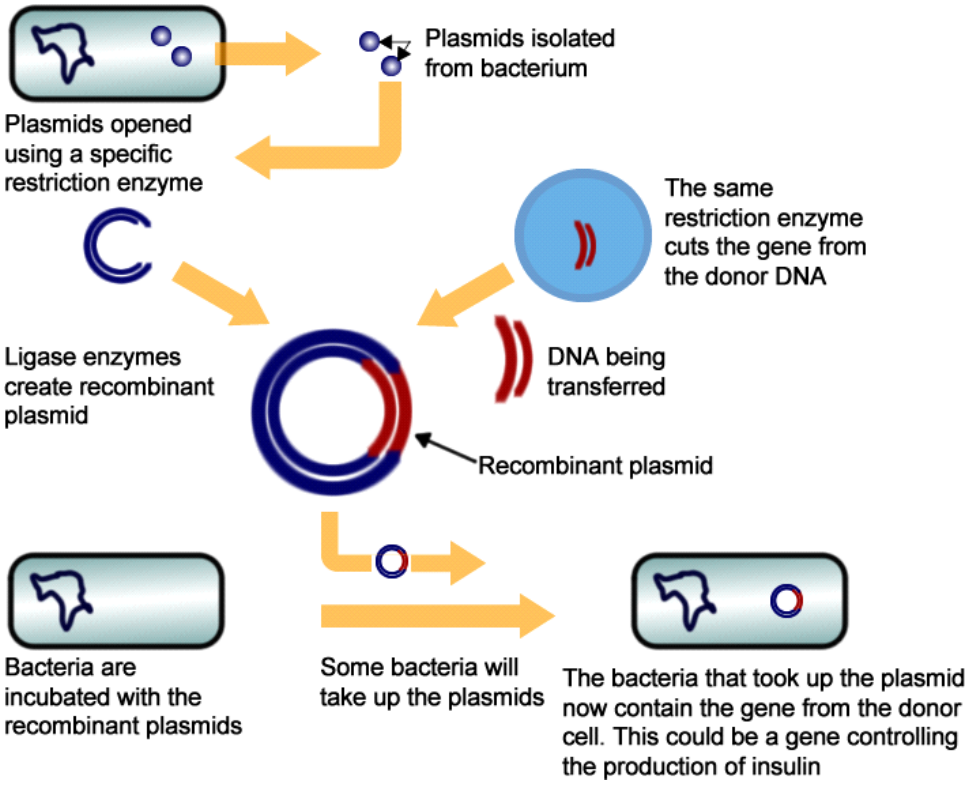


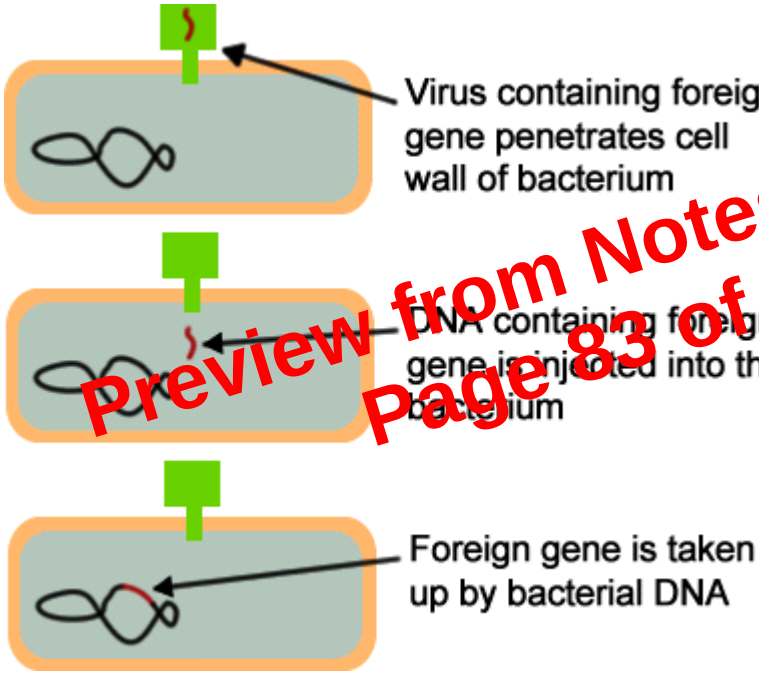
Chromosomes are copied as the DNA replicates and more histones (proteins the DNA coils around) are made. Each chromosome gets a sister chromatid which are joined together by a centromere.

1. Prophase – the nuclear membrane breaks down.
2. Metaphase – the spindle forms and the chromatids attach themselves to the spindle fibres by their centromeres.
3. Anaphase – the spindle fibres shorten and pull the sister chromatids of each chromosome to opposite ends of the cell (basically the chromosome splits into half).
4. Telophase – two nuclei form at the poles of the cell, each with a copy of the chromosome from the parent cell and the cell splits.

Preview from Notesale.co.uk
Page 73 of 113







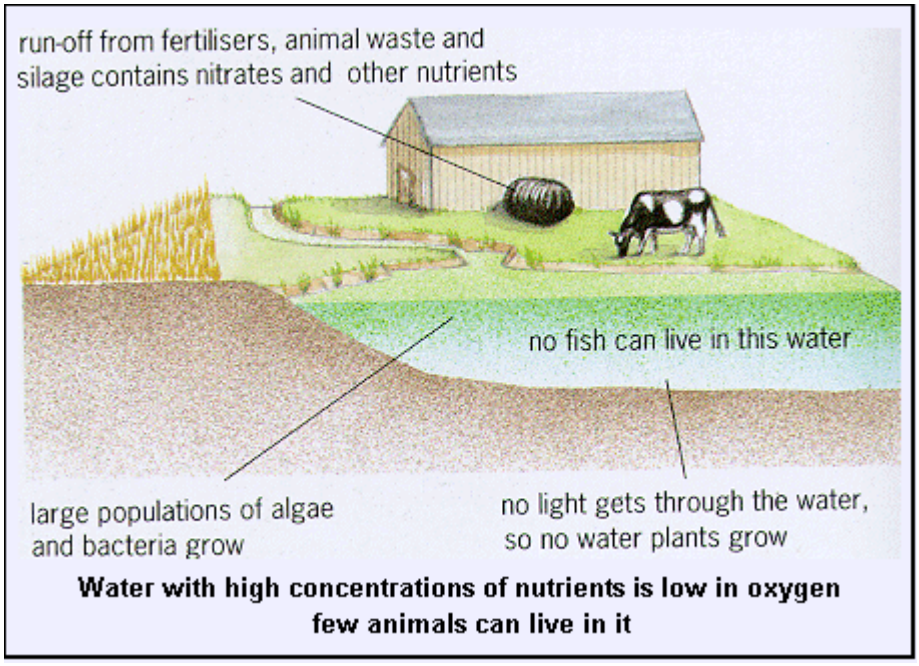
Preview from Notesale.co.uk
Page 83 of 113

To transfer a gene from any cell into a bacterium, biologists must insert the gene into a plasmid (small circular pieces of DNA found in bacterium). The plasmid is called a vector because it is the means of transferring the gene. The bacterium is then transferred to a fermenter.

Another vector that could be used is a virus that attacks a bacterium. It does this by attaching to the cell wall of the bacterium and injecting its own DNA into the bacterial cell. This DNA becomes incorporated into the DNA of the host cell, and eventually causes the production of many virus particles.

Different bacteria have been genetically modified to manufacture a range of products. Once they've been modified, they are cultured in fermenters to produce large amounts of the product such as:

- Human Insulin: For people suffering from diabetes.



Water with high concentrations of nutrients is low in oxygen
few animals can live in it

However, fertilisers can also cause problems. The ions in them are very soluble, and as a result, are easily leached (carried out with water) from the soils and can enter lakes and rivers from sewages. This increases the level of nitrates and other ion and causes eutrophication.

- As nitrate levels rise, algae use them to make proteins and reproduce rapidly, forming an algal bloom.
- This prevents light from penetrating further in the water. Submerged plants cannot photosynthesise as a result, and die.
- The algae also die as they run out of nitrates.
- Bacteria decay the dead plants and algae, releasing more nitrates and allowing the cycle to repeat. As they reproduce more and more due to the large amount of dead matter, their respiration uses up more and more oxygen. Because of the depletion of oxygen, all life in the water will die.

Preview from Notesale.co.uk
Page 87 of 113

Revision Questions and Answers

17 February 2017 14:35

Preview from Notesale.co.uk
Page 91 of 113

Turgid cells cause the cell to push against the cell wall - this is called turgid pressure. This is good for plants as it helps to support the plant tissues.

21. Describe an experiment using a non-living system that shows diffusion taking place. Then, do the same for osmosis.

    a. Make up some agar jelly with phenolphthalein and dilute sodium hydroxide.
    b. Then fill a beaker with some dilute hydrochloric acid. Using a scalpel, cut a few cubes from the jelly and put them into the beaker of acid.
    c. Then if you leave the cubes for a while they will eventually turn colourless as the acid diffuses into the agar jelly and neutralises the sodium hydroxide.

22. How is active transport different from diffusion in terms of a) concentration gradients and b) energy requirements?

    Diffusion always moves from a high concentration to an area of low concentration, and requiring no energy. Active transport uses energy released during respiration to travel against the concentration gradient.

23. Describe how surface area to volume ratio affects the movement of substances in and out of cells.

    If the surface area is large and the volume is small, solutions will move as fast as possible into these cells.
    If the surface area is small and the volume is large, solutions will move very slowly into these cells.
    If the surface area is large and the volume is large, or the surface area is small and the volume is small, then solutions will move medium speed and equally as fast as each other.

Preview from Notesale.co.uk
Page 94 of 113

21. Explain how villi help with absorption in the small intestine.

Villi increase the surface area so more nutrients can be absorbed into the blood stream at the same time. Each cell on the surface of a villus contain its own microvilli, which are little projections which increase the surface area even more.

Preview from Notesale.co.uk
Page 97 of 113

c. There are air spaces inside the leaf. This lets gases like carbon dioxide and oxygen move more easily between cells. It also increases the surface area for gas exchange.
d. The lower surface is full of little holes called stomata. They are to let gases like CO2 and O2 diffuse in and out. They also allow water to escape - which is known as transpiration.

12. Describe an experiment you could use to show the effect of light on gas exchange in leaves. What would you use as a control.

a. Add the same volume of hydrogen-carbonate solution to four boiling tubes.
b. Put similar sized, healthy-looking leaves into three of the tubes and seal with a rubber bung. Trap the leaf stem with the bung to stop it falling down into the solution if you need to.
c. Completely wrap one tube in aluminium foil, and a second tube in gauze.
d. Place all the tubes in bright light. This will let plenty of light onto the uncovered leaf, and a little light onto the one covered by a gauze. No light will get to the leaf covered in foil.
e. Leave the tubes for an hour, then check the colour of the indicator.
f. You would leave the fourth test tube with nothing in but indicator - as a control

13. What are the little holes on the lower surface of the leaf called?

Stomata

14. Name the key structures of the respiratory system.

a. The thorax
b. The diaphragm
c. Lungs (inside thorax)
d. Pleural membranes (surround the lungs)
e. Trachea
f. Bronchi - bronchioles - alveoli

Preview from Notesale.co.uk
Page 101 of 113

15. What happens to the intercostal muscles and diagram when you breathe in?

Intercostal muscles and diaphragm contact.

16. What happens to the intercostal muscles and diagram when you breathe out?

Intercostal muscles and diaphragm relax.

17. Explain why exercise increases your breathing rate.

Breathing speeds up to get more oxygen and to get rid of more carbon dioxide.

18. Describe why exercise increases your heart rate.

This is because muscles respire more during exercise - they require more oxygen and carbon dioxide, hence increasing your heart rate.

19. Give four ways that the alveoli's structure is ideal for gas exchange.

a. The huge number of microscopic alveoli gives the lungs an enormous surface area.
b. There is a moist lining for gases to dissolve in.
c. They have very thin cell walls - only one cell thick for efficient gas exchange as the cells don't have very far to diffuse.
d. They have a great blood supply to maintain a high concentration gradient

20. How does smoking contribute to coronary heart disease?