Title of contents :))

Human Digestive System

-consists of the alimentary canal and the associated organs
-alimentary canal consist of the mouth, oesophagus, stomach, small intestine, large intestine, rectum and the anus (basically route where food passes through)
-associated organs include salivary glands, pancreas, gall bladder and liver

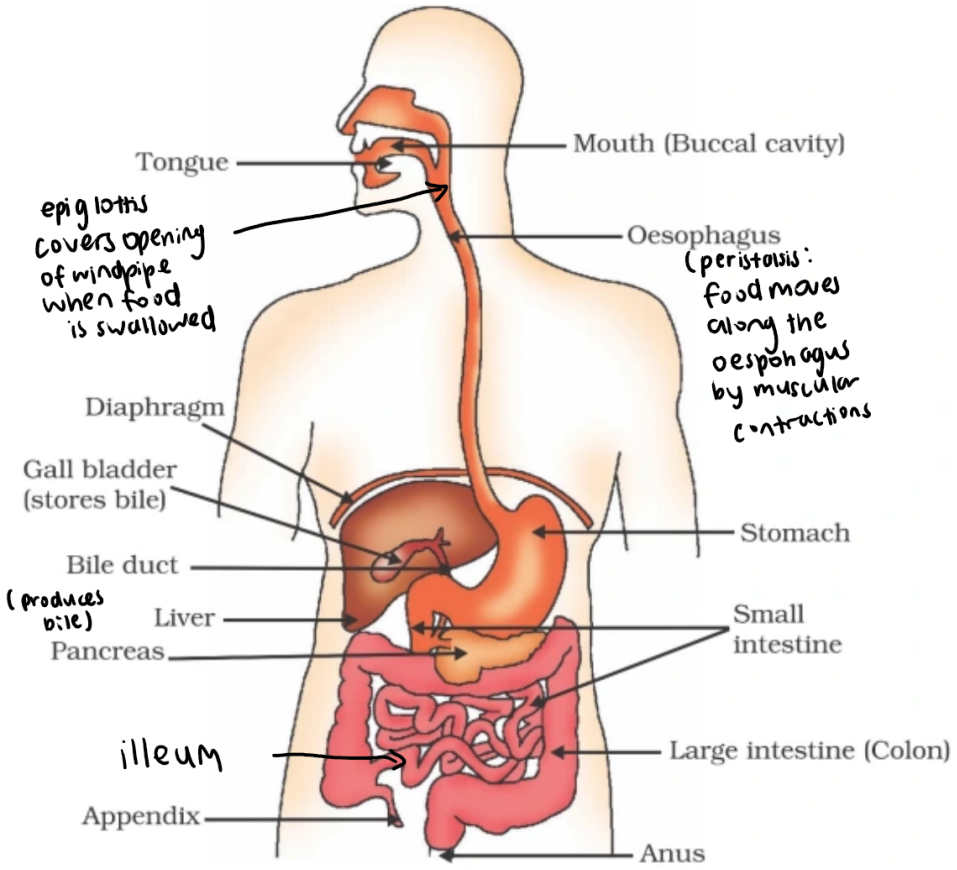


Figure 6.6 *Human alimentary canal*

Functions of the different parts of the digestive system
-Digestion of food begins in the mouth, and continues in the stomach and ends in the small intestine

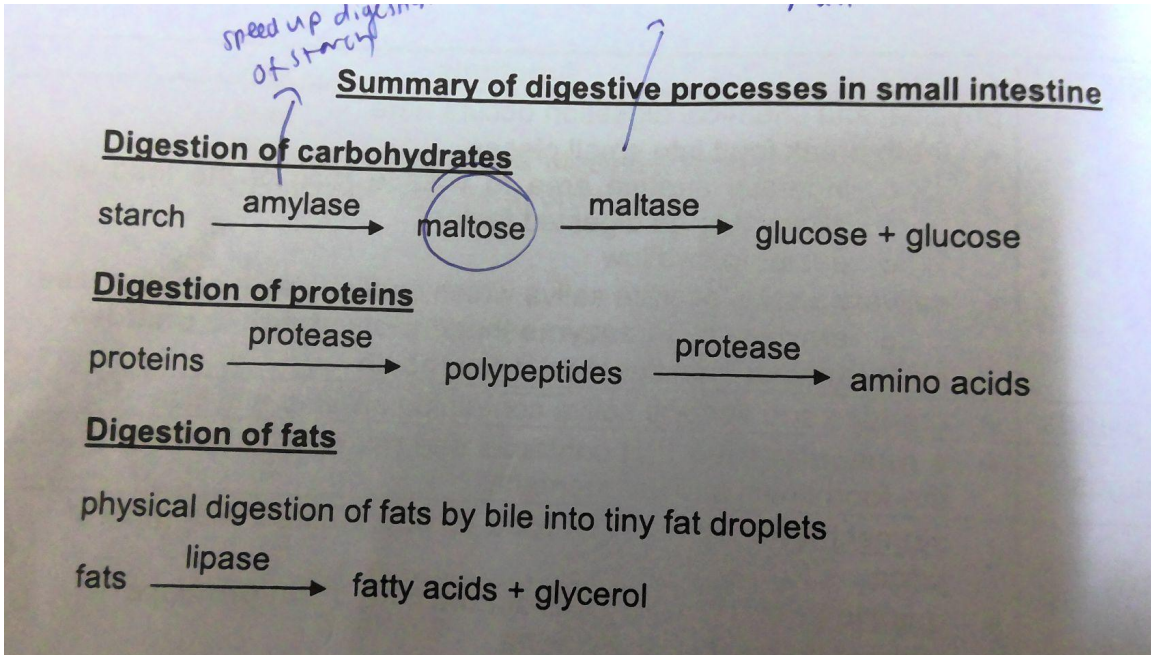
-Physical digestion (e.g. chewing and churning action of the stomach) helps to break food into smaller pieces
-Chemical digestion by enzymes hydrolyses the food molecules into simpler, more soluble and diffusible molecules so that they can be absorbed into the bloodstream

Enzymes
-substances produced by the body that speeds up the rate of chemical reactions, including digestion, biological catalyst
-OR WELLS biological catalysts that alter the rate of chemical reactions in our body without being changed and are specific in action

class of enzymes	acts on	end (final) products of digestion
carbohydrate (e.g. amylase and maltase)	carbohydrates	Simple sugars (e.g. glucose)
protease	proteins	amino acids
lipase	fats	fatty acids and glycerol

structure	functions
mouth	physical and chemical digestion occurs here! 1. teeth break food into smaller pieces -increase surface area to volume ratio of the food which allows it to be digested faster -easier to swallow 2. salivary glands secrete saliva which contains salivary amylase -amylase is an enzyme that digests starch to maltose 3. no proteins or fats digestion in the mouth
salivary glands	-produce and secrete saliva containing salivary amylase
esophagus	-a muscular tube that contracts and relaxes rhythmically to push the food down into the stomach
stomach	-stomach churns to break food up and mixes it with gastric juice -gastric juice contains hydrochloric acid and protease -hydrochloric acid kills bacteria -protease digests proteins into simpler proteins (polypeptides) -NO carbohydrate or fats digestion
pancreas	1. produces pancreatic juice -contains amylase, protease and lipase for the digestion of scratch, proteins and fats respectively
gall bladder	-releases bile into the small intestine -bile is produced in the liver but stored in the gall bladder -bile breaks up fats into tiny fat droplets -this increases the surface area to volume ratio of fats for digestion by lipase to speed up digestion
small intestine	-partially digested food (acid chyme) entering from the stomach mixed with digestive juices from the pancreas, gall bladder and intestinal glands -food is completely digested in small intestine

large intestine	-only food that cannot be digested enters the large intestine -the colon absorbs remaining water and dissolved ions -the rectum stores feces temporarily
anus	-feces (containing undigested food) is expelled from the body through the anus

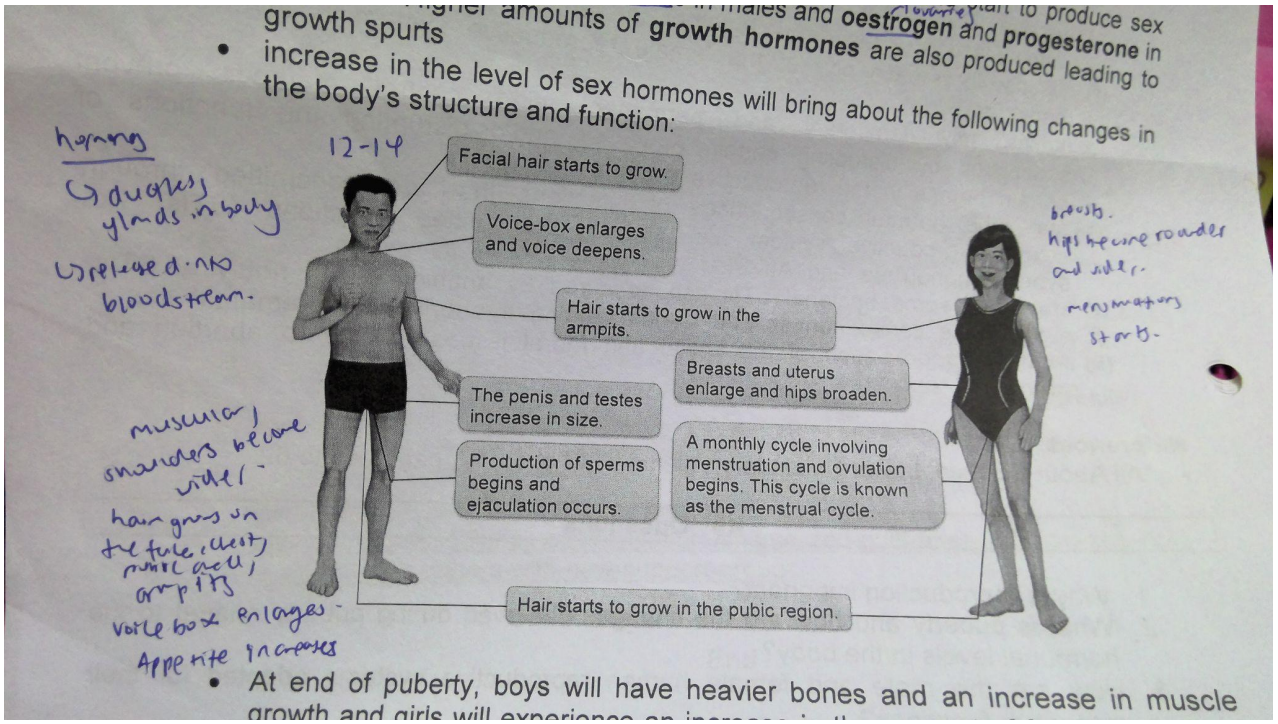


End products
-are relatively small
-small enough to pass through walls of small intestine and into the blood vessels, to be distributed to the other parts of the body by the circulatory system
-most of the water consumed is also absorbed in the small intestine
-the remaining water and dissolved ions are absorbed in the colon

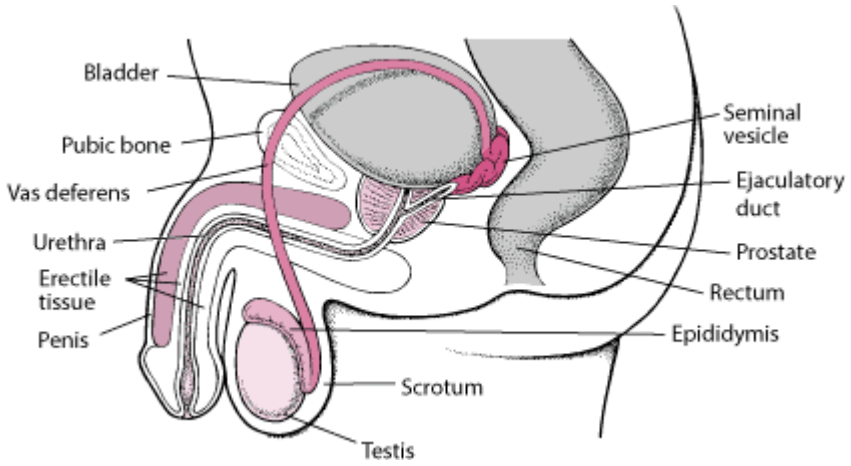
end product of digestion	how they are used by the body
glucose	-glucose is used in cells during respiration to release energy
amino acids	-amino acids are used by cells to make proteins, which are used for growth of new cells and repair of damaged tissues
fatty acids and glycerol	-fatty acids and glycerol combine again to form fats which are stored -fats can also be oxidised to release energy

Human Sexual Reproductive System

Puberty
-a period of active growth, when an adolescent becomes physically mature and capable of reproducing
-during puberty, reproductive organs become mature and start to produce sex hormones, such as testosterone in males and oestrogen and progesterone in females
-high amounts of growth hormones are also produced leading to growth spurts
-at the end of puberty, boys will have heavier bones and an increase in muscle growth and girls will experience an increase in the amount of fat tissues at the breasts, hips and pubic region



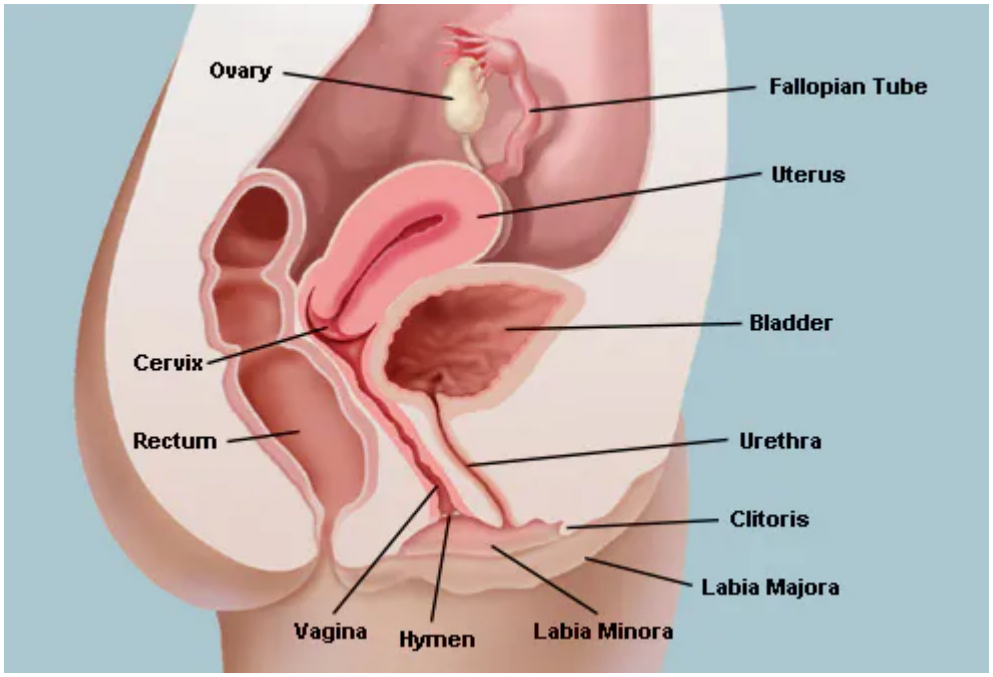
Male reproductive system



Organ (s)	Description/function
Testis (plural: testes)	Produces sperms and male sex hormones such as testosterone
Epididymis	Stores inactive sperms from testis before they are released into the sperm duct
Scrotum (scrotal sacs)	A pair of pouch-like sacs that hold the testes. They help to keep the testes beyond the main body cavity, hence maintain them at a lower temperature than body temperature for healthy development of sperms.
Sperm duct	The pathway travelled by sperms after they are released from the testis to the urethra
Prostate gland	Release fluids that contain nutrients and enzymes that are needed to activate the sperms. The mixture of this fluid and sperms is called semen.
Urethra	Extends from the urinary bladder, through the penis, to the outside of the

	body where urine and semen are passed out.
Penis	An erectile organ with spongy tissues that will be filled with blood. During sexual intercourse, it enters the vagina to deposit sperm-containing semen.

Female reproductive system



Organ (s)	Description/function
Ovaries	Produce eggs/ova and female sex hormones such as estrogen and progesterone. Mature eggs are released from the ovary.
Oviduct (fallopian tube)	A narrow muscular tube leading from the ovary to the uterus. Mature eggs are released from the ovary into the oviduct. Fertilisation occurs in this organ. The muscle tissues in the oviduct wall contract and relax to push the egg along the oviduct towards the uterus
Uterus (womb)	The organ in which the foetus develops during pregnancy. The muscle tissues in the walls of the uterus contract to push the foetus out during birth.
Uterine lining (endometrium)	Soft inner lining of the uterus. Needed for embryo implantation.
Cervix	A circular ring of muscles at the lower end of the uterus. The cervix contracts to keep the fetus within the uterus during pregnancy.
Vagina (birth canal)	The organ where semen is deposited during sexual intercourse.
Vulva	The opening of the vagina

Sperm
-head: contains nucleus, a small amount of cytoplasm, and an enzyme-containing acrosome
-middle piece: contains numerous mitochondria
-tail or flagellum: enables the sperm to swim towards the egg
-produced throughout the life of a sexually matured male human

Egg
-at birth, about 70 000 potential egg cells are already present in the ovaries
-has a nucleus
-relatively large amount of cytoplasm
-cell surface membrane that is surrounded by an outer membrane
-cannot move on its own; moved by the sweeping action of the cilia and the contraction and relaxation of muscles in the wall of the oviduct
-eggs are released into the oviducts from the time a female reaches puberty until she reaches 45-55 years of age, and usually only one mature egg is released every month.

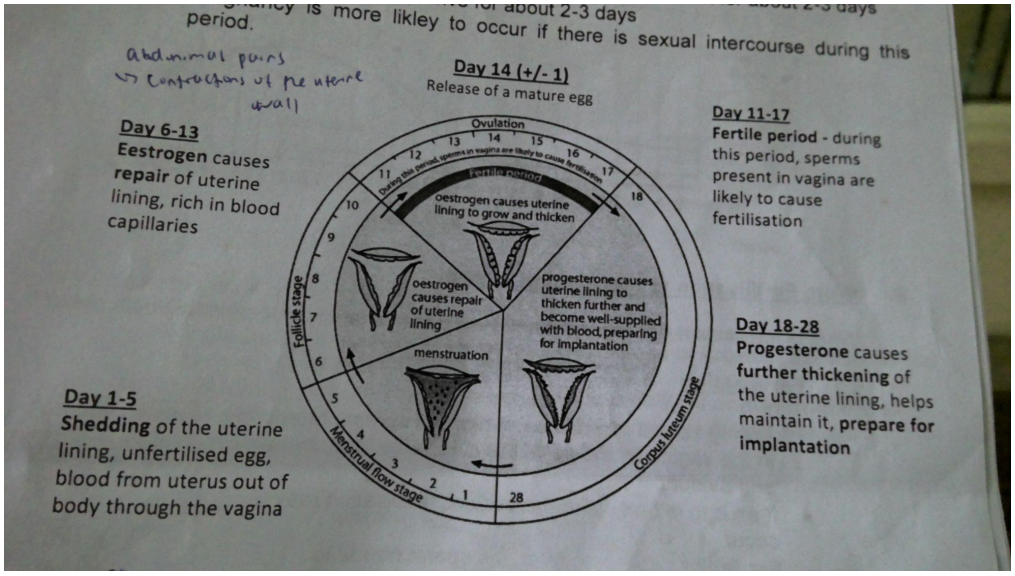
comparison chart (because why not!)

comparison	sperm	egg
similarity	both contain half as many chromosomes as normal body cells	
differences	released in millions	released one at a time
	able to move	unable to move on its own
	very small	comparatively large
	very little cytoplasm	a lot of cytoplasm

The Menstrual Cycle

Days	Events
1-5	Menstruation- the discharge of blood and dead tissues from the uterine lining through the vagina
6-13	Repair of uterine lining (endometrium)
14 (+/-1)	Ovulation- the release of a mature egg from the ovary into the oviduct
11-28	Growth and continued thickening of uterine lining in preparation for implantation

-length of cycle may vary from 21-33 days but on average is 28 days
-variation in length is normal, but can also be affected by factors such as stress, illness and malnutrition



-IF fertilisation does not occur, level of estrogen and progesterone will start to decrease.
-When hormones reach a low level, uterine lining cannot be maintained and will be shed during menstruation.
-IF fertilisation occurs, uterine lining will continue to thicken and be maintained in preparation of implantation of the fertilised egg.

Fertilisation
-sperm and egg meet
-sperm penetrates egg by releasing enzymes from its acrosome to break down part of the egg membrane
-only one sperm allowed to meet egg
-once single sperm has entered, the egg membrane changes such that no other sperm can penetrate it
-the nucleus of the sperm fuses with the nucleus of the egg to form the zygote, which now has a full set of chromosomes (46, 2 pairs of 23)

Development of embryo
-After fertilisation, the zygote travels down the oviduct.
-zygote undergoes multiple cell division cycles and develops into a ball of cells called an embryo
-embryo reaches the uterus where it gets embedded in the uterine lining, this is called implantation.
-after implantation, the embryo continues to grow and develop, the placenta forms for the exchange of substances between the fetus and the mother, fetus connected to placenta by the umbilical cord
-when major organs are formed, embryo now upgrades to become fetus. fetus will continue to increase in size until it is ready to be born
-during birth, contractions of the uterus wall help to push the fetus out through the vagina

Family planning

Natural methods
1. Abstinence
- not having sexual intercourse at all
2. Rhythm method
- not having sexual intercourse during the fertile period (day 11-17) of the woman's menstrual cycle
3. WIthdrawal method
- withdrawal of penis just before ejaculation (release of semen)

Chemical methods
1. Contraceptive pills

- contain certain female hormones which prevent ovulation
- pills need to be taken daily, is reliable when a woman follows the instructions
- may have some side effects

2. Spermicides
- chemicals that kills sperms
- in the form of gels, aerosol foams, foaming tablets
- not reliable when used on its own
- usually used with a condom or diaphragm

Mechanical Methods

1. Diaphragm
- a dome-shaped rubber cap with an elastic rim
- inserted into the vagina and positioned over the cervix
- prevents sperms from entering uterus

2. Condom
- thin rubber tube which covers the penis before sexual intercourse
- is impermeable to sperms hence sperms cannot enter uterus and fertilisation cannot occur
- is impermeable to bacteria and viruses and hence provides protection for the users against sexually transmitted infections

3. Intra-uterine device (IUD)
    - a piece of plastic or metal inserted into the uterus by a certified doctor
    - prevents implantation of the embryo
    - can be kept in uterus for around 3-5 years

Surgical Methods

1. Vasectomy
- involves tying and cutting of sperm ducts via surgery
- fertilisation not possible as sperms are not released into vagina

2. Ligation
- involves the tying and cutting of both oviducts via surgery
- prevents fertilisation as the sperms cannot meet the egg

Sexually Transmitted Infections

Acquired Immunodeficiency Syndrome (AIDS)
-STI that is caused by the Human Immunodeficiency Virus (HIV)
-attacks a type of white blood cells, hence, the immune system cannot function normally
-virus can remain dormant in body for many years before symptoms appear
-A HIV-infected person will develop AIDS as the infection progresses. During the final stages of the infection, the patient will develop severe weight loss, pneumonia and brain infection.
-can be transmitted via:

1. unprotected sexual intercourse with an infected person
2. sharing of hypodermic needle with an infected person
3. blood transfusion from an infected person
4. substance exchange at the placenta during pregnancy
5. through breastmilk

-can be prevented by:

1. keeping to a single sex partner, or abstaining from sex
2. using a condom during sexual intercourse
3. not abusing drugs as drug abusers are in the habit of sharing needles
4. not sharing instruments that can break skin and get contaminated with blood
5. making sure needles used for hypodermic purposes are sterilised

currently fatal :((but can be slowed down!)

Syphilis
-caused by a bacterium and can be treated with antibiotics
-signs and symptoms vary depending on the stage of infection
-symptoms in the early stages include painless sores, rashes
-without treatment, syphilis can lead to damage throughout your body including heart failure and nerve problems, and death

Gonorrhea
-caused by a bacteria and can be treated with antibiotics
-initial symptoms include burning sensation while urinating and a greater frequency of urination, white/yellow discharge from penis/vagina
-infection may spread to other parts of the reproductive system causing infertility
-some babies become blind when the bacteria enter the baby's eyes during birth

Issues related to Human Reproduction

Pre-marital sex
-unwanted pregnancies: unmarried couples usually are not emotionally ready for a child, and may also not be earning enough money to support a child. Some people in society also cannot accept unwed mothers.
-sexually transmitted infections: stand a risk of catching it especially if partner has it and does not tell you/does not know

Abortion
-termination of a pregnancy
-can lead to feelings of guilt and can spiral into depression
-some reasons for having an abortion:
1. the life of the mother and/or foetus is/are in danger
2. the mother may be permanently harmed if the pregnancy continues
3. the unwanted pregnancy resulted from rape

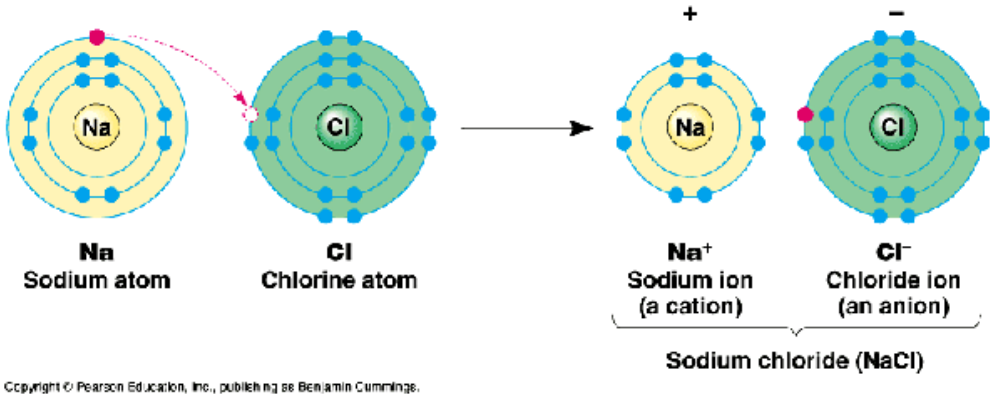
Chemical Bonding

valence electrons
-electrons in the outermost shell of an atom
-can be deduced from the electronic configuration of the element or by its group number in the periodic table

noble gases
-are unreactive and exists as monatomic gases
-observed that other elements tend to gain, lose or share electrons to attain the same electronic configuration as a noble gas a.k.a. stable noble gas configuration (SNGC)

ionic bonding
***** is the electrostatic forces of attraction between the cations and the anions *****
-when atoms gain or lose electrons, they form charged ions
-metals tend to lose their valence electrons to achieve SNGC and become cations
-non-metals tend to gain electrons to achieve SNGC and become anions
-as the ions have opposite charges, they experience electrostatic forces of attraction between them

an example: (sodium and chlorine)



Covalent bonding
***** is the electrostatic forces of attraction between positive nuclei and shared localised electrons *****
-since all non-metals need to gain electrons to attain SNGC, when non-metals bond with non-metals, they must do so by sharing electrons
-shared electrons attracted by both nuclei
-when atoms are covalently bonded together, they form a molecule
determining the elements from the chemical name

1. look at prefix (di, mono, tri)
2. memorise the fixed diatomic molecules (hydrogen, nitrogen, oxygen, group 17)
3. memorise the rest 😢

Summary (or a TLDR)
-chemical bonds are electrostatic forces of attraction that bind particles together to form matter
-when different types of particles interact electrostatically, different types of bonds are formed

type of bonding	electrostatic attraction between...	
	positively charged particle	negatively charged particle
ionic	cation	anion
covalent	nuclei	shared localised electron

Chemical Changes

13.1.2 Naming Ionic Compounds

- A binary compound is a compound formed from only **two** elements.
- Generally, ionic compounds have two parts to their names:

magnesium	*chloride*
cation (+)	anion (–)
same as the name of the metal it came from	change the name of the element to end with **-ide**

- For transition metals, as most of them have **more than one** oxidation state/charge, it is reflected with Roman numerals after the metal.
  - E.g. copper(II) chloride, iron(III) oxide
- Exception: zinc and silver compounds have no Roman numerals in their names. You are expected to know the charge of the ions they form, along with lead.

name of ion	formula
silver	Ag^{+}
zinc	Zn^{2+}
lead(II)	Pb^{2+}

- Some ions are made up of groups of atoms. These are known as **polyatomic ions**.

name of ion	formula
ammonium	NH_4^{+}
hydroxide	OH^{-}
nitrate	NO_3^{-}
hydrogen carbonate	HCO_3^{-}
carbonate	CO_3^{2-}
sulfate	SO_4^{2-}
phosphate	PO_4^{3-}

prefixes
one - mono
two - di
three - tri
four - tetra
five - penta
etc etc.

Weird things to take note of (thank, covalent)
-Hydrogen, nitrogen, oxygen and all Group VII elements are diatomic.
-Noble gases are monatomic.

things you must memorise!!

chemical name	chemical formula
ammonia	NH_3
methane	CH_4
water	H_2O

hydrogen peroxide	H_2O_2
ozone	O_3

Clues to determine if it is a chemical change
● production of gas (bubbling/ effervescence)
● change in colour / odour
● formation of precipitate (new solid formed)
● heat/light energy required/ released
*note: these are just guidelines and not definitive

Balancing Equations
-Write down the chemical formulae of all the reactants and products
-Put numbers in front of the formulae of the reactants or products to ensure that the number of atoms of each element on both sides of the equation is the same
-BALANCE O AND H LAST PLS CAI WEI JUST REMEMBER THIS

what a balanced equation looks like

b) sodium + water □ sodium hydroxide + hydrogen

$2Na(s) + 2H_2O(l) \square 2NaOH(aq) + H_2(g)$

State symbols
-solid (s),
-liquid (l),
-gas (g),
-aqueous i.e. dissolved in water (aq)
(that's it, for once!)

solubility table

Salts	Solubility In Water
Li^+, Na^+, K^+ (Group I) and NH_4^+	Always soluble
nitrates	Always soluble
chlorides	Soluble except **A**g*C*l, **P**b*C*l_2
sulfates	Soluble except **B**aSO_4, **C**aSO_4, **P**bSO_4
oxides, hydroxides, carbonates	Insoluble except for Group 1 salts and ammonium salts *calcium hydroxide is slightly soluble (limewater)

Acids
-is a substance that produces hydrogen ions (H^+) when dissolved in water
-Pure acids are usually in the form of simple covalent molecules. The process of acid molecules forming ions in solution is known as ionization. It is the H^+ ions that gives an acid its acidic properties.
-strong acid: fully dissociated in water, weak acid: partially dissociated in water
-MUST BE DISSOLVED IN WATER JUST IN CASE YOU DIDN'T GET THE HINT HERE

common acids

common name	name of covalent molecule (before dissolved in water)	formula	description	ions produced in aqueous solutions	
hydrochloric acid	hydrogen chloride	HCl	strong acid	H^+	Cl^-
nitric acid	hydrogen nitrate	HNO_3	strong acid	H^+	NO_3^-
sulfuric acid	hydrogen sulfate	H_2SO_4	strong acid	$2H^+$	SO_4^{2-}
phosphoric acid	hydrogen phosphate	H_3PO_4	weak acid	$3H^+$	PO_4^{3-}
acetic acid	ethanoic acid	CH_3COOH	weak acid	H^+	CH_3COO^-

Properties of Acids

1) Acids have a sour taste.
2) Acid solutions are good electrical conductors (ions free to act as charge carriers).
3) Acids turn blue litmus red.
4) Acids react with bases to form a salt and water ONLY. (neutralisation)
5) Acids react with metals to form a salt and hydrogen gas.
6) Acids react with carbonates and hydrogen carbonates to form a salt, water and carbon dioxide gas.

What is a salt?
-products of the reaction between an acid and a base, with all or some of the H^+ ions replaced by another cation (usually from the base)

eqn 1: acid +base → salt + water (neutralization)
*neutralization produces water from hydrogen cations and hydroxide anion
eqn 2: acid + carbonate → salt+ water + carbon dioxide
eqn 3: acid + metal → salt + hydrogen
DOES NOT WORK WITH UNREACTIVE METALS
list includes: copper, silver, gold, platinum

Uses of acids

chemical	uses
ethanoic acid	main component in vinegar
sulfuric acid	production of ammonium sulfate, which is used in fertilisers
	production of detergents
	component in car batteries

Base: any metal oxide or hydroxide that reacts with an acid to produce a salt and water only. Most of the bases are insoluble in water.
Alkali (soluble base): a substance that produces hydroxide ions (OH^-) in aqueous solution. Alkalis are usually group I metal oxides and hydroxides.

common alkalis

common name	chemical name	formula	description
caustic soda	sodium hydroxide	NaOH	strong alkali
caustic potash	potassium hydroxide	KOH	strong alkali
slaked lime	calcium hydroxide	$Ca(OH)_2$	strong alkali (but only slightly soluble in water)
ammonia solution	aqueous ammonia	NH_3 (aq)	weak alkali

a note for ammonia:

Note:

1. Aqueous ammonia is formed by dissolving NH_3 into water. It is to be written as NH_3 (aq). It is alkaline because some ammonia molecules accept protons from water to produce NH_4^+ and OH^- ions.

$$NH_3(g) + H_2O(l) \rightleftharpoons NH_4^+(aq) + OH^-(aq)$$

Properties of Alkalis
1) Alkalis have a bitter taste and feel soapy.
2) Alkalis turn red litmus blue.
3) Alkalis react with acids to form a salt and water only.
4) Alkalis react with ammonium salts upon warming to produce a salt, water and ammonia gas.
5) Alkalis react with some salts to produce insoluble hydroxides.

Reactions of Alkalis
eqn 1: acid + alkali → salt + water
eqn 2: alkali + ammonium salt → salt + water + ammonia
eqn 3: alkali (containing metal A) + salt (of metal B) → salt (of metal A) + metal hydroxide (of metal B)

Uses of bases
Case study: controlling pH of soil
Most plants will not grow well if the pH of the soil is below 5 or above 9. To reduce the acidity of the soil, farmers add bases such as calcium oxide (quicklime) or calcium hydroxide (slaked lime). This is known as ‘liming’ the soil. As these bases are not very soluble in water, they are not easily washed away by rain and thus remaining effective for long periods.

Other uses

chemical	uses
magnesium oxide	component of antacid for relieving gastric pain
	making of refractory bricks
magnesium hydroxide	component in toothpaste to neutralise acid on teeth
	component of antacid for relieving indigestion
calcium oxide and calcium hydroxide	reduce acidity in soil

The pH Scale

-concentration of a solution is the amount of solute dissolved in a unit volume of solution
-pH is a measure of concentration of hydrogen ions in a solution, which informs us how acidic or alkaline a solution is
-is numbered between 0 and 14.

pH < 7	ph = 7	ph > 7
concentration of H^+ higher than concentration of OH^-	concentration of H^+ equals concentration of OH^-	concentration of H^+ lower than concentration of OH^-
acidic	neutral	alkaline

Forces

-an influence which changes (or tries to change) the state of motion of a body or the shape or size of a body
-SI unit: Newton (N)

mass vs weight!! (highkey important)

mass	***weight***
Is the measure of the amount of substance in a body	Is the gravitational force on a body
Is a scalar	Is a vector
Is constant regardless of the gravitational field strength	Varies according to the gravitational field strength
Is usually measured by an electronic balance/beam balance	Is usually measured by a spring balance or a compression balance

Gravitational force
-Weight is a gravitational force or a force due to gravity acting on a body
-****draw weight from centre of gravity of body
-non-contact force j

Friction
-occurs between two surfaces rubbing against each other (may be solids, liquids or gases)
-friction usefulness (walking without slipping/vehicles can brake/holding objects without slipping)
-friction not-so-usefulness (machines decrease in efficiency/parts of machine cause wear and tear/causes friction burns e.g. lashings i.e. rope burns)

Tension
-acts through a stretched rope, string or cable
-contact force

Normal contact force
-exerted on body by a surface in contact with it
-exerted on body perpendicular to surface

-contact force

Upthrust
-exerted on a body immersed (partially/fully) in a fluid

Electrostatic force
-acts on a charged body by an electric field which may be produced by another charged body
-non-contact force

Magnetic force
-acts on a magnetic object or magnetic pole of a magnet
-non-contact force

**Effects on Forces
A force can…

- Start or stop a body
- Change speed or direction of body
- Change size and/or shape of body
- Can bring about turning effects in the body
- Can exert pressure on a body (single force/ net force)

Pressure
P=F/A
Where P: pressure (Pa or N/m²)
F: force (N)
A: area (m²)

Energy Work Power

Work Done
-defined as the product of a force and the distance moved by the object in the direction of the force
-SI unit: joule (J)
-Formula: work= F*d
Where work: work done (J)
F: force (N)
D: distance (m)
3 conditions:

1) Force acting on an object
2) Object moves
3) The object moves along the direction of the force

Energy
-ability to do work
-SI unit: joule (J)
*energy transferred = work done

Gravitational Potential Energy
*GPE=mgh
-refers to the amount of stored energy due to gravity in an object.
-an object at a higher point above the ground will have more GPE than object at ground

Kinetic Energy
-refers in the energy due to movement of a body
-all moving bodies/objects have KE
*KE=½ mv²
Where m:mass (kg)
and v:speed (m/s)
-is proportional to the mass of the object and to the square of the speed of the object
SO object with 2 times speed has 4 times KE

Conservation of Energy ,
***Principle of Conservation of Energy:
Energy cannot be created or destroyed. It can only be converted from one form to another.
-sadly does not happen in real world due to air resistance (energy lost as heat energy, sound energy)

Power
-defined as the rate of work done per unit time
SI unit: watt (W)
P= work/time OR energy change/time
used in electricity too!!

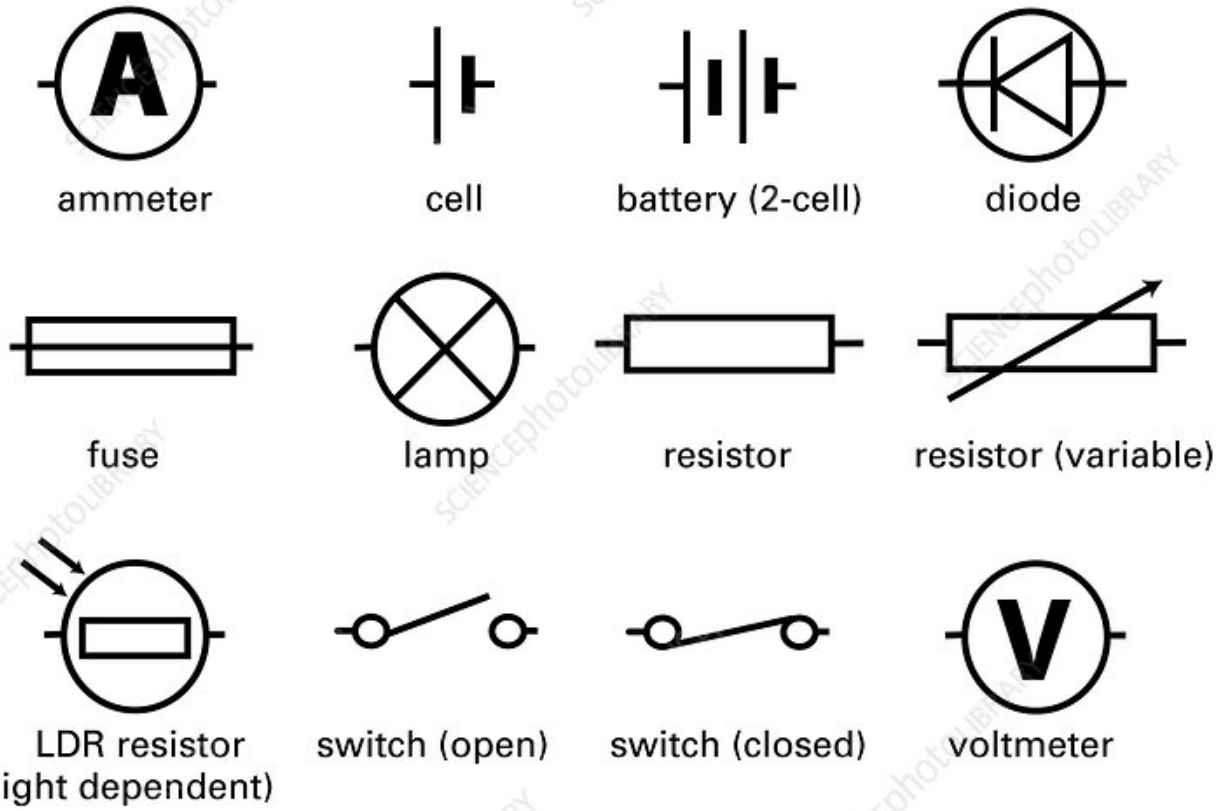
Renewable energy sources

Renewable	***Non-renewable***
-solar energy -hydroelectric energy -wind energy -tidal energy -geothermal energy -biomass	Fossil fuels - Crude oil - Natural gas - Coal

Electricity

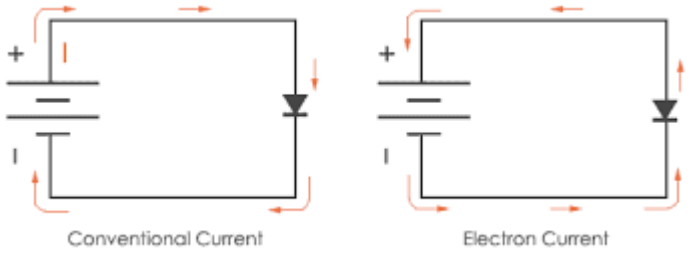
Charge
-rate of flow of electric charge
I=Q/t
Where Q is electric charge (C)
And t is time (s)
SI unit: ampere (A)

Circuit Symbols



(ignore the LDR resistor and the diode. the non-magic of google.)

Current in a Circuit



Potential difference
-potential difference across circuit component is the work done to drive an electric charge through the component
-SI unit: volt (V)

Resistance
-ratio of potential difference across the component to the current through the component
***V=IR
Where I: current (A)
V: volt (V)
R: Resistance (Ω)
SI unit for resistance: ohm (Ω)
Resistance of material- ability of component to resist the flow of charge through it

Effective resistance
-total resistance in a circuit due to resistance of resistors

Series
$R_e = R_1 + R_2 + ...$
(sum of resistance of all resistors in series)

Parallel
$1/R_e = 1/R$ (sum of all resistors in parallel)

Series vs Parallel (2 resistors)

	Resistors in series	Resistors in parallel
Current	$I = I_1 = I_2$	$I = I_1 + I_2$
Potential difference	$V = V_1 + V_2$	$V = V_1 = V_2$
Resistance (total)	$R_e = R_1 + R_2$	$1/R_e = 1/R_1 + 1/R_2$

Heating effect of electric current
- More resistance, more heat

Applications: Electric kettle, filament lamp

Magnetic effect of electric current
- Electric current flows through coil of wire, which sets up a magnetic field

Applications: Magnetic crane, electric bell

Chemical effect of electric current
- Electric current can cause chemical compound to break down or produce new compounds

Application: Electroplating, electrolysis

Power
-is the amount of electrical energy it converted to other forms of energy in units of time
***P=E/t
Where E is energy (J)
And t is time (s)
SI unit: watt (W)

Electrical hazards
1) Damaged insulation

-wires (insulation) frequently subjected to wear and tear. Wire should be replaced if insulation is damaged.
-if exposed, live wire comes into contact with metal casing; metal casing becomes live

2) Overheating of cables

-Overloading the wires with too much current will cause the wires to heat up significantly
-the insulation may melt or catch fire

3) Damp conditions

-pure water does not contain free ions
-tap water does so it conducts electricity
-also lowers resistance of human skin and current flows through body
~~fantastic~~

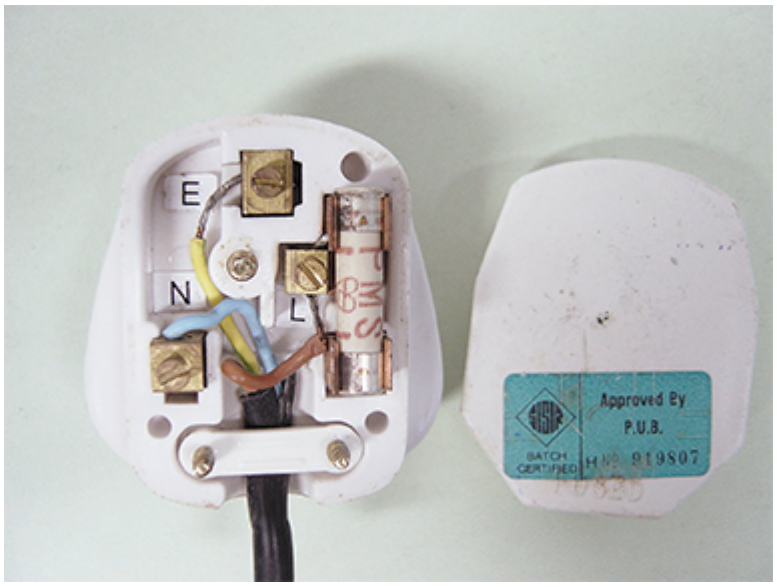
Safety appliances
Switch

-improves safety for the users of the circuit as well as provides convenience
-switch should **always** be placed along the live wire so that when the switch is open, the appliance will be disconnected from the high voltage source

Fuse
-a piece of wire which will melt to disconnect the appliance from the high potential when the current through it exceeds its rating
-disadvantage: cannot be reused
-diff fuse rating achieved by: different metal and different thickness of same metal

Earthing
-earth wire becomes very important as it provides a path for the charges to travel from the metal casing to the ground
-earth wire has negligible resistance, it is connected between the metal casing of the appliance and the ground
-when earth wire becomes live, the large surge of current through the live wire above rating of fuse; causes the fuse to blow

Socket



So live: brown
Neutral: blue
Earth: green and yellow

2 pin plugs have NO EARTH WIRE; usually have double insulation

Circuit breaker
Consumer unit- main switch
(user can switch off all electricity supply to house)
MCB (miniature circuit breakers)
-separate circuits
-once reached upper limit, will switch off (or trip)

Interactions within Ecosystems

Habitat - the place where an organism lives

Population - a group of organisms of the same species
Community - different populations of organisms living together and reproducing in the same habitat
Ecosystem - a community of organisms in a habitat that interact with one another and with their physical environment

Abiotic factors (physical)

Light
-intensity of light determines kinds of plants and hence, the kinds of animals found in a habitat
-plants photosynthesise and have different preferences and adaptations for it

Temperature
-affects activities of all organisms
-FOR PLANT: low temperatures decrease the rate of photosynthesis in plants hence growth of plant is stunted
-FOR ANIMALS: low temperatures decrease the rate of blood circulation hence animal becomes sluggish
-most plants and animals can survive in temperatures between 0℃ and 45℃, some others have adaptive traits that makes them capable of surviving under more extreme conditions

Water
-all organisms need water to survive
-the amount of water in any place depends on the rainfall it receives throughout the year
-in general, more organisms can be found where water is available, BUT OF COURSE THERE ARE EXCEPTIONS (thank.)

Air
-Air contains the gases that organisms need to live
-Plants need carbon dioxide to photosynthesise
-Polluted water usually contains less dissolved oxygen than fresh, clean water. As a result, many fishes die due to a lack of oxygen

Mineral salts and salinity
-Mineral salts are important in the production of many essential substances such as proteins, vitamins and chlorophyll
-Plants and animals do not grow well if they lack mineral salts
-Plants obtain mineral salts through absorption from the soil while animals get mineral salts from the food they eat
-The concentration of mineral salts dissolved in water affects the salinity of the environment

pH (acidity/alkalinity)
-PROBABLY EVERYTHING IS SENSITIVE TO pH LEVEL OF THEIR SURROUNDINGS OR SOMETHING
-land plants cannot absorb the mineral salts from the soil if it is too acidic
-freshwater organisms can tolerate a pH of about 7, while marine organisms can tolerate a pH of about 8 (which is slightly alkaline)
-aquatic plants can affect the pH level of water varies during different times of the day. In strong daylight, aquatic plants use the dissolved carbon dioxide in water to carry out photosynthesis. This decreases the acidity of the water caused by dissolved carbon dioxide, thereby increases the pH of the water

Interaction between organisms

Predator-prey relationship
predator - an animal that hunts and kills other animals for food

prey - an animal that is killed and eaten by another animal
-predators (YOU LUCKY BEASTS) have adaptive traits such as keen senses, speed, strong claws or jaws to increase their likelihood of catching and killing prey
-prey also have adaptive traits to protect them from predators, such as camouflage.
-prey and predator population levels are closely connected because predator depends on prey as food source

1. If the prey population drops (e.g. due to over-feeding), predator numbers will decrease as competition within the predator population increases
2. if the prey population rises, predator numbers will increase as a result of the over-abundance of a food source

Mutualism
-a relationship between two species of organisms where both organisms benefit

Parasitism
-Parasitism is a relationship between two species of organisms in which one (the parasite) benefits at the expense of the other (the host)
-parasite normally does harm to its host

Commensalism
-a relationship between two species of organisms in which one species benefits while the other is unaffected
-commensal organism may depend on its host for food, shelter, support, transport, or a combination of these

Processes involved in maintaining stable ecosystems

Energy transfer
-All organisms need energy to carry out life processes (to do work)
-The source of this energy is the sun
-Light energy from the sun enters an ecosystem when it is absorbed by photosynthetic organisms and converted into chemical energy
-chemical energy in photosynthetic organisms is transferred to other organisms through feeding
-during cellular respiration, chemical energy stored in these organisms is released and used to carry out life processes
-results in transfer of energy between organisms
Nutrient/chemical cycling
-carbon, oxygen, nitrogen and water are essential nutrients or chemicals for life
-in a balanced ecosystem, these substances are continually cycled, e.g. water cycle, nitrogen cycle, carbon cycle etc.
-the cycling of nutrients is brought about by physical, chemical and biological processes, involving both the biotic and abiotic factors of the environment

Photosynthesis and respiration
-important processes in the flow of energy in any ecosystem

Photosynthesis

$$\underset{\text{Carbon Dioxide}}{6\,CO_2} + \underset{\text{Water}}{6\,H_2O} \xrightarrow[\textit{Chlorophyll}]{\textit{Sunlight}} \underset{\text{Carbohydrate}}{C_6H_{12}O_6} + \underset{\text{Oxygen}}{6\,O_2}$$

Respiration

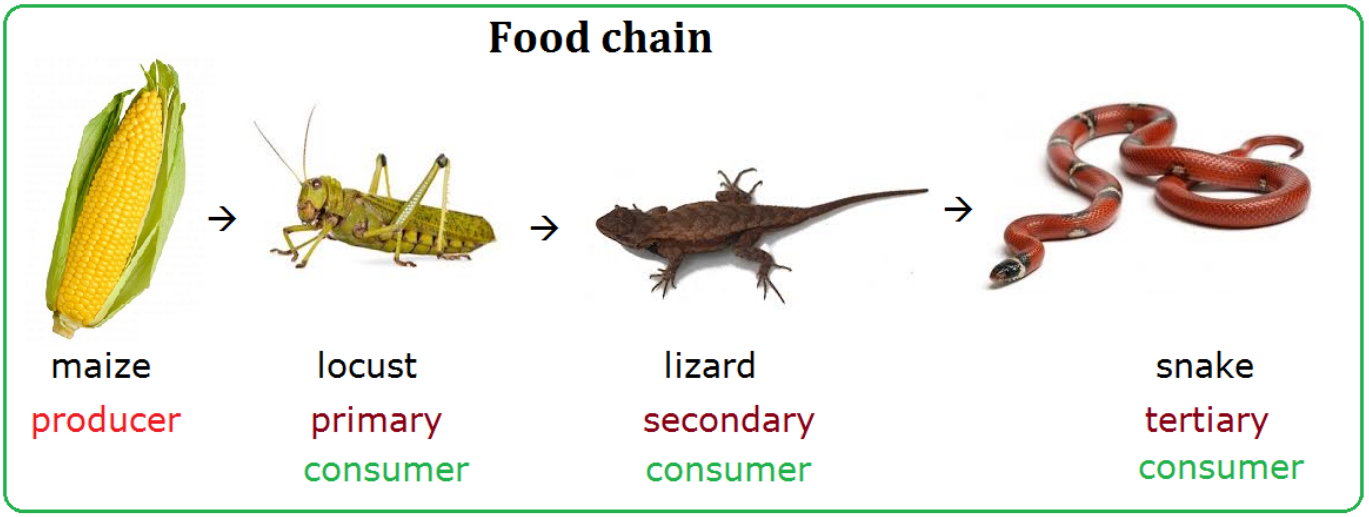
$$\underset{\text{glucose}}{C_6H_{12}O_6} + 6\,\underset{\text{oxygen gas}}{O_2} \rightarrow 6\,\underset{\text{carbon dioxide gas}}{CO_2} + 6\,\underset{\text{water}}{H_2O} + \underset{\text{energy}}{ATP}$$

Differences!!!!

Photosynthesis	Aerobic respiration
Occurs in organisms containing chlorophyll	Occurs in all organisms, in all cells
Takes place only where there is light	Takes place all the time
Absorbs light energy	Releases energy
Uses carbon dioxide and water	Uses oxygen
Synthesise carbohydrate molecules	Oxidises carbohydrate molecules
Oxygen formed as one of the products	Carbon dioxide and water formed as products

Food chains
-shows the feeding relationship between organisms, ALWAYS shows how energy is transferred from one organism to another
-always begin with a producer
-each stage of a food chain is known as a trophic level (feeding position of an organism in a food chain)

example!

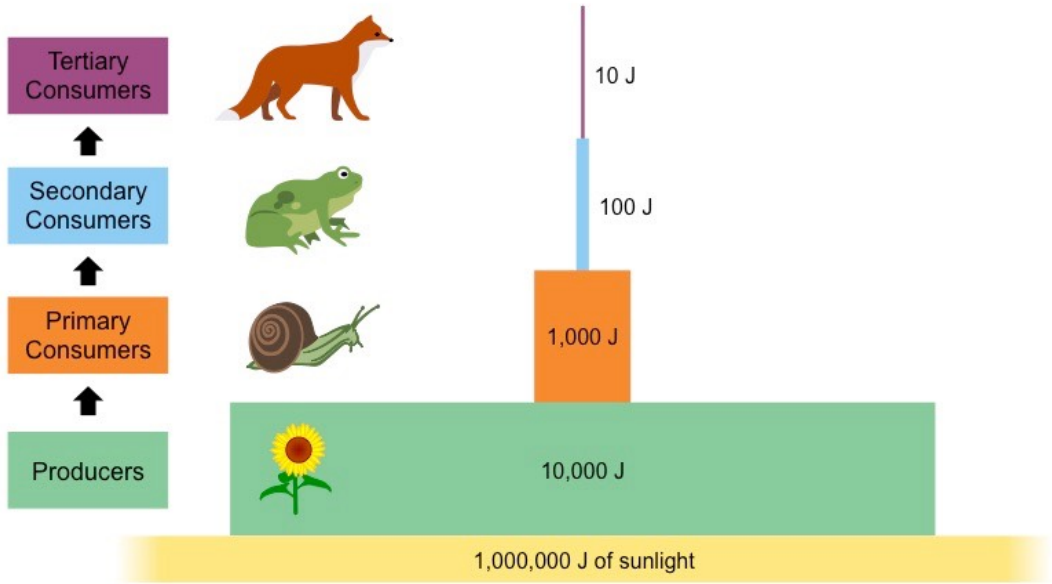


food webs
-BASICALLY more than 1 food chain interlinked together

energy loss
-as energy is transferred from one organism to the next in a food chain, the amount of energy transferred gradually decreases
-bc energy lost to the environment at each trophic level
-can be lost as:

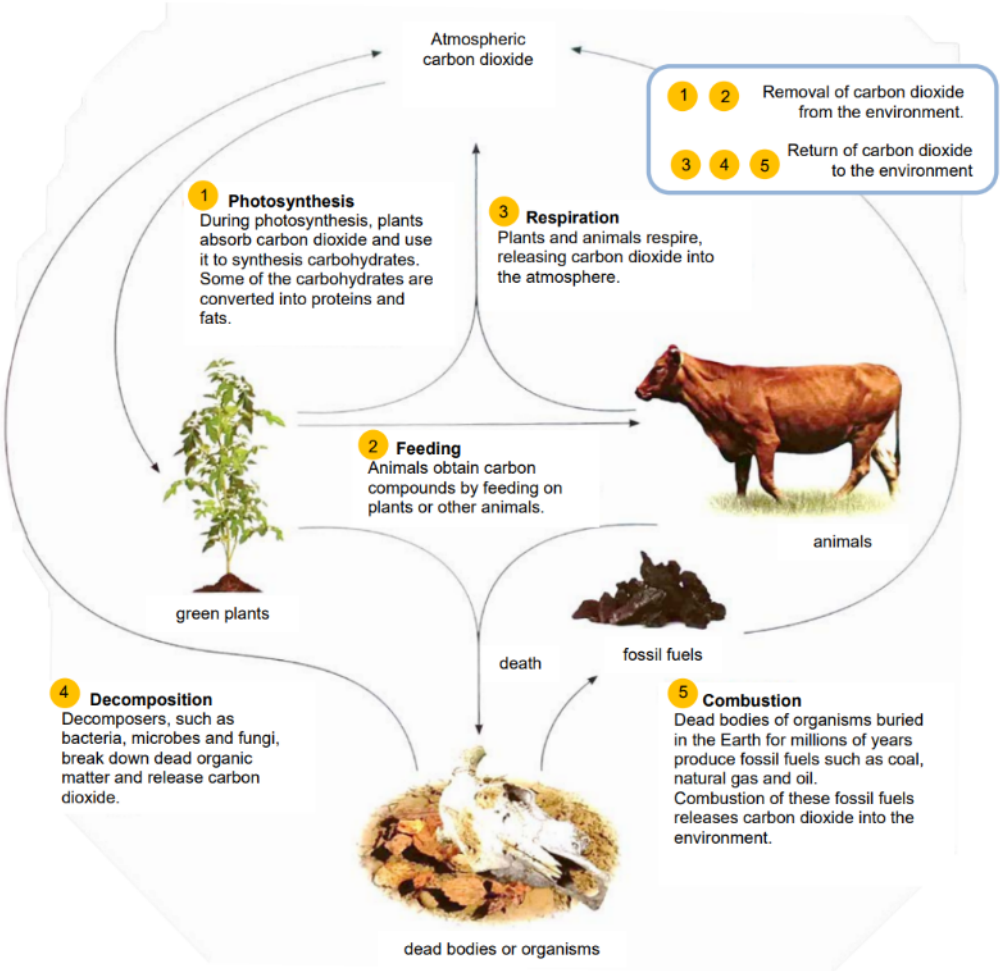
1. thermal energy during respiration
2. chemical energy in uneaten body parts, e.g. bones/feathers
3. chemical energy in the form of undigested matter passed out/egested by consumers
4. chemical energy in the form of excretory waste products excreted by consumers, e.g. urea

10% rule
basically this:



-only about 10% of the energy available at each trophic level in a food chain is passed to the next trophic level
-this progressive loss of energy explains why food chains are generally short. a shorter food chain means more energy is available to the final consumer
-as the thermal energy lost cannot be recycled nor used to do work, ecosystems require a constant influx of energy from the sun

Carbon cycle



JUST MEMORISE THIS
-continuous supply of carbon dioxide for photosynthesis in plants
-enables energy to flow through ecosystem

Carbon sinks
-an area which stores carbon compounds for an indefinite period
-stores more carbon than it releases
-two main natural carbon sinks are forests and oceans

Question
Verbs!!!

-State

-Calculate (must show working!)

-Describe
if possible use numbers/ use keywords

-Explain
e.g. Explain why you are late.
woke up late → can't catch bus → reach school gates late → therefore late
talk about formulas hehe :)