SCIENCE

FORM 4

CIKGU EYLIA BINTI MUSTAFA

SMK SYED AHMAD, PERLIS

CIKGU CHE FATHANAH BINTI CHE MAN

SMK ABDUL RAHMAN TALIB, KUANTAN

TYPES OF FIRE EXTINGUISHERS

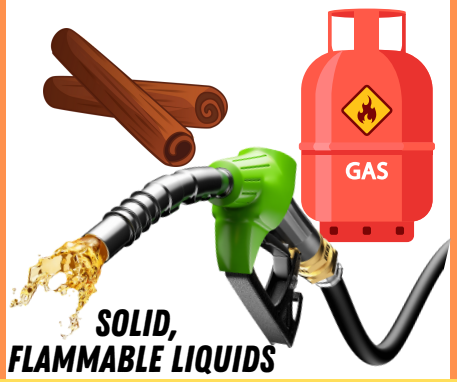
WATER

LABEL - RED

SOLID

FOAM

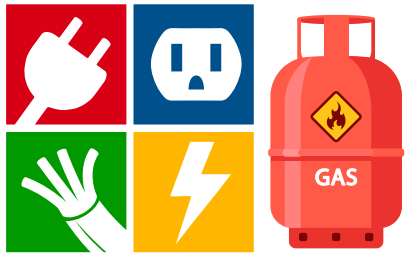
LABEL - CREAM



SOLID, FLAMMABLE LIQUIDS

CARBON DIOXIDE

LABEL - BLACK



ELECTRICAL APPLIANCES, GAS, VAPOUR

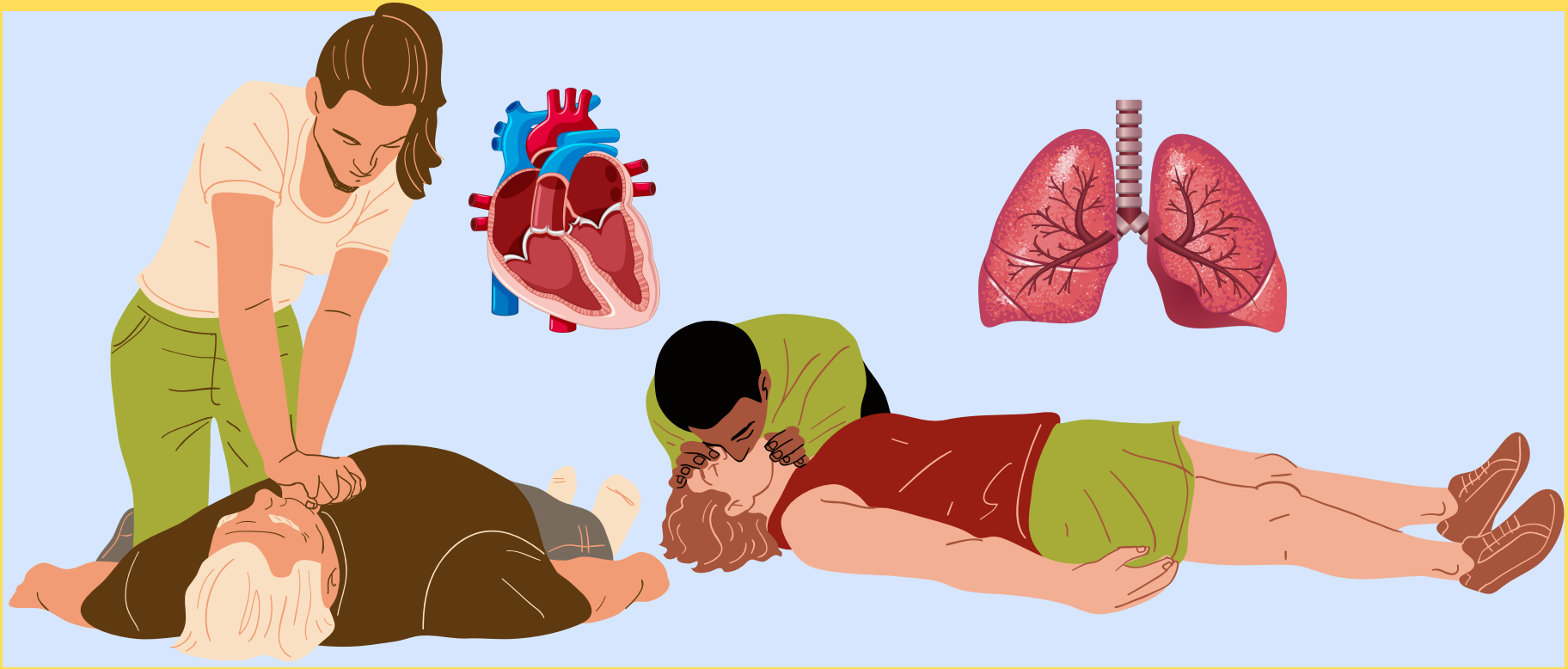
DRY POWDER

LABEL - BLUE

ALL TYPES OF FIRE

CARDIOPULMONARY RESUSCITATION (CPR)

Emergency help that involves a combination of chest compressions and breathing into the mouth.

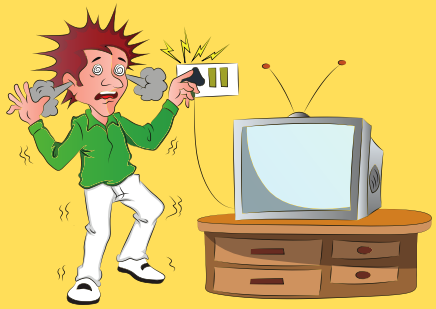


IMPORTANCE

- To produce artificial blood circulation by pumping blood through the heart.
- To supply oxygen to the body of the victim.

SOME ACCIDENTS THAT REQUIRE CPR

1. Electric shock



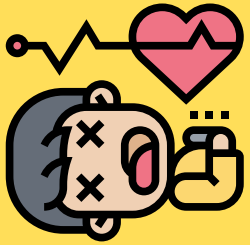
2. Heart attck

3. Lightning strike

4. Drowning

SITUATIONS OF INDIVIDUAL THAT NEEDS CPR

- Does not breathe
- Does not respond to stimulus
- Does not have a heartbeat or a pulse

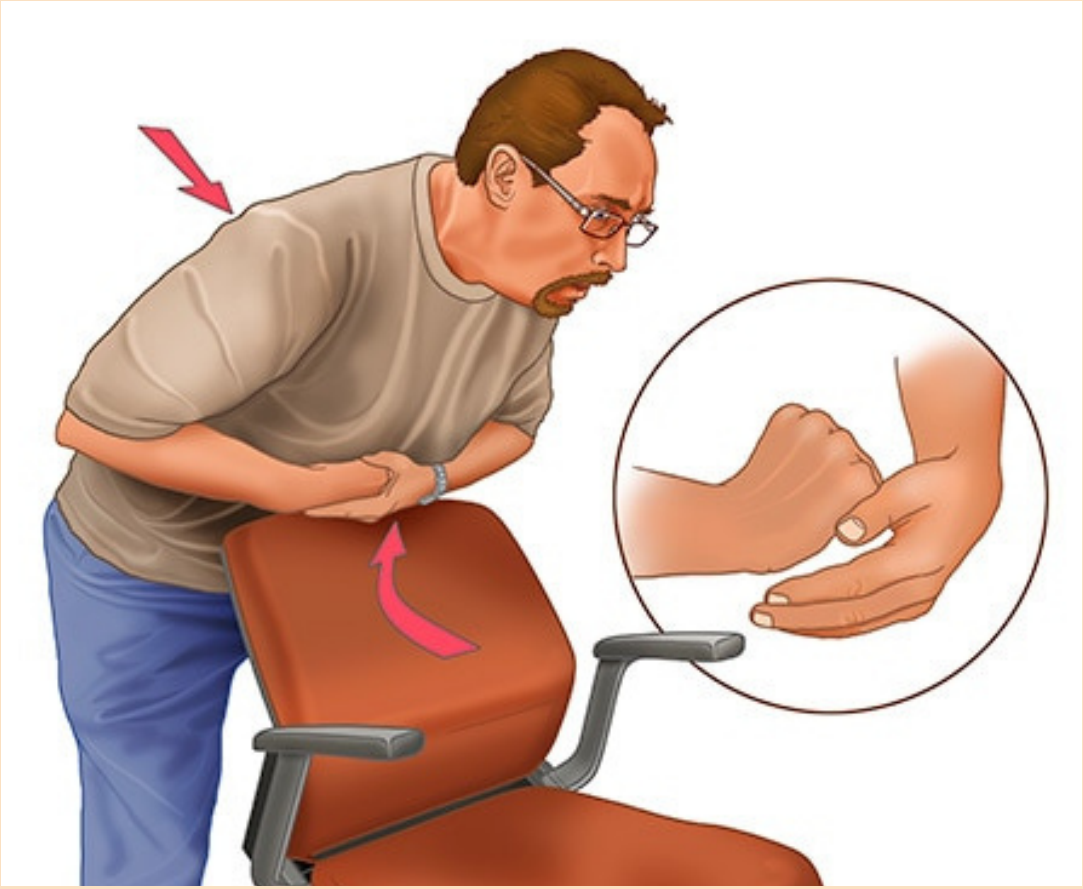


IF CPR NOT PERFORMED USING THE CORRECT PROCEDURE

- Broken ribs
- Exhaled air does not enter the lungs
- No artificial blood circulation is produced

HEIMLICH MANOEUVRE

Emergency aid that is performed to save an individual who is choking.



Involves strong pressure/force between the navel and below the ribs of the victim.

SITUATIONS THAT REQUIRE HEIMLICH MANOEUVRE

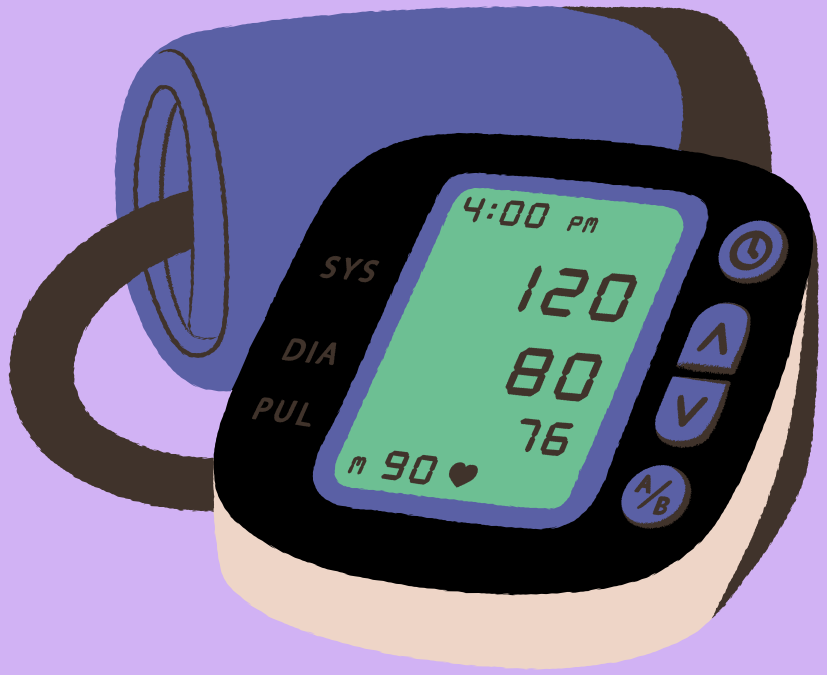
Holding the neck with both hands

Unable to speak or cough

Skin, lips and nails appear bluish or blackish

BLOOD PRESSURE

DIGITAL SPHYGMOMANOMETER



High blood pressure can cause

NORMAL BLOOD PRESSURE

120/80 mmHg

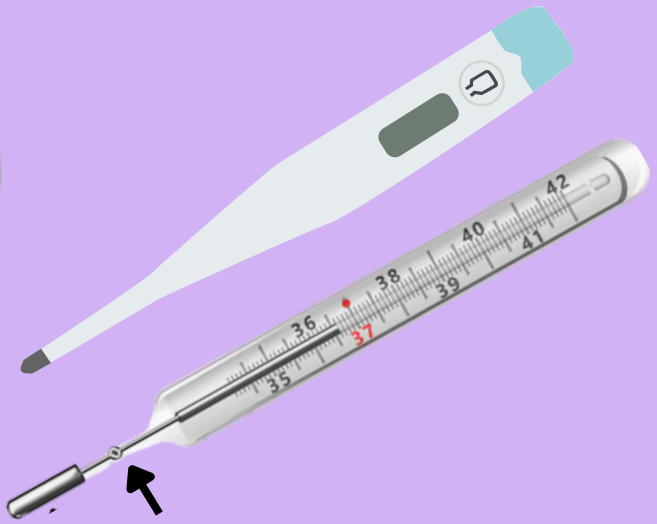
Systolic pressure

Diastolic pressure

Way to prevent :
Do a regular check up

TYPES OF THERMOMETERS

INFRARED THERMOMETER



kink - to prevent the mercury From flowing back into the bulb quickly (get more accurate reading)

CLINICAL THERMOMETER

LABORATORY THERMOMETER

measure the temperature of liquids (-10 to 110°C)

RECTAL THERMOMETER

infants less than 3 months old (through the rectum)

PULSE RATE

THE NUMBER OF HEARTBEATS PER MINUTE

Pregnant women have a higher pulse rate than non-pregnant women

The heart needs to pump more blood to supply oxygen and nutrients to the Foetus

Females have a higher pulse rate than males

Females have a smaller heart, needs to pump blood Faster

Active men have a higher pulse rate than resting men

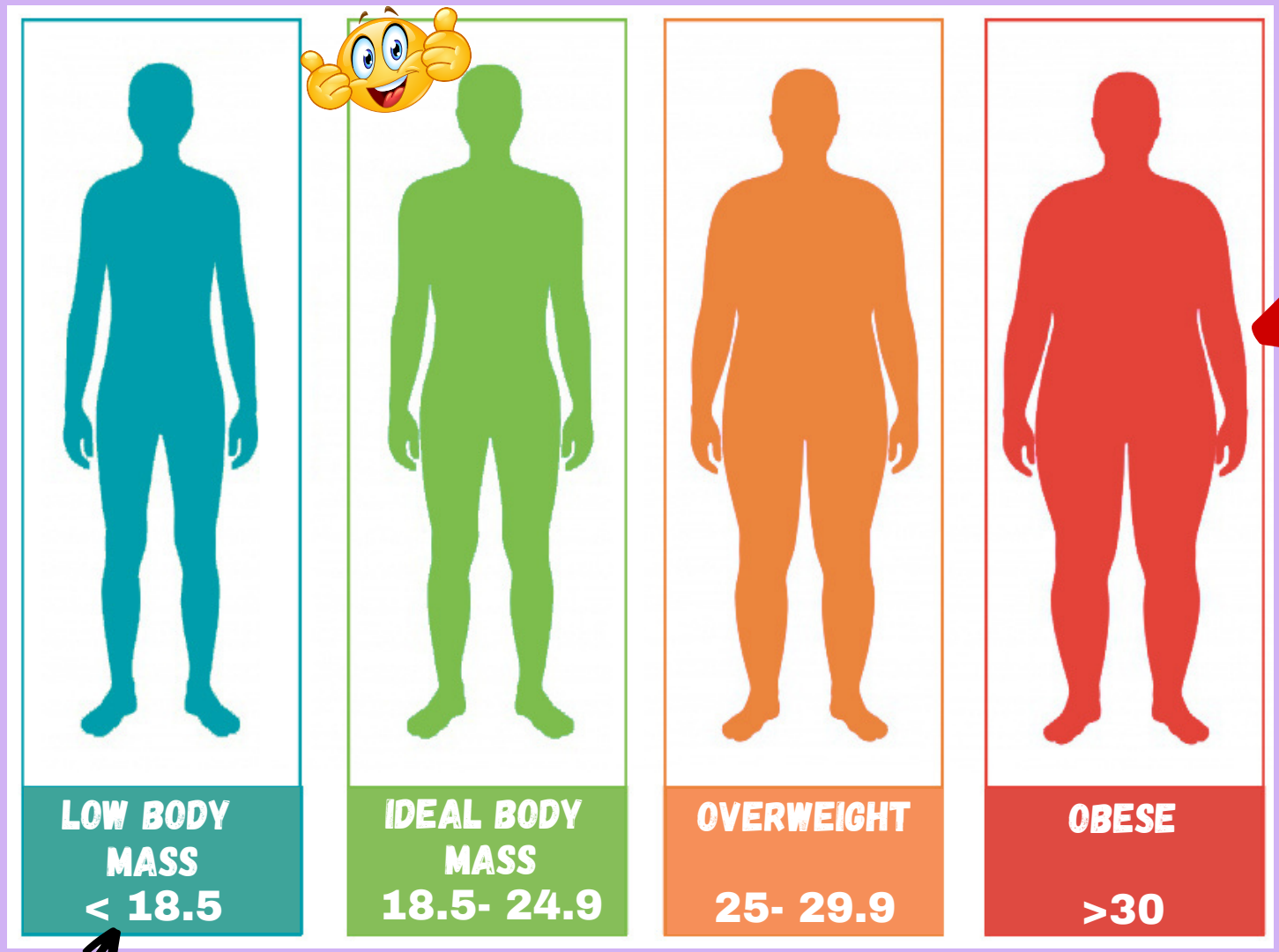
The heart needs to pump blood Faster to supply more oxygen

The older a person is, the lower the pulse rate

Older person has lower metabolisme rate

BODY MASS INDEX (BMI)

THE MEASUREMENT OF BODY MASS AGAINST HEIGHT



$$\frac{\text{Body mass (kg)}}{[\text{Height (m)}]^2}$$

Heart attack

High blood pressure

Stroke

Diabetes mellitus

Complication of joint/bone

anaemia, heart attack,
compromised body defence against disease,
fatigue, depression

GREEN TECHNOLOGY

Development and **application** of products, equipment and systems used to **conserve the environment and nature**, as well as minimise or **reduce the negative impacts** of human activities.

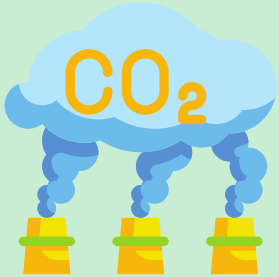
4 MAIN PILLARS OF GREEN TECHNOLOGY

- **Energy** – promote energy efficiency and seek energy independence
- **Environment** – minimise negative effects and conserve the environment
- **Economy** – increase the national economy through the use of technology
- **Social** – improve the quality of life for all

ENERGY SECTOR

SOCIO-SCIENTIFIC ISSUES

The use of petroleum, natural gas and coal is increasing and causing the depletion of fossil fuels.



Combustion release of carbon dioxide (greenhouse gas)

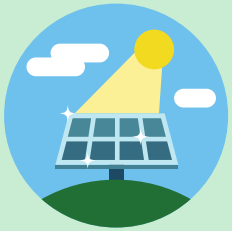
Causes global warming

Causes extreme climate change

APPLICATION OF GREEN TECHNOLOGY

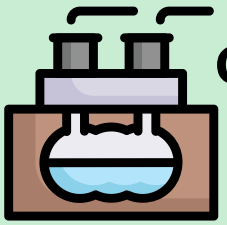
USE RENEWABLE ENERGY

Hydro energy source



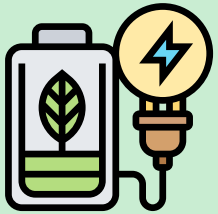
Solar energy source

Wind energy source

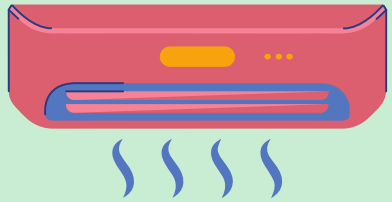


Geothermal energy source

EXAMPLES OF ENERGY-EFFICIENT



Switch off when not in use



Air-conditioner temperature : 24-25°C

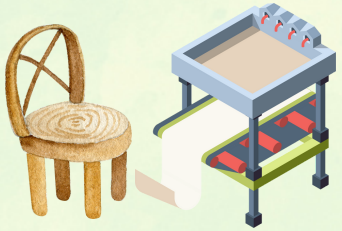
Use energy-efficient electrical appliances

AGRICULTURE AND FORESTRY SECTOR

SOCIO-SCIENTIFIC ISSUES

Settlements

Agriculture

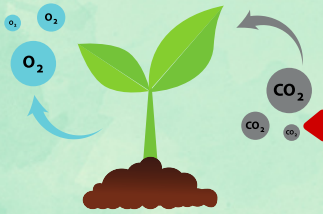


High demand of furniture and paper

Major floods

Deforestation

Landslides



Interferes with the gas cycle. Increase of carbon dioxide gas

Open burning can cause haze.

Use of pesticides/ chemical fertilisers can cause soil pollution/ water pollution.

APPLICATION OF GREEN TECHNOLOGY

Compost fertiliser produced from agricultural wastes.

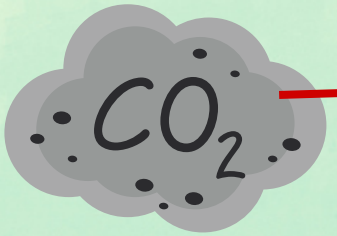
Replanting trees to conserve existing species.

Control logging activities.
Gazette more areas as forest reserves to ensure forest ecosystems are conserved and remain in equilibrium.

TRANSPORTATION SECTOR

SOCIO-SCIENTIFIC ISSUES

95% motor vehicles use petrol and diesel derived from petroleum.
Non-renewable energy sources can deplete.



Fumes emitted by motorised vehicles contain carbon dioxide and carbon monoxide gas.

Causes acid rain

Destroy plants, soil loses its fertility.

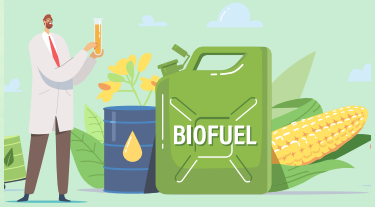
Destroy aquatic organisms

Corrode buildings

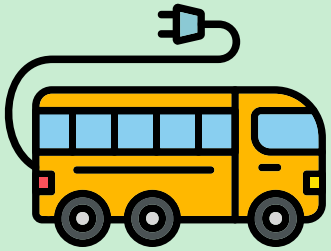
APPLICATION OF GREEN TECHNOLOGY

Green transportation is environment-friendly transportation, does not release/ releases minimal greenhouse gas.
Ex : walking, cycling and using green vehicles.

Invention of Natural Gas Vehicles (NGV)



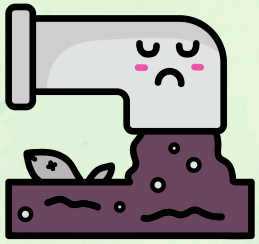
Use of biofuel as an alternative for petroleum.



Example:
Use of electric buses at Malacca.

WASTE AND WASTEWATER MANAGEMENT SECTOR

SOCIO-SCIENTIFIC ISSUES



Rubbish, chemical waste and sewage dumped into the rivers and oceans.
(disruption to the ecosystem)

Food wastes that are not properly disposed can cause environmental pollution.

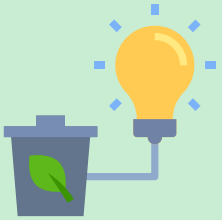
The generation, management and decomposition of solid wastes can increase greenhouse gases.
(global climate change)

Around 268 million tons of paper is produced in a year.
1 ton of paper = 2-4 tons of timber
(paper is also a contributor of solid waste)

APPLICATION OF GREEN TECHNOLOGY

Minimise the use of paper

Prepare food according to the needs of individual



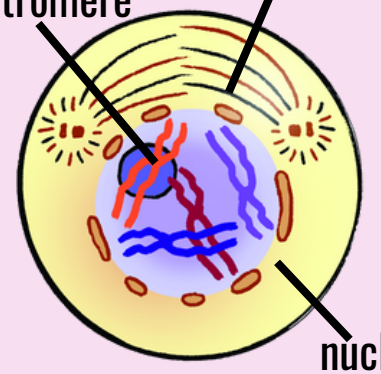
Convert solid waste into a biomass energy source

Biological treatment process -convert solid waste to compost fertiliser

Since 2015, the government has been encouraging to sort household waste. Can reduce solid waste at landfills.

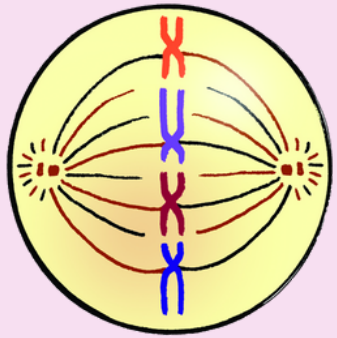
Implement the concept of 5R, Refuse, Reduce, Reuse, Recycle, Recovery
Aim-to achieve zero waste.

MITOSIS



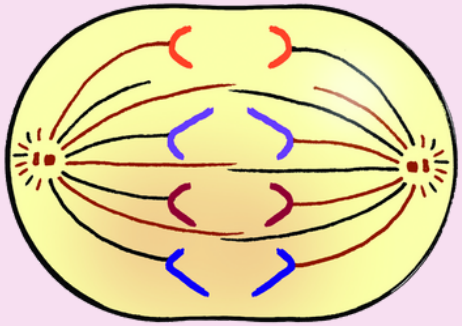
PROPHASE

Chromosomes **thicken** and **shorten**



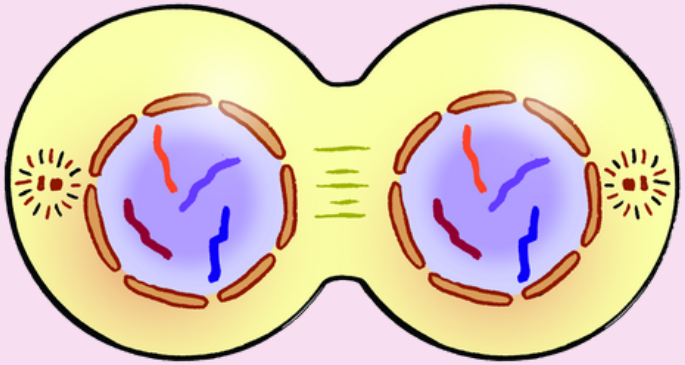
METAPHASE

Chromosomes **are arranged** at the **equatorial plane**



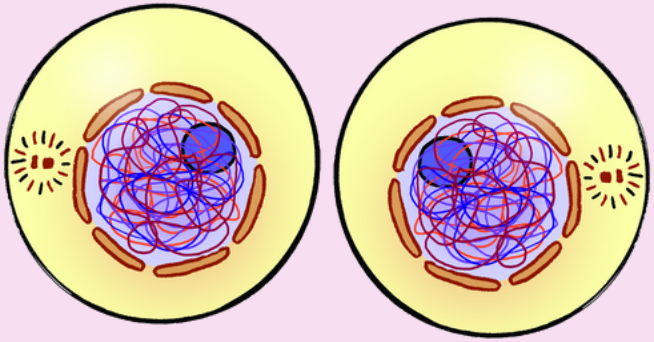
ANAPHASE

Centromere splits into two. Sister chromatid **separates**, **moves** to **opposite poles**



TELOPHASE

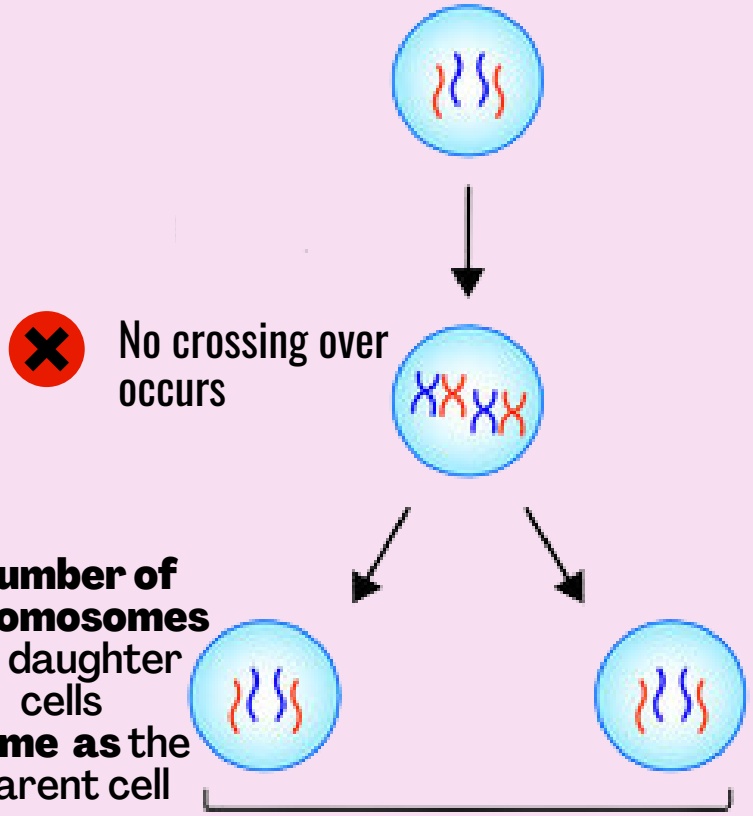
- Chromatids reach the opposite poles.
- Nuclear membrane and nucleolus are formed again.
- Cytoplasm divides



2 DAUGHTER CELLS

2 daughter cells have **the same number of chromosomes** and **genetic information** as the parent cell.

MITOSIS



Number of chromosomes of daughter cells **same as** the parent cell

2 DAUGHTER CELLS

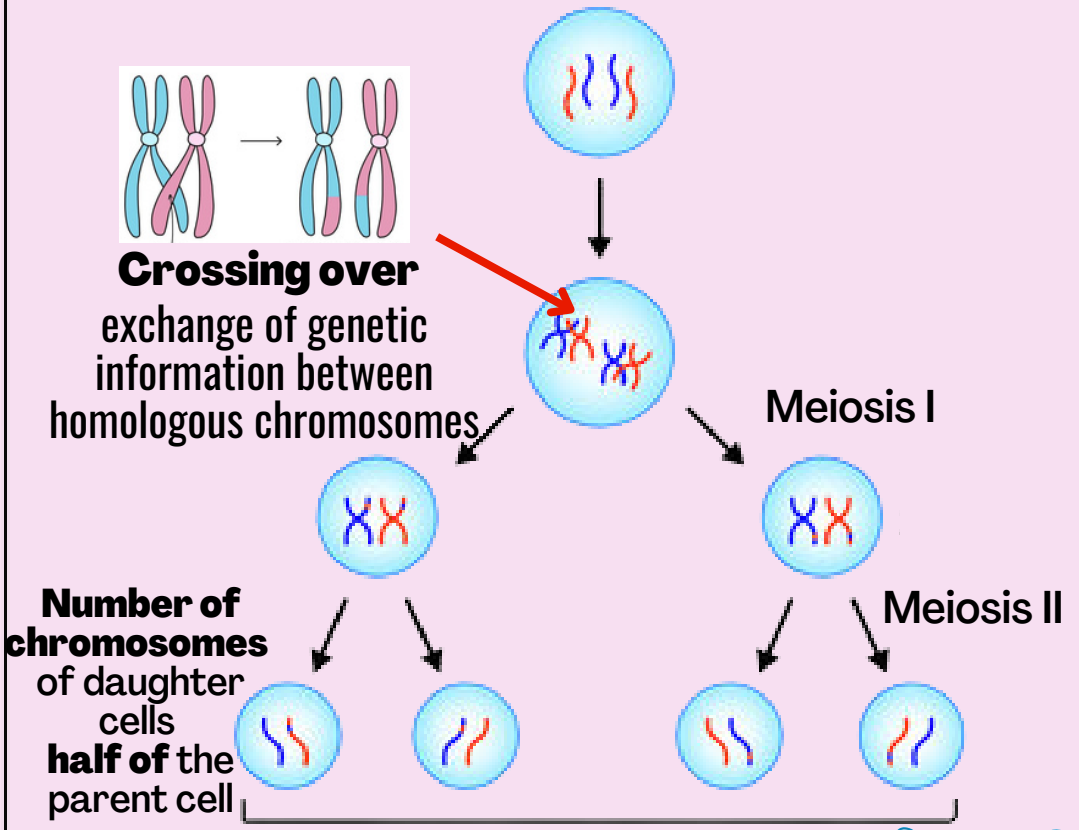
Mitosis produces new cells for **growth**, **replaces damaged**/**dead cells.**

Takes place in **somatic cell** (humans/animals)
Takes place in **root tip**/**shoot** (plants).

Daughter cells are **genetically identical.**

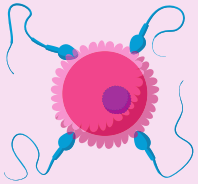
MEIOSIS

Crossing over
exchange of genetic information between homologous chromosomes



Number of chromosomes of daughter cells **half of** the parent cell

4 DAUGHTER CELLS



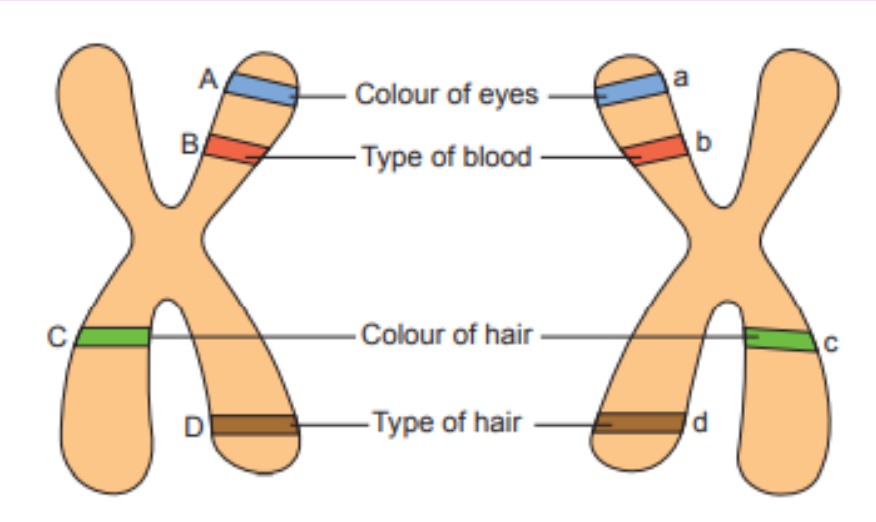
Meiosis produces gametes (**sperm**/**ovum**) for reproduction.

Takes place in **reproductive organs** (testis/ovary)
Takes place in **anther**/**ovary** (plants)

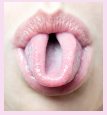
Daughter cells are **genetically not identical.**

INHERITANCE

Transmission of characteristics from parents to their children.



DOMINANT ALLELE

- Show the characteristic it controls and will cover the effect of recessive allele.
- Represented by CAPITAL LETTERS.
- Example :
  1. Ability to roll the tongue 
  2. Black hair 
  3. Free earlobes 

RECESSIVE ALLELE

- Show the characteristic it controls if the dominant allele is absent (both alleles are recessive)
- Represented by small letters.
- Example :
  1. Inability to roll the tongue 
  2. Blonde hair 
  3. Attached earlobes 

DETERMINING A CHILD'S GENDER

Parents :

Genotype : 44 + XY

Meiosis

44 + XX

Meiosis

Gamete : 22 + X, 22 + Y, 22 + X, 22 + X

Fertilisation

Genotype of offspring : 44 + XX, 44 + XX, 44 + XY, 44 + XY

Gender of offspring :

Female

Female

Male

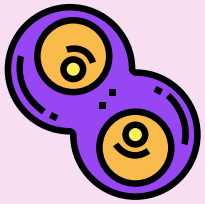
Male

Probability of getting a boy = a girl = 50%.

The **gender** of the offspring depends on the **type of sperm** (**father**) that fertilises the ovum

FACTORS THAT CAUSE MUTATION

NATURALLY

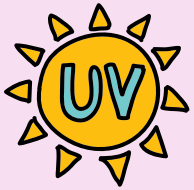


Cell division

Pregnancy at a late age

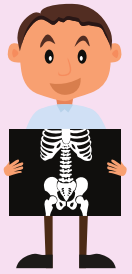
MUTAGEN

Radioactive rays



Ultraviolet rays

Carcinogen



X-rays

MUTATION

Spontaneous change that takes place in the genes or chromosomes that causes changes of characteristics in the offspring that inherits the genetic material.

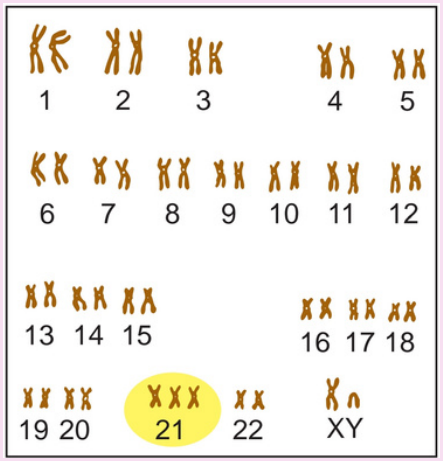
CHROMOSOME MUTATION

Changes in the number or structure of the chromosome

GENE MUTATION

Chemical changes that occur to a gene

CHROMOSOME MUTATION

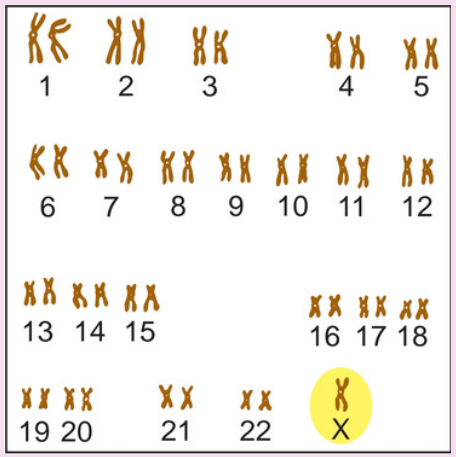


DOWN'S SYNDROME
47 CHROMOSOME

Extra 1 chromosome in chromosome 21.

Characteristics :

- physical and mental retardation
- short neck
- slanted eyes
- shorter body

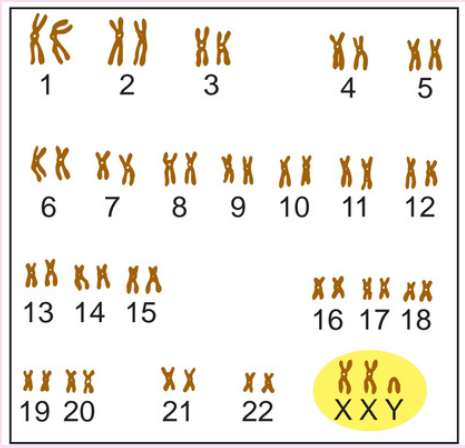


TURNER'S SYNDROME
44 +XO

Lack of an X chromosome in a female.
(45 chromosomes)

Characteristics:

- undeveloped secondary sexual characteristics of a female.



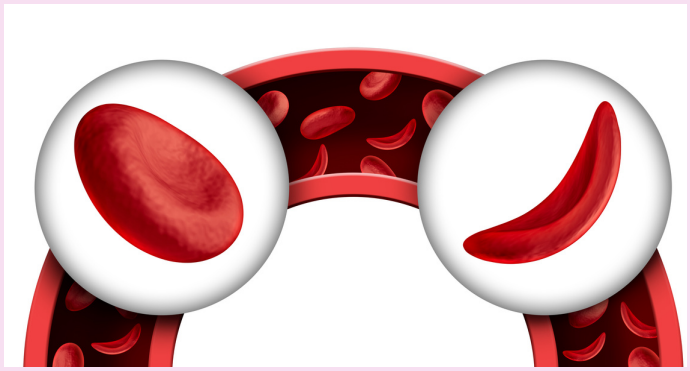
KLINEFELTER'S SYNDROME
44 +XXY

Extra chromosome X in a male.
(47 chromosomes)

Characteristics:

- has female characteristics like breasts
- small testis
- sterile

GENE MUTATION

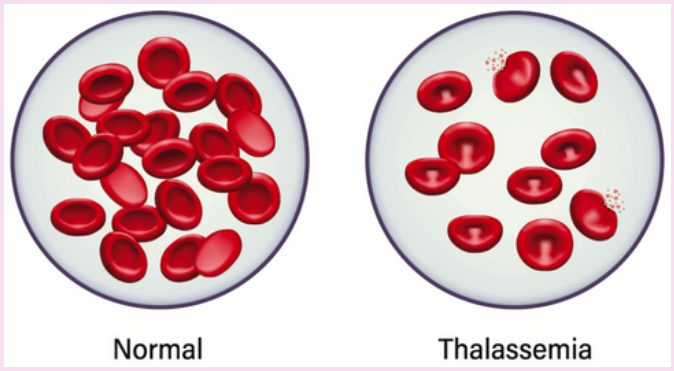


SICKLE CELL ANAEMIA

Sickle-shaped red blood cells that affects the transport of oxygen. (Caused by recessive genes on the autosomes).

HAEMOPHILIA

Difficulty in the clotting of the blood. Faces risk of continuous blood loss if wounded/ injured.



THALASSEMIA

Has small red blood cells with a shorter lifespan. Causes severe blood loss.

ALBINISM

Has a reduced amount of melanin/ no melanin at all.
White skin, pink eyes, white hair.

COLOUR BLINDNESS

Cannot differentiate between red and green colours.
Controlled by a recessive gene on the chromosome X.
Usually occurs in males.

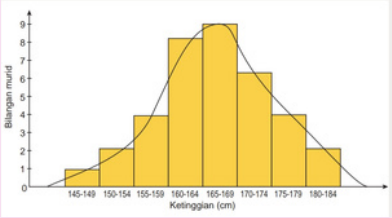
VARIATION

The differences in characteristics among individuals from the same species.

CONTINUOUS VARIATION

Differences that are not distinct/ not clear

Factor: Environmental /genetic



Height

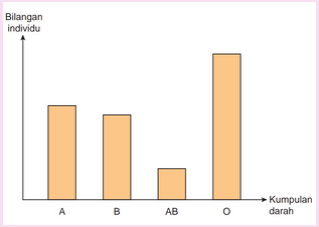
Body mass

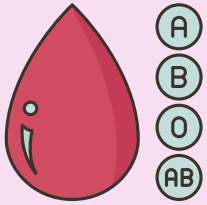
Skin colour

DISCONTINUOUS VARIATION

Differences that are distinct/ very clear

Factor: Genetic

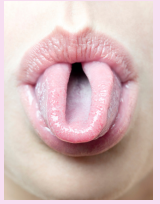




Blood group

Type of fingerprints

Type of earlobes



Ability to roll a tongue

TYPE OF SUPPORT IN ANIMALS

ENDOSKELETON

- All vertebrates.
- Consists of bones and cartilage.

EXOSKELETON

- Most invertebrates.
- Consists of a hard layer of waxy chitin or shell.

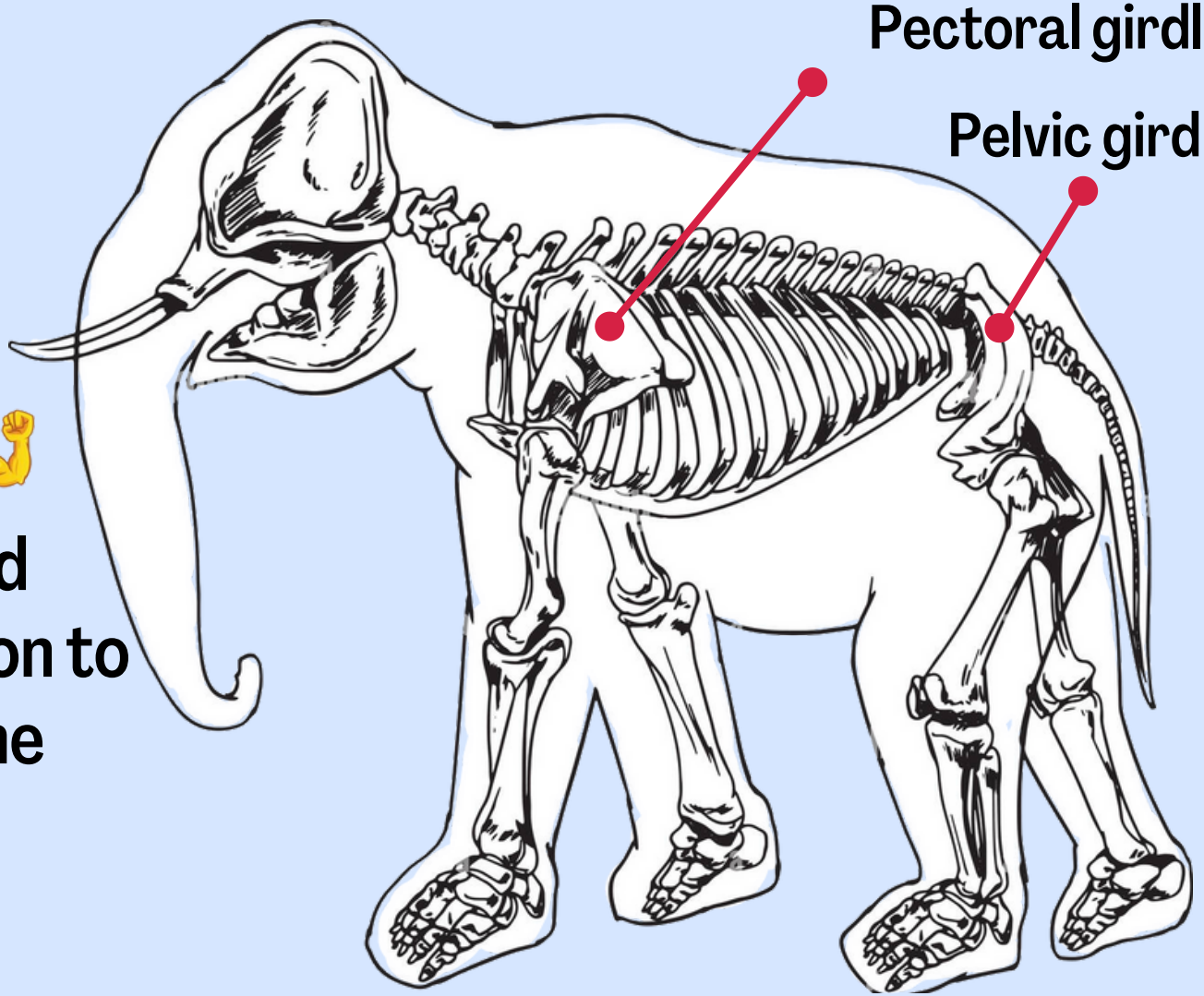
HYDROSTATIC SKELETON

- Invertebrates with soft bodies.
- Consists of a muscular wall that encloses the body cavity that is filled with fluid.
- The fluid exerts pressure on the muscular wall of the body in all directions causing body to be firm and maintain the body shape.

1. support body weight.
2. protects internal organs.
3. maintains body shape.
4. attachment for muscles (to move body parts)

ENDOSKELETON

1. TERRESTRIAL VERTEBRATES



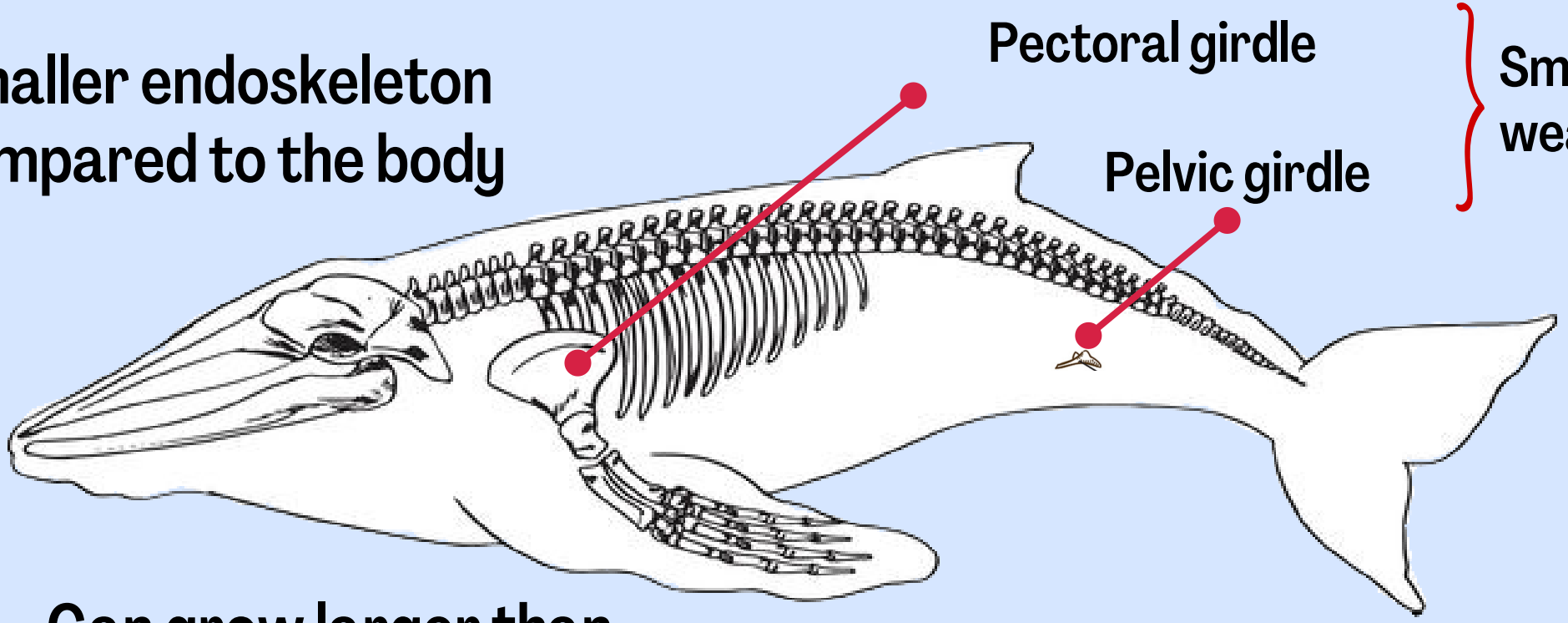
STRONG and FIRM skeleton to SUPPORT the body

A BIG skeletal frame, compatible to body size

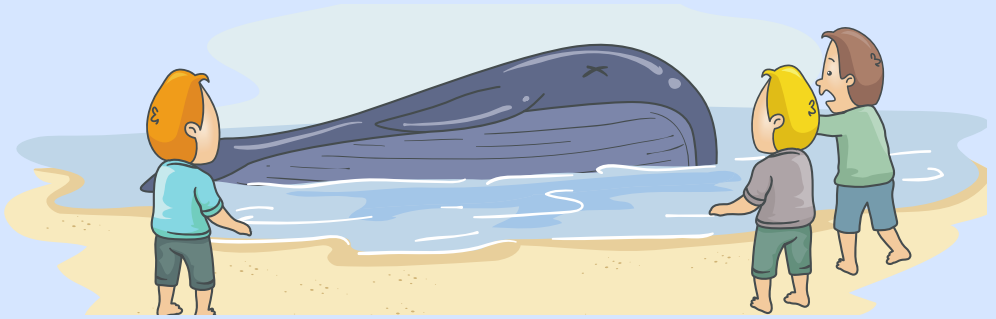
ENDOSKELETON

2. AQUATIC VERTEBRATES

Smaller endoskeleton compared to the body



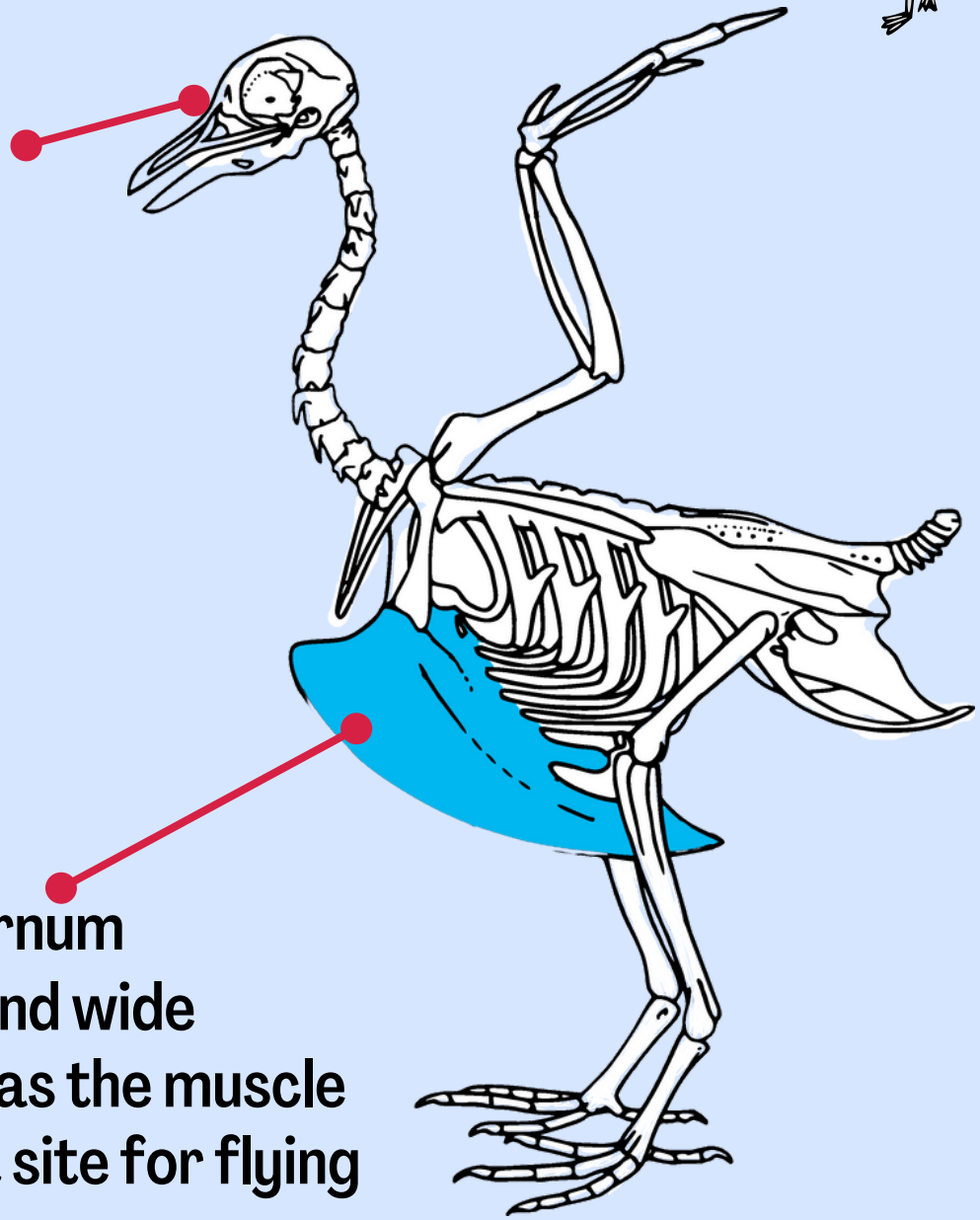
Can grow larger than the size of skeleton - body weight is supported by the buoyancy force.



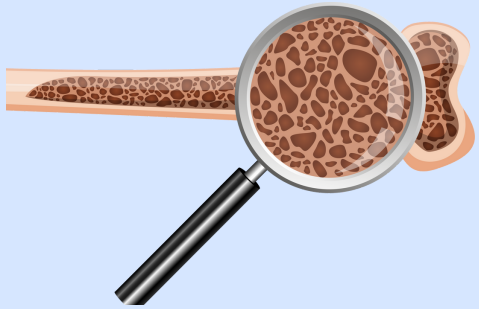
ENDOSKELETON

3. BIRDS

Size of a bird's skull
is small
- easier to fly

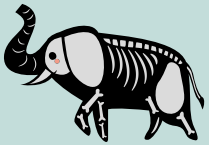


Have bones that
are hollow and light



Sternum
Flat and wide
- functions as the muscle
attachment site for flying

COMPARISON BETWEEN HOLLOW BONE AND COMPACT BONE

HOLLOW BONE 	COMPACT BONE 

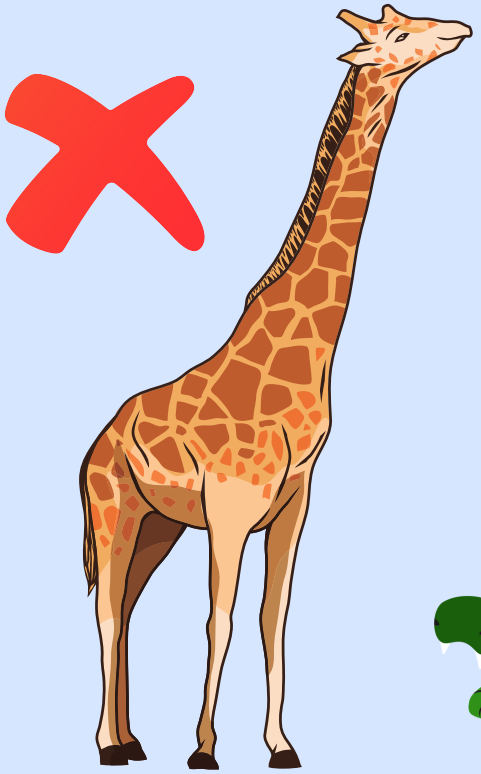
SIMILARITIES

1. Both is used to support and the movement.
2. Both need calcium and phosphorus.

DIFFERENCES

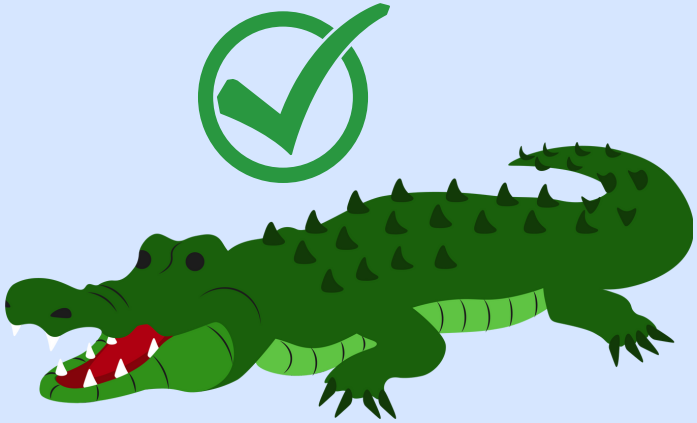
Light	Heavy
Small bone	Big bone
Belongs to birds	Belongs to terrestrial vertebrates
Move faster	Move slower
Stronger	Less strong
Need less calcium and phosphorus	Need more calcium and phosphorus

FACTORS OF STABILITY IN ANIMALS



LESS STABLE

- Centre of gravity is high
- Small base area



MORE STABLE

- **Centre of gravity is low**
- **Large base area**

PROBLEM SOLVING IN STABILITY

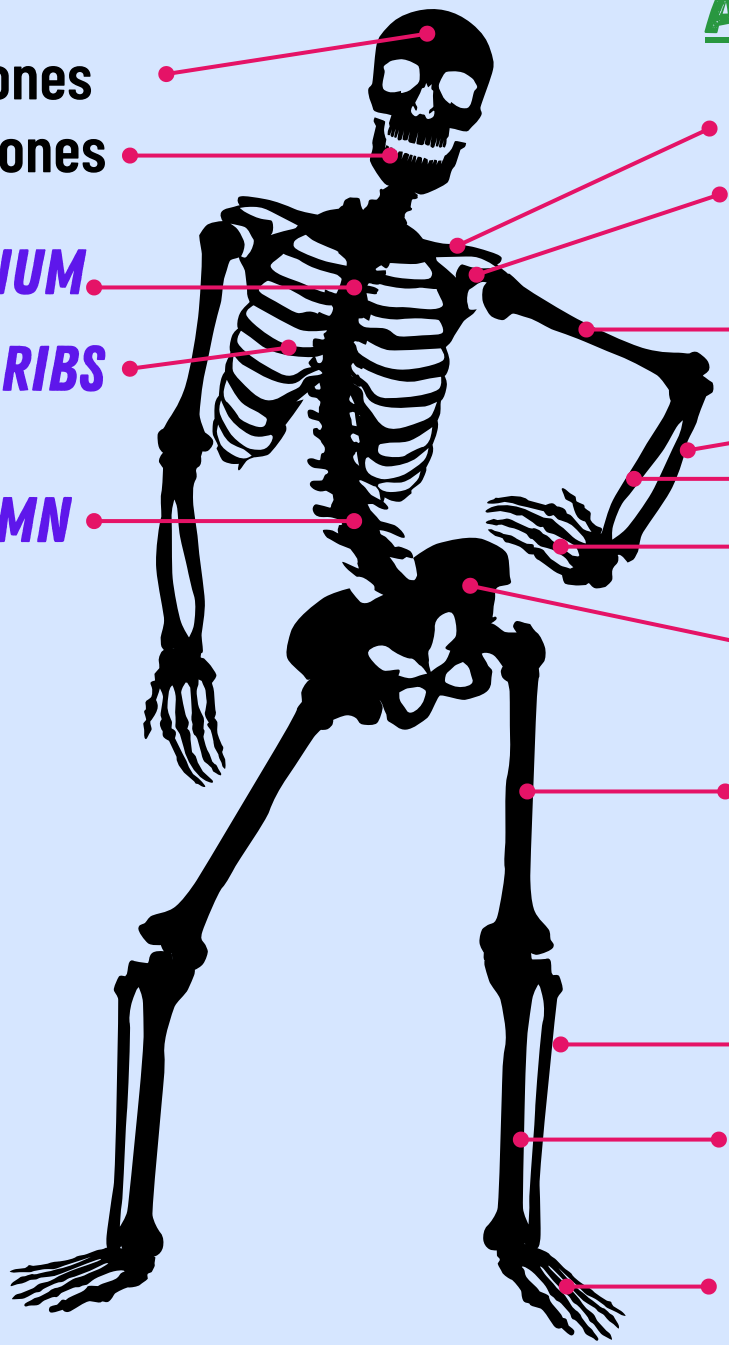
Giraffe will spread its legs when drinking water.

- Lower its centre of gravity.
- Increase its base area.

Kangaroo uses its tail as a strut.

- Increase the base area when not moving.

HUMAN SKELETAL SYSTEM



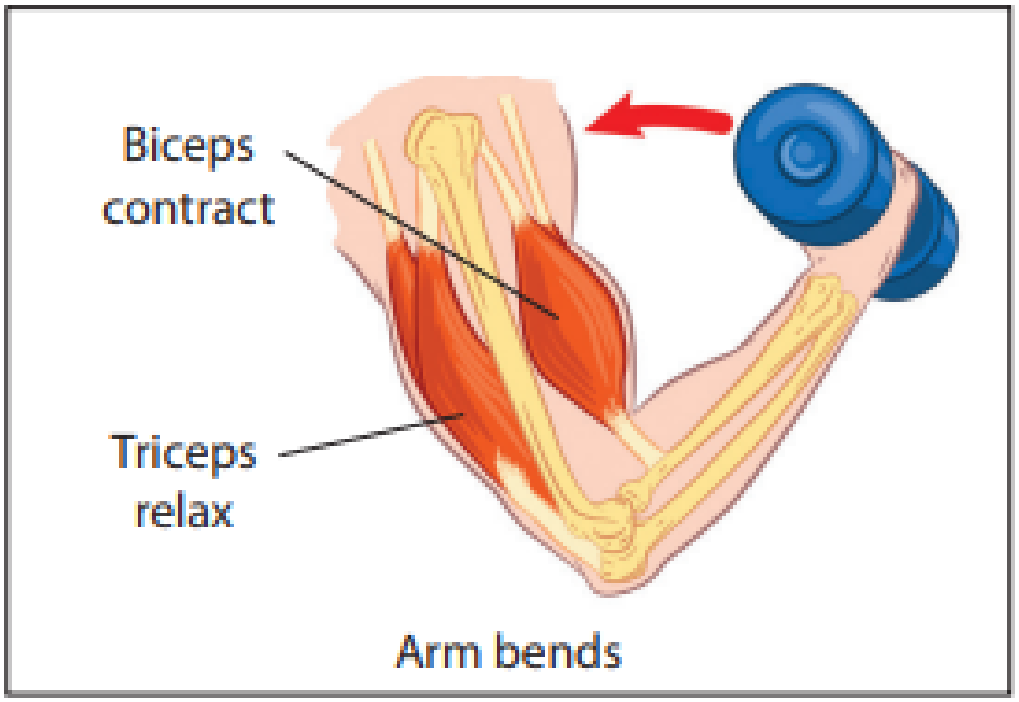
AXIAL SKELETON

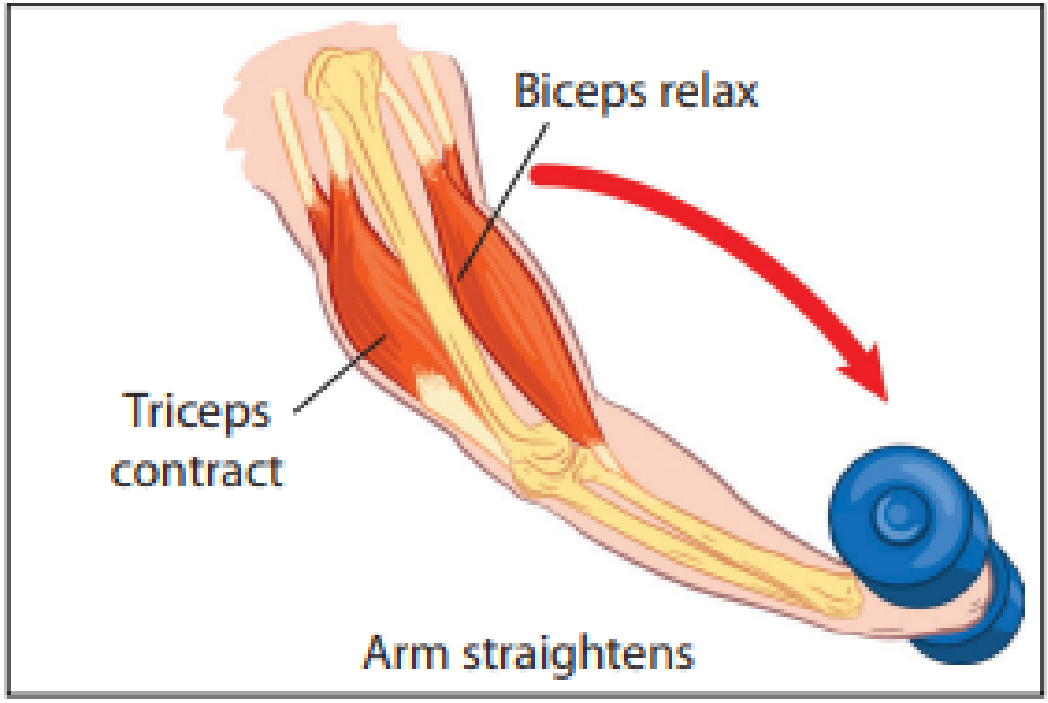
- SKULL
  - Cranial bones
  - Facial bones
- STERNUM
- RIBS
- VERTEBRAL COLUMN

APPENDICULAR SKELETON

- PECTORAL GIRDLE
  - Clavicle
  - Scapula
- UPPER LIMB
  - Humerus
  - Ulna
  - Radius
  - Metacarpus
- PELVIC GIRDLE
- LOWER LIMB
  - Femur
  - Fibula
  - Tibia
  - Metatarsus

ANTAGONISTIC MOVEMENT OF MUSCLES TO BEND AND STRAIGHTEN THE ARM

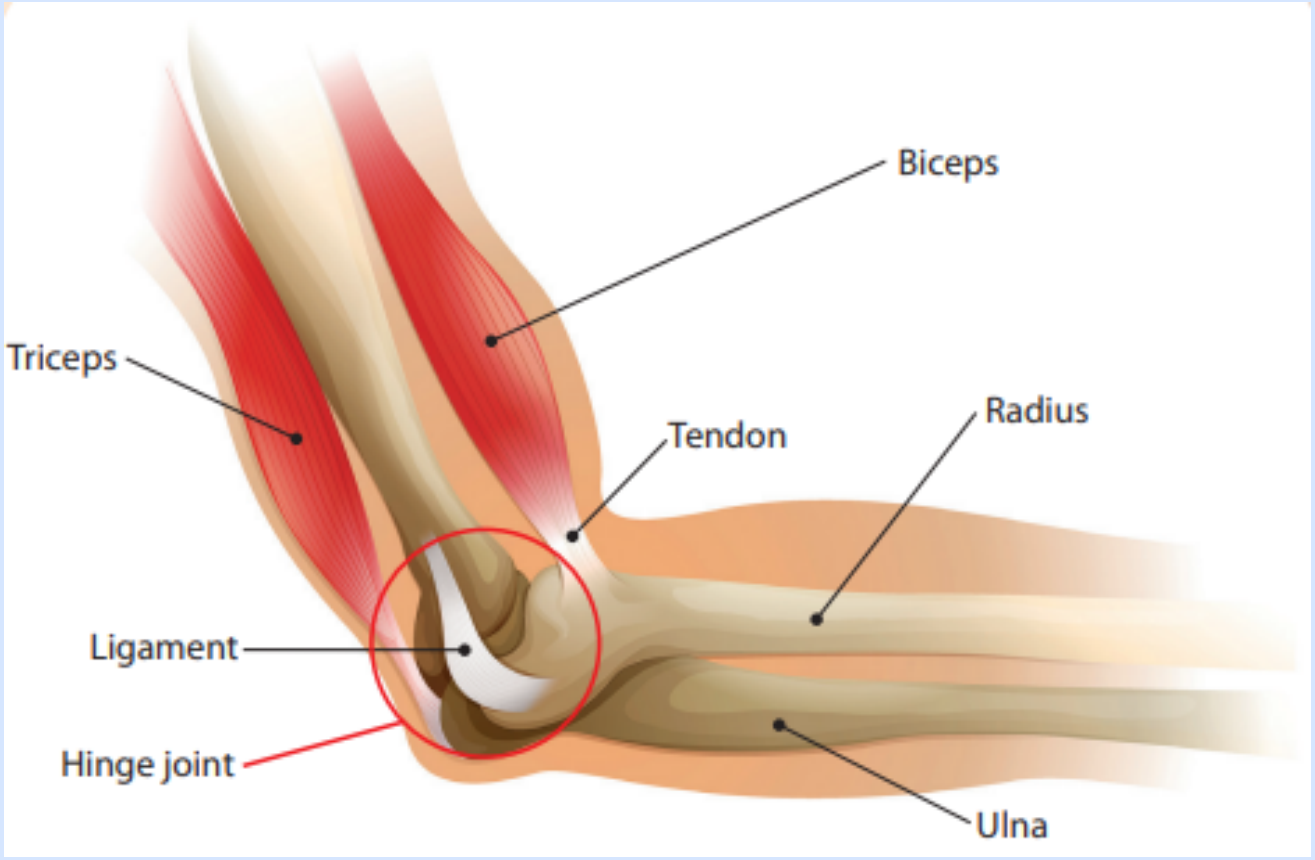


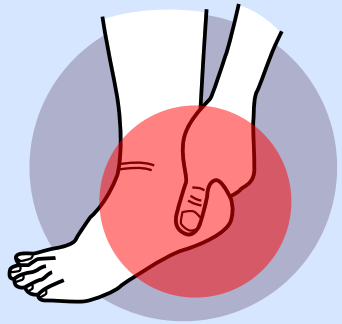


ARM BENDS

ARM STRAIGHTENS

MOVABLE JOINT (HINGE JOINT)



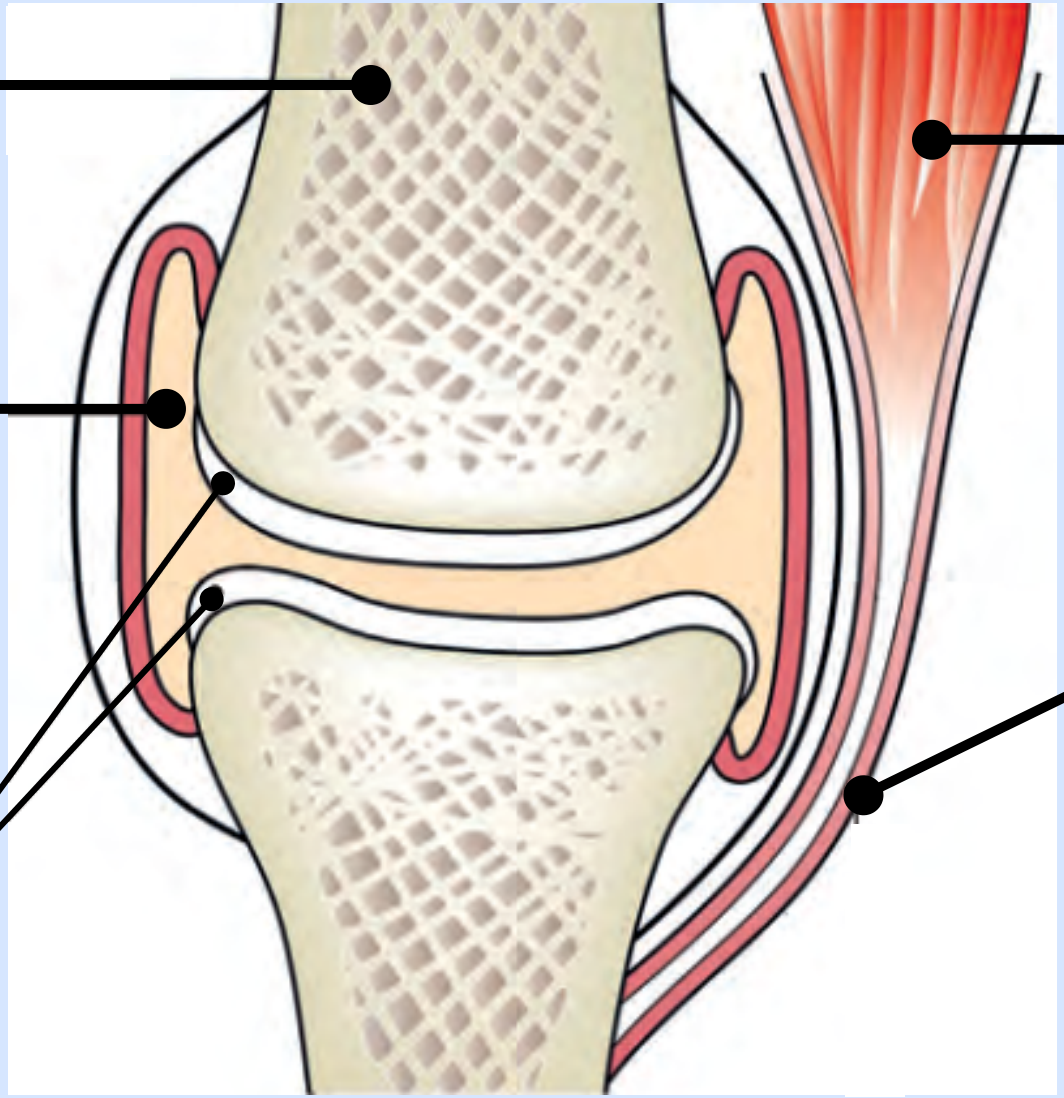


Swollen sprained leg
Caused by- ligament in the joint are torn.
Treatment- take painkiller/physiotherapy/ surgery.

Ligament - **elastic, flexible** and **strong** connective tissue that joins two bones.

Tendon - connective tissue that connects muscles to the bone.
- consists of a combination of fibres that are **strong** and **inelastic**.

FUNCTIONS OF THE SYNOVIAL FLUID, CARTILAGE AND TENDON AT THE JOINT



BONE

MUSCLE

SYNOVIAL FLUID

- to lubricate and provide nutrients to the cartilage.
- as a lubricant in the joint.

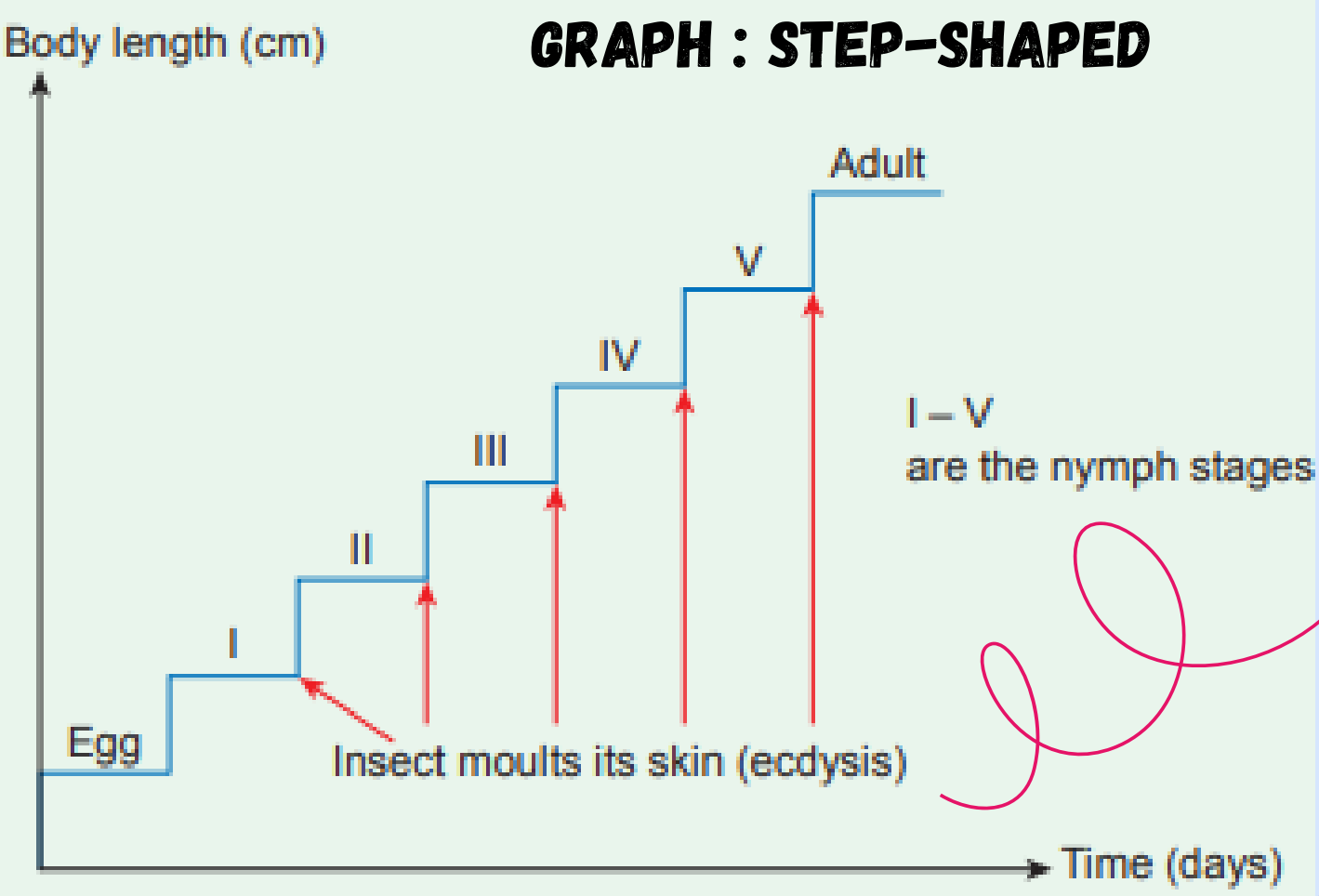
CARTILAGE

- acts as a cushion and protects the joint.
- reduce friction.

TENDON

- combination of fibres that are strong and inelastic.
- connective tissue that connects **muscles** to the **bone.**
- transfers the force produced by muscle contraction to the bone.

GROWTH CURVE OF ANIMALS WITH EXOSKELETON



Horizontal part - zero growth (instar), it is obstructed by a hard old exoskeleton.

Vertical part : drastic growth occurs

ECDYSIS (SHEDDING THE SKIN)

↓

Animals suck in air

↓

Expand their bodies

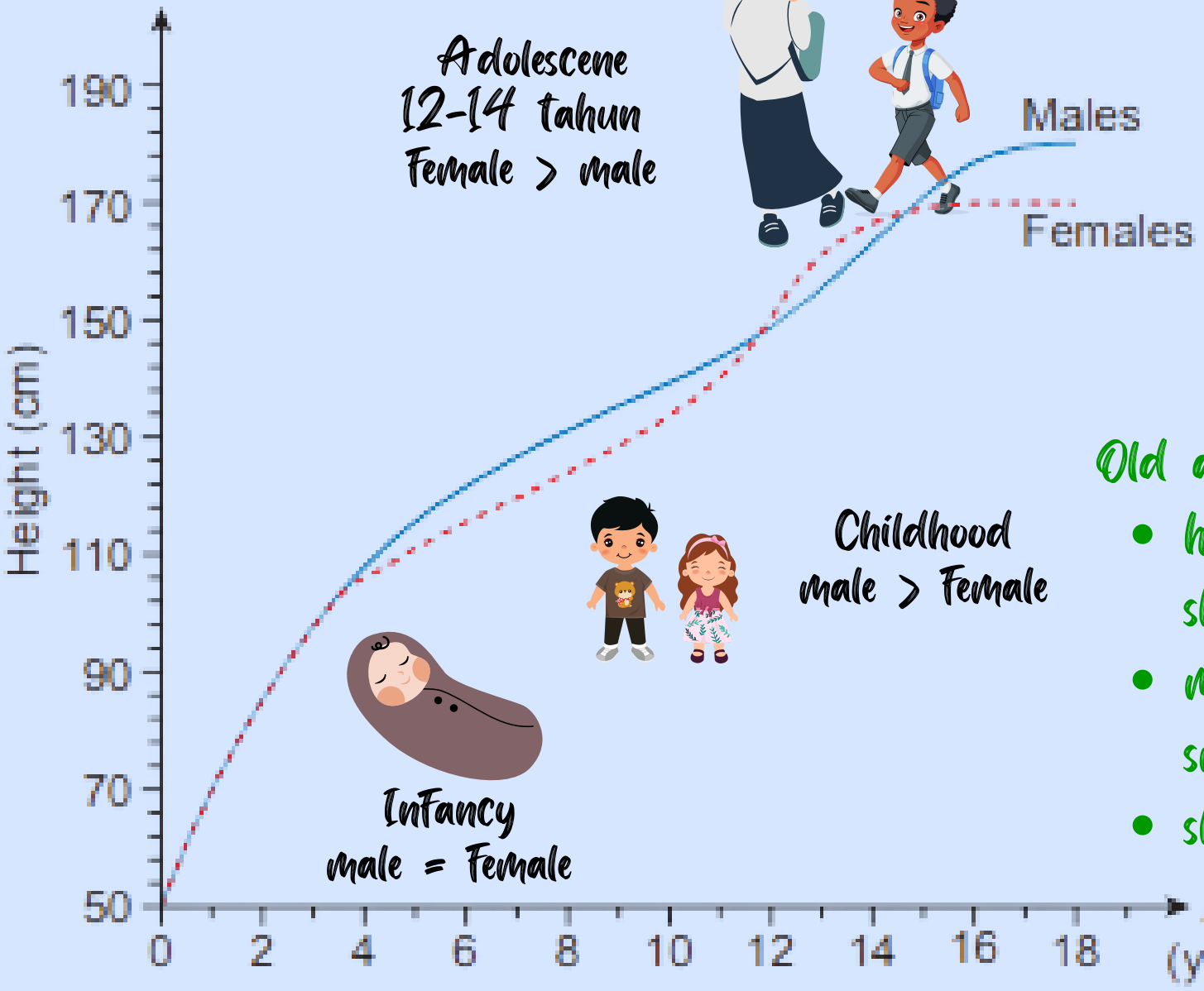
↓

Old exoskeleton breaks, replaced with a new and soft skin

↓

Rapid growth occur to increase the size before the new exoskeleton hardens

GROWTH CURVE FOR MALES AND FEMALES
GRAPH : SIGMOID SHAPE



Adolescene
12-14 tahun
Female > male

Adult
male > Female

Childhood
male > Female

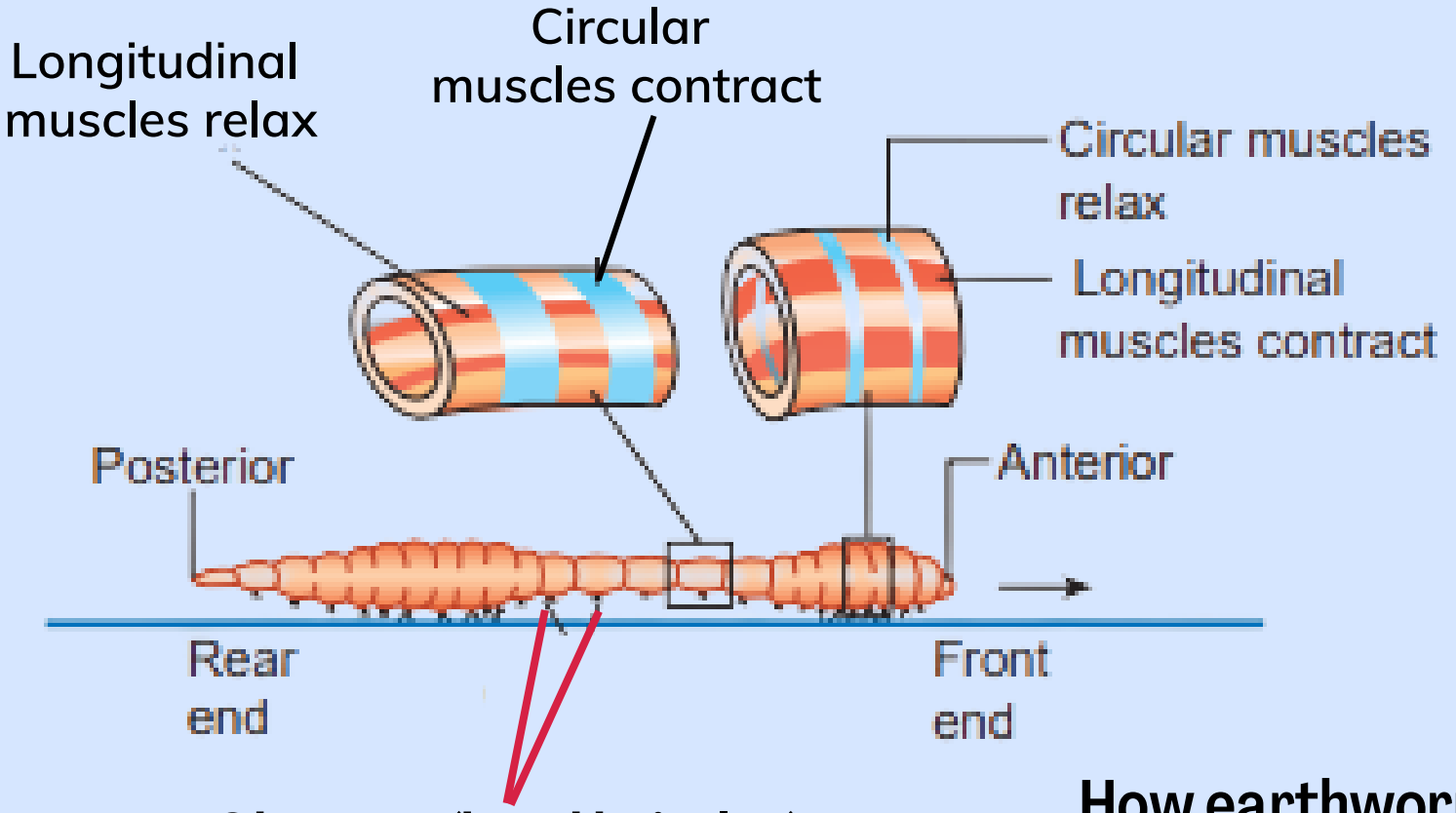
Infancy
male = Female

Old age - negative growth

- human body begins to shrink.
- muscle parts become smaller
- skins begins to dry

HYDROSTATIC SKELETON IN THE EARTHWORM

-The earthworm moves is caused by the contraction and relaxation of the circular muscles and longitudinal muscles that take place antagonistically.
-That action cause the movement from the anterior part to the posterior part.



Chaetae (hard bristles)- help body segment grip the ground

How earthworm can growth? By increasing its fluid in the body.

SUPPORT SYSTEM OF TERRESTRIAL PLANTS

WOODY PLANTS

Hard, strong and tough woody tissue, that is built from lignin, a tough and hard complex substance.

PROP ROOTS

Roots that grow from stems/branches into the soil.
Banyan tree, pandan tree, fig tree

STILT ROOTS

Support mangrove plants living in swamps

BUTTRESS ROOTS

Big and tall trees.
Durian tree, Angsana tree

NON-WOODY (HERBACEOUS) PLANTS

TURGIDITY OF THE CELLS

Balsam plant depends on the turgidity that is stored in the stem cells for support. If they lack of water, the stems will become soft & wilt.

TENDRILS

Wraps around other plants/ objects for support
Cucumber/ bitter gourd/pumpkin

CLASPING ROOTS

Hold onto another plant/structure for support.
Orchid plant, money plant

SUPPORT SYSTEM OF AQUATIC PLANTS

LOTUS

WATER HYACINTH

1. **WATER BUOYANCY FORCE**

2. **AERENCHYMA TISSUE**
   Thin-walled cells, form air spaces.

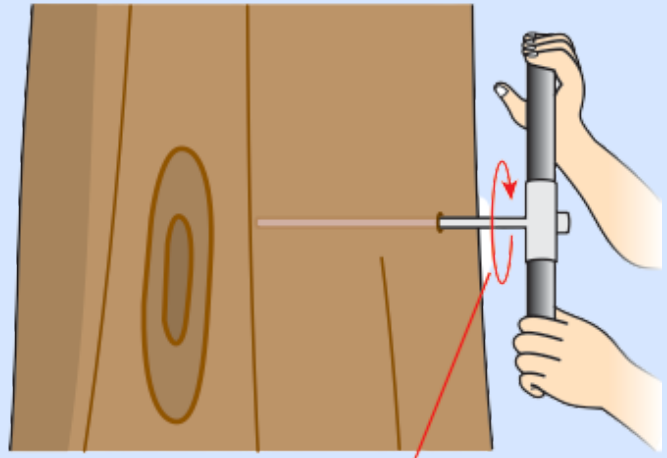
3. **HOLLOW STEMS**
   The plants swell and have hollow and big stems to increase the buoyancy force.

DETERMINING THE AGE OF WOODY PLANTS

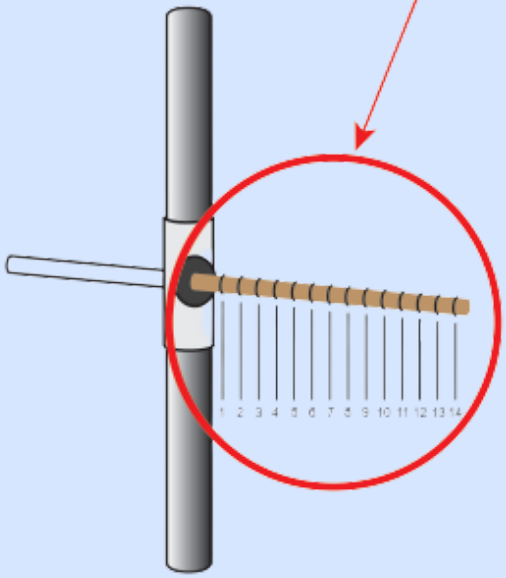
SELECTED TREE IS CUT DOWN

The growth rings seen in the trunk are counted.

1 ring = 1 year

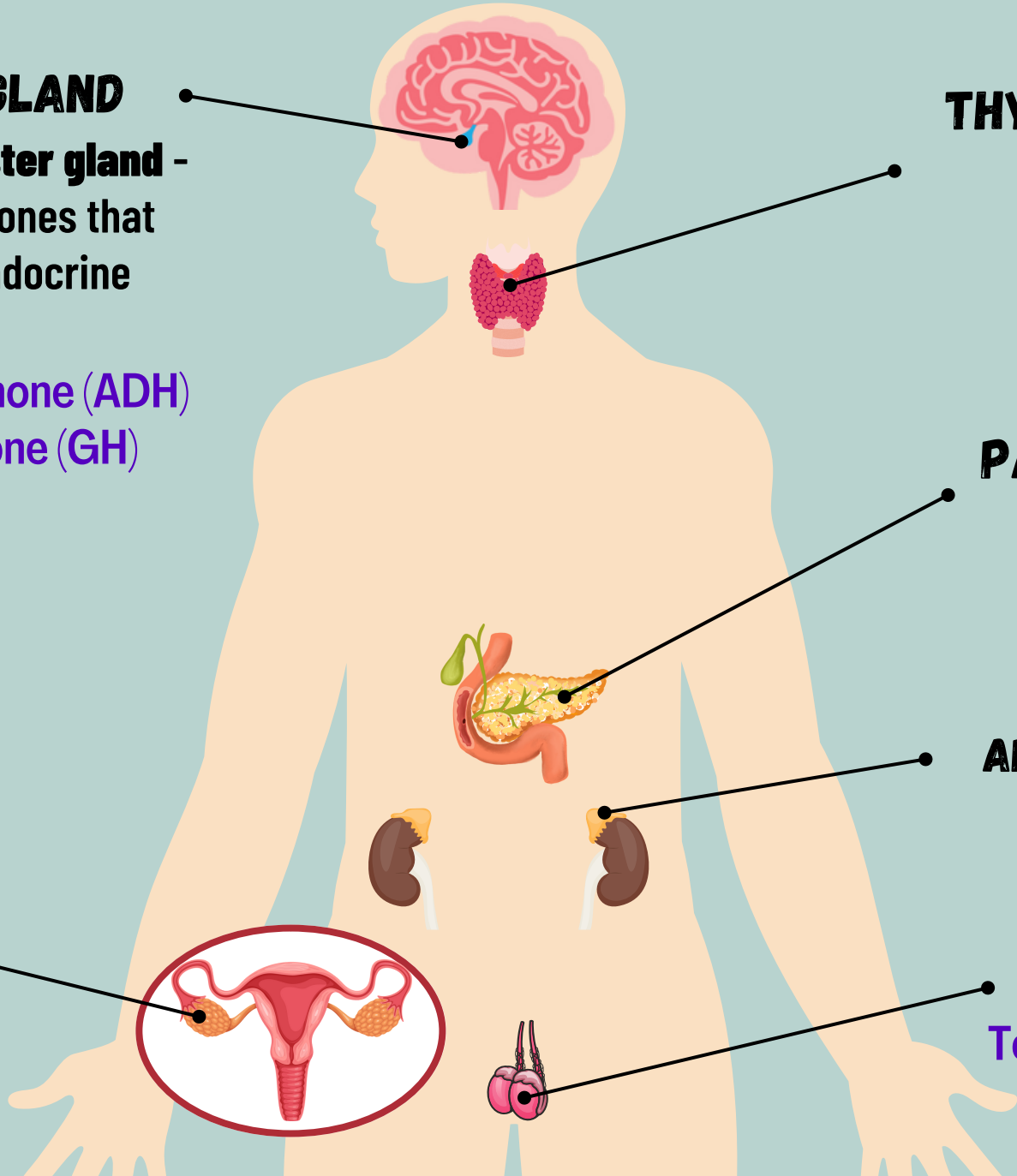


TREE IS NOT CUT DOWN



- The tree is drilled to 75% of the drill depth.
- The drill bit is removed & the growth rings are counted.
- This method will save the tree from being cut.

ENDOCRINE GLANDS



PITUITARY GLAND

Also known as **master gland** - it produces hormones that control other endocrine glands.

Antidiuretic hormone (ADH)
Growth hormone (GH)

THYROID GLAND

Thyroxine

PANCREAS

Insulin

ADRENAL GLAND

Adrenaline

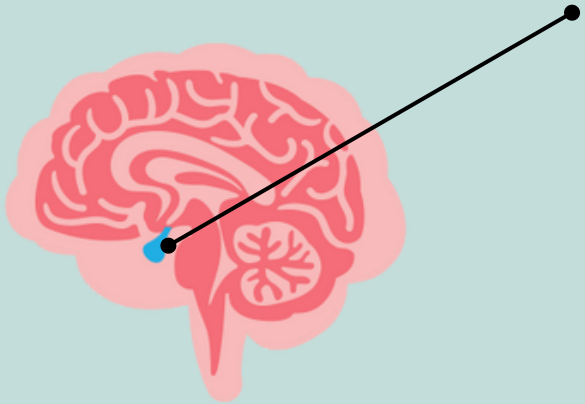
OVARY

Oestrogen and Progesterone

TESTIS

Testosterone

PITUITARY GLAND



ANTIDIURETIC HORMONE (ADH)

Function :

- Controls the quantity of water reabsorbed by the kidneys.

Effect of deficiency :

- poor reabsorption of water at the collecting duct in the kidney.
- excessive production of urine.
- excessive thirst
- diabetes insipidus

Effect of excess :

- headache
- dizziness

GROWTH HORMONE (GH)

Function :

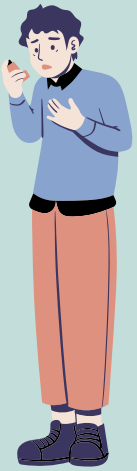
- Stimulates growth in children.
- Maintains healthy body composition in adults.
- Maintains the muscle and bone mass of adults.

Effect of deficiency :

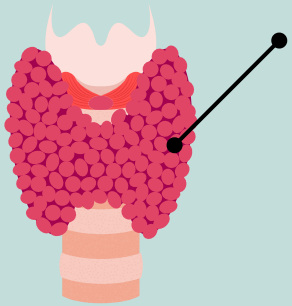
- dwarfism

Effect of excess :

- uncontrolled growth
- acromegaly (gigantism)



THYROID GLAND



THYROXINE

Function :

- Controls the rate of metabolism.
- Controls the physical and mental development in children.

Effect of deficiency :

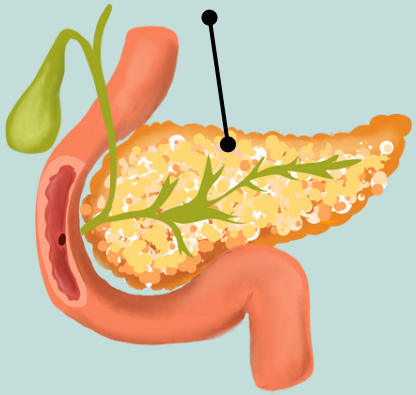
- goitre

- low rate of metabolism
- stunted physical and mental development in children (cretinism)
- tendency to become fat
- less energy in adults (myxedema)

Effect of excess :

- high rate of metabolism
- sweating and always feeling hot
- sleeping difficulties
- very good appetite but tendency to become thin
- thyroid gland enlargement, protruding eyeballs and swollen neck

PANCREAS



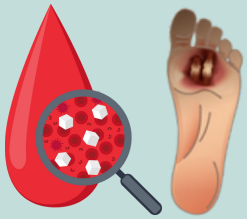
INSULIN

Function :

- Controls the glucose level in the blood by converting excess glucose into glycogen to be stored in the liver.

Effect of deficiency :

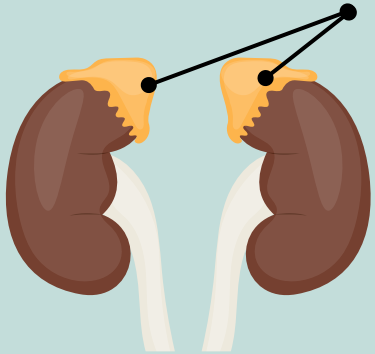
- increase in blood glucose level
- diabetes mellitus



Effect of excess :

- low glucose level
- hypoglycaemia
- excessive thirst

ADRENAL GLAND

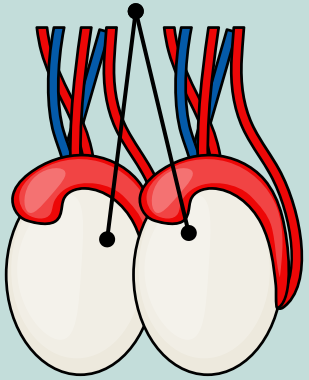


ADRENALINE

Function :

- Prepares your body to act in an emergency situation by :
  - increasing the rate of metabolism
  - increasing the rate of heartbeat
  - increasing the glucose level in the blood
  - dilating the size of the pupil

TESTIS



TESTOSTERONE

Function :

- Controls the development of male secondary sexual characteristics such as deep voice & the growth of moustache.
- Stimulates sperm production.

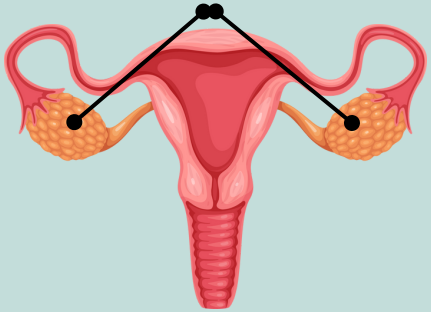
Effect of deficiency :

- delay in reaching puberty.
- low sperm count.

Effect of excess :

- male characteristics in women.

OVARY



OESTROGEN

Function :

- Controls the female secondary sexual characteristics such as development of breasts & broadening of the hip.
- Stimulates the production of ova.
- Prepares the uterus for implantation of embryo.

Effect of deficiency :

- development of female secondary sexual characteristics to be disrupted.

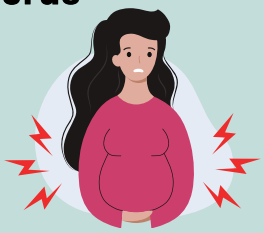
Effect of excess :

- female characteristics in men.

PROGESTERONE

Function :

- Maintains the thickness of the wall of the uterus for the implantation of embryo.



Effect of deficiency :

- menstrual problem
- miscarriage
- headache

TYPES OF DRUGS

DEPRESSANT

- Prevents or slow down impulse transmission in body coordination.
- Will be sleepy and less anxious.
- Example: barbiturates, alcohol

STIMULANT

- Speeds up impulse transmission in body coordination.
- Will feel very confident and alert to the surroundings.
- Example : amphetamine & methamphetamine.

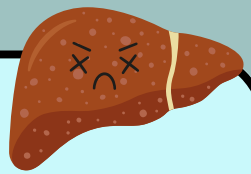
INHALANT

- Chemical substances that can be inhaled through breathing.
- Causes hallucination.
- Damages the brain, lungs and kidneys.
- Example : solvent, gas substance

HALLUCINOGEN

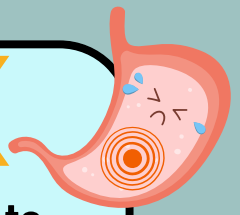
- Changes the path of impulses in the brain.
- Causes hallucination, affects perception.
- Causes hearing of voices.
- Example : ketamine, LSD (lysergic acid diethylamide)

EFFECTS OF DRUG & ALCOHOL ABUSE ON PHYSICAL & MENTAL HEALTH



LIVER CIRRHOSIS

- Continuous consumption of alcoholic drinks/ drug abuse can cause toxic effects on the liver.
- Liver undergoes chronic damage, scarring, hardening and failure to function normally.



STOMACH ULCER

- **Alcohol** causes the stomach to produce more acid.
- Causes irritation/ inflammation of the stomach lining.
- Patient will complain of heartburn, bloatedness, nausea and vomiting.

VIOLENT BEHAVIOUR

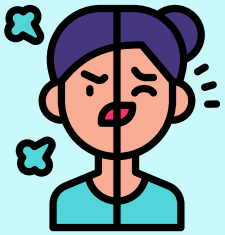
- **Amphetamine** - will activate brain cells, increase the rate of metabolism.
- The user will become more active, unable to sleep, violent & aggressive.

HALLUCINATION

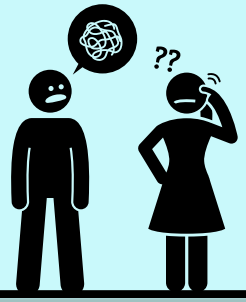
- **Marijuana** -disrupts the brain function.
- Causes the person to experience hallucination, paranoia/suspicious feeling & fear of others.
- May lead to aggressive behaviour towards other people.

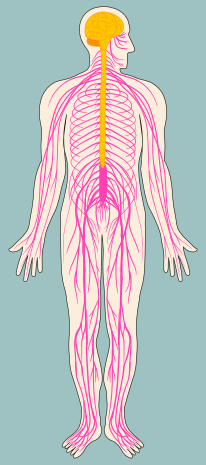
EFFECTS OF DRUG & ALCOHOL ABUSE ON BODY COORDINATION

HORMONAL IMBALANCE



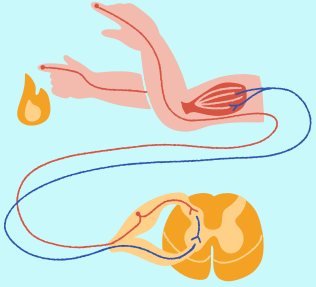
UNCLEAR SPEECH





Slowing the flow of nerve impulses & affecting the brain function.

SLOW REFLEX ACTION



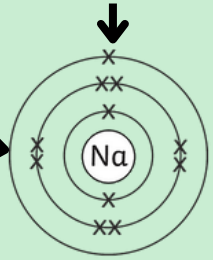
LOSS OF BALANCE

MODERN PERIODIC TABLE OF ELEMENTS

18 GROUPS
7 PERIODS

Principle for the Arrangement - <u>increasing proton number from left to right and top to bottom</u>

1 valence electron = **GROUP 1**



3 shells occupied with electrons = **PERIOD 3**

State the position of Na atom in Periodic Table.
(Proton number = number of electron = 11.
Electron arrangement of sodium atom - 2.8.1)
Group 1 , Period 3

Group - Vertical columns in the Modern Periodic Table of Elements
Period -Horizontal rows in the Modern Periodic Table of Elements

ALKALI METALS GROUP 1

ALKALINE EARTH METALS GROUP 2

INERT GASES (STABLE) GROUP 18

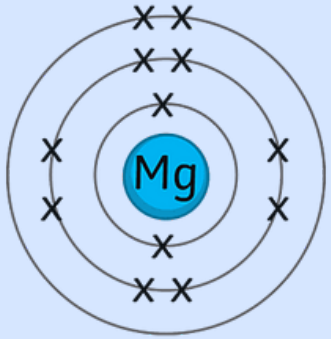
HALOGENS GROUP 17

1 H Hidrogen 2 ← PROTON NUMBER / RELATIVE ATOMIC MASS

METAL
SEMI-METAL
NON-METAL

PERIOD	GROUP 1	2	TRANSITION ELEMENTS 3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1	1 H Hidrogen 2																	2 He Helium 4
2	3 Li Litium 7	4 Be Berillium 9											5 B Boron 11	6 C Karbon 12	7 N Nitrogen 14	8 O Oksigen 16	9 F Fluorin 19	10 Ne Neon 20
3	11 Na Natrium 23	12 Mg Magnesium 24											13 Al Aluminium 27	14 Si Silikon 28	15 P Fosforus 31	16 S Sulfur 32	17 Cl Klorin 35.5	18 Ar Argon 40
4	19 K Kalium 29	20 Ca Kalsium 40	21 Sc Skandium	22 Ti Titanium	23 V Vanadium	24 Cr Kromium	25 Mn Mangan	26 Fe Ferum	27 Co Kobalt	28 Ni Nikel	29 Cu Kuprum	30 Zn Zink	31 Ga Gallium	32 Ge Germanium	33 As Arsenic	34 Se Selenium	35 Br Bromin 80	36 Kr Kripton 84
5	37 Rb Rubidium 85.5	38 Sr Strontium 88	39 Y Itrium	40 Zr Zirkonium	41 Nb Niobium	42 Mo Molibdenum	43 Tc Technetium	44 Ru Rutenium	45 Rh Rodium	46 Pd Palladium	47 Ag Argentum	48 Cd Kadmium	49 In Indium	50 Sn Stanum	51 Sb Antimony	52 Te Tellurium	53 I Iodin 127	54 Xe Xenon 131
6	55 Cs Sesium 133	56 Ba Barium 137		72 Hf Hafnium	73 Ta Tantalum	74 W Tungsten	75 Re Rhenium	76 Os Osmium	77 Ir Iridium	78 Pt Platinum	79 Au Aurum	80 Hg Merkuri	81 Tl Thallium	82 Pb Plumbum	83 Bi Bismuth	84 Po Polonium	117 At Astatin 210	86 Rn Radon 222
7	87 Fr Fransium 223	88 Ra Radium 226		104 Rf Ruterfordium	105 Db Dubnium	106 Sg Seaborgium	107 Bh Bohrium	108 Hs Hassium	109 Mt Meitnerium	110 Ds Darmstadtium	111 Rg Roentgenium	112 Cn Kopernicium	113 Nh Nihonium	114 Fl Flerovium	115 Mc Moscovium	116 Lv Livermorium	117 Ts Tennessine	118 Og Oganesson

FORMATION OF POSITIVE ION

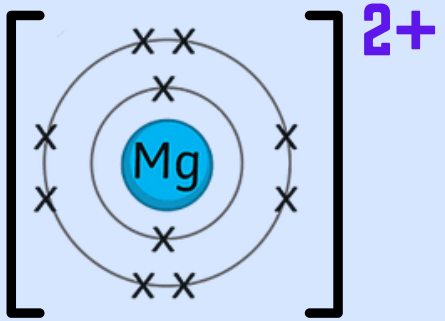


2.8.2

MAGNESIUM ATOM

not stable

DONATES ELECTRONS



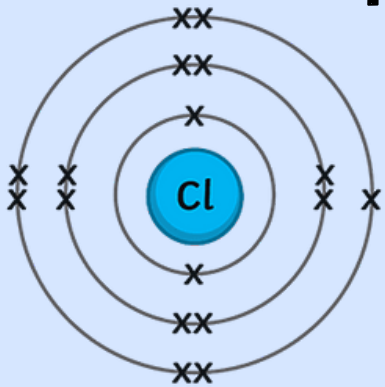
2.8

MAGNESIUM ION

achieve an octet electron arrangement

(8 electrons in the outermost shell)

FORMATION OF NEGATIVE ION

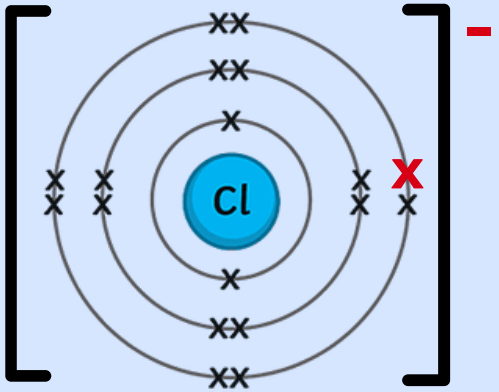


2.8.7

CHLORINE ATOM

not stable

ACCEPTS ELECTRON



2.8.8

CHLORIDE ION

achieve a stable octet electron arrangement

ISOTOPE

Atoms of the same element that have the **same proton number** but **different number of neutrons/nucleon number.**

Element	Proton number	Nucleon number
P	15	32
Q (Isotope)	11 (same proton number)	24 (different nucleon number)
R	11	23

Which element is a pair of isotope? Explain your answer.

Q and R, because Q and R have the same proton number but different nucleon number.

USES OF ISOTOPES

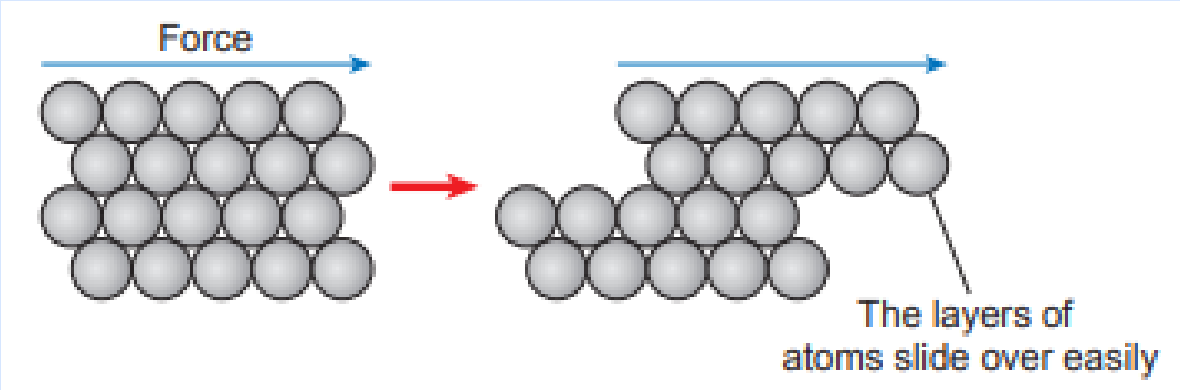
- **Medical field**
  - Sodium-24 : to detect the positions of blood clots in veins.
  - Iodine-131 : to treat thyroid cancer.
  - Cobalt-60 : to kill cancer cells.
- **Food Technology**
  - Cobalt-60 : to destroy the microorganism on vegetables.
- **Agriculture**
  - Phosphorus-32 : to study the rate of absorption of phosphorus fertiliser in plants.
  - Carbon-14 : to study the rate of photosynthesis of a plant.
- **Archaeology**
  - Carbon-14 : to estimate the age of fossils and artifacts.

ALLOY

Mixture of **several types of metals** or mixture of **metal and non-metal** by a certain percentage.
Alloy is **stronger, harder,** and **resistant to corrosion.**

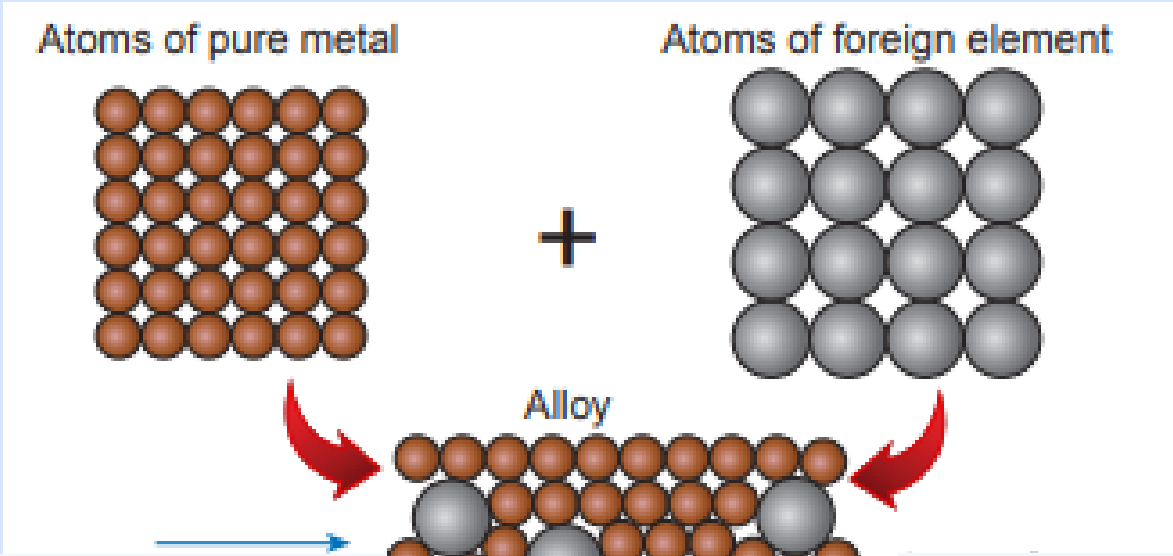
ATOMS OF PURE METAL

- Atoms are same size, closely - packed and orderly in layers.
- When force is applied, the layers of atoms easily slide over each other.



ALLOY

- Atoms are different size and not arranged in order.
- When force is applied, the layers of pure metal have difficulty in sliding over each other.
- **Therefore, the hardness increases.**



ALLOY

Body of vehicles

Railway tracks

Buildings

STEEL

Iron + Carbon

Hard & Strong

Body of aeroplanes

DURALUMIN

Aluminium + Copper + Magnesium + Manganese

Light, strong, resistant to corrosion

Decorative items

PEWTER

Tin + Copper

Shiny surface, resistant to corrosion

Monument

Coins

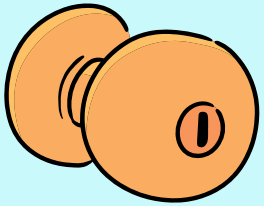
Medals

BRONZE

Copper + Tin

Hard, resistant to corrosion

Musical instruments



Doorknobs

Keys

BRASS

Copper + Zinc

Strong, shiny surface, malleable

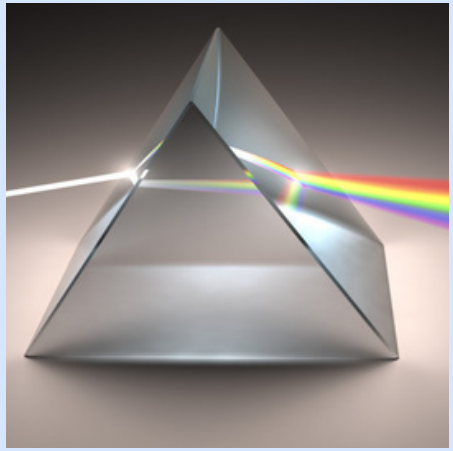
GLASS

Made of SILICA

Made from borosilicate glass. High resistance to heat & chemicals.

Made from soda-lime glass. Easy to shape.

Transparent.



Made from lead crystal glass. High refractive index

CERAMIC

Made of clay (ALUMINIUM SILICATE).

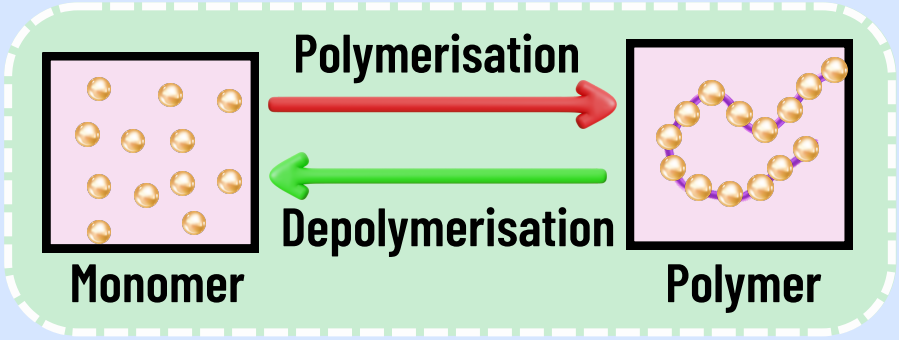
Ceramic tiles. Durable, sparkling & beautiful.

Ceramic dining ware. Resistant to heat & corrosion.

Dentures. Hard & strong.

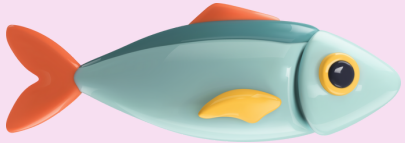
Ceramic flowerpots. Hard & strong.

POLYMER



Polymer is a long chain molecule formed from a combination of small units of molecules (monomer).

NATURAL POLYMER

Natural polymer	Monomer	Uses
Carbohydrate	Glucose	
Protein	Amino acid	
Natural rubber	Isoprena	

SYNTHETIC POLYMER

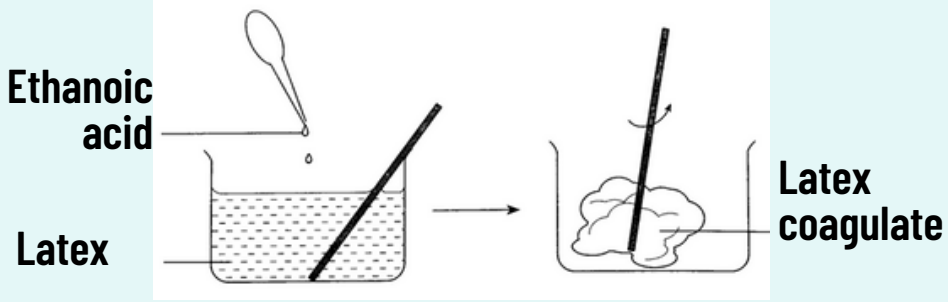
Synthetic polymer	Monomer	Uses
Polythene	Ethene	 Plastic containers
Polystyrene	Styrene	 Container for electrical equipment
Perspex	Methyl methacrylate	 Windows for vehicles
Synthetic rubber	Neoprene	 Tyres, gloves

NATURAL RUBBER

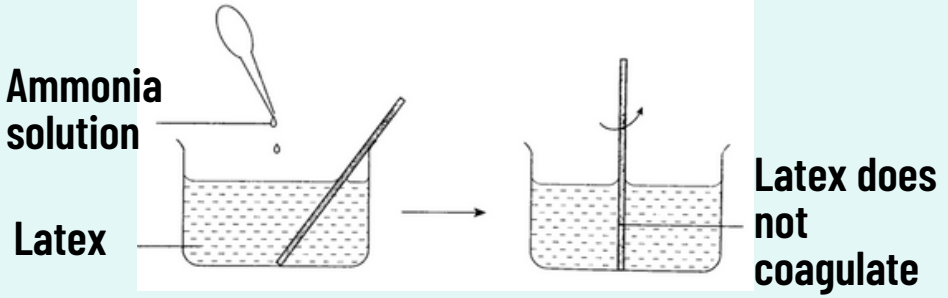
PROPERTIES OF NATURAL RUBBER

- Soft & Elastic
- Good electrical insulator
- Non-heat resistant
- Not permeable to air

THE ACTION OF ACID & ALKALI ON LATEX



- Acid will coagulate latex.
- Positively-charged hydrogen ions from the acid will neutralise the negative charges of the protein membrane.
- Rubber molecules will collide, protein membrane will break, chain of rubber polymer coagulates.

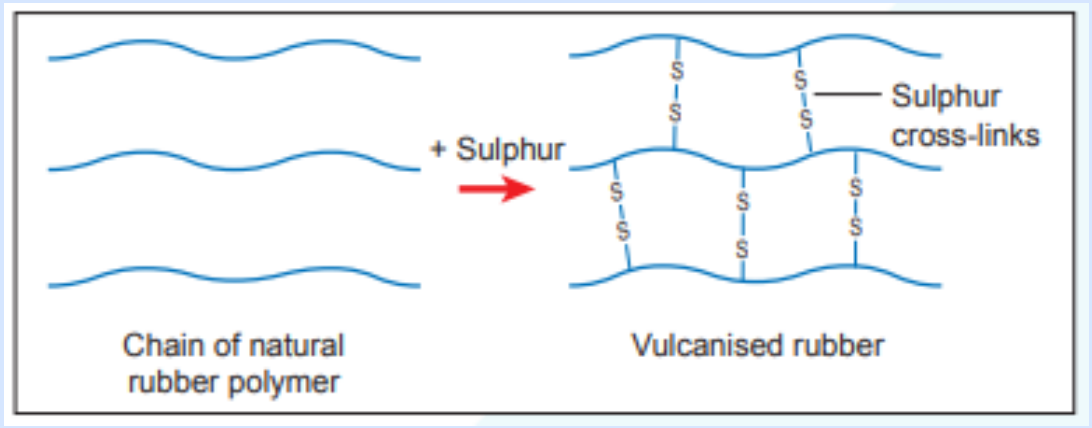


- Ammonia will prevent the coagulation of latex.
- Hydroxide ions from the alkali will neutralise the hydrogen ions from the acid.
- Negative charges remain on the protein membrane. Rubber molecules repel one another & remain in liquid form.

VULCANISED RUBBER

VULCANISATION OF RUBBER

- Process of heating rubber with sulphur.
- Cross-links between sulphur and rubber polymer chains prevent the molecules of rubber from sliding & difficult to break when force is applied.



PROPERTIES OF VULCANISED RUBBER

- Resistant to heat
- Harder & more elastic
- Not permeable to liquid & air
- Good electrical insulator
- Does not oxidise easily
- Does not react with acid & alkali

USES

Shoe soles

Gloves

Car tyres

TRADITIONAL MEDICINE

GINGER

Relieve body aches.

Relieve bloatedness.

GINSENG

Increase immunity.

Maintain body health.

QUININE

Treat malaria.

HIBISCUS PLANT

Relieve headache.

Prevent hair loss.

ALOE VERA

Reduce pain due to sunburn.

Treat blisters/ scalded skin.

COMPLEMENTARY MEDICINE

ACUPUNCTURE

To stimulate the nervous system to relieve pain.

CHIROPRACTIC

To make adjustments to the bone position.

TRADITIONAL MASSAGE

Manipulates the body tissue using hands, fingers and fist.

HOMEOPATHY

Give strengthens the body's immunity against infectious disease.

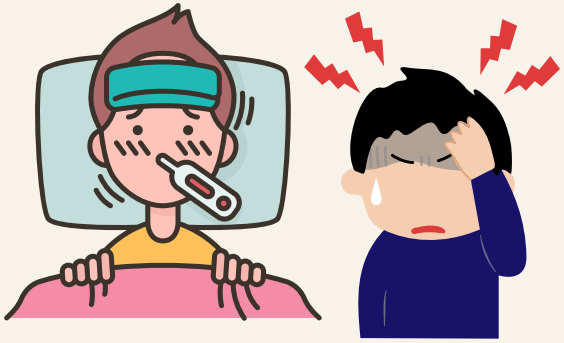
HERBAL THERAPY

Plants or parts of the plants that cure diseases.

MODERN MEDICINE

ANALGESICS

Relieves pain.

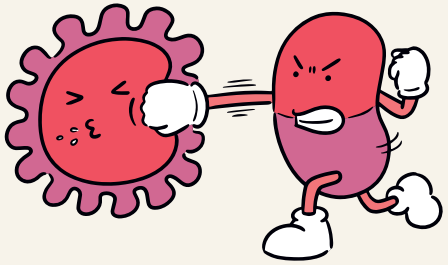


Example :

- Aspirin
- Paracetamol
- Codeine

ANTIBIOTICS

Kills the growth of infectious bacteria.



Must be finished within the prescribed duration to ensure all the bacteria are destroyed.

Example : penicillin, streptomycin

PSYCHOTHERAPEUTIC

Treat psychiatric patients.

Need to follow the dosage prescribed by the doctor - can cause mood swings, thought disorder and changes in a person's behaviour.

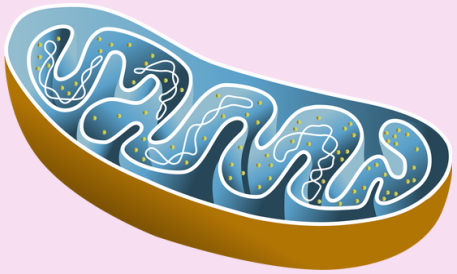
- Stimulants -stimulate & activate the brain activity. Eg: amphetamine
- Antidepressants - treat depression. Eg: imipramine, amitriptyline
- Antipsychotics- have sedative effects. Eg: tranquiliser, barbiturates , doxepin dan haloperidol

TRADITIONAL MEDICINE	MODERN MEDICINE	COMPLEMENTARY MEDICINE
Treatment using natural substances from plants and animals	Uses modern technology (surgery, laser treatment, radiotherapy)	Does not use medicine, drugs & synthetic chemical substances. Does not involve surgery & stitches.
Inherited & practised from generation to generation	Treatment that uses synthetic medicine	Various methods of healthcare & treating diseases
Effectiveness of the treatment is slower & takes a longer time	Treatment is more effective and faster	Additional treatment performed with modern medicine to treat diseases
Low treatment cost	High treatment cost	Low treatment cost
Effectiveness proven with experience	Effectiveness is proven clinically	Considers the views of modern & traditional medical practitioners

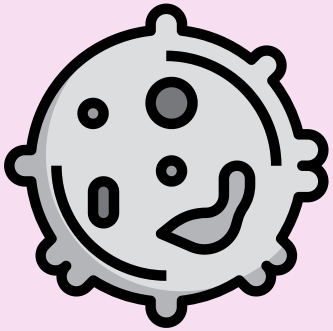
FACTORS THAT PRODUCE FREE RADICALS

INTERNAL FACTORS

Metabolism



Inflammation



FREE RADICAL

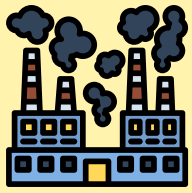
Causes DNA damage

EXTERNAL FACTORS

Cigarette smoke

Toxic waste

Ultraviolet rays



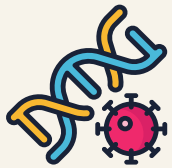
Air pollution

Ionising radiation

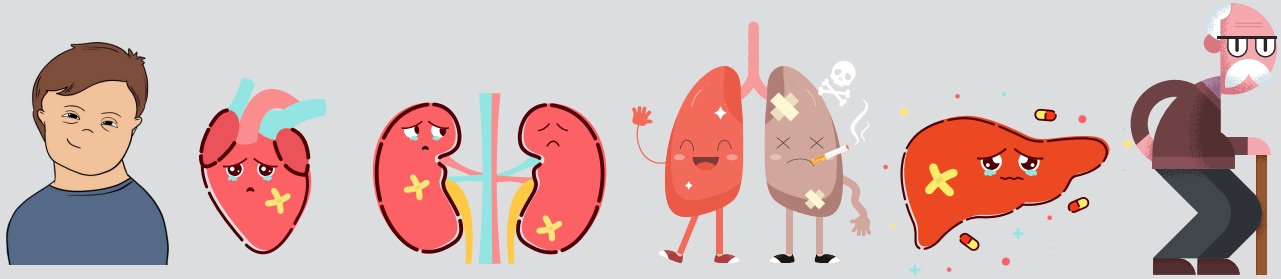
EFFECTS OF FREE RADICALS ON HUMAN HEALTH

Free radicals
atoms/ molecules that lack one electron (unstable, reactive) and **tend to attack** other atoms/ molecules.

Free radicals damage DNA structure, forms carcinogenic substances that may cause:



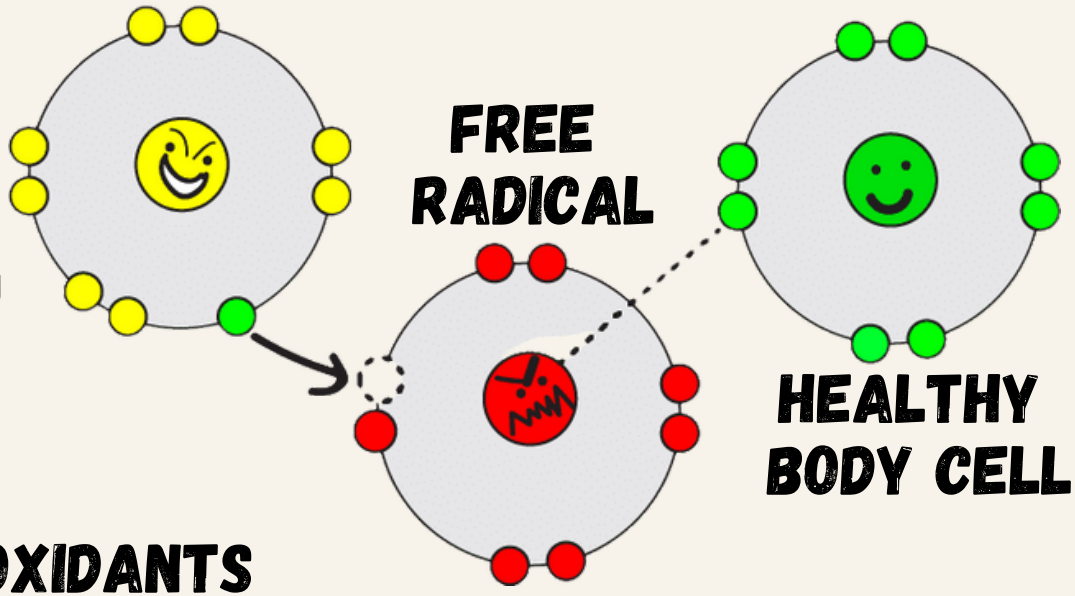
- mutation
- canser
- cardiovascular disease
- damage the kidneys, liver and lungs
- infertility
- premature aging conditions such as wrinkles and grey hair



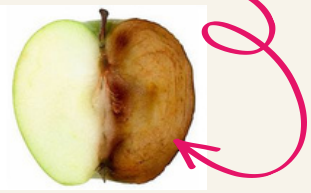
ANTIOXIDANT SUBSTANCES

ANTIOXIDANTS

- Chemical substances that are needed by our body to slow down/ stop the oxidation process.
- Protects body cells from damage by free radicals.



OXIDATION ON APPLE (EXPOSED TO AIR)



Lime juice (antioxidant substance) can slow down the oxidation process.

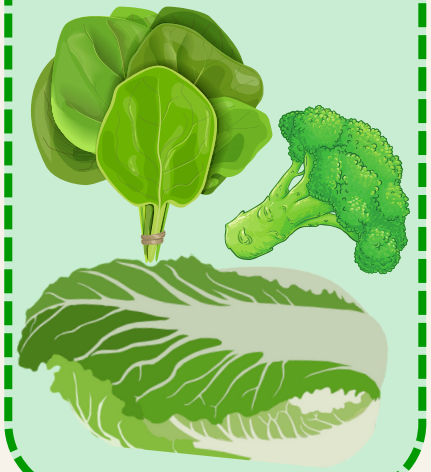
EXAMPLES OF ANTIOXIDANTS

BETA CAROTENE

Most red,yellow or orange coloured food. Carrots, manogoes, sweet potatoes.

LUTEIN

Often associated with healthy eyes. Green leafy vegetables



LYCOPENE

Fruits. Papaya, guava, tomato

VITAMIN C

Known as ascorbic acid. Citrus fruits, spinach, strawberries, cereals.

VITAMIN E

Known as alpha-tocopherol. Palm oil, wheat germ oil, corn oil, soybean oil

ACTIVE INGREDIENTS IN HEALTH PRODUCT

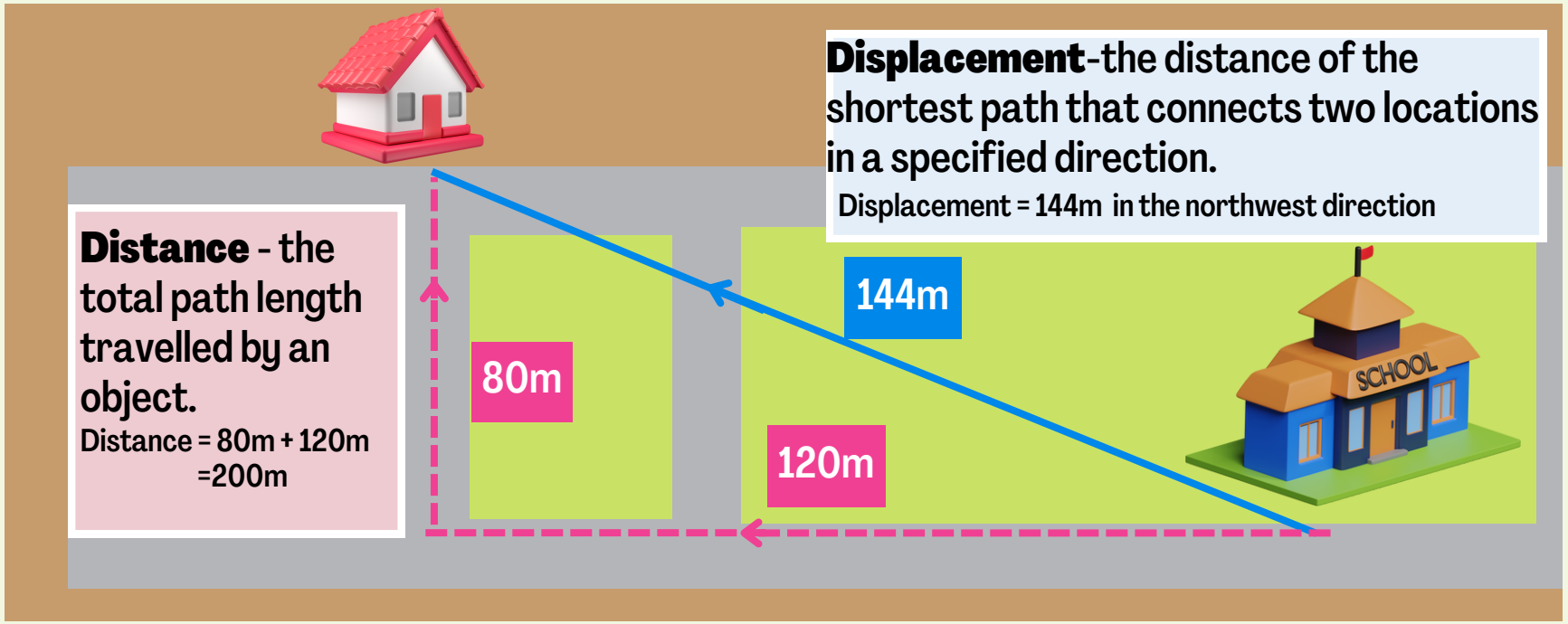
Active ingredients are specific components in a product that have effects on the cure or prevention of disease.

- To restore and maintain our health.
- To ensure normal growth and increase the body's immunity.
- A necessity to maintain health while busy working.
- As a complement to eating habits.

Be careful when using health products

- Choose suitable health products which are registered with the Ministry of Health, Malaysia (KKM).
- Read and check the labels first to know the contents and how to consume the health product correctly.
- Get the advice of medical doctors.

LINEAR MOTION



SPEED — The rate of change of distance

$$\text{Speed} = \frac{\text{Distance}}{\text{Time}}$$

Unit = m/s

AVERAGE SPEED — The rate of change of total distance travelled

$$\text{Average speed} = \frac{\text{Total distance}}{\text{Total time}}$$

Unit = m/s

VELOCITY — The rate of change of displacement

$$\text{Velocity} = \frac{\text{Displacement}}{\text{Time}}$$

Unit = m/s

ACCELERATION — The rate of change of velocity

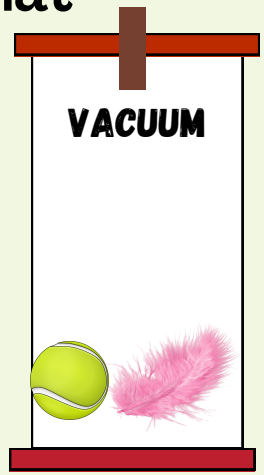
$$\text{Acceleration, } a = \frac{\text{Change of velocity}}{\text{Time taken}} = \frac{\text{Final velocity } (v) - \text{Initial velocity } (u)}{\text{Time taken } (t)}$$

Unit = m/s^2

TYPES OF LINEAR MOTION

Can be determined from the distance between dots on the ticker tape.

Ticker tape	Distance between dots	Type of motion
Direction of motion 	Distance between dots is constant	Uniform velocity
Direction of motion 	Distance between 2 consecutive dots increases uniformly	Velocity increases uniformly (Uniform acceleration)
Direction of motion 	Distance between 2 consecutive dots decreases uniformly	Velocity decreases uniformly (Uniform deceleration)
Direction of motion 	Distance between 2 consecutive dots is not constant	Non-uniform velocity

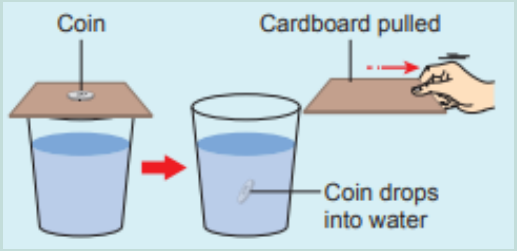
FREE FALL	NON-FREE FALL
Object falls due to the effect of **gravitational force only**. Only occurs in a **vacuum**. (space with no air).	Object falls due to the effect of gravitational force and affected by **air resistance**, mass or others.
Same gravitational acceleration no matter what their mass and shape are. Example : In vacuum, **a feather and tennis ball will reach the bottom simultaneously** when released from the same height. 	Different gravitational acceleration depends on mass and shape. Example : In air, a feather take a longer time to reach the bottom compare to tennis ball when released from the same height. 

Time taken for the free fall object to fall is shorter than non-free fall object.

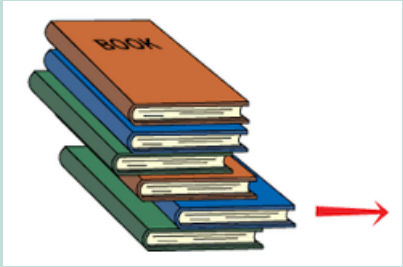
INERTIA

Natural tendency of an object to resist any change in its original state, whether at rest or in motion.

ORIGINAL STATE OF OBJECT AT REST



When the cardboard is pulled quickly, the coin will fall into the glass. The inertia of the coin will maintain the original state of the coin.



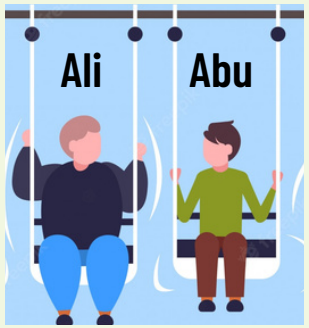
When a book is pulled from a stack of books, the other books above it will drop to the bottom.

ORIGINAL STATE OF OBJECT IN MOTION

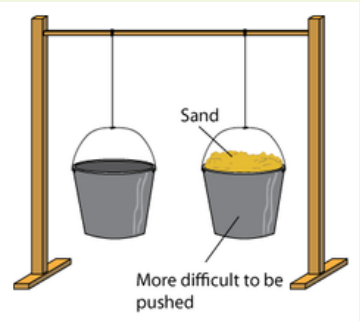
Inertia of the passenger maintains the original state of passenger, that is, being in motion. Thus, the passenger continues his forward motion.

THE LARGER THE MASS OF AN OBJECT, THE LARGER THE INERTIA OF THE OBJECT.

The **mass of a trolley** filled with things is **larger**, therefore its **inertia** is also **larger**. This causes the trolley to be more difficult to move from its original state.

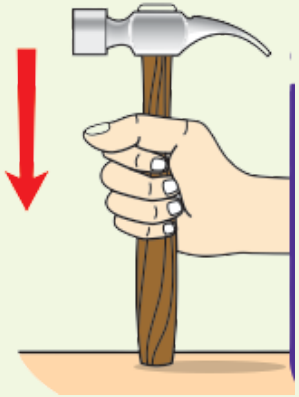


Time taken to stop swinging for Ali is longer.
Mass of Ali is higher, inertia of Ali is higher



Time taken to stop swinging for pail that filled with sand is longer.
Pail that filled with sand has higher mass, so higher inertia.

EFFECTS OF INERTIA IN DAILY LIFE

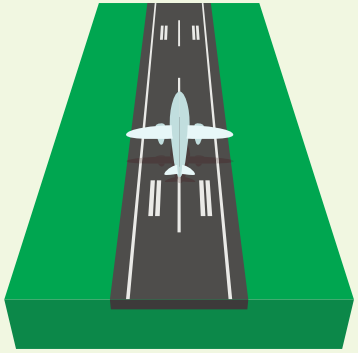


The loose head of a hammer can be tightened by banging its handle against a hard surface. A swift bang drives the hammer head downwards due to inertia.

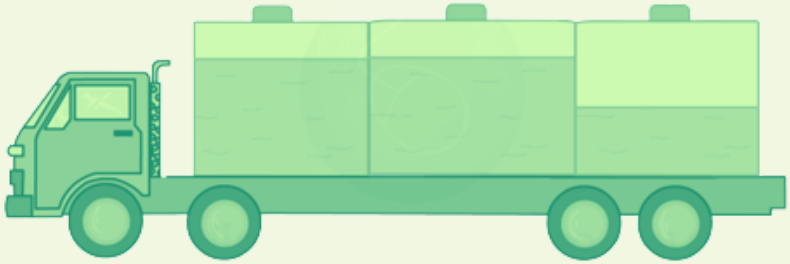
A car is equipped with airbags, headrests and safety belts to reduce the effects of inertia.

The chilli sauce in a bottle can be poured out easily by moving the bottle downward quickly with a sudden stop. (Inertia causes the chilli sauce to pour out of the bottle)

A wet umbrella can be dried by spinning it quickly. Inertia causes the rain drops to fall from the umbrella even though the umbrella has stopped spinning.



During landing, an aeroplane of large mass cannot stop within a short distance due to inertia. Therefore, long runways are needed to land safely.

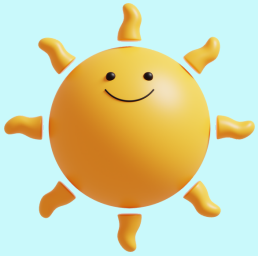


The tank of a tanker is divided into a few small components. Each component will contain a smaller mass of petrol. A smaller mass has a smaller inertia, so the impact of inertia can be reduced if an accident happens.

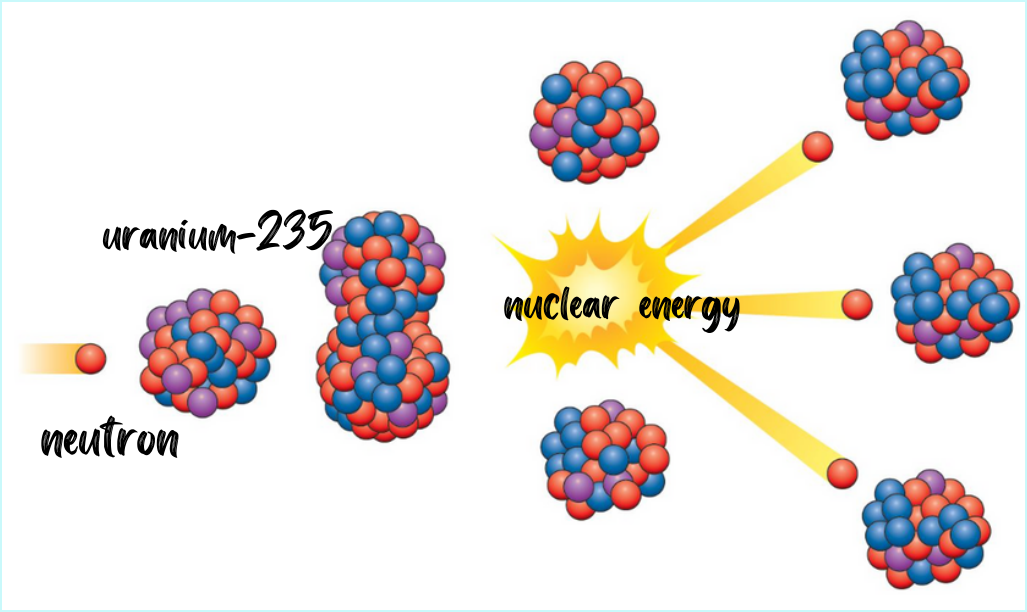
NUCLEAR ENERGY

Alternative energy that is used to generate electricity.

Greater quantity of energy and more efficinet.

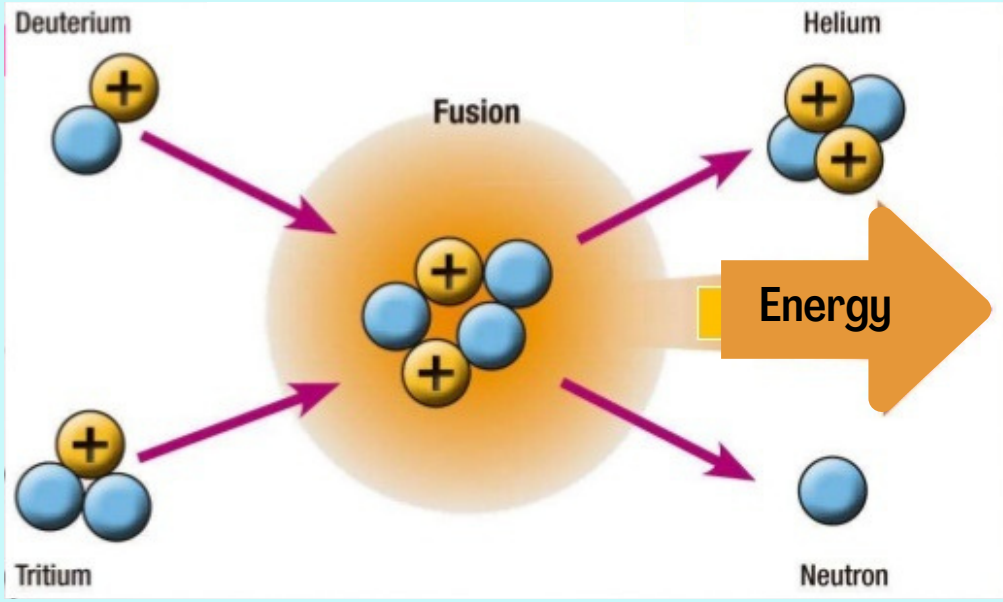


NUCLEAR FISSION



Chain reaction - The nuclear fission will occur continuously when a neutron bombards and splits a new nucleus of large mass.

NUCLEAR FUSION



Process of combining two light radioactive nuclei to form a heavier nucleus and energy.

Releases more nuclear energy than nuclear fission.

NUCLEAR POWER STATION

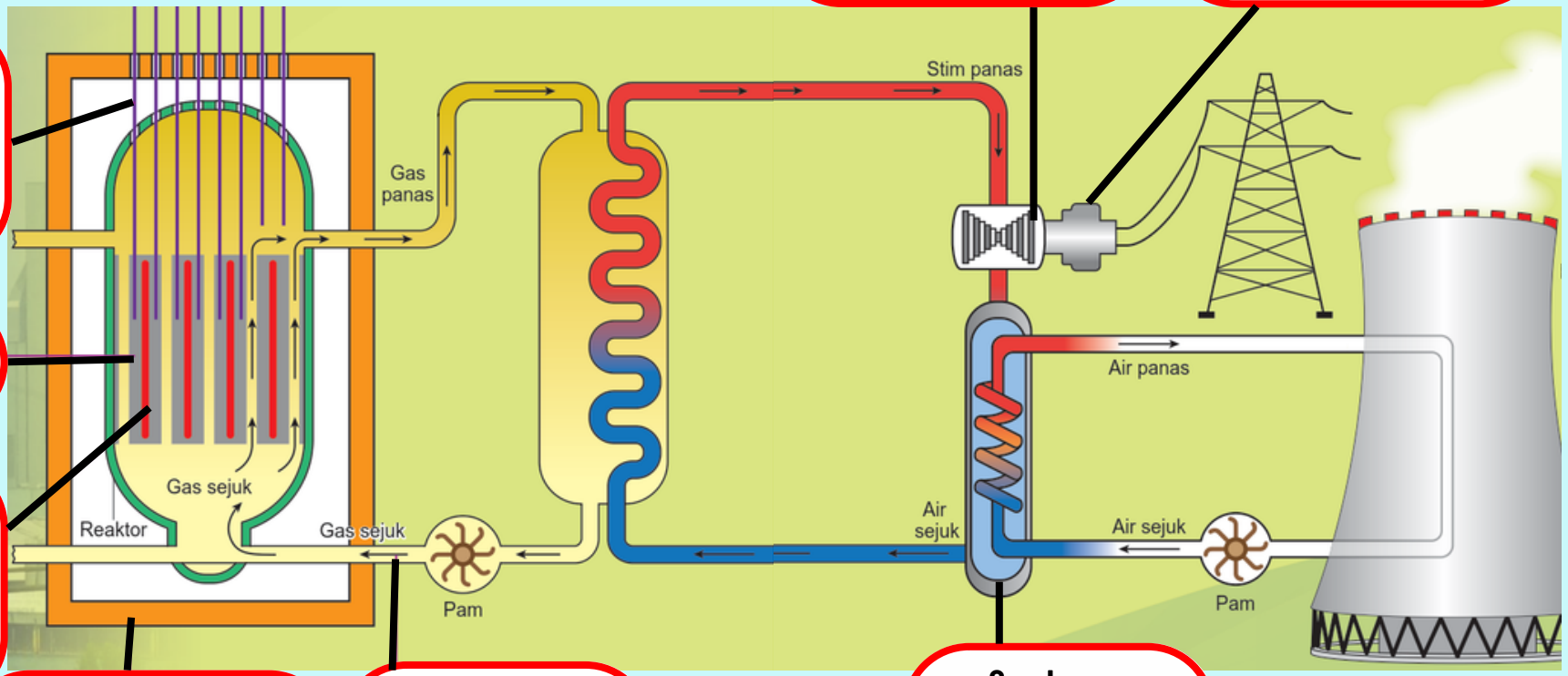
Turbine
The turbine is rotated by steam causing magnets in the generator to spin

Electricity generator
Generates electricity.

Boron control rods
Control the rate of nuclear fission reaction by absorbing surplus neutrons

Graphite moderator
Slow down the neutrons

Uranium fuel rods
Release heat energy through nuclear fission to heat up gas flowing through the reactor core



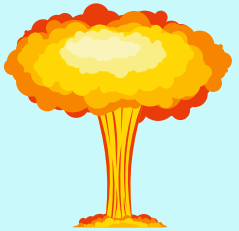
Concrete shield
Prevent radioactive radiation leakage from the reactor.

Cooling agent
Absorbs heat produced by the nuclear reaction

Condenser
Cools and condenses steam into water

Cooling tower

EFFECTS OF RADIATION SPREAD FROM NUCLEAR TEST



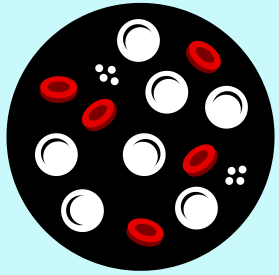
SOMATIC EFFECTS

Tiredness

Nausea

Hair loss

Cataract

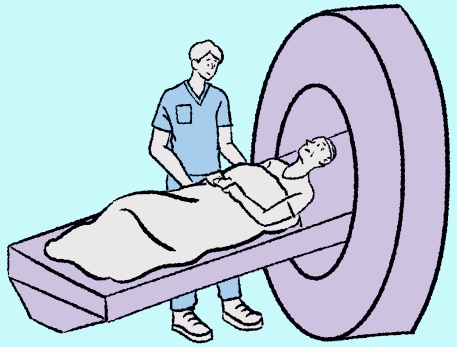


Leukaemia

GENETIC EFFECTS

Deformation in babies

Cell mutation



Cancer

JUSTIFICATION FOR THE CONSTRUCTION OF NUCLEAR POWER STATION IN MALAYSIA

AGREE

1. Alternative energy.
2. Nuclear energy is more environment-friendly.
3. The cost of generating electricity from nuclear energy is cheaper.
4. Has a lot of usages in daily life.
5. The rate of energy generation from nuclear energy source is higher compared to fossil fuel energy sources.

DISAGREE

1. Improper disposal of radioactive wastes can cause environmental pollution.
2. If exposed to radioactive radiation can cause mutation and cancer.
3. Requires a high cost for the construction and maintenance of a nuclear power station.
4. Radioactive radiation leakage & accidents can happen due to the negligence & mistakes of monitoring systems.