Science Unit 7

Air

The layer of earth is called atmosphere

Air is a mixture of gases

It’s a mixture of nitrogen(78%), oxygen(21%), carbon dioxide(0.03%), noble gases(0.9%), water and other gases(0.07%)

Air is essential to living things

Test for the gases in air

Oxygen

Colourless, odourless, burning splint burn more brightly, glowing splint relight, Hydrogencarbonate indicator remains red and no colour change, lime water remains colourless and no change

Carbon dioxide

Colourless, odourless, burning splint and glowing splint goes out, Hydrogencarbonate indicator change from red to yellow and lime water change from colourless to milky

Water and water vapour

The dry cobalt chloride paper change from blue to pink when touch water or water vapour

The cobalt chloride paper dry in desiccator

The are no simple test for nitrogen and noble gases because they are very unreactive.

Application of gases in air

Oxygen can help patient with breathing problem.

The mixture of gas fuel and oxygen is use for cutting metal

Carbon dioxide is use to make fire extinguisher

Solid carbon dioxide (dry ice) can produce fog effect as it change into gas state directly in room temperature

Nitrogen is use to fill food package to prevent the food from go bad

Liquid nitrogen is use to store cell and tissues

Noble gases are a group of very unreactive gases include argon, helium, and neon

Argon use to fill light blub

Helium use to fill balloon and airship

Neon use to fill advertising lights

Photosynthesis

Plants make food by their own called autotroph.

The raw materials, energy source, is need to produce food by a process called photosynthesis.

Raw materials include carbon dioxide and water.

Carbon dioxide absorb from air through stomata

Water absorb from soil through roots

Energy source is light energy absorb by chlorophyll

Glucose is produce during photosynthesis and is use for plant growth and respiration.

Th glucose is converted into starch as a temporary storage if it not use immediately

Both glucose and starch is carbohydrates.

The starch is produced and oxygen is given out to the air during the photosynthesis.

If we can carry out experiments show the starch is presence in leaf and oxygen is given out into air by iodine test and glowing splint. We can prove photosynthesis is take place

Iodine test: when iodine solution touch starch, it will change from brown to blue-black

Control set-up: is set up identical to the experimental set-up expect the factor under testing

Comparing the result with the experimental set-up to confirm the changes in the result is only due to the factor

Put the leaf into boiling water to remove the cell membrane

Put the leaf in hot alcohol to remove the chlorophyll

The alcohol become green and the leaf become pale-yellow

Put the leaf in the hot water to remove the alcohol on the leaf and make the leaf soft

Add the iodine solution to the leaf. The leaf will change from brown to blue-black

Show the starch is presence in the leaf and the photosynthesis is take place

Fill the transparent plastic with water and mix with sodium Hydrogencarbonate powder.

Sodium hydrogencarbonate powder produce carbon dioxide when mix well with water

Put the green water plant in the bottle and the squeeze the bottle and close it to ensure there don’t contain any gases in the bottle. The gas produced is all by the plant.

Put under bright light for at least four hours and put glowing splint into the bottle.

The glowing splint relight and show the oxygen is given out to the air and the photosynthesis

Destarch the plant: put the plant in the dark at least 48 hours. All the starch in the plant will converted into glucose and use by plant. To ensure the plant do not contain any starch before the investigation to ensure the test is fair.

Soda lime is use to absorb the carbon dioxide

Remove two leaves from destarched plant and put into to two different plastic bags. One plastic bag contain soda lime to absorb carbon dioxide. Put them under bright light for about 4 hours

Add the iodine solution to the leaves. The leaf inside the plastic bag without soda lime change from brown to blue-black while the leaf inside the plastic bag with the soda lime remains brown. Show the carbon dioxide is necessary to the photosynthesis.

Remove a leaf from destarched plant and put under bright light about 4 hours.

Add the iodine solution to the leaf. The green parts of the leaf change from brown to blue-black while the non-green parts of the leaf remain brown and shows chlorophyll is necessary for photosynthesis

Remove two leaves from destarched plant and put one of them under bright light

The leaf under bright light change from brown to blue-black, while the leaf without under the bright light is remains brown shows the light is necessary for photosynthesis

Photosynthesis is an essential life process. It provide food for living things and maintain the balance of oxygen and carbon dioxide in Nature.

Food chain show the feeding relationship and the flow of energy of living things

Sun is the ultimate source of energy for all food chains

Plants can make their own food called producer and animals feed on other plants and animals called consumer

Energy transferred from producer and consumer through feeding.

Respiration

All our body activities require energy

Food is the source of energy of all living things

We obtained energy from food through respiration

The chemical energy in food is converted into other useful form of energy through respiration

Respiration take place in body cell

Cell use oxygen to break down food to release energy in useful form and the carbon dioxide and water is produce during the respiration

Glucose is the food broken down during respiration

Respiration will produce water while burning will not

Respiration take place in body cell while burning take place in air

Both plant and animal carry out respiration

Photosynthesis is stored the energy into food while respiration is release energy from food

Photosynthesis only take place in plant while respiration take place in both plants and animals

Photosynthesis only take place under the presence of light while respiration take place all the time

Gas exchange

Hydrogencarbonate indicator change to purple < 0.03% carbon dioxide contain in air, red = 0.03%, yellow > 0.03%

Both photosynthesis and respiration include a gas exchange between the living things and the environment

There is a net gas exchange in plant.

Plant carry out both photosynthesis and respiration.

The net gas exchange of plant depend on the relative rate of photosynthesis and respiration

In the daytime, the both photosynthesis and respiration take place and photosynthesis has a higher rate than respiration

There is a net uptake of carbon dioxide and net release of oxygen in daytime.

In night, only the respiration is take place in plant.

There is a net uptake of oxygen and net release of carbon dioxide in night.

In human, the exhaled air contain more water vapour and carbon dioxide. Show the carbon dioxide and water are produce during respiration and removed from body

Human have a breathing system for gas exchange

Gas exchange allow us to have continuously supply of oxygen to cell for respiration

Air enter nasal cavity. Pass down through trachea. Trachea divide into two bronchi.

Breathing is take place in lungs. Lungs is support by rib and diaphragm.

Inside lungs, bronchi further divide into bronchioles.

Bronchioles end in a bunch of air sac. Gas exchange take place in air sacs.

Air sacs a surrounded by many blood vessels called \*capillaries

Along the nasal cavity, trachea, bronchi and some large bronchioles are lined with mucus-producing cell and ciliated cells

Mucus-producing cell produce mucus and mucus is use to trap the dust particles and bacteria from enter the breathing system

Ciliated cells have tiny hair-like cilia on their surface.

Cilia use to moved back and forth to sweep out the mucus which the dust particles and bacteria are trapped

Tar is a harmful substance deposits in lungs and other parts of breathing system.

\*Tar increase mucus production and make cilia stick together.

Mucus build up the air way and make the air way narrower. Make human gas exchange more difficult.

Tar in cigarette cause lung cancer, respiratory diseases and cough

Nicotine in cigarette cause addiction and increase heart rate, blood pressure, cause heart diseases in long term.

Carbon monoxide is colourless, odourless and toxic. It reduce the oxygen content in blood. Heart need to beat faster to provide enough oxygen for cell for respiration. Cause heat diseases in long term.

Carbon dioxide and oxygen in Nature

Both photosynthesis and respiration are two essential life process which maintain the balance of carbon dioxide and oxygen in Nature.

Human activities such as cutting down trees, burning of fossil fuel producing large amount of carbon dioxide are disrupting the balance of carbon dioxide and oxygen in Nature and increase the carbon dioxide.

\*Greenhouse gas can trap heat in atmosphere from Sun and keep the Earth warm called greenhouse effect.

Carbon dioxide is a type of greenhouse gases.

Increase of carbon dioxide in atmosphere enhance the greenhouse effect. More heat is trap in atmosphere and the annual mean temperature increase cause global warming.

Global warming cause melting ice in polar region and climate change.

Melting ice in polar region cause average sea level rise and more frequent flooding in low costal region

\*Rise of temperature will cause climate change

Climate change cause more frequent storm, drought, heat waves, and food shortage as warmer weather is less favourable for growing crops.

To slow down global warming, we help reduce the emission by low-carbon living.

\*Refers to a lifestyle emit a less carbon dioxide

Air quality

Burning of fossil fuel in factories, power station and vehicles produce large amount of air pollutant, include, carbon monoxide, sulphur dioxide, nitrogen oxide and suspended particulates.

Carbon monoxide cause fainting, headaches and even dead.

Sulphur dioxide and nitrogen oxide cause irritation to our breathing system and eye

Suspended particulates cause lungs cancer and respiratory diseases.

\*Fine suspended particulates are the suspended particulates with diameter smaller than 2.5 millimetres.

AQHI air quality health index is a way to inform public of short-term health risk of air pollution and help public to takes measure of health protection

It is measure certain air pollutant measure by air quality monitoring stations set up by EPD environment protection department.

The higher the index, the poorer the environment.

1-6 No action need

7 reduce outdoors activities for elderly, children, and people with respiratory diseases

8-9 reduce outdoors activities to the minimum for elderly, children, and people with respiratory diseases; reduce outdoors activities for general public

10+ avoid outdoors activities for elderly, children, and people with respiratory diseases; reduce outdoors activities to the minimum for public; reduce outdoors activities for outdoor workers