



Photosynthesis

State the word equation for photosynthesis  
Carbon dioxide + water  $\xrightarrow{\text{sunlight}}$  Glucose + oxygen

Describe how products produced in photosynthesis are used in plants

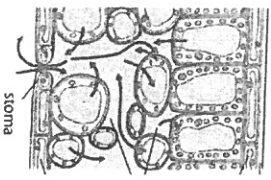
Glucose - used to make large, complex molecules (that plants/algae use to grow (biomass)) oxygen is used in respiration

Explain why photosynthesis is an endothermic reaction

Energy is taken in during the reaction

reactors:

Starch (storage)  
- Sucrose



Explain how leaves are adapted for their function: underside of leaf

Stomata - needed for gas exchange

CO<sub>2</sub> + oxygen diffuse directly into + out of the leaf

Guard cells change the shape of stomata.

Less of chloroplasts on top of leaf

Answers (B2)

Factors that affect photosynthesis

Describe the effect of temperature on the rate of photosynthesis

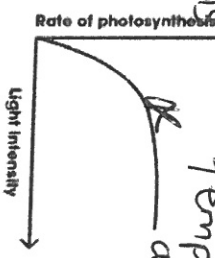
As temp increases so does the rate of photosynthesis (enzymes)

If it gets too hot (45°C) enzymes denature.

Describe the effect of light intensity on the rate of photosynthesis

As light intensity increases so does the rate of photosynthesis

Temp or CO<sub>2</sub> are limiting factors



Describe the relationship between light intensity and rate of photosynthesis prior to it levelling off

The rate increases steadily as light levels increase (directly proportional up to a certain point)

Explain the effect of light intensity on the rate of photosynthesis

Rate of photosynthesis is directly proportional to light intensity + inverse proportional to the distance from a light source

Inverse square law: light intensity  $\propto \frac{1}{\text{distance}^2}$

Describe the effect of carbon dioxide on the rate of photosynthesis

In CO<sub>2</sub> increases the rate of photosynthesis

If you halve the distance the rate will be 4 times

Mitochondria  $\rightarrow$  release energy?

Absorbing water and mineral ions

Explain how root hair cells are adapted to their function

Large surface area for absorbing water + mineral ions from the soil

Explain how water flows from the soil into the cytoplasm of a root hair cell

Osmosis  $\rightarrow$  Diffusion

high  $\rightarrow$  low

Explain how water flows from the soil into the cell walls of a root hair cell

Diffusion

Describe how plants take in mineral ions to make new proteins

Active transport low  $\rightarrow$  high

energy from mitochondria

Transpiration

Describe how water is lost from leaves

Evaporation + diffusion of water from a plant's surface (leaves)

State the vessel water and mineral ions are transported around the plant in

xylem

### Transpiration

State 3 factors that would increase transpiration in plants

- Light intensity (brighter)
- Temperature (higher)
- Air flow (stronger wind)

Describe how a student could investigate the effect of wind on transpiration (include controls, independent and dependent variables)

Potometer - wind / no wind using a fan

Record starting position of air bubble

Start stopwatch + record distance moved by bubble

Speed = estimate of transpiration rate (mm/min)

Describe how the xylem is adapted for its function

Take up water + mineral ions

• lignified (made of lignin to strengthen) dead cells

• no end cell walls + a hole shown in middle to allow

continuous flow of water + mineral ions

### Translocation

State the vessel that sucrose is transported around the plant in

Phloem - living cells

Explain why sieve cells have very little cytoplasm  
more room for the central channel

Explain why companion cells have many mitochondria

Companion cells actively pump sucrose into or out of the sieve cells. ~~that~~ to transport sucrose to

Plants

make sucrose from the glucose + starch made in photosynthesis. It is translocated (transported) in the sieve tubes of the phloem tissue.

Controls - some temp

- some light

- some abx conc.

- some amount of time

Independents = wind / no wind

Dependents = distance moved by bubble

Controls (see above)

(see above)

Be resp of the plants

Mitochondria are needed to release energy for active transport to occur.

(low  $\rightarrow$  high)

Hormones

Describe how hormones are carried in the body  
*in the blood*

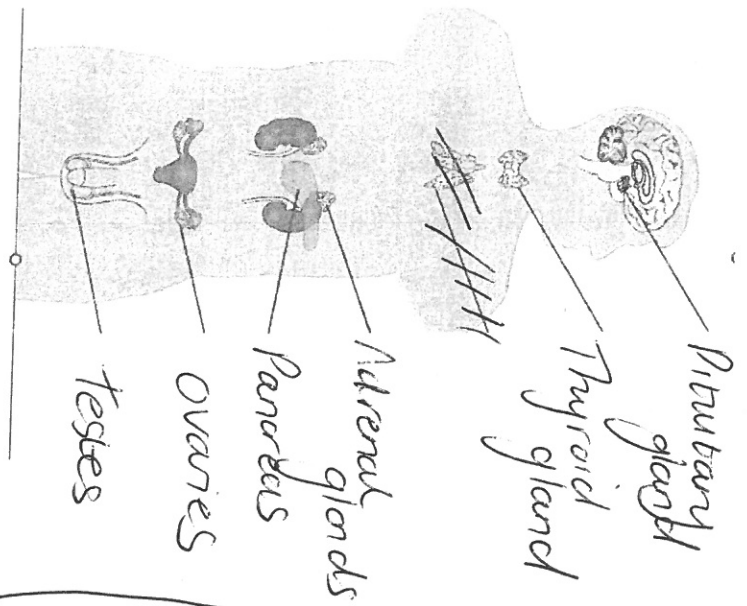
State the name given to organs that secrete hormones

*Glands - endocrine glands*

Identify the different places that secrete hormones

*(endocrine system)*

Name an example of a hormone released for each



Hormonal control of metabolic rate (HIGHER)

Describe what is meant by metabolic rate

*The speed at which chemical reactions occur in the body*

Describe how negative feedback can control the amount of thyroxine in the blood

An increase in Thyroxine concentration directly causes changes that bring about decrease in the amount of thyroxine

Describe the effect of thyroxine (released by thyroid gland)

*Taken in by many different cells and reacts with them to release heat. Heat cells contract more rapidly + strongly. Also increases the rate at which proteins + carbs are broken down*

Explain how the body responds to low levels of thyroxine in the blood

1) Hypothalamus -> Thyrotropin releasing hormone (TRH)

2) TRH stimulates pituitary gland to release Thyroid stimulating hormone (TSH)

3) TSH stimulates thyroid to release thyroxine

State 3 target organs of adrenalin

*Heart, liver, blood vessels*

Explain how adrenalin prepares the body for fight or flight response

*Increased heart rate (heart muscle contracts more)*

*Increased blood pressure (muscles relax)*

*Increased blood flow to muscles*

*Released blood sugar levels by stimulating liver to change glycogen to glucose*

The menstrual cycle

Describe the effect of oestrogen on the uterine lining

*causes the lining of the uterus to thicken + glow*

Describe the effect of progesterone on the uterine lining

*Maintains the uterine lining*

Describe what happens during ovulation

*The follicle ruptures and the egg is released*

Describe what happens during menstruation

*When the levels of progesterone falls + there's a fall in oestrogen level, the uterine lining breaks down.*

State 2 barrier methods of contraception

*male condom / diaphragm or cap (use with spermicide)*

Describe how condoms prevent fertilisation

*Prevents sperm entering the vagina*

Explain how the hormone pill prevents fertilisation

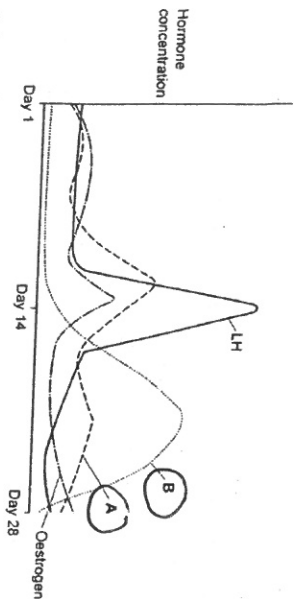
*Releases hormones to prevent ovulation*

*(oestrogen + progesterone)*

*Thickens mucus lining the cervix making it difficult for sperm to get through.*

*reduces production of TRH from hypothalamus + inhibits TSH*

**Hormones and the menstrual cycle (HIGHER)**



Identify hormone A and B

A) FSH

B) Progesterone

Describe the role of FSH P.G

egg to mature

stimulates oestrogen production

Describe the role of LH P.G

ovulation (day 14)

stimulates endings of follicle to turn into corpus luteum (progesterone)

Explain how oestrogen, LH and FSH interact to prepare the body for a fertilised egg

FSH (P.G) → egg to mature

stimulate oestrogen production

oestrogen (oocytes) → lining of uterus to thicken + grow

stimulates LH

LH (P.G) → ovulation + development of corpus luteum.

height: hip ratio = waist (cm)

**Assisted reproductive technology**

State the names of two hormones given to women undergoing IVF

FSH + LH (egg production)

↓ mature ↓ release

Describe what happens in IVF

eggs are collected + fertilised in lab

using man's sperm. They are grown

in embryos. Once they are ready

hairs of cells are a rub are inserted to the women's uterus to improve chance

Explain why LH and FSH are used in clomifene therapy

Some women are infertile because they don't ovulate or ovulate regularly

Clomifene - causes increase in LH to be released by the body. Stimulates egg maturation + ovulation by knowing

pregnancy

Control of blood glucose

Describe how the body responds to high levels of glucose in the blood (who detects, release and effect)

Insulin

Insulin secreted by pancreas

Insulin targets the liver

Liver removes glucose from the blood + turns glucose into glycogen

Blood glucose reduces

BMI = weight (kg) / height (m)<sup>2</sup>

**Control of blood glucose (HIGHER)**

Describe how the body responds to low levels of glucose in the blood (who detects, release and effect)

Glucaagon

Glucaagon secreted by pancreas

Glucaagon targets the liver

Liver turns glycogen into glucose + puts glucose back into blood

Blood glucose increases

Diabetes

Describe what causes type 1 diabetes

Lack of insulin

Describe how type 1 diabetes is treated

Injecting insulin

Limit intake of foods rich in carbs

regular exercise (sugars)

Describe what causes type 2 diabetes

Resistant to insulin

don't respond properly to the hormone

Describe how type 2 diabetes is treated

Healthy diet / regular exercise / losing weight

Describe how BMI/waist:hip ratio and type 2 diabetes is linked

Correlation between obesity + Type 2

BMI over 30 = obese

waist:hip ratio (abdomen fat)

above 1.0 in men and 0.85 in

Efficient transport and exchange

Identify substances that need to be exchanged in the body

Oxygen, carbon dioxide, water, dissolved food, mineral ions, urea

Name the process by which substances are exchanged by

diffusion (+ osmosis (water))

Explain how capillaries are adapted to allow for fast exchange of substances

one cell thick - increases rate of diffusion  
 very narrow - squeeze into gaps  
 between the vessels - substance can diffuse

Describe how surface area to volume ratio is linked to rate of exchange

larger surface area to volume ratio means greater/larger rate of exchange

Describe how to calculate surface area to volume ratio

Surface area = length x width

Volume = length x width x height

Explain how the alveoli are adapted for efficient gas exchange

Moist lining - dissolving gases  
 Good blood supply - maintain concentration gradient of O<sub>2</sub> + CO<sub>2</sub>  
 very thin walls - minimise distance  
 enormous surface area

The circulatory system

List the components in the circulatory system (blood)

RBC, WBCs, Platelets, Plasma  
 Very tiny cells  
 veins, arteries, capillaries

Describe the role of each component in the circulatory system

RBCs -> carry oxygen from the lungs around the body

WBCs -> phagocytes + lymphocytes - defend against infections  
 Platelets - help to clot

Plasma - liquid that carries everything away from heart

Blood under pressure - strong elastic walls, thick walls, small lumen

Describe how veins are adapted to their function (to the heart)

blood at low pressure, thinner walls, bigger lumen, valves

Explain the role of valves in veins

Help keep blood flowing in the right direction

Explain how erythrocytes are adapted to their function

Biconcave disc shape - large surface area  
 No nucleus - more room for O<sub>2</sub>

Red pigment called haemoglobin in the lungs oxygen sticks to it and becomes oxyhaemoglobin

Blood

Describe the role of lymphocytes

WBCs - engulf + kill germs + produce antibodies/antitoxins

Describe the role of phagocytes

WBCs - engulf (ingest + digest) microorganisms

Describe the role of erythrocytes

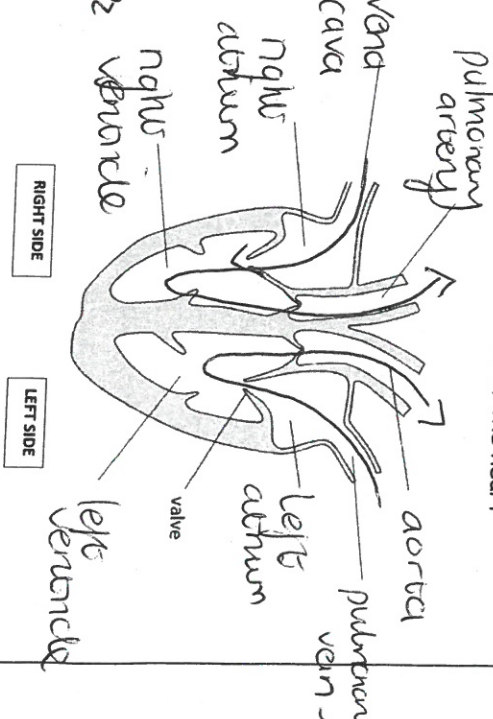
carry oxygen from the lungs around the body

Describe the role of platelets

Help the blood to clot at a wound

The Heart

Label the structures of the heart



Plasma -> RBCs, WBCs, platelets, glucose, amino acids, CO<sub>2</sub>, urea, hormones, proteins, anti-bodies

### The Heart

Explain how the blood leaving the pulmonary artery is different to the blood leaving the aorta

blood leaving the pulmonary artery is deoxygenated. Blood leaving the aorta is oxygenated

Explain why the left side of the heart is thicker than the right side

More muscle needed to pump blood around the whole body at high pressure

Right ventricle only has to pump 10% to the lungs

Volume of blood pumped by ventricle = stroke volume x heart rate

Calculate the cardiac output of a heart that pumps out 0.88L of blood 60 times a minute

$$1 \text{ litre} = 1000 \text{ cm}^3$$

$$0.88 \text{ L} = 880 \text{ cm}^3$$

$$880 \text{ cm}^3 \times 60 = 52,800 \text{ cm}^3 \text{ min}^{-1}$$

Explain why regular exercise increases the cardiac output

Regular exercise increases the strength of heart muscle + ventricle size

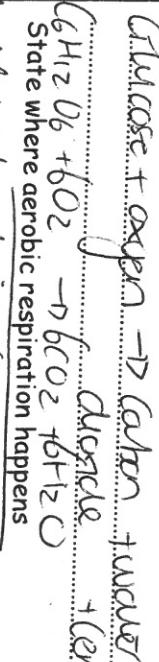
Fitter people often have bigger stroke volumes + their hearts can beat more slowly to achieve the same cardiac output

$$0.88 \times 60 = 52.8 \text{ litres/min}$$

Plants anaerobic respiration = glucose  $\rightarrow$  ethanol + carbon dioxide

### Cellular respiration

State the equation for aerobic respiration



State where aerobic respiration happens

Mitochondria (inner membrane)

State the equation for anaerobic respiration

Glucose  $\rightarrow$  lactic acid (+ energy)

State where anaerobic respiration happens

Cytoplasm

Describe the effects of exercise on the body

rate of breathing + depth of breathing  $\uparrow$

More blood to deliver oxygen + glucose + remove  $CO_2$

More oxygen for aerobic respiration

Explain why athletes recover faster after exercise than unfit people

More energy + removal of  $CO_2$

### Cellular respiration continued

Explain why aerobic and anaerobic respiration is an exothermic process

energy is transferred to the surroundings (heats)

Describe how lactic acid concentrations would change during exercise

less oxygen to muscles  $\rightarrow$  start to respire anaerobically

Explain why lactic acid concentration in the blood decreases after exercise has finished

Heart + breathing rate remain high after exercise - extra oxygen is needed to replace the  $O_2$  left in the blood

Describe the effect of temperature on the rate of respiration

Heart + breathing rate remain high after exercise - extra oxygen is needed to replace the  $O_2$  left in the blood

Explain the effect of temperature on the rate of respiration

enzymes speed up the rate of respiration - more active when warmer

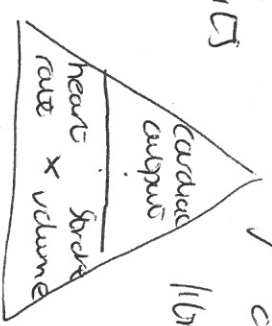
not too warm - enzymes will denature!

units

litres/min

litres/min

litres/min



litres/min

Ecosystems

Define community

All the organisms of different species living in a habitat

Define population

All the organisms of one species in a habitat

Define habitat

Place where an organism lives

Describe how to use quadrats to estimate a population size

Place randomly - count all organisms

Repeat 10 times or more

Work out mean no. of organisms per quadrat

Scale up - multiply mean by total area

In a 1m<sup>2</sup> quadrat on a rocky shore there are 25 limpets. The total area is 500m<sup>2</sup>.

Estimate the total population size of limpets

Mean  $\frac{25}{1} \times 500$

= 12,500

Describe how organisms in a rainforest are interdependent

organisms in a community are interdependent - rely on one another for food, shelter, to survive + reproduce

Abiotic factors and communities

State what abiotic factors are

non-living factors

List examples of abiotic factors

Temperature, water, light intensity, levels of pollutants

Describe how one abiotic factor would differ moving away from a tree

light intensity would increase as you move away - less shade

Describe how a belt transect can be used to investigate the effect of abiotic factors on organisms

Mark out line (transect) - collect data from quadrats placed next to each other or regular intervals

- repeats several times + find mean

Plot graph to see if changing abiotic factor

Explain the effects of drought on an ecosystem

concurrent factor

Biotic factors and communities

State what biotic factors are

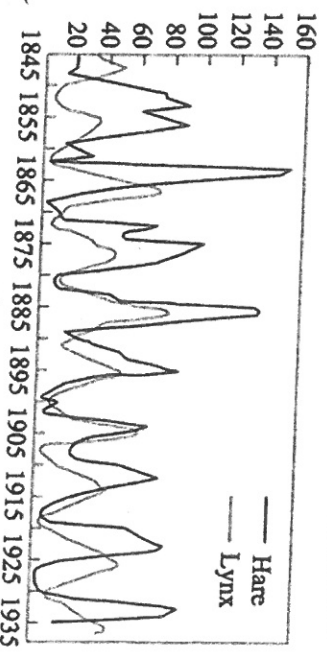
living factors

Name some biotic factors organisms will compete for

Food, Competition, Habitat, Predation

Describe how introducing a predator can affect a community

It may decrease the number of prey species as they would remove their food source



Identify the predator: Lynx

Identify the prey: Hare

Explain your answers

The lynx population increases as the hare population decreases

mutualism (both benefit)

# Relationship between two species of plants/animals in which one benefits at the expense of the other

## Parasitism and mutualism

### Define parasitism

The presence of living as a parasite on another animal or organism  
 Explain how a tapeworm is adapted to living inside its hosts (intestines)

Hooks + suckers attach the worms head to intestine  
 Flattened body - absorption of nutrients  
 over whole surface  
 male + female sex organs so fert. usurer  
 Explain how headlice are adapted to living on hair and skin

Sharp mouthparts can pierce skin + suck blood  
 Sharp claws grip on to hair/skin  
 eggs are glued to hairs to prevent falling off

### Define mutualism

A relationship between 2 organisms from which both organisms benefit.

Tube worms live near hydrothermal vents. Tube worms and chemosynthetic bacteria have a mutualistic relationship. Explain how.



Tube worms host chemosynthetic bacteria inside their bodies. The bacteria is self from predators and bacteria uses the products produced by the bacteria to survive.

## Biodiversity and humans

### Explain the advantages of fish farming

- Protein source: globally produce more fish so reduce overfishing of wild fish (increased population)

### Explain the disadvantages of fish farming

lots of fish in small space - creates bad of faeces from the fish, sink to the bottom of water. can change conditions - many harm wild organisms that live there parasites + diseases spread more easily between fish in pens

### Describe the difference between indigenous and non-indigenous

indigenous = native  
 - animals been here  
 non-indigenous = doesn't naturally occur  
 Describe how the overuse of fertilisers in a field can nearby can cause fish in the lake to die

### Eutrophication

run the wash into lake / increase in nutrients  
 algae/bacteria on surface of water  
 - block out light  
 - plants can't photosynthesise due to lack of light + start to die / decompose  
 - Microorganisms move in + use up oxygen through respiration  
 - organisms (fish) that need oxygen for aerobic respiration die

## Preserving biodiversity

### Describe what reforestation is

land where forest previously stood is replanted to form a new forest.

### Describe what conservation is

when an effort is made to protect area of endangered species/habitat

### Explain why endangered organisms are being kept in captivity.

To increase their numbers

## The water cycle

### Describe how water is cycled in the water cycle

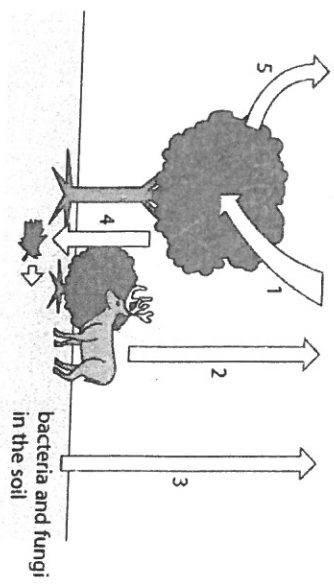
- Evaporation / transpiration = water-vapour  
 - clouds + condenses to form clouds  
 - falls as precipitation on land (rain / snow / hail) as freshwater  
 - drains into the sea + where process starts again

### Describe the process of desalination

To produce potable water from salt water  
 - Removes salts (minerals) from salt water  
 - Distillation - water is boiled + evaporates - cools + condenses



The carbon cycle



Identify processes that increase levels of carbon dioxide in the atmosphere

Respiration, combustion, decay

Identify processes that decrease levels of carbon dioxide in the atmosphere

Photosynthesis

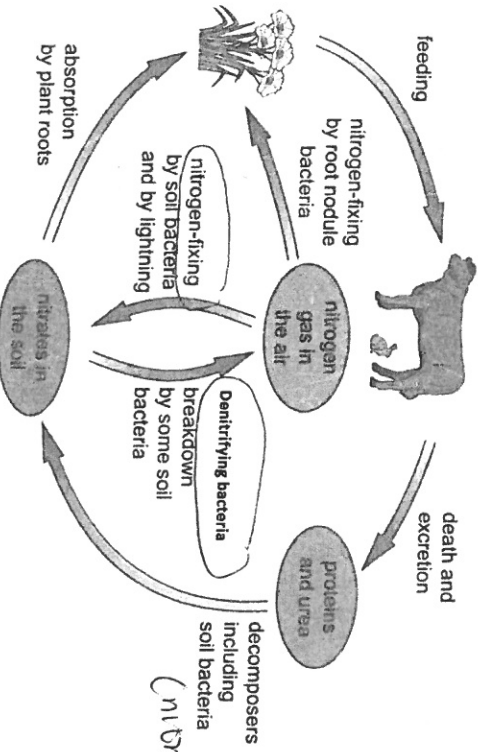
Describe the role of decomposers in the carbon cycle

Release CO<sub>2</sub> back into atmosphere by respiration as they break down material

Explain the effect on the carbon cycle with an increasing population

Increased respiration - ↑ CO<sub>2</sub>  
Deforestation (houses)  
Use fossil fuels being burnt  
↑ CO<sub>2</sub>

The nitrogen cycle



State what nitrates are needed for in plants

to make proteins to grow

Explain the role of bacteria in producing nitrates available to plants

Nitrifying bacteria -> turn ammonia into nitrates

Nitrogen-fixing bacteria -> turn atmospheric nitrogen into nitrates

Denitrifying bacteria -> nitrates into atmospheric nitrogen

Explain how crop rotation can ensure levels of nitrates in the soil remain high

Different crops are grown each year in a cycle. Includes nitrogen-fixing crops (beans, peas) which help to put nitrates back into the soil. Describe how nitrates in plants are cycled to become nitrates in the soil.

Plants are eaten by animals - the excretion decomposes + nitrifying bacteria make in and burn ammonia into nitrates in the soil.

from the crop to use the following year

