

Phagocytes	Phagocytosis	Phagocytes engulf the pathogens and digest them.	
Lymphocytes	Antibody production	Specific antibodies destroy the pathogen. This takes time so an infection can occur. If a person is infected again by the same pathogen, the lymphocytes make antibodies much faster.	
	Antitoxin production	Antitoxin is a type of antibody produced to counteract the toxins produced by bacteria.	

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oxin is a type of antibody produced to teract the toxins produced by bacteria.			
AQA GCSE INFECTION AND RESPONSE part 1			
Plants have several ways of			

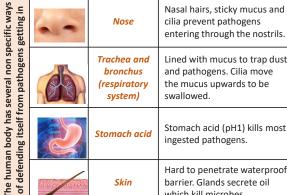
White blood cells are Immune system Human defence systems

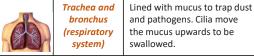
part of the immune

systems

Non-specific defence

Pathogens are identified by white blood cells by the different proteins on their surfaces ANTIGENS.







Hard to penetrate waterproof Skin barrier. Glands secrete oil which kill microbes

Pathogens may infect plants or animals and can be spread by direct contact, water or air

Identification Detection φ Stunted growth Detection and identification plant diseases (bio only) Reference using Spots on leaves gardening manual Area of decay or website, growths laboratory test for pathogens, testing Malformed kit using stem/leaves monoclonal Discolouration antibodies. Presence of pests

Bacteria

or nucleus).

organisms

celled

Cell wall. Single

coat

Nitrate ions needed for protein synthesis - lack of nitrate = stunted growth.

Magnesium ions needed to make chlorophyll not enough leads to chlorosis - leaves turn yellow.

Protists

Usually single

celled.

Bacteria may produce toxins that damage tissues and make us fell ill

Physical	Mechanical
Thick waxy layers, cell walls stop pathogen entry	Thorns, curling up leaves to prevent being eaten
Chemical	

defending themselves from

pathogens and animals

Antibacterial and toxins made by plant

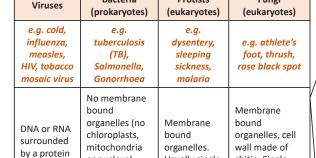
Fungi

chitin. Single

cellular

celled or multi-

р	Pathogen	Disease	Symptoms	Method of transmission	Control of spread
ι	Virus	Measles	Fever, red skin rash.	Droplet infection from sneezes and coughs.	Vaccination as a child.
nt	Virus	HIV	Initially flu like systems, serious damage to immune system.	Sexual contact and exchange of body fluids.	Anti-retroviral drugs and use of condoms.
	Virus	Tobacco mosaic virus	Mosaic pattern on leaves.	Enters via wounds in epidermis caused by pests.	Remove infected leaves and control pests that damage the leaves.
/	Bacteria	Salmonella	Fever, cramp, vomiting, diarrhoea.	Food prepared in unhygienic conditions or not cooked properly.	Improve food hygiene, wash hands, vaccinate poultry, cook food thoroughly.
	Bacteria	Gonorrhoea	Green discharge from penis or vagina.	Direct sexual contact or exchange of body fluids.	Use condoms. Treatment using antibiotics.
	Protists	Malaria	Recurrent fever.	By an animal vector (mosquitoes).	Prevent breeding of mosquitoes. Use of nets to prevent bites.
	Fungus	Rose black spot	Purple black spots on leaves.	Spores carried via wind or water.	Remove infected leaves. Spray with fungicide.



Communicable diseases Pathogens organisms disease Viruses live and reproduce inside cells causing damage





Traditionally drugs were extracted from plants and microorganisms **Digitalis Aspirin** Penicillin Most new drugs are synthesised by chemists in the pharmaceutical industry. Discovered by A painkiller and Extracted from anti-Alexander foxglove plants inflammatory Fleming from and used as a that was first the Penicillium heart drug found in willow mould and used as an antibiotic bark

Drugs have to be tested and trialled before to check they are safe and effective

	re /	Efficacy	Make sure the drug works	
	New drugs a extensively tested for	Toxicity	Check that the drug is not poisonous	
		Dose	The most suitable amount to take	

Preclinical trials - using cells, tissues and live animals - must be carried out before the drug can be tested on humans.

Clinical trials use healthy volunteers and patients

Stage 1	Stage 2	Stage 3	Stage 4
Healthy volunteers try small dose of the drug to check it is safe record any side effects	A small number of patients try the drug at a low dose to see if it works	A larger number of patients; different doses are trialled to find the optimum dose	A double blind trial will occur. The patients are divided into groups. Some will be given the drug and some a placebo.

Antibiotics have greatly reduced deaths **Antibiotics and** from infectious bacterial disease painkillers antibiotics e.g. penicillin Bacteria can antibiotics. mutate **Painkillers** Sometimes this makes

antibiotic drugs. Discovery

them resistant to

and drug

development

Double blind trial:

patients and scientists do

not know who receives the new drug or placebo

until the end of the trial.

This avoids bias

AQA INFECTION AND **RESPONSE** Kill infective bacteria inside the body. Specific bacterial infections require specific

e.g. aspirin, paracetamol, ibuprofen

Drugs that are used to treat the symptoms of a disease. They do not kill pathogens

Vaccination

because viruses live and reproduce inside cells

A person is unlikely to suffer the symptoms of the harmful disease and it's spread in a population is prevented

Antibiotics

cannot be

use to

treat viral

pathogens

It is difficult to

develop drugs

to kill viruses

without harming body

tissues

Used to immunise a large proportion of the population to prevent the spread of a pathogen

Small amount Vaccination of dead or inactive form of the pathogen

1st infection by pathogen

and other

medicines

Re-infection by the same pathogen

White blood cells detect pathogens in the vaccine. Antibodies are released into the

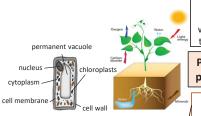
White blood cells detect pathogens. Antibodies are made much faster and in larger amounts.

Created more side effects than expected (fatal in some cases) and are not as widely used as everybody hoped when first developed

A placebo can look identical to the new drug but contain no active ingredients

Monoclonal antibodies can be used in a variety of ways			
Diagnosis	Detecting pathogens	Detecting molecules	Treatment
e.g. pregnancy test – measure the level of hormones	Can detect very small quantities of chemicals in the blood	Fluorescent dye can be attached so it can be seen inside cells or tissues	Bound to radioactive substance, toxic drug or chemical Cancer cells are targeted to normal body cells are unharmed





Respiration, stored as insoluble starch, fats or oils for storage, cellulose for cell walls, combine with nitrates from the soil to form amino acids for protein synthesis

Plants use the glucose produced in photosynthesis in a variety of ways

Photosynthetic reaction

Limiting factors (why the rate stops

The plant manufactures glucose from carbon dioxide and water using energy transferred from the environment to the chloroplasts by light

Plants make use **Photosynthesis** of light energy from the environment (ENDOTHERMIC) to make food (glucose)

Carbon dioxide + Water → Oxvgen + Glucose

 \rightarrow O₂ + C₆H₁₂O₆

The rate of photosynthesis is affected by temperature, light intensity, carbon dioxide concentration, and the amount of chlorophyll

How the rate is affected

(photosynthesis)

	ractor	now the rate is affected	going up)
ynthesis	Temperature	As the temperature of the environment the plant is in increases rate of photosynthesis increases (up to a point) as there is more energy for the chemical reaction.	Photosynthesis is an enzyme controlled reaction. If the temperature increases too much, then the enzymes become denatured and the rate of reaction will decrease and stop
Factors affecting the rate of photosynthesis	Light intensity	Light intensity increases as the distance between the plant and the light sources increases. As light intensity increases so does the rate of photosynthesis (up to a point) as more energy is available for the chemical reaction.	At point X another factor is limiting the rate of photosynthesis. This could be carbon dioxide concentration, temperature or the amount of chlorophyll
Factors affecti	Carbon dioxide concentration	Carbon dioxide is needed for plants to make glucose. The rate of photosynthesis will increase when a plant is given higher concentrations of carbon dioxide (up to a point).	At point X another factor is limiting the rate of photosynthesis. This could be light intensity, temperature or the amount of chlorophyll
	Amount of chlorophyll	Chlorophyll is a photosynthetic pigment that absorbs light and allows the reaction between water and carbon dioxide to occur	Another factor could limit the rate of photosynthesis. This could be light intensity, temperature or the carbon dioxide concentration

Control conditions in enhouses to reduce limiting cors can improve crop yields Used to provide optimum Heating temperatures for maximum plant growth. Enhances the natural sunlight **Artificial** greenhouses to r factors can impro especially overnight and on lighting cloudy days. Extra Gas can be pumped into the air carbon inside the greenhouse. dioxide

AQA GCSE BIOENERGETICS part

Light Intensity

0.1

Carbon dioxide concentration %

Rate of photosynthesis

means that if you double the rou quarter the light intensity Graph lines C and D: If temperature is increased by 10°C then a slight increase in rate of photosynthesis occurs.

This

aw.

square

inverse

the opeys

intensity

Light inte distance k

between the plant

dioxide concentration and temperature are increased the rate of photosynthesis increases significantly up to a **Graph lines A**

Graph line A: Rate could be limited by temperature and/or amount of chlorophyll. Plant tissue can be damaged when carbon dioxide concentrations exceed 0.1%

Growers must balance the economics of additional costs of controlling the conditions to maximise photosynthesis with making a profit.

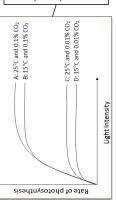


Rate of photosynthesis HT Only

Explain graphs of

two or three factors and decide which is the limiting factor

Graph Lines A and B: If carbon dioxide concentration is increased from 0.01% to 0.1% then a large increase in rate occurs up to a point.



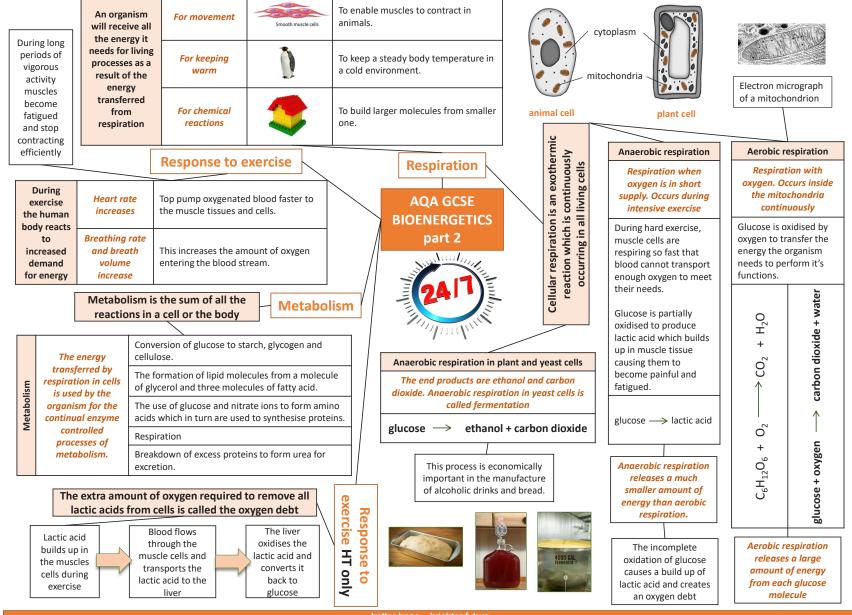
better hope - brighter fu

Rate of photosy



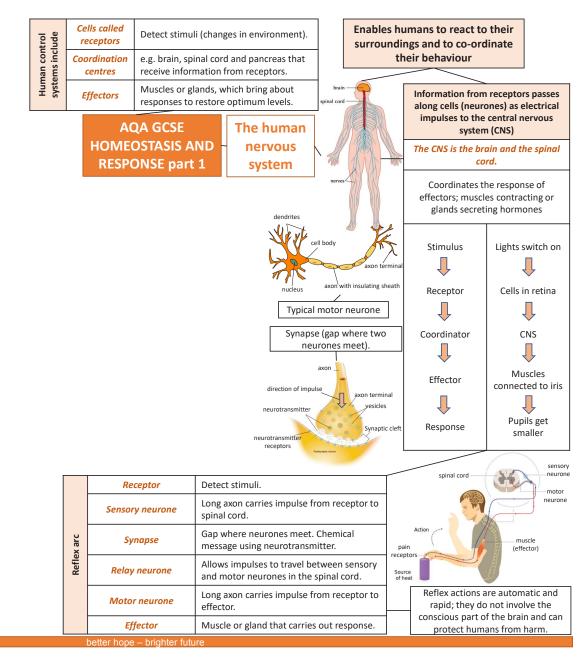






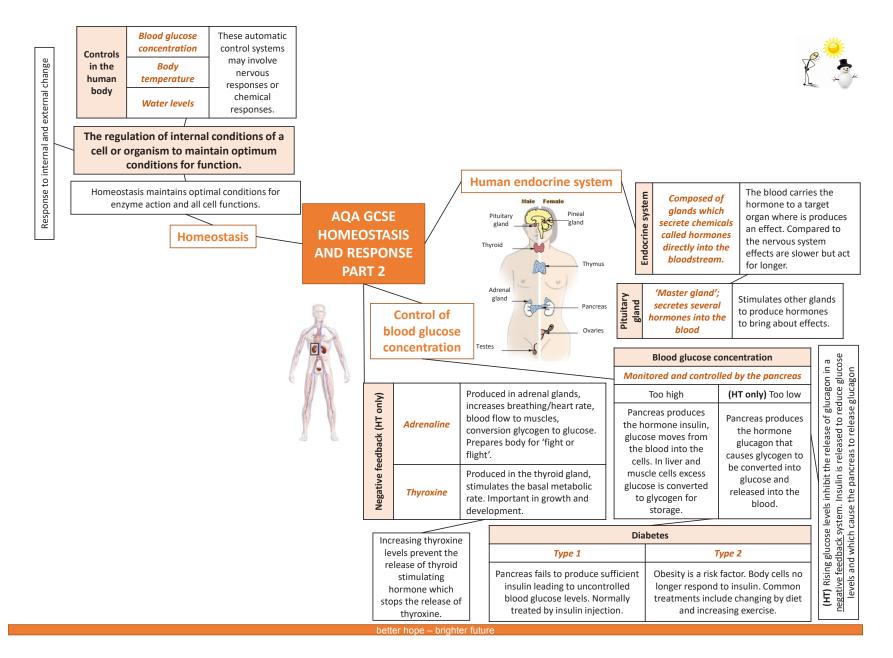






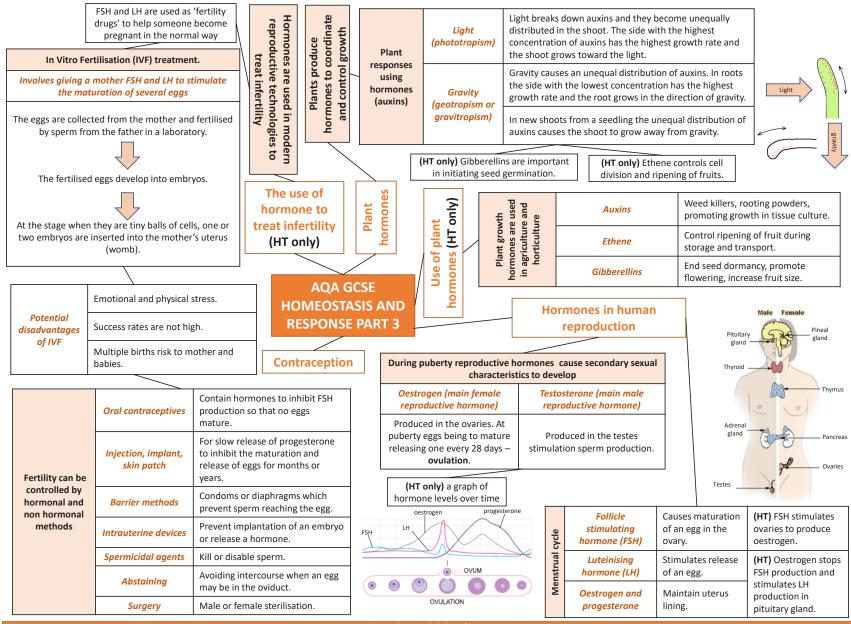
















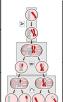
Meiosis halves the number of chromosomes

Gametes are made in reproductive organs (in animals ovaries and testes)

Copies of the genetic information are made.

The cell divides twice to form four gametes each with single set of chromosomes.

All gametes are genetically different from each other.



Sexual reproduction involves the fusion of male and female gametes.

Asexual reproduction involves only one parent and no fusion of gametes.

AQA GCSE INHERITANCE,

VARIATION AND

EVOLUTION Part 1

Sperm and egg in animals.

Pollen and egg cells in flowering plants.

e.g. cloning of females only in an aphid population. Produced by meiosis. There is mixing of genetic information which leads to a variety in the offspring.

Only mitosis is involved. There is no mixing of genetic information. This leads to genetically identical clones.



Gametes join at fertilisation to restore the number of chromosomes

Meiosis

Cells divide by

meiosis to

form gametes

The new cell divides by mitosis. The number of cells increase. As the embryo develops cells differentiate.

Meiosis leads to non-identical cells being formed while mitosis leads to identical cells

being formed

proteins e.g. and enzyme active site will change or a structural protein loses its Sexual and asexual reproduction

strength

Some change the shape

and affect the function of

Most do not (HT) Making new proteins alter the (protein synthesis) protein so that

its appearance Composed of chains of or function is amino acids. A sequence of not changed. 3 bases codes for a particular amino acid.

Mutations occur continuously (HT only)

Protein synthesis (HT only)

In DNA the complementa ry strands C, A. T. G always link in the same way. C always linked to G on the opposite strand and A

to T.

When the protein chain is complete it folds to form a unique shape. This allows

proteins to do their job as enzymes, hormones or new structures such as collagen.

DNA in the nucleus unravels.

Enzymes make a copy of the DNA strand called mRNA.

mRNA moves from the nucleus to ribosome in the cytoplasm.

Ribosomes translate each 3 bases into amino acids according to mRNA template

Ribosomes link amino acids brought by carrier proteins.

A long chain of amino acids form. Their specific order forms a specific protein.

A sequence of 3 bases is the code for a particular amino acid. The order of bases controls the order in which each amino acid is assemble to produce a specific protein.

DNA structure

Genetic material in the

nucleus is composed of

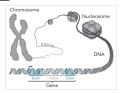
a chemical called DNA.

DNA and

the genome

Polymer made up of two strands formina a double helix.

Contained in structures called chromosomes. A gene is a small section of DNA on a chromosome. Each gene codes for a sequence of amino acids to make a specific protein.



The genome is the entire genetic material of an organism.

> human genome has now been studied.

It is of great importance for future medical developments

Searching for genes linked to different types of disease.

Understanding and treatment

Tracing migration patterns

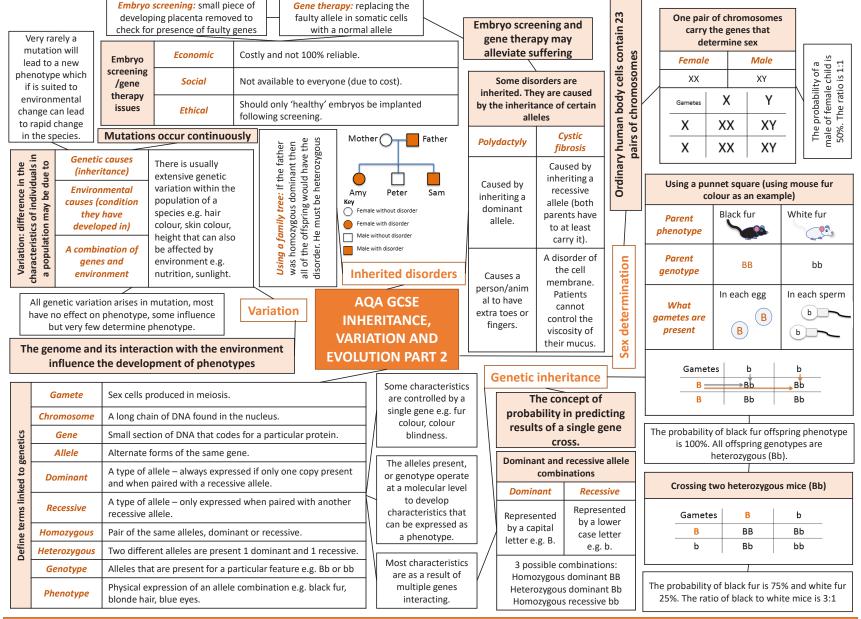
The whole

of inherited disorders.

from the past.











Over time this results in the formation of new species. The theory of evolution by natural selection. A change in the inherited characteristics of a population over time through the process of natural

Scottish Blackface

Through natural selection of variants (genotypes) that give rise to phenotypes best suited to their environment or environmental change e.g. stronger, faster. This allows for variants to pass on their genotype to the next generation.

经纪念中

Classification of living organisms **Evolutionary trees are a method** used by scientists to show how organisms are related **Choosing characteristics**

Use current classification data for living organisms and fossil data for extinct organisms



Desired characteristics are chosen for usefulness or appearance

Disease resistance in food crops.



Animals which produce more meat or milk.



Domestic dogs with a gentle nature.



Large or unusual flowers.





have

Selective breeding can lead to 'inbreeding' where some breeds are particularly prone to disease or inherited defects e.g. British Bulldogs h breathing difficulties.

Concern: effect of GMO on wild populations of flowers and insects.

> Genes from the chromosomes of humans or other organisms can be 'cut out' and transferred to the cells of other organisms.

Genetically modified crops (GMO)

Crops that have genes from other organisms To become more resistant to insect attack or herbicides.

To increase the vield of the crop.

Species of all living evolved

selection.

Finn-Dorset (Nuclear Donor)

Direct Current Pulse

Cloning

(Biology

only)

Tissue

culture

Cuttinas

Embryo

transplants

things have from simple life forms that first developed 3 billion years ago.

If two populations of one species become so different in phenotype that they can no longer interbreed to produce fertile offspring they have formed two new species.

Evolution

AQA GCSE

INHERITANCE

VARIATION

AND

EVOLUTION

PART 3

Small groups of cells to

grow new plants. Important

for preservation of rare

plants and commercially in

nurseries.

Part of a plant is cut off and

grown into full plant.

Splitting apart cells from

animals embryo before they

become specialised. New

clone embryos are inserted

into womb of adult female.

Concern: some people have ethical

objections to adult cell cloning e.g.

welfare of the animals.

Cloning techniques in plants/animals



Humans have been doing this for thousands of years since they first bred food from crops and domesticated animals.

The process by which humans breed plants/animals for particular genetic characteristics

> Selective breeding

Genetic engineering

Modern medical is exploring the possibility of GM to over come inherited disorders e.g. cystic fibrosis

Selective breeding

Choosing parents with the desired characteristics from a mixed population

Chosen parents are bred together.

From the offspring those with desired characteristics are bred together.

Repeat over several generations until all the offspring show the desired characteristics.

Concern: effect of GMO on human health not fully explored

- 3. Vector inserts genes into the required
- 4. Genes are transferred to the required characteristics.

Adult cell cloning

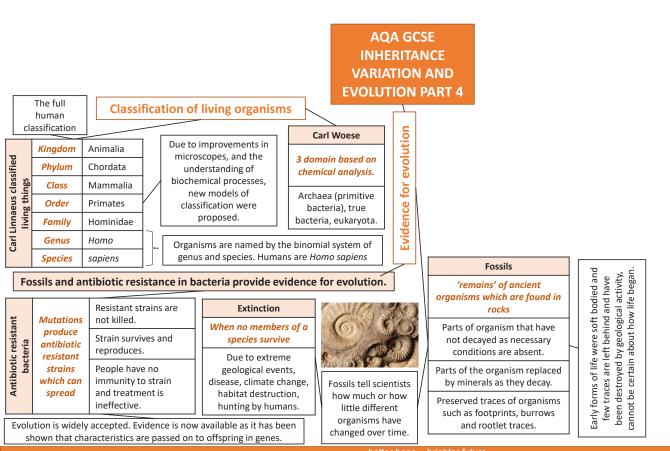
- 1. Nucleus is removed from an unfertilised egg.
- 2. Nucleus from body cell is inserted into egg cell.
- 3. An electric shock stimulates the egg to divide into an embryo
- 4. Embryo cells are genetically identical to adult cells.
- 5. When embryo has developed into ball of cells it is inserted into host womb.

Genetic engineering process (HT only)

- 1. Enzymes are used to isolate the required gene.
- 2. Gene is inserted into a vector bacterial plasmid or virus.
- plants/animals/microbes at an early stage of development so they develop

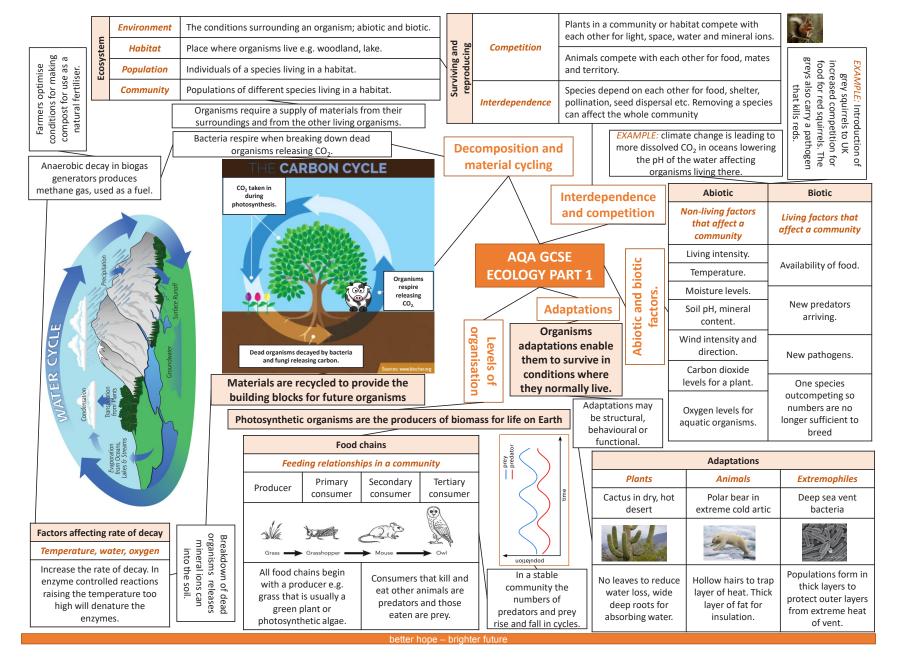










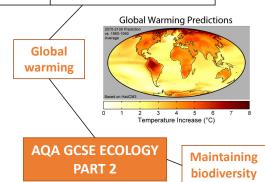






lobal warmin

Levels of CO₂ and methane in the atmosphere are increasing. Decreased land availability from sea level rise, temperature rise damages delicate habitats, extreme weather events harm populations of plants and animals. There is a global consensus about global warming and climate change based on systematic reviews of thousands of peer reviewed publications.



Human activity can have a positive impact on biodiversity

Scientists and concerned citizens

Put in place programmes to reduce the negative impacts of humans on ecosystems and biodiversity

Breeding programmes for endangered species.

Protection and regeneration of rare habitats.

Reintroduction of field margins and hedgerows in agricultural areas where farmers grow only one type of crop.

Reduction of deforestation and CO₂ emissions by some governments.

Recycling resources rather than dumping waste in landfill.

Some of the programmes potentially conflict with human needs for land use, food production and high living standards.

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