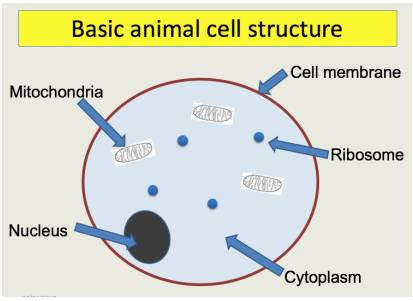
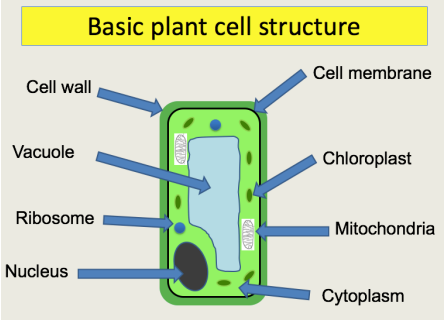
Biology Key Knowledge Paper 1

Function of cell parts

- Nucleus – controls the cell, contains DNA
- Cell membrane – allows substances in and out
- Cell wall – shape, structure, support
- Mitochondria – respiration
- Ribosomes – make protein
- Vacuole (plant only) – stores water and sap
- Chloroplast (plant only) - photosynthesis
- Cytoplasm – liquid that fills the cell, chemical reactions occur here





Magnification

- Magnification = Image size ÷ actual size
- Magnification = eyepiece lens x objective lens

Eukaryotic cells

- Have a nucleus. Eg. Animal, plant cells

Prokaryotic cells

- Do not have a nucleus. Eg. bacteria

Stem cells

- Mainly found in the embryo
- Can differentiate – this means turn into any other type of cell

The cell cycle

- Stage 1 – chromosomes and cell organelles copied
- Stage 2 – called mitosis. Chromosomes move to each end of the cell
- Stage 3 – called cytokinesis. Cell splits into two identical cells
- Cell cycle needed for growth and repair

Diffusion

- Movement of particles
- From a high concentration to a low concentration

Osmosis

- Movement of water
- From a high concentration to a low concentration
- Across a partially permeable membrane

Active transport

- Movement of mineral ions
- From a low concentration to a high concentration
- Requires input of energy

Topic 1
Cell Biology

Biology Key Knowledge Paper 1

Organisation
- Cells are the basic building blocks of all living organisms
- Tissues are groups of cells with a similar structure and function
- Organs are groups of tissues performing specific functions
- Organs are grouped into organ systems, which work together to form organisms

Food tests – reagents (chemicals) needed and colour change
- Sugar – Benedict's reagent, blue → green → orange → red
- Starch – Iodine, orange → blue-black
- Protein – Biuret reagent, blue → purple
- Lipids – ethanol, clear → cloudy

Digestive system
- Bile is made in the liver and stored in the gall bladder
- Bile is alkaline to neutralize hydrochloric acid from the stomach
- Bile emulsifies fat to form small droplets which increases the surface area

Enzymes
- Enzymes work by the lock and key method - special shape is called the active site
- Active site can be changed by high or low temperatures and pH
- An enzyme with a damaged active site is denatured

Name of enzyme	Where made in the body	Breaks down → into
Amylase	Salivary glands, pancreas, small intestine	Starch → glucose
Protease	Stomach, pancreas, small intestine	Protein → amino acids
Lipase	Pancreas, small intestine	Lipids → fatty acids + glycerol

Structure of the blood
- Red blood cells – contain haemoglobin to carry oxygen, bi-concave shape for large surface area
- White blood cells – defends against pathogens
- Platelets – cause blood to clot
- Plasma – liquid part of the blood, carries CO_2, hormones and nutrients

The heart
- Right side carries deoxygenated blood
- Right side pumps blood to the lungs to collect oxygen
- Left side carries oxygenated blood
- Left side thicker to pump blood all around the body
- Heart has 4 chambers
- Pacemaker cells found in the right atrium

Topic 2 Organisation

Biology Key Knowledge Paper 1

Blood vessels
- Arteries – thick muscular walls, blood under high pressure, takes blood away from the heart
- Veins – large lumen, lower pressure, valves prevent backflow of blood, takes blood to the heart
- Capillaries – one cell thick to allow diffusion of oxygen and nutrients into cells and CO_2 out of cells

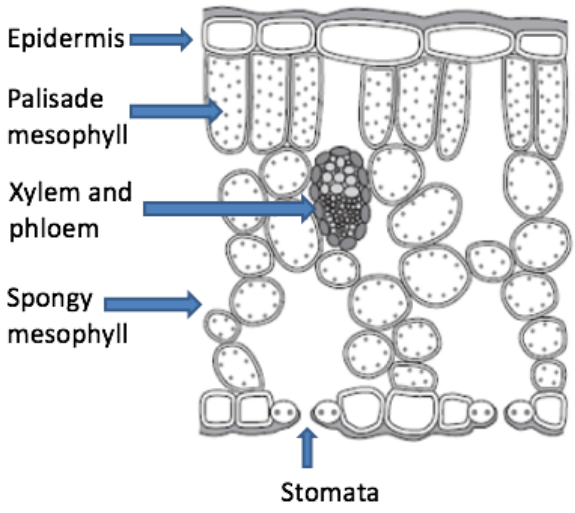
Heart disease
- Layers of fatty material build up inside arteries, reducing flow of blood and oxygen
- Stents used to keep he arteries open
- Statins used to reduce build up of fatty material
- Faulty heart valves can be replaced with biological or mechanical valves

The lungs
- Air enters the lungs via the trachea (windpipe) and bronchi
- Alveoli are tiny air sacs surrounded by capillaries
- Alveoli have large surface area and thin walls to allow diffusion of gases

Plant tissues
- Epidermal tissues
- Palisade mesophyll
- Spongy mesophyll
- Xylem and phloem
- Meristem tissue found at the growing tips of shoots and roots
- The leaf is a plant organ

Plant structures
- Root hair cells have a large surface area to allow absorption of water and mineral ions
- Xylem vessels transport water and mineral ions from roots to leaves
- Phloem tubes transport sugars around plants
- Movement of sugars in plants is called translocation
- Stomata and guard cells in leaves control gas exchange and water loss

Transpiration
- Movement of water through a plant
- Water enters through root hair cells
- Factors that increase rate of transpiration include:
- Increasing temperature
- Increasing air movement
- Increasing light intensity
- Reducing humidity



Topic 2 Organisation

Biology Key Knowledge Paper 1

Pathogens

- Pathogens are microorganisms that cause infectious disease
- Bacteria – may produce toxins that damage tissues and make us feel ill
- Virus – live and reproduce inside cells
- Fungi
- Protists

Disease	Pathogen that causes it	How it is spread
Salmonella	Bacteria	Under cooked food
Gonorrhoea	Bacteria	Sexual contact
Measles	Virus	Airborne
HIV	Virus	Sexual contact, sharing needles
Tobacco mosaic virus	Virus	Direct contact
Rose black spot	Fungus	Airborne or through water
Malaria	Protist	Mosquito vector

Human defence systems

- Skin – physical barrier
- Nose and trachea – have ciliated cells and mucus to trap and remove pathogens
- Stomach – contains acid that destroys pathogens

White blood cells

- Phagocytes – engulf and digest pathogens
- Lymphocytes – produce antibodies
- Antitoxins produced to neutralize toxins

Vaccination

- Introducing small quantities of dead or inactive pathogens
- Stimulates white blood cells to produce antibodies
- If the same pathogen re-enters the body the white blood cells quickly produce the correct antibodies

Antibiotics and other drugs

- Antibiotics only kill bacteria
- The heart drug digitalis comes from foxgloves (a plant)
- Aspirin comes from willow (a plant)
- Penicillin comes from a fungus

Topic 3
Infection & response

Biology Key Knowledge Paper 1

Photosynthesis
- Carbon dioxide + water → glucose + oxygen
- $6CO_2 + 6H_2O \rightarrow C_6H_{12}O_6 + 6O_2$
- Photosynthesis is an endothermic reaction
- Energy is transferred from the environment to the the chloroplasts by light

Limiting factors of photosynthesis
- Temperature
- Light intensity
- Carbon dioxide concentration

Uses of glucose produced by photosynthesis
- Respiration
- Converted into starch for storage
- Used to produce fat or oil for storage
- Used to produce cellulose
- Used to produce amino acids

Respiration
- An exothermic reaction which is continuously occurring in living cells
- Organisms need energy for chemical reactions, movement and keeping warm

Aerobic respiration
- Glucose + oxygen → carbon dioxide + water

Anaerobic respiration
- Glucose → lactic acid

Response to exercise
- Heart rate and breathing rate increase
- To supply muscles with more oxygenated blood
- If not enough oxygen is supplied lactic acid builds up

Metabolism
- The sum of all the reactions in a cell or in the body
- Metabolism includes:
- Conversion of glucose to starch, glycogen and cellulose
- Formation of lipid molecules
- Use of glucose to form amino acids and then proteins
- Respiration
- Breakdown of excess protein to form urea for excretion

Topic 4 Bioenergetics

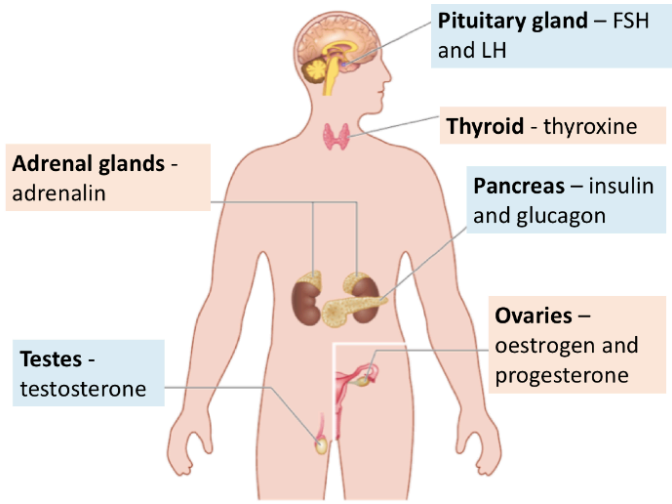
Biology Key Knowledge Paper 2

Homeostasis
- The regulation of internal conditions
- Blood glucose levels
- Body temperature
- Water levels

The central nervous system (CNS)
- Receptor cells detect a stimulus
- Electrical impulses are sent along sensory neurons
- Motor neurons send a message to an effector (muscle or gland)
- Reflex actions do not involve the conscious part of the brain
- A synapse is the gap between two neurons

Hormones
- A hormone is a chemical messenger releases by an endocrine gland
- Hormones carried in the blood to a target organ
- Hormones slower than the nervous system but effects last for longer

Endocrine glands and hormones produced
- Pituitary gland – FSH, LH
- Pancreas – insulin and glucagon
- Thyroid – thyroxine
- Adrenal glands – adrenaline
- Ovary – oestrogen and progesterone
- Testes – testosterone



Type 1 diabetes
- Pancreas does not make insulin
- Have to inject insulin

Type 2 diabetes
- Cells do not respond to insulin
- Managed by diet and exercise
- Obesity is a risk factor

Hormones and reproduction
- Menstrual cycle takes place approximately every 28 days
- FSH causes maturation of an egg in the ovary
- LH stimulates the release of the egg (ovulation)
- Oestrogen and progesterone are involved in maintaining the uterus lining

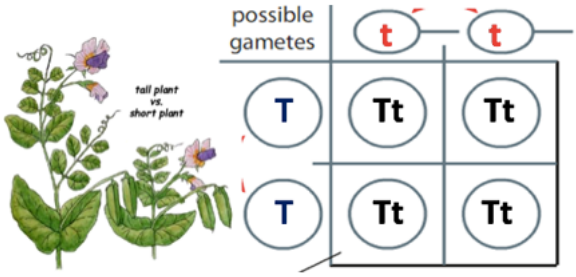
Topic 5
Homeostasis & response

Biology Key Knowledge Paper 2

Sexual and asexual reproduction
- Gametes (sex cells) in animals – sperm and egg
- Gametes in flowering plants – pollen and egg
- Asexual reproduction leads to identical offspring (clones)
- Sexual reproduction leads to variation

Meiosis
- Cells in ovaries and testes divide by meiosis to form gametes
- Cells divide twice to form four gametes
- Gametes are all genetically different and have half the number of chromosomes

DNA and genome
- The genome of an organism is the entire genetic material
- DNA is a double helix structure, 4 base pairs (A-T, C-G)
- A gene is a small section of DNA



Inheritance
- Alleles are different forms of the same gene
- Genotype is the genes in an organism eg. Bb
- Phenotype is the physical characteristic eg. White flowers
- Dominant alleles are always expressed
- Bb = heterozygous BB and bb = homozygous
- Male chromosomes are XY Female chromosomes are XX
- Polydactyly (having extra fingers or toes) is caused by a dominant allele
- Cystic fibrosis (a disorder of cell membranes) is caused by a recessive allele

Evolution
- A change in the environment causes competition
- The best adapted survive, reproduce and pass on their genes
- Evidence for evolution found in the fossil record

Selective breeding
- Desired characteristics are selected, these animals or plants are bred together
- Offspring that show the desired characteristic are bred together

Genetic engineering
- A process which involves modifying the genome of an organism by introducing a gene from another organism

Classification
- Three domain system – archaea, bacteria and eukaryote
- All organisms have a binomial name eg. Humans are *Homo sapiens*

Topic 6
Inheritance, variation & evolution

Biology Key Knowledge Paper 2

Abiotic factors
- Non-living factors that affect a community
- Light intensity
- Temperature
- Water levels
- Soil pH
- Wind intensity
- O_2 and CO_2 levels

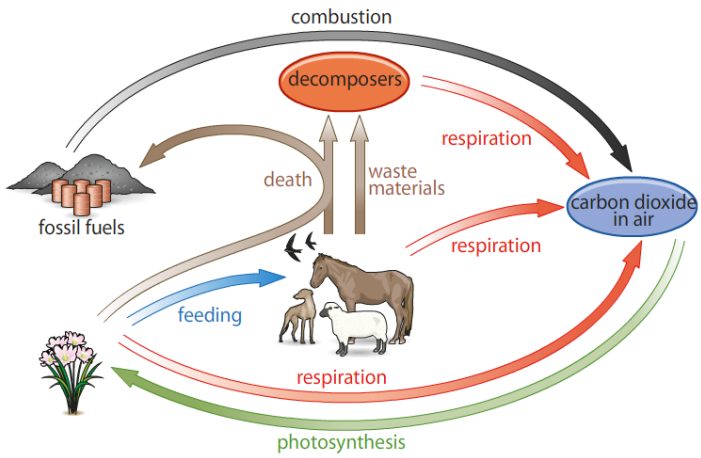
Biotic factors
- Living factors which can affect a community
- Availability of food
- Predators
- Pathogens

Adaptations
- Structural – physical features. Eg. Thick fur, spiky leaves
- Behavioural – things organisms do to survive. Eg. Hide from predators
- Functional – things that help an organism survive. Eg. Photosynthesis in plants

Food chains
- Always start with a producer – usually a green plant or alga which makes glucose by photosynthesis
- Producer → primary consumer → secondary consumer → tertiary consumer

Sampling techniques - Quadrats
- Quadrat – hollow square frame
- Place randomly in the area you wish to sample
- Count up the number of organisms
- Repeat many times and find the average
- Multiply the average by the number of quadrats that will fit into the area

Carbon cycle
- Respiration – organisms release CO_2
- Photosynthesis – plants take in CO_2
- Decomposers – release CO_2
- Combustion – burning fossil fuels releases CO_2



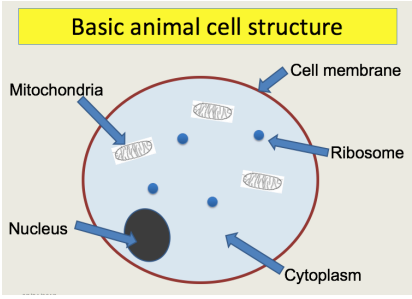
Biodiversity
- The variety of all different species of organisms
- Ways to increase biodiversity:
- Breeding programmes for endangered species
- Reduction of deforestation
- Recycling resources

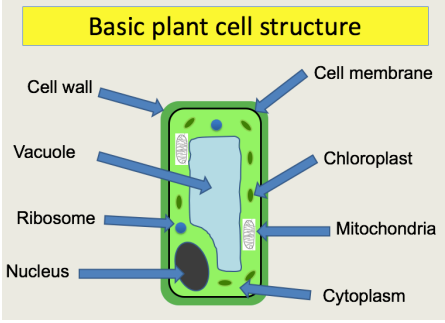
Topic 7 Ecology

Biology Key Knowledge Paper 1

Function of cell parts

- Nucleus – _____
- Cell membrane – _____
- Cell wall – _____
- Mitochondria – _____
- Ribosomes – _____
- Vacuole (plant only) – _____
- Chloroplast (plant only) - _____
- Cytoplasm – _____





Magnification

- Magnification = _____ ÷ _____
- Magnification = _____

Eukaryotic cells

- Have a _____. Eg. _____

Prokaryotic cells

- Do not _____. Eg. _____

Stem cells

- Mainly found in the _____
- Can _____ – this means _____

The cell cycle

- Stage 1 – _____
- Stage 2 – _____
- Stage 3 – _____
- Cell cycle needed _____

Diffusion

- _____
- _____

Osmosis

- _____
- _____
- _____

Active transport

- _____
- _____
- _____

Topic 1
Cell Biology

Biology Key Knowledge Paper 1

Organisation

- Cells are the _____
- Tissues are _____
- Organs are _____
- Organs are grouped into _____, which work together to form _____

Food tests – reagents (chemicals) needed and colour change

- Sugar – _____
- Starch – _____
- Protein – _____
- Lipids – _____

Digestive system

- Bile is made in the _____ and stored in the _____
- Bile is alkaline to _____
- Bile emulsifies _____

Enzymes

- Enzymes work by the _____- special shape is called the _____
- Active site can be changed by _____
- An enzyme with a damaged active site is _____

Name of enzyme	Where made in the body	Breaks down → into
Amylase		
Protease		
Lipase		

Structure of the blood

- Red blood cells – contain _____ to carry _____, bi-concave shape for _____
- White blood cells – _____
- Platelets – _____
- Plasma – _____

The heart

- Right side carries _____
- Right side pumps blood to the _____
- Left side carries _____
- Left side _____
- Heart has _____ chambers
- Pacemaker cells found in the _____

Topic 2 Organisation

Biology Key Knowledge Paper 1

Blood vessels

- Arteries _____
- Veins – _____
- Capillaries – _____

Heart disease

- Layers of fatty material _____
- Stents used to keep _____
- Statins used to _____
- Faulty heart valves can be _____

The lungs

- Air enters the lungs via the _____
- Alveoli are tiny _____
- Alveoli have large _____

Plant tissues

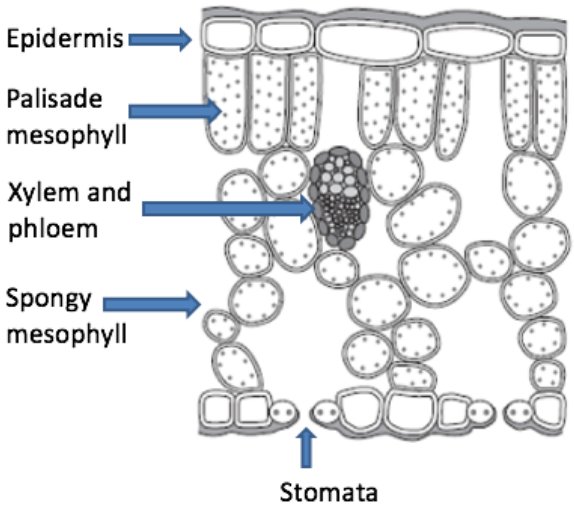
- _____
- _____
- _____
- _____
- _____
- The leaf is a plant _____

Plant structures

- Root hair cells have a large _____
- Xylem vessels transport _____
- Phloem tubes transport _____
- Movement of sugars in plants is called _____
- Stomata and guard cells in leaves control _____

Transpiration

- Movement of _____
- Water enters through _____
- Factors that increase rate of transpiration include:
- Increasing _____
- Increasing _____
- Increasing _____
- Reducing _____



Topic 2 Organisation

Biology Key Knowledge Paper 1

Pathogens

- Pathogens are _____
- Bacteria – _____
- Virus – _____
- _____
- _____

Disease	Pathogen that causes it	How it is spread
Salmonella		
Gonorrhoea		
Measles		
HIV		
Tobacco mosaic virus		
Rose black spot		
Malaria		

Human defence systems

- Skin – _____ barrier
- Nose and trachea – _____
- Stomach – _____

White blood cells

- Phagocytes – _____
- Lymphocytes – _____
- Antitoxins produced to _____

Vaccination

- Introducing small quantities of _____
- Stimulates white blood cells to _____
- If the same pathogen re-enters the body the white blood cells _____

Antibiotics and other drugs

- Antibiotics only kill _____
- The heart drug digitalis comes from _____
- Aspirin comes from _____
- Penicillin comes from _____

Topic 3
Infection & response

Biology Key Knowledge Paper 1

Photosynthesis

- _____ + _____ → _____ + _____
- $6CO_2 + 6H_2O \rightarrow C_6H_{12}O_6 + 6O_2$
- Photosynthesis is an _____ reaction
- Energy is transferred from the environment to the the _____ by _____

Limiting factors of photosynthesis

- _____
- _____
- _____

Uses of glucose produced by photosynthesis

- _____
- _____
- _____
- _____
- _____

Respiration

- An _____ reaction which is continuously occurring in living cells
- Organisms need energy for _____

Aerobic respiration

- _____ + _____ → _____ + _____

Anaerobic respiration

- _____ → _____

Response to exercise

- _____
- _____
- _____

Metabolism

- The sum of all the _____
- Metabolism includes:
- Conversion of glucose to _____
- Formation of _____
- Use of glucose to form _____
- _____
- Breakdown of excess protein to form _____

Topic 4 Bioenergetics

Biology Key Knowledge Paper 2

Homeostasis

- The regulation of _____
- _____
- _____
- _____

The central nervous system (CNS)

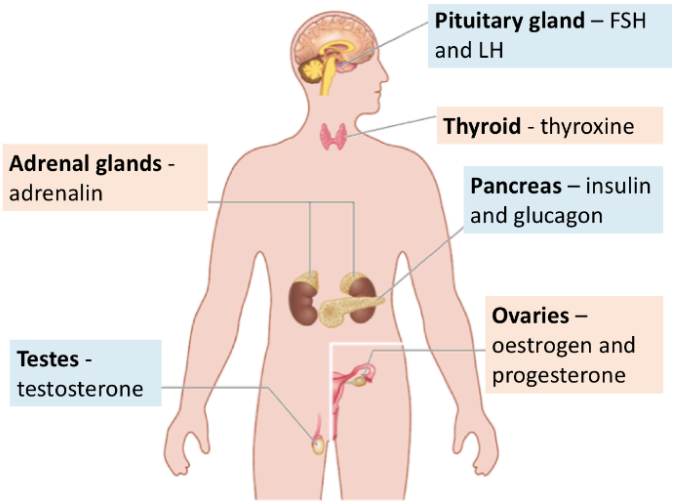
- Receptor cells detect a _____
- Electrical _____ are sent along _____
- Motor neurons send a message to an _____
- Reflex actions do not involve _____
- A synapse is _____

Hormones

- A hormone is a _____
- Hormones carried _____
- Hormones slower _____

Endocrine glands and hormones produced

- Pituitary gland – _____
- Pancreas – _____
- Thyroid – _____
- Adrenal glands – _____
- Ovary – _____
- Testes – _____



Type 1 diabetes

- Pancreas _____
- Have to _____

Type 2 diabetes

- Cells do not _____
- Managed by _____
- Obesity is a _____

Hormones and reproduction

- Menstrual cycle takes place _____
- FSH causes _____
- LH stimulates _____
- Oestrogen and progesterone are _____

Topic 5
Homeostasis & response

Biology Key Knowledge Paper 2

Sexual and asexual reproduction

- Gametes (sex cells) in animals – _____
- Gametes in flowering plants – _____
- Asexual reproduction leads to _____
- Sexual reproduction leads to _____

Meiosis

- Cells in ovaries and testes divide by meiosis to form _____
- Cells divide _____ to form _____ gametes
- Gametes are all _____ and have half the number of _____

DNA and genome

- The genome of an organism is _____
- DNA is a _____
- A gene is a _____

possible gametes	t	t
T	Tt	Tt
T	Tt	Tt

Inheritance

- Alleles are _____
- Genotype is _____
- Phenotype is _____
- Dominant alleles _____
- Bb = _____ BB and bb = _____
- Male chromosomes are _____ Female chromosomes are _____
- Polydactyly (having _____) is caused by a _____ allele
- Cystic fibrosis (_____) is caused by a _____ allele

Evolution

- _____
- _____
- _____

Selective breeding

- _____
- _____

Genetic engineering

- A process which involves modifying the _____ of an organism by introducing a gene from _____

Classification

- Three _____ system – _____
- All organisms have a _____ name eg. Humans are *Homo sapiens*

Topic 6
Inheritance, variation & evolution

Biology Key Knowledge Paper 2

Abiotic factors

- _____ factors that affect a community
- _____
- _____
- _____
- _____
- _____
- _____

Biotic factors

- _____ factors which can affect a community
- _____
- _____
- _____

Adaptations

- Structural – _____
- Behavioural – _____
- Functional – _____

Food chains

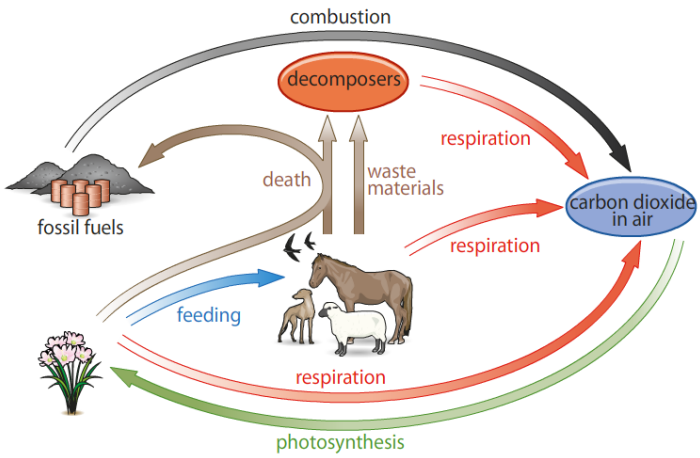
- Always start with a _____ – usually a _____which makes glucose by _____
- Producer → _____ → _____ → _____

Sampling techniques - Quadrats

- Quadrat – _____
- Place _____
- Count up _____
- _____
- _____

Carbon cycle

- _____
- _____
- _____
- _____



Biodiversity

- _____
- Ways to increase biodiversity:
- _____
- _____
- _____

Topic 7 Ecology