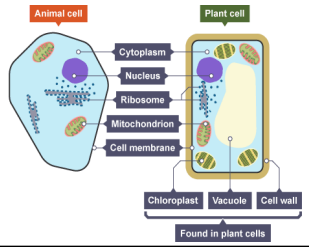
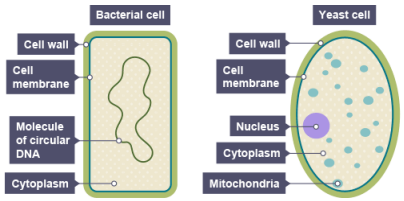
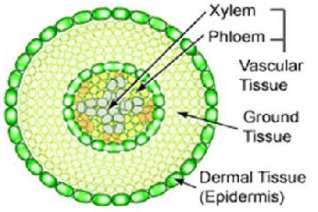
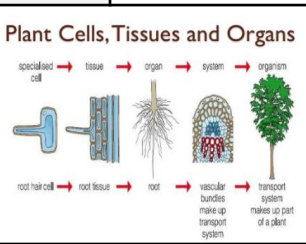
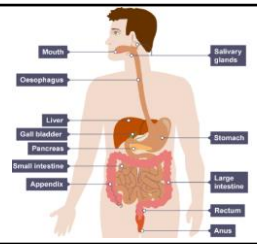
B2 Cells and simple transport

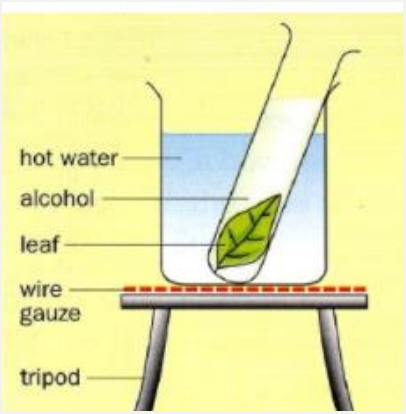
What are the parts of most human and animal cells?	Nucleus, cell membrane, cytoplasm, mitochondria, ribosomes	What is yeast?	A single celled organism made of cytoplasm, nucleus, cell membrane, cell wall
What is the function of the nucleus?	Controls the cell activities	Cells are specialised to carry out their function. Give examples of specialised cells and their adaptations	Red blood cells have no nucleus and a large surface area so there is space to transport oxygen; sperm cells have a middle part filled with mitochondria to release energy required for swimming; root cells have fine hair extensions to increase surface area for water absorption
What is the function of the cell membrane?	Controls the passage of substances into and out of the cell		
What is the function of the cytoplasm?	Where most reactions take place		
What is the function of ribosomes?	Where protein synthesis occurs		
What is the function of mitochondria?	Where most energy is released during respiration		
What are the additional parts of plant cells?	Permanent vacuole, chloroplasts, cell wall	By which process do dissolved substances move in and out of cells?	Diffusion (moving from an area of high concentration to low concentration)
What is the function of the cell wall?	Made of cellulose to strengthen the plant	What affects the rate of diffusion?	The greater the difference in concentration, the greater the rate of diffusion.
What is the function of chloroplasts?	Absorb light energy to make food during photosynthesis	By which process does oxygen diffuse into and out of cells?	Diffusion
What is the function of the permanent vacuole?	Filled with cell sap		
Bacterial cells consist of…	Cytoplasm, cell membrane, cell wall, genes not in distinct nucleus; flagella for movement		

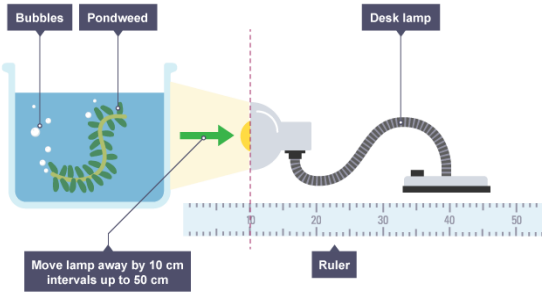
B2 Tissues, Organs and Organ Systems

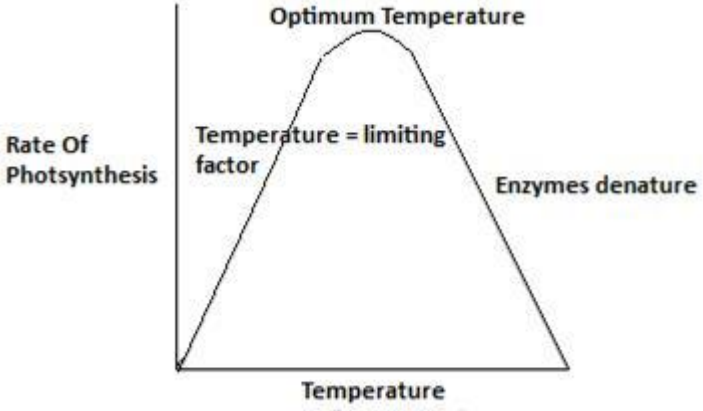
Order these from smallest to largest: organ, cell, tissue, organ system	Cell, tissue, organ, organ system	What is the function of the large intestines?	Absorb water from the undigested food producing faeces
What is tissue?	A group of specialised cells with similar structure performing the same function	What is the function of the liver?	To produce bile
What is an organ?	An aggregation of tissues that perform a specific function; e.g. the stomach is an organ made of muscular tissue to churn the contents, epithelial tissue to cover the inside and outside of the stomach and glandular tissue to produce digestive enzymes	What is the function of the small intestines?	To absorb soluble foods into the blood stream; this is where digestion occurs
		What is the function of the stomach?	This is where digestion occurs
What is an organ system?	A collection of organs that perform a specific function	What is the function of the pancreas and salivary glands?	To produce digestive juices
What is the function of muscular tissue?	To contract to bring about movement	List the plant organs	Roots, stem, leaves
What is the function of epithelial tissue?	To cover specific surfaces (e.g. stomach lining; skin)	Give examples of plant tissues	Epidermal tissue: covers the plant Mesophyll tissue: carries out photosynthesis Xylem and Phloem: transport substances around the plant
What is the function of glandular tissue?	To produce substances such as enzymes and hormones		
Name the components of the digestive system	Salivary glands, oesophagus, stomach, pancreas, liver, small intestines, large intestines	  	

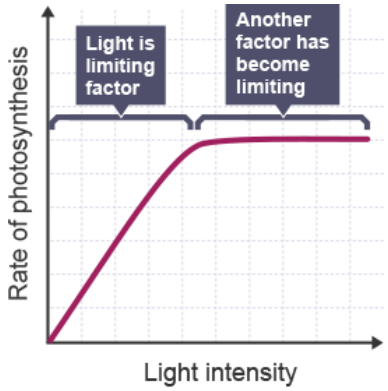
B2 Photosynthesis

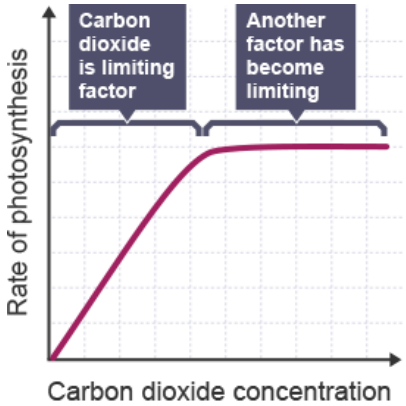
What is the photosynthesis word equation?	carbon dioxide + water $\xrightarrow{\text{light energy}}$ glucose + oxygen
Which part of the plant cell absorbs the light energy?	Chlorophyll inside the chloroplasts
The rate of photosynthesis may be limited by these factors	Shortage of light, low temperature, shortage of CO_2
Plants use the glucose produced during photosynthesis …	To convert it into insoluble starch for storage; for respiration; to produce fat or oil for storage; to produce cellulose to strengthen the cell wall; to produce proteins
What do plants need to absorb from the soil to produce proteins?	Nitrate ions
How to test for starch in a leaf	To test for starch in a leaf 1. Remove a green leaf from the plant 2. Boil the leaf in boiling water Stop enzymatic reactions within cells in leaf 3. Put the boiled leaf in boiling tube containing alcohol (ethanol) Extract chlorophyll as ethanol dissolves lipids in cell membranes 4. Return the leaf to the hot water Softens the leaf and allows penetration of iodine 5. Remove leaf and perform the iodine test



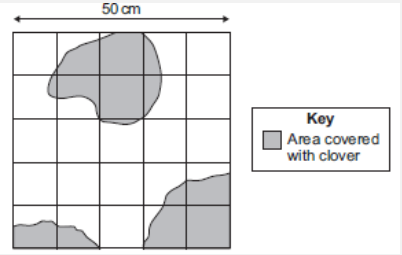
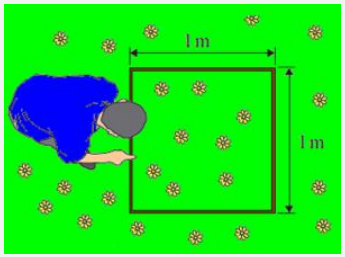


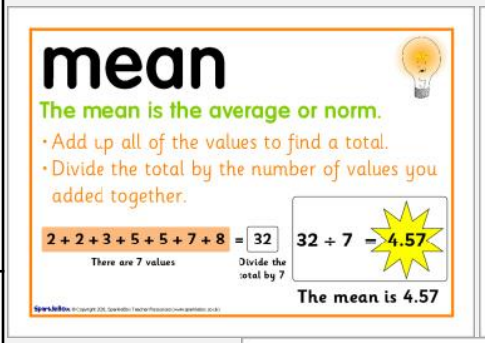


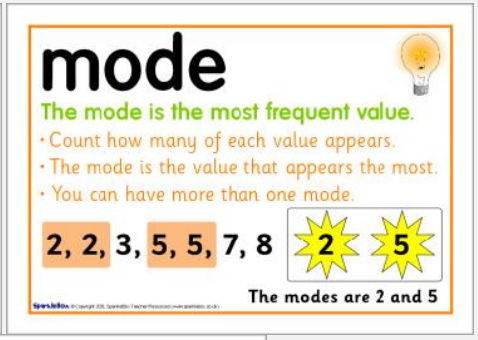


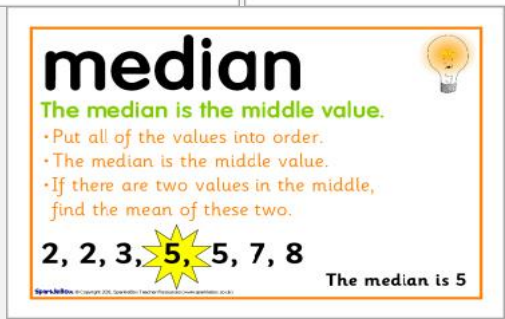


B2 Organisms and their environment

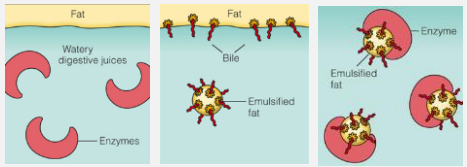
Mean	The average of the numbers	Your sample size should be…	Large to ensure your data is reliable and valid
Median	The middle number of the sequence	How to ensure your data is reliable	Repeat the experiment using the same method and variables
Mode	The number that occurs most often	How to estimate the number of squares covered by an organism 	Count the number of squares that are fully covered and add up the number of squares that are partially covered. In this example the answer is around 7.5.
List physical factors that might affect the distribution of an organism in a habitat	Temperature, availability of nutrients, amount of light, availability of water, oxygen, carbon dioxide		
How to take a random sample of an organism in a habitat 	Use 2 tape measures at right angles along adjacent sides of the field to create x,y axis. Use a random number generator and generate some coordinates; place the quadrat and count the number of organisms. Repeat to get 10 results. Scale up the mean population density.		
How to sample an organism in a habitat using a transect 	Use a tape measure to produce a transect along the sample area. Place the quadrats at regular intervals along the tape and count the organism inside the quadrat. Repeat the transect several times at random or regular intervals along the habitat.		







B2 Proteins and their functions and uses

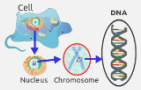
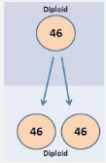
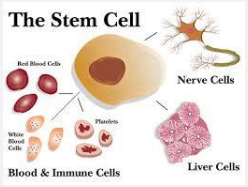
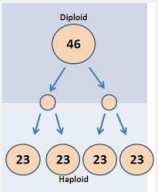
What are proteins made of?	Long chains of amino acids that are folded to produce a specific shape that enables other molecules to fit into the protein.
What functions do proteins carry out in the body?	Act as structural components, such as muscles; hormones, antibodies, catalysts
What are enzymes?	Proteins that act as biological catalysts to increase the rate of chemical reactions.
Do all enzymes work at all pH values?	No; each enzyme works best at a specific pH.
What happens to the shape of the enzyme when the pH is too high or too low and the temperature is too high?	The shape changes. The enzyme can no longer perform its function. We say the enzyme has denatured.
Where do most enzymes, apart from digestive enzymes work?	Inside body cells.
Define digestion	Breaking large, insoluble food molecules into smaller, soluble food molecules to they can be passed into the blood stream in the small intestines.
Where is the enzyme amylase produced?	Salivary glands, pancreas, small intestines
Which food group is broken down by amylase?	Starch into sugars in the mouth and small intestines
Where is the enzyme protease produced?	Stomach, pancreas, small intestines
Which food group is broken down by protease?	Proteins into amino acids in the stomach and small intestines.
Where is the enzyme lipase produced?	Pancreas and small intestines
Which food group is broken down by lipase?	Fats into fatty acids and glycerol in the small intestines.
Why is HCl, produced by the stomach, required?	Because the enzymes in the stomach work best at a low pH
What is the role of bile, produced by the liver and stored in the gall bladder, during digestion? 	To neutralise the acid produced by the stomach and provide alkaline conditions for the enzymes in the small intestines. Bile also acts as an emulsifier. It breaks up large fat molecules into small fat droplets which increases the surface area and makes digestion of fats faster.
Give uses of enzymes that can be used at home and in industry [although enzymes can allow reactions to happen at lower temperature and pressure, enzymes are still expensive to produce themselves]	Biological detergents: lipase and protease [you can now wash clothes at 30^{o}C which saves energy]; baby food: protease to pre-digest food; carbohydrase converts starch to sugar inside sweets as starch is cheaper to buy; slimming foods: isomerase to convert glucose to sweeter fructose- you eat less of sweet food

B2 Respiration

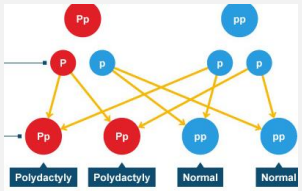
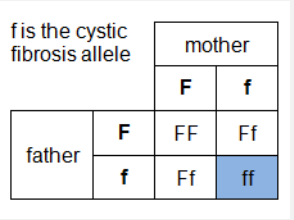
Chemical reactions inside cells are controlled by…	enzymes	Word equation for anaerobic respiration	Glucose → carbon dioxide + lactic acid; less energy released
Define aerobic respiration	Glucose and oxygen → carbon dioxide + water; energy released	Define oxygen debt 	The amount of oxygen needed to break down the lactic acid produced during anaerobic exercise
Where does aerobic respiration take place?	Continuously inside the mitochondria of animal and plant cells		
The energy released during respiration is used….	To build larger molecules from smaller ones; enable muscles to contract in animals; to maintain a steady body temperature; in plants, to build up sugars, nitrates and other nutrients into amino acids and then proteins.	Describe muscle fatigue	Muscles stop contracting efficiently when they are subjected to long periods of vigorous exercises. This is due to the build up of lactic acid in the muscles. Lactic acid is poisonous and causes cramps.
Describe and explain the changes that take place during exercise 	The heart rate increases and the rate and depth of breathing increases to ensure blood flow to muscles increases so the supply of sugar and oxygen increases and carbon dioxide is removed quickly from the cells.	Why do you continue to breathe heavily after exercise?	To ensure oxygen is delivered to muscles to repay the O_2 debt
Muscles store glucose as…	Glycogen. Glycogen is converted back to glucose during exercise.		
Which type of respiration takes place with insufficient oxygen?	Anaerobic respiration.		

Constituent	Inhaled Air	Exhaled Air
Oxygen	20.9%	16%
Carbon dioxide	0.03%	4.0%
Water vapour	Variable	Variable but more than in inhaled air
Nitrogen	78.1%	78.1%
Noble gases	0.94%	0.94%

B2 Cell division and inheritance I

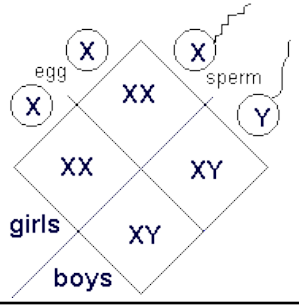
Where are chromosomes found? 	Inside body cells, inside the nucleus. Chromosomes are found in pairs.	Describe what happens at fertilisation	Gametes join and form a single body cell with new pairs of chromosomes. The cell repeatedly divides by mitosis to form a new individual.
What are chromosomes?	Coiled up pieces of DNA that contain the genetic information		
Which cells divide by mitosis?	Body cells	What is the main difference between animal and plant cells?	Most types of animal cells differentiate at an early stage. Many plant cells can differentiate throughout life.
Describe mitosis 	Copies of the chromosomes are made. Then the cell divides once to form two genetically identical body cells.		
When does mitosis occur?	During growth or to produce replacement cells.	What are stem cells? 	Cells from human embryos and adult bone marrow which can be made to differentiate into many different types of cells. Human stem cells can develop into any other cell
How many sets of chromosomes do body cells have?	Two		
How many sets of chromosomes doe sex cells have?	one	What are stem cells used for?	To treat conditions such as paralysis, Parkinson's
What is another term for sex cells?	gametes	Why are many people against stem cell research?	Unethical to use embryonic stem cells as the embryo will be destroyed after extracting the stem cells. Removing bone marrow is very painful.
What is meiosis?	Cell division that leads to gametes; it happens inside the testes and ovaries		
Describe meiosis 	Copies of chromosomes are made. The cell divides twice to form four gametes. Each gamete has a single set of chromosomes.	What is a gene?	A small section of DNA
		What does a gene do?	It codes for a particular combination of amino acids to make a specific protein

B2 Cell division and inheritance II

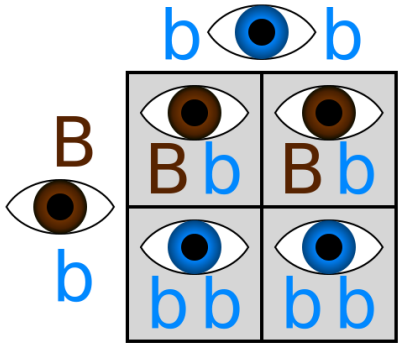
What is sexual reproduction and why does it lead to variety	Gametes fuse; one of each pair of alleles comes from each parent	What is meant by the term homozygous?	The two alleles are the same, e.g. bb or BB
How many pairs of chromosomes are in body cells	23 pairs; 46 chromosomes	What is genetic fingerprinting?	Determining a person's DNA sequence to identify them.
Which are the two sex chromosomes?	X and Y; females have two X chromosomes; males have one X and one Y chromosome	What is polydactyly? 	Having extra fingers or toes- caused by a dominant allele P and can be passed on by only one parent who carries the faulty gene.
Different forms of the same gene are called	alleles		
What is a dominant allele?	An allele that controls the development of a characteristic when it is present on only one of the chromosomes	What is Cystic fibrosis? 	A disorder of cell membranes and the pancreas caused by a recessive allele f of a gene. It must be inherited from both parents. Parents can be carriers but not have the disorder.
What is a recessive allele?	An allele that controls the development of characteristics only if the dominant allele is not present.	What is embryo screening?	Embryos are screened for alleles that cause genetic disorders.
What is meant by the term genotype?	The combination of alleles an organism has, e.g. bb or BB or Bb	Why are there concerns over embryo screening?	It could lead to abortions and the selection of embryos that fit a specific stereotype. During the screening process the embryo might become damaged. The process is expensive. But health care costs could be reduced as no medical care is needed if the embryo is aborted.
What is meant by the term phenotype?	The characteristic shown as a result of the combination of alleles. E.g. Blue eyes		
What meant by the term heterozygous?	The two alleles are different, e.g. Bb		

B2 Cell division and inheritance III

Draw a genetic cross diagram (Punnett square)
to demonstrate that the chance of having a boy is equal to the chance of having a girl



Draw a gentic cross diagram (Punnett square) to show how eye colour is inherited from a blue eyed mother (genotype bb) and a brown eyed father (genotype Bb).



50:50 chance of having blue or brown eyes.

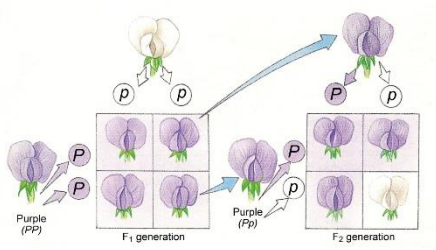
Who was Gregor Mendel?

A monk who pollinated peas with purple flowers with pollen from peas with white flowers.

When all the offspring had purple flowers, he decided to breed the offspring with each other. The result was that some peas has white and some had purple flowers.

What conclusion did Mendel draw from his experiment results?

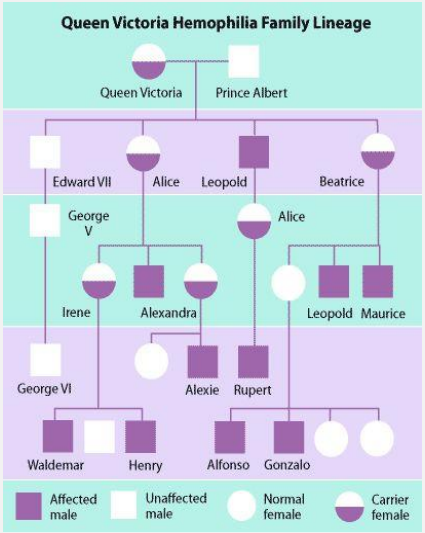
Peas have two factors for colour with one being stronger than the other.



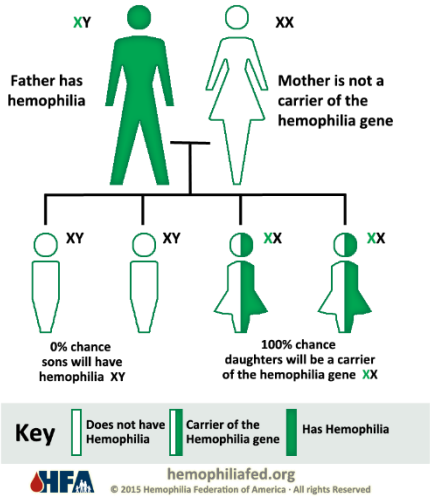
Why did Gregor Mendel not have his work recognised until after his death?

He was a monk rather than a scientist. Genes had not been discovered when he was alive.

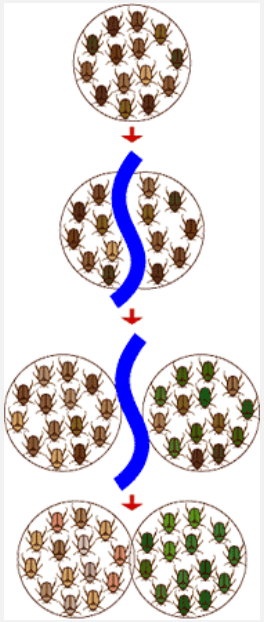
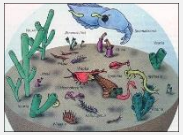
What conclusion can you make about the inheritance pattern for haemophilia?



It is an X-linked recessive inheritance pattern:



B2 Fossils and Speciation

Why can scientists not be certain about how life began?	Not enough fossil evidence; no-one was around at the time	What causes extinction? 	Changes to the environment due to geological activity; new predators; new diseases; new, more successful competitors; single catastrophic event; through speciation
Where does evidence for early forms of life come from?	Fossils		
What are fossils?	The remains of organisms from many years ago, which are found in rocks.	Describe how new species are formed 	1. Isolation – two populations of a species become separated (e.g. as a result of geological or human activity) 2. Genetic variation – each population has a wide range of alleles 3. Natural selection – organisms that have an allele that allows them to survive are able to breed and pass on the allele 4. Speciation – the original two populations are now so different that they could no longer interbreed if they came together. Two new species have formed.
How are fossils formed? 	1. traces, e.g. footprints, burrows, rootlet traces 2. Plant/animal is buried underground. Bones/tissue washed away and replaced by minerals (mould and cast) 3. Trapped in ice/amber so that micro-organisms cannot decompose organism		
Why are few traces of early life forms left behind? 	Many early life forms were soft-bodied which means they left few/faint traces behind. These traces were mainly destroyed by geological activity (volcanic eruptions; washed away by waves)	What is an endemic species? 	Organisms of the endemic species can only be found in one habitat and nowhere else on Earth. They are often found on islands but not exclusively. Example: komodo dragon
Why are scientists interested in fossils?	We can learn how much/little an organisms has changed over time.		