Biology Paper 1

Contents:

• Inheritence, variation and evolution

AQA Biology (8461) from 2016 Topic B4.6 Inheritance, variation and evolution				
Topic	Student Checklist	R	A	G
4.6.1 Reproduction	Describe features of sexual and asexual reproduction			
	Describe what happens during meiosis and compare to mitosis			
	Describe what happens at fertilisation			
	Describe the structure of DNA and its role in storing genetic information inside the cell			
	Explain the term 'genome' and the importance of the human genome (specific examples from spec only)			
	Bio ONLY: Describe the structure of DNA, including knowledge of nucleotide units			
	Bio & HT ONLY: Explain complementary base pairing in DNA			
	Bio & HT ONLY: Explain the relationship between DNA bases (ATCG), amino acids and proteins			
	Bio & HT ONLY: Describe how proteins are synthesised on ribosomes, including protein folding and its importance for protein function			
	Bio & HT ONLY: Explain what mutations are, and the possible effects of mutations			
	Bio & HT ONLY: Explain what non-coding parts of DNA are, and why they are important			
	Describe how characteristics are controlled by one or more genes, including examples			
	Explain important genetic terms: gamete, chromosome, gene, allele, genotype, phenotype, dominant, recessive, homozygous and heterozygous			
	Explain and use Punnet square diagrams, genetic crosses and family trees			
	HT ONLY: Construct Punnet square diagrams to predict the outcomes of a monohybrid cross			
	Describe cystic fibrosis and polydactyly as examples of inherited disorders			
	Evaluate social, economic and ethical issues concerning embryo screening when given appropriate information			
	Describe how the chromosomes are arranged in human body cells, including the function of the sex chromosomes			

• homeostasis and response

AQA Biology (8461) from 2016 Topic B4.5 Homeostasis and response				
Topic	Student Checklist	R	A	G
4.5.1 Homeostasis	Describe what homeostasis is and why it is important stating specific examples from the human body			
	Describe the common features of all control systems			
4.5.2 The human nervous				
	Bio ONLY: Describe how body temperature is monitored and controlled			
	Bio & HT ONLY: Explain how the body's responses act to raise or lower temperature in a given context			
4.5.3 Hormonal coordination in humans	Describe the endocrine system, including the location of the pituitary, pancreas, thyroid, adrenal gland, ovary and testis and the role of hormones			
	State that blood glucose concentration is monitored and controlled by the pancreas			
	Describe the body's response when blood glucose concentration is too high			
	Explain what type 1 and type 2 diabetes are and how they are treated			
	HT ONLY: Describe the body's response when blood glucose concentration is too low			
	HT ONLY: Explain how glucagon interacts with insulin to control blood glucose levels in the body			
	Describe how water, ions and urea are lost from the body			
	Describe the consequences of losing or gaining too much water for body cells			
	HT ONLY: Recall that protein digestion leads to excess amino acids inside the body and describe what happens to these			
	Describe how the kidneys produce urine			
	HT ONLY: Describe the effect of ADH on the permeability of the kidney tubules and explain how the water level in the body is controlled by ADH			
	Describe how kidney failure can be treated by organ transplant or dialysis and recall the basic principles of dialysis			
4.5.4 Plant hormones	*gravitropism and the role of auxin*			
	Bio & HT ONLY: Describe the functions of gibberellins and ethene in plants			
	Required practical 8: investigate the effect of light or gravity on the growth of newly germinated seedling			

• Ecology

AQA Biology (8461) from 2016 Topic B4.7 Ecology				
Topic	Student Checklist	R	A	G
4.7.1 Adaptations, interdependence	Recall what an ecosystem is			
	Describe which resources animals and plants compete for, and why they do this			
	Explain the terms 'interdependence' and 'stable community'			
	Name some abiotic and biotic factors that affect communities			
	Explain how a change in an abiotic or biotic factor might affect a community			
4.7.2 Organisation of an ecosystem	Represent the feeding relationships within a community using a food chain and describe these relationships			
	Explain how and why ecologists use quadrats and transects			
	Describe and interpret predator-prey cycles			
	Required practical 9: measure the population size of a common species in a habitat. Use sampling to investigate the effect of one factor on distribution			
	Describe the processes involved in the carbon cycle			
	Describe the processes involved in the water cycle			
	Bio ONLY: Explain how temperature, water and availability of oxygen affect the rate of decay of biological material			
	Bio ONLY: Explain how the conditions for decay are optimised by farmers and gardeners, and the reasons for this			
	Bio ONLY: Describe how methane gas can be produced from decaying materials for use as a fuel			
	~~*Bio ONLY: Required practical 10: investigate the effect of temperature on the rate of decay of fresh milk by measuring pH change*~~			
4.7.3 Biodiversity and the effect of human interaction on ecosystems				
	Describe the impact of human population growth and increased living standards on resource use and waste production			
	Explain how pollution can occur, and the impacts of pollution			
	Describe how humans reduce the amount of land available for other animals and plants			
	Explain the consequences of peat bog destruction			
	Describe how the composition of the atmosphere is changing, and the impact of this on global warming			
	Describe some biological consequences of global warming			
4.7.4 Trophic levels in an ecosystem				
	Bio ONLY: State how much energy producers absorb from the Sun and how much biomass is transferred			
	Bio ONLY: Explain how biomass is lost between trophic levels, including the consequences of this and calculate efficiency between trophic levels			
4.7.5 Food production	*Bio ONLY: Explain the term 'food security' and describe biological factors that threaten it*			
	Bio ONLY: Explain how the efficiency of food production can be improved			
	Bio ONLY: Explain the term 'factory farming', including examples, and ethical objections			

homeostasis and response

definition: homeostasis is the mountainance of a constant internal environment.

for the body to function properly 3 different things need to be controlled:

1. Blood Glucose levels
2. Water levels
3. Temperature

Organs used in homeostasis:

- **Brain** - Control Centre
  - cerebral cortex
  - cerebellum
  - medulla
- **The CNS** (Central Nervous System) - Sends Signals → consists of:
  - Brain
  - Spinal chord
  - receptors + effectors

  Stimuli detected: travels from place of detection to Brain: conscious reaction

  Stimuli detected: travels from place of detection to spinal chord: reflex response

  → nerve cells carry the stimulus: They are very long and therefore can transmit fast electrical signals

  however, when tranferring a signal from one cell to another, it can slow down as it must cross a Synapse
  ↳ becomes a Slow Chemical Signal
- **The Pancreas** - Produces insulin
- **Effectors/muscles** - responsible for movement
- **Glands** - Produces hormones

Regulation of Body Temperature:

- regulated around the thermoregulatory center in the Brain

Too Cold:

- hairs stand up → to trap a layer of air
- Stop Sweating
- vasoconstriction starts → blood vessels constrict so they are further away from the skin → less blood flow near surface of skin, so less heat loss
- muscles shiver ↳ movement produces energy

Too Hot:

- hairs lie flat → so they're not trapping any air
- Start Sweating → water will evaporate causing heat and energy loss
- Vasodilation → blood vessels grow wider so blood flows closer to skin → blood flowing closer to skin results in heat loss

human endocrine systems:

- pituitary gland → in the Brain: produces LH & FSH
- thyroid → produces thyroxine: helps in regulating our metabolism
- adrenal gland → in the neck → produces adrenaline: triggers fight or flight response
- pancreas → behind the stomach → produces insulin: helps regulate blood glucose levels
- Ovaries → (females) → produces oestrogen
- testies → (male) → produce testosterone: increases muscle + hair growth

Control of blood Glucose

high levels

- after a meal is eaten, blood Glucose levels start to rise
- This is picked up by the Pancreas
- Pancreas produces insulin → sent out into blood
- insulin causes cells to remove glucose from blood
- liver and muscle cells can convert Glucose to Glycogen and store it
- once Glucose is removed, blood Glucose levels fall

low levels

- if blood Glucose levels are too low, it's picked up by the Pancreas
- Pancreas will produce Glucagon
- Glucose previously stored in liver and muscle cells returns to blood
- This causes blood Glucose levels to rise again

Glucagon converts Glycogen to Glucose → very important not to mix up names

Diabetes:

Type 1:

- Pancreas doesn't work properly → doesn't produce right amount of insulin

Treatment: insulin injections

Type 2:

- cells become unsensetive to insulin

Treatment: control diet, excercise

Symtoms: Both

- weight loss
- increased need to urinate
- being very thirsty
- blurry vision
- fatigue
- hunger

Control of water

Kidneys have 3 functions:

- remove urea
- control ion content
- control water content

3 ways we lose water:

- urine
- sweat
- when we exhale

3 ways kidneys function:

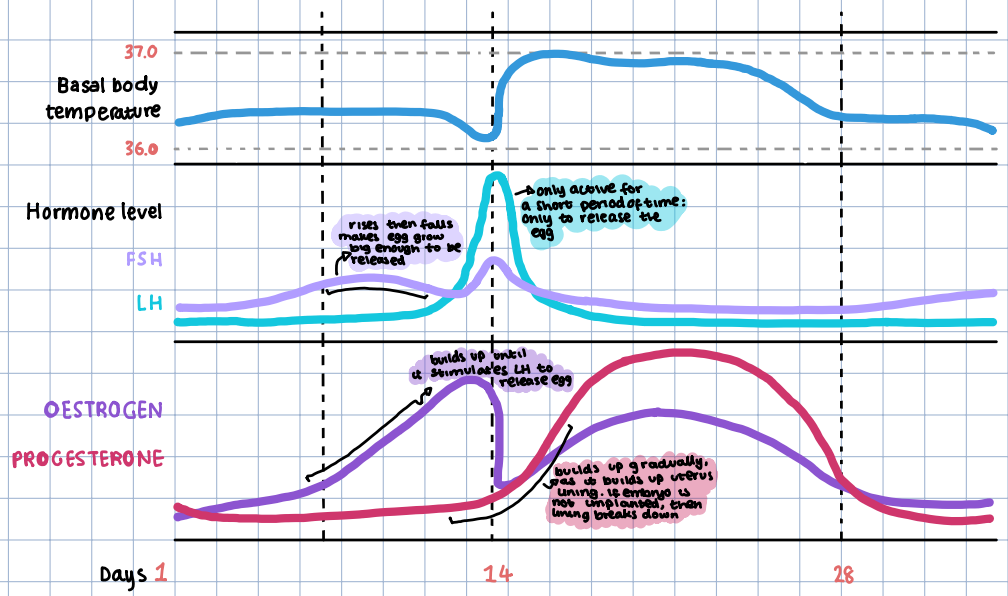
- ultrafiltration: blood under high pressure, enters kidneys. water, ions, urea and sugar are squeezed into the capsule → start of nephron
- reabsorption: as they flow through the nephron, useful items are reabsorbed: all sugar (→ active transport), some ions (→ active transport), some water (→ ADH controls amount of water absorbed)
- release of waste: anything that isn't reabsorbed will be released as urine

If someone's kidneys don't work properly the can do kidney diallysis. A machine filters the blood 3 times a week: 4hrs each time ∴ very time consuming

or a kidney transplant but could have long waiting lists and risk of rejection

Periods

hormones all over the place!



contraception

Barrier

- Diaphram → stops sperm only
- Condom → stops sperm & STI

hormonal

- Pills → stop egg being implanted
- coil IUDs → stop egg being implanted

other

- Tube tied → no sperm or egg
  - permanent

IVF:

advantages:

- a child

disadvantages:

- lots of drugs over small period of time.
- side effects of drugs
- long term consequences
- very expensive → minimum £5000
- doesn't always work → around 40% success rate

Phototropism:

- growth towards light
- Shoots

geotropism / gravitropism:

- grows towards gravity
- roots

gibberellins:

- growth

ethene:

- ripening

auxins:

- growth in the right direction

Inheritance, Variation and Evolution

mitosis
- 2 identical daughter cells → diploid (contains two complete sets of chromosomes)
- used for growth / repair

meiosis
- 4 different daughter cells → haploid (having 2 single, unpaired chromosomes) → called gametes due to this
- used for sexual reproduction

gametes:
- male: sperm
- femal: egg
- plant male: pollen: found in stamen
- plant female: egg: found in stigma

asexual reproduction:
- common in plants and Bacteria/fungi
- produces a genetically identical population
- cell division by mitosis

advantages
- only one parent → more time-efficient
- energy conserved

disadvantage
- genetically identical → if one is susceptible to disease, they all are and can be wiped out at once

sexual reproduction
- commonly in animals
- produces genetically different offspring
- cell division by meiosis

advantages
- genetically different → if one is susceptible to disease, all of them won't suffer

disadvantage
- mate is required → Time consuming

DNA:
→ deoxy ribose nucleic acid
- DNA is made by bases that fit together
- There are 4 bases:
  - Thymine
  - Adenine
  - Guanine
  - Cytosine
- T always fits with A
- G always fits with C
- has a sugar-phosphate backbone → 2 which stretch around outside to create a double helix

genome:
- a gene is a stretch of DNA that codes for a characteristic
- a genome is all the genes in an organism

amino acids:
- 3 bases codes for one amino acid
- These amino acids build up and fold → in complicated ways to create a protein
- If any part of the amino acid chain is different, the enzyme will fold up differently and that effect how the work in the body
- only some

keywords:
gamete - sex cell
chromosome - bundled up DNA
allele - different versions of genes
dominant - only need one gene to express characteristic
recessive - need 2 identical recessive genes to express characteristic
homozygous - same gene
heterozygous - different gene
genotype - what genes you have
phenotype - a collection of your characteristics
nucleotid - base + Sugar + Phosphate

Punnet square

example:
- mother:
  - genotype: Rr
  - Phenotype: carrier
- father
  - genotyper: Rr
  - Phenotype: carrier

	R	r
R	RR homozygous non-sufferer	Rr heterozygous carrier
r	Rr heterozygous carrier	rr homozygous sufferer

Polydactyly
- is dominant

mother:
- genotype: dd
- phenotype: 5 fingers

father:
- genotype: Dd
- phenotype: 6 fingers

	d	d
D	Dd	Dd
d	dd	dd

heterozygous: 6 fingers

homozygous: 5 fingers

Cystic fibrosis
- is recessive

mother
- genotype: Ff
- phenotype: carrier

father
- genotype: ff
- phenotype: normal

	F	f
f	Ff	ff
f	Ff	ff

in this case the child having cystic fibrosis is pretty much not happening. Since it's recessive you'd need 2 carriers for there to be any chance. 2/4 are carriers though.

Species:
- animals geographically separated tend to make new species

Selective Breeding:
- Breeding for a particular characteristics

Insulin production:
- original DNA + bacterial DNA
- put original into bacteria
- Produces large amounts in short time

Embryo screening:
advantages:
- healthy embryos
- genetic match for sibling

disadvantage
- embryo created and destroyed

Chromosomes
- 23 pairs
- 46 in total
- xx = female xy = male

Phenotype:
- depends on genotype
- and environment
  - diet
  - exercise
  - choice

Copying DNA: Evolution

Evolution - life began on Earth as simple organisms more than 3billion years ago. All life has evolved from these simple organisms

natural selection:
- random variation in genes leads to variation in a population
- individual characteristics suitable to environment, are more likely to be passed on

cloning:

- few ways to do it:

Rooting

plant → chop of a piece → rooting hormone → soil

Tissue culture:

- let one cell divide and take that keep dividing

Peneculin

- has saved millions of lives
- mrsa - bacteria resistent to antibiotics

Protein Synthesis

- order of amino acid determine shape and function in proteins

Stage 1: Transcription: nucleus

- bass sequence of gene is copied into complimentary template molecule: RNA / mRNA
- mRNA goes into cytoplasm

Stage 2: translation: cytoplasm

- mRNA attaches to Ribosome
- Amino acids are brought to Ribosome on carrier molecules (tRNA)
- Ribosome reads bases on mRNA
- joins correct amino acids in correct order
- when complete: protein folds into unique shape

mutations:

- change to a base
- most mutations have no effect
- But if a mutation changes shape then its a problem

non-coding genes:

- switch genes on and off
- tell genes when to produce Proteins

Ecology

Ecosystem: animals and plants that live within an area

Things needed to survive
- food
- water
- air
- sometimes mate

Abiotic
non-living
- light intensity
- Temperature
- water levels
- pH
- Wind levels
- wind
- CO_2 levels
- oxygen levels

Biotic
living
- food
- predators
- pathogens

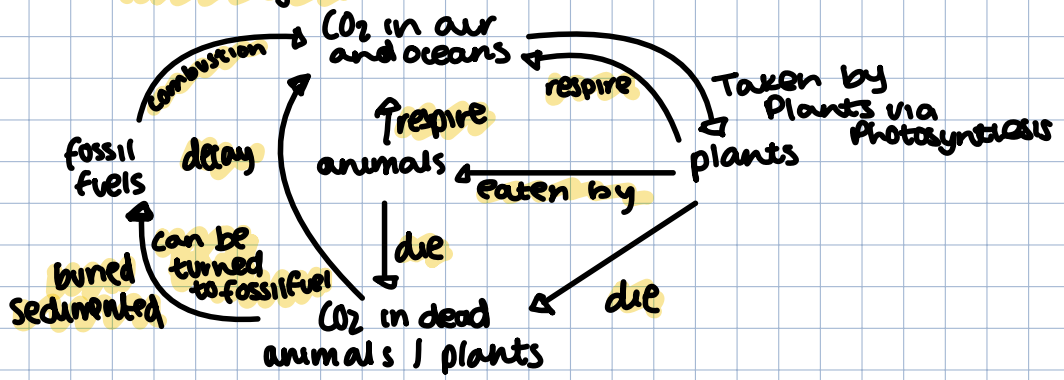
animals need to adapt to their environment so they can survive

Cacti: adaptation:
- shallow roots
- spine
- can store water in leaves

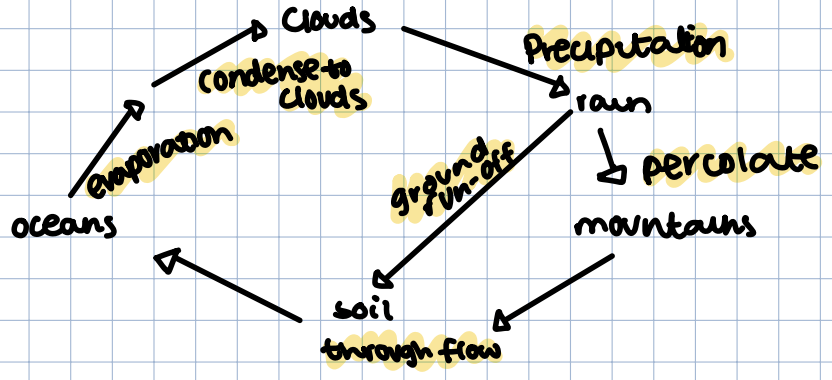
Snow fox: adaptation
- white: blend in
- small ears
- thick coat

organic compounds:
- compounds containing carbon

Carbon cycle



water cycle



Decay: