Key Knowledge for B5- Homeostasis + Response (Triple)

Homeostasis	
What is homeostasis?	• Maintaining constant internal conditions. • Important to maintain optimum (best) conditions for enzymes
What is negative feedback?	• When something moves away from the normal level, eg. glucose, it is then brought back to the normal level.
Nervous System	
What is the central nervous system (CNS) made up of?	• Brain and spinal cord
What is the role of the nervous system?	• To carry messages in the form of electrical impulses around the body.
How are neurones adapted to their function?	• Neurones can carry electrical impulses • Neurones are long • Neurones are insulated • Neurones are branched
What are the stages in a nervous response?	1. Stimulus 2. Receptor 3. Sensory neurone 4. Co-ordinator 5. Motor neurone 6. Effector
What is a reflex action?	• A rapid and automatic nervous response that by-passes the conscious parts of the brain
Why are reflex actions important?	• Protect us from harm
What co-ordinates the response?	• The relay neurone
What is a synapse?	• A gap or junction between neurones (nerve cells)

What happens at the synapse?	• Chemicals are released • They diffuse across the synapse • They trigger an impulse in the next neurone
The Brain	
What is the function of the Cerebral cortex?	• Responsible for consciousness, intelligence, memory and language
What is the function of the Cerebellum?	• Responsible for muscle co-ordination
What is the function of the medulla?	• Controls unconscious activities such as breathing and heartbeat
Give 3 methods used to study the brain	• Studying patients with brain damage • Electrically stimulating different parts of the brain and seeing what the effect is • MRI scans
Why is examining the brain difficult?	• It's very delicate and easily damaged

The Eye	
What is the sclera and what is its function?	• Tough supporting wall of the eye (white bit)
What is the cornea and what is its function?	• Transparent outer layer at the front of the eye • Refracts light into the eye
What is the iris and what is its function?	• Coloured part of the eye • Contains muscles (radial + circular) which allow it to control the size of the pupil
What is the pupil and what is its function?	• The hole in the centre of the eye • Allows light through
What is the lens and what is its function?	• Found behind the pupil • Refracts the light so as to focus it on the retina
What is the retina and what is its function?	• Found at the back of the eye • Contains light receptor cells
What is the optic nerve and what is its function?	• Nerve which carries impulses from the light receptors in the retina to the brain
Which muscles are contained in the iris?	• Circular and radial
Describe how the pupil becomes smaller in bright light	• Circular muscles in the iris contract • Radial muscles relax
Describe how the pupil becomes wider/ dilated in dim light	• Radial muscles in the iris contract • Circular muscles relax
How do we focus on near objects?	• Ciliary muscles contract • Suspensory ligaments slacken • Lens becomes fat • Light is refracted more
How do we focus on far objects?	• Ciliary muscles relax • Suspensory ligaments tighten • Lens goes thin • Light is refracted less
What do we call long-sightedness?	• Hyperopia

What is long-sightedness?	• Unable to focus on near objects
What causes long-sightedness?	• Lens doesn't refract the light enough • Image is brought into focus behind the retina
How is long-sightedness corrected?	• Use a convex lens • This refracts the light more so that the image is focused on the retina
What do we call short-sightedness?	• Myopia
What is short-sightedness?	• Unable to focus on far objects
What causes short-sightedness?	• Lens refracts the light too much • Image is brought into focus in front of the retina
How is short-sightedness corrected?	• Use a concave lens
How do contact lenses work?	• Sit on surface of eye and help refract light more or less
Give an advantage and a disadvantage of contact lenses	• <u>Advantage</u>- more convenient for sport • <u>Disadvantage</u>- can cause eye infections
How does laser eye surgery work?	• Uses a laser to change the shape of the cornea so that light is refracted more/ less
Give an advantage and a disadvantage of laser eye surgery	• <u>Advantage</u>- permanent correction • <u>Disadvantage</u>- risk of complications during surgery that could make vision worse
How does replacement lens surgery work?	• Natural lens is removed and replaced with an artificial one made of clear plastic
Give an advantage and a disadvantage of replacement lens surgery	• <u>Advantage</u>- permanent correction • <u>Disadvantage</u>- risk of complications during surgery that could make vision worse and even cause blindness. More risky than laser eye surgery

Endocrine System	
What is the endocrine system?	• A group of glands that release hormones into the bloodstream
Name 6 glands	• Pituitary gland • Thyroid • Adrenal • Ovaries • Testis • Pancreas
Why is the pituitary gland called the master gland?	• Produces several hormones which then, in turn, cause other glands to produce hormones
What are hormones?	• Chemical messengers • Travel in the bloodstream to target organs
How is the endocrine system different than the nervous system?	The endocrine system is: • slower to act • longer-lasting
Where is adrenaline produced?	• Adrenal glands
What effect does adrenaline have?	• Increases the heart rate and boosts delivery of oxygen and glucose to the brain and muscle. • Prepares the body for 'fight or flight'
Where is thyroxine produced?	• Thyroid gland
What effect does thyroxine have?	• Stimulates the basal metabolic rate • Plays an important role in growth and development
How are thyroxine levels maintained	• By negative feedback

Control of Temperature	
Which part of the brain monitors body temperature?	• Thermoregulatory centre
How does the brain monitor core body temperature?	• Receptors in the thermoregulatory centre detect the temperature of blood flowing through it
How is the skin involved in monitoring body temperature?	• Skin receptors detect changes in peripheral temperature • They send impulses to the thermoregulatory centre
Too Hot/ Cooling Down	
How does vasodilation work to cool us down?	• Blood vessels supplying the skin capillaries dilate (widen) • More blood flows near to the surface of the skin • More heat energy is lost to the surroundings
How does sweating work to cool us down?	• Sweat evaporates from the skin • Releases heat energy to the surroundings
Too Cold/ Warming up	
How does vasoconstriction work to warm us up?	• Blood vessels supplying the skin capillaries constrict (narrow) • Less blood flows near to the surface of the skin • Less heat energy is lost to the surroundings
How does shivering work to warm us up?	• Muscles contract • Increases rate of respiration • More heat energy released
How do hairs work to warm us up?	• Hairs stand on end • They trap a layer of air which is a good insulator • Less heat energy is released to the surroundings

Control of Blood Glucose	
Which organ monitors and controls your blood glucose concentration?	• The pancreas
Which hormone is released if there is **too much** glucose in the blood?	• Insulin
Which hormone is released if there is **too little** glucose in the blood?	• Glucagon
What effect does insulin have?	• Causes **glucose** to be stored in the muscle + liver cells as **glycogen**
What effect does glucagon have?	• Causes **glycogen** to be converted into **glucose** and released from liver + muscle cells into the blood
Which type of diabetes is inherited?	• Type 1
Which type of diabetes is caused by lifestyle?	• Type 2
What is wrong with a person if they have type 1 diabetes?	• They are not producing enough insulin
How is type 1 diabetes treated?	• Insulin injections
What are the advantages/ disadvantage of a pancreas transplant for someone with type 1 diabetes?	• <u>Advantages</u>- permanent cure, no need to inject insulin, glucose levels remain more constant • <u>Disadvantages</u>- pancreas may be rejected/ have to take drugs to suppress immune system
What is wrong with a person if they have type 2 diabetes?	• Muscle/ liver cells are not responding to the insulin
How is type 2 diabetes treated?	• Exercise and low-sugar diet

Kidneys	
How does water leave the body?	• From the lungs during exhalation • From the skin as sweat • Urine
What is the role of the kidneys?	• To remove excess water + ions from the blood • To remove all urea from the blood
Why is it important that cells don't lose or gain too much water by osmosis?	• They will not function efficiently
How is urea formed?	• From excess amino acids • Amino acids are deaminated to form ammonia • Ammonia (toxic) is then converted to urea
What does filtration involve?	• In the kidneys the blood is filtered and small molecules (water, glucose, urea) are squeezed out of the blood into the kidney tubes.
What is selective reabsorption?	• All glucose is reabsorbed back into blood • Some water/ ions are reabsorbed back into blood • No urea is absorbed back into blood
What happens to the urea?	• Removed from the body in urine • This is called excretion
What is ADH and where is it produced?	• Hormone • Pituitary gland
What is the role of ADH?	• Released when blood water is too low (dehydrated). • Acts on kidney tubes and causes them to become more permeable so that more water is reabsorbed back into blood

Kidney Failure	

What is dialysis?	• Blood is filtered through a dialysis machine
	• Contains a partially permeable membrane
	• Contains dialysis fluid which contains:
	  ○ No urea
	  ○ Glucose at normal concentration
	  ○ Ions at normal concentration

What are the advantages of dialysis?	• Keeps you alive if you have kidney failure
What are the disadvantages of dialysis?	• Expensive on the long-term • Urea levels build up between sessions • Takes 3-4 hours 3 times/ week • Can cause blood clots and infections
What are the advantages of a kidney transplant?	• Urea levels kept constantly low • Time not spent on dialysis • Cheaper on the long term
What are the disadvantages of a kidney transplant?	• Shortage of donor organs • Kidney may be rejected • Have to take drugs to suppress immune system

Menstrual Cycle	
In the menstrual cycle how often is an egg released?	• Every 28 days
What is the release of an egg called?	• Ovulation
What are the 4 hormones involved in the menstrual cycle?	• FSH • LH • Oestrogen • Progesterone
Which gland produces FSH and LH?	• Pituitary gland
Which gland produces oestrogen?	• Ovaries
What is the role of FSH?	• Causes egg to mature • Stimulates ovaries to produce oestrogen
What is the role of oestrogen?	• Causes the wall of the uterus to build up • Stimulates LH production • Inhibits FSH
What is the role of LH?	• Causes an egg to be released (ovulation)
What is the role of progesterone?	• Maintains the uterus lining • Inhibits FSH and LH
What is the main reproductive hormone in men and what is its function?	• Testosterone • Stimulates sperm production

Contraception	
How do oral contraceptives work?	• Contain oestrogen/ progesterone • Inhibit FSH • No eggs mature
How do injections, implant or skin patch work?	• Progesterone released over a long period of time • Inhibits FSH and LH • No eggs mature, no eggs released
How do barrier methods work?	• Condoms prevent the sperm reaching an egg
How does an intrauterine device work?	• Prevents the implantation of an embryo • Releases hormones
How does a spermicide work?	• Kill sperm
How does abstaining work?	• Don't have sex
How does sterilisation work?	• Female- fallopian tubes are tied- egg can't get through • Male- Sperm ducts are tied- sperm can't get through
Treating Infertility	
How do fertility drug work?	• Contain FSH + LH • Ensure hormone levels are high enough to mature + release an egg
What does IVF involve?	• Mixing egg and sperm in a lab • Embryos develop • 1 or 2 embryos are transferred into mother's uterus
What are the disadvantages of IVF?	• Low success rates • Expensive • Can lead to multiple births (more risky) • Unused embryos are destroyed (ethical issues)

Plant Hormones	
What are plant growth hormones called?	• Auxins
What is a response to light called?	• Phototropism
How do shoots respond to light?	• Auxins diffuse to the shaded side • This results in unequal distribution of auxin • The auxin on the shaded side cause cells to elongate faster • The shoot grows towards the light
What is a response to gravity called?	• Geotropism or Gravitropism
What effect to auxins have on shoots?	• Stimulate growth
What effect do auxins have on roots?	• Inhibit growth
How do shoots grow upwards/ away from gravity?	• Auxins diffuse to the lower side • This results in unequal distribution of auxin • The auxin on the lower side cause cells to elongate faster • The shoot grows upwards/ away from gravity
How do roots grow downwards/ towards gravity?	• Auxins diffuse to the lower side • This results in unequal distribution of auxin • The auxin on the lower side cause cells to elongate slower • The root grows downwards/ towards gravity
What are auxins used for in agriculture?	• Weedkillers • Rooting powders • Promoting growth in tissue culture
What is ethene used for in the food industry?	• Control ripening of fruit during storage and transport
What are gibberellins used for?	• To end seed dormancy • Promote flowering • Increase fruit size