

AQA Biology GCSE - Student Progress Sheet

Name:

Target:

Unit 4.5 – Homeostasis and Response

4.5.1. Homeostasis



a	I know that homeostasis is the automatic regulation of the internal conditions of a cell or organism to maintain optimal conditions for enzyme action and all cell functions.			
b	I know that these automatic control systems may involve nervous responses or chemical responses.			
c	I can describe examples of homeostasis in the human body, including the control of: <ul style="list-style-type: none"> • blood glucose concentration; • body temperature; • water levels. 			
d	I know that all control systems include: <ul style="list-style-type: none"> • cells called receptors, which detect stimuli (changes in the environment); • coordination centres (such as the brain, spinal cord and pancreas) that receive and process information from receptors; • effectors (muscles or glands) which bring about responses to restore optimum levels. 			

4.5.2. The Human Nervous System

4.5.2.1. Structure and Function

a	I know that the nervous system enables humans to sense and respond to their surroundings (and to coordinate their behaviour).			
b	I can name the main parts of the nervous system and explain how the parts are adapted to their functions.			
c	I can describe the path of an electrical impulse through the nervous system: stimulus → receptors → sensory neurones CNS (brain and spinal cord) ← motor neurones → effectors.			
d	I know that the central nervous system (CNS) consists of the brain and spinal cord and that it coordinates the response of effectors which may be muscles contracting or glands secreting hormones.			
e	I can describe the reflex arc and explain how the various structures are related to their function, including: the sensory neurone, synapse, relay neurone, and motor neurone.			
f	I know that reflex actions are automatic and rapid and that they do not involve the conscious part of the brain.			
g	I can explain why reflex actions are important to an animal's survival.			



4.5.2.2. The Brain (Biology Only)

a	I know that the brain controls complex behaviour and that it is made of billions of interconnected neurones and different regions that carry out different functions.			
b	I can identify the cerebral cortex, cerebellum and medulla on a diagram of the brain, and describe their functions.			
c	I can explain some of the difficulties of investigating brain function and treating brain damage and disease. (HT Only)			
d	I can describe how neuroscientists have been able to map the regions of the brain to particular functions by studying patients with brain damage, electrically stimulating different parts of the brain and using MRI scanning techniques. (HT Only)			
e	I know that the complexity and delicacy of the brain makes investigating and treating brain disorders very difficult. (HT Only)			
f	I can evaluate the benefits and risks of procedures carried out on the brain and nervous system. (HT Only)			

4.5.2.3. The Eye (Biology Only)

a	I know that the eye is a sense organ containing receptors sensitive to light intensity and colour.			
b	I can identify the following structures on a diagram of the eye and explain how their structure is related to their function: retina, optic nerve, sclera, cornea, iris, ciliary muscles and suspensory ligaments.			
c	I can describe how the eye responds to dim light.			
d	I know that accommodation is the process of changing the shape of the lens to focus on near or distant objects.			
e	I can describe how the eye focuses on a near object: The ciliary muscles contract \longrightarrow the suspensory ligaments loosen \longrightarrow the lens is then thicker and refracts light rays strongly.			
f	I can describe how the eye focuses on a distant object: The ciliary muscles relax \longrightarrow the suspensory ligaments are pulled tight \longrightarrow the lens is then pulled thin and only slightly refracts light rays.			
g	I can describe two common defects of the eyes in which rays of light do not focus on the retina: myopia (short sightedness) and hyperopia (long sightedness).			
h	I can describe how myopia and hyperopia are treated with spectacle lenses which refract the light rays so that they do focus on the retina.			
i	I know that new technologies now include hard and soft contact lenses, laser surgery to change the shape of the cornea and a replacement lens in the eye.			
j	I can interpret ray diagrams showing myopia and hyperopia and demonstrate how spectacle lenses correct them.			



4.5.2.4. Control of Body Temperature (Biology Only)

a	I know that body temperature is monitored and controlled by the thermoregulatory centre in the brain and that it contains receptors sensitive to the temperature of the blood.			
b	I know that the skin contains temperature receptors and sends nervous impulses to the thermoregulatory centre.			
c	I know that if the body temperature is too high, blood vessels dilate (vasodilation) and sweat is produced from the sweat glands and that both of these mechanisms cause a transfer of energy from the skin to the environment.			
d	I know that if the body temperature is too low, blood vessels constrict (vasoconstriction), sweating stops and skeletal muscles contract (shiver).			
e	I can explain how these mechanisms lower or raise body temperature in a given context. (HT Only)			

4.5.3. Hormonal Coordination in Humans

4.5.3.1. Human Endocrine System

a	I know that the endocrine system is composed of glands which secrete chemicals called hormones directly into the bloodstream and that the blood carries the hormone to a target organ where it produces an effect.			
b	I can identify the position of the following glands on a diagram of the human body: <ul style="list-style-type: none"> • pituitary gland; • pancreas; • thyroid; • adrenal gland; • ovary; • testes. 			
c	I know that, compared to the nervous system, the effects of the endocrine system are slower but act for longer.			
d	I know that the pituitary gland in the brain is a 'master gland' which secretes several hormones into the blood in response to body conditions and that these hormones in turn act on other glands to stimulate other hormones to be released to bring about effects.			



4.5.3.2. Control of Blood Glucose Concentration

a	I know that blood glucose concentration is monitored and controlled by the pancreas.			
b	I know that if the blood glucose concentration is too high, the pancreas produces the hormone insulin that causes glucose to move from the blood into the cells and that, in liver and muscle cells, excess glucose is converted to glycogen for storage.			
c	I know that Type 1 diabetes is a disorder in which the pancreas fails to produce sufficient insulin and that it is characterised by uncontrolled high blood glucose levels and is normally treated with insulin injections.			
d	I know that, in Type 2 diabetes, the body cells no longer respond to the insulin produced by the pancreas and that it is treated by a carbohydrate controlled diet and an exercise regime.			
e	I know that obesity is a risk factor for Type 2 diabetes.			
f	I can compare Type 1 and Type 2 diabetes.			
g	I know that if the blood glucose concentration is too low, the pancreas produces the hormone glucagon that causes glycogen to be converted into glucose and released into the blood. (HT Only).			
h	I can explain how glucagon interacts with insulin in a negative feedback cycle to control blood glucose (sugar) levels in the body. (HT Only).			

4.5.3.3. Maintaining Water and Nitrogen Balance in the Body (Biology Only)

a	I know that if body cells lose or gain too much water by osmosis, they do not function efficiently and I can explain the effect on cells of osmotic changes in body fluids.			
b	I know that water leaves the body via the lungs during exhalation.			
c	I know that water, ions and urea are lost from the skin in sweat.			
d	I know that the lungs and skin have no control over the loss of water, ions and urea from the body.			
e	I know that excess water, ions and urea are removed via the kidneys in the urine.			
f	I know that the digestion of proteins from the diet results in excess amino acids which need to be excreted safely. In the liver these amino acids are deaminated to form ammonia. Ammonia is toxic and so it is immediately converted to urea for safe excretion. (HT Only)			
g	I can describe the function of kidneys in maintaining the water balance of the body.			
h	I know that the kidneys produce urine by filtration of the blood and selective reabsorption of useful substances such as glucose, some ions and water.			
i	I know that the water level in the body is controlled by the hormone ADH which acts on the kidney tubules. (HT Only)			
j	I can describe the effect of ADH on the permeability of the kidney tubules. (HT Only)			
k	I know that ADH is released by the pituitary gland when the blood is too concentrated and it causes more water to be reabsorbed back into the blood from the kidney tubules. This is controlled by negative feedback.			
l	I know that people who suffer from kidney failure may be treated by organ transplant or by using kidney dialysis.			
m	I can describe how kidney dialysis works.			
n	I can evaluate the advantages and disadvantages of treating organ failure by mechanical device or transplant.			



4.5.3.4. Hormones in Human Reproduction

a	I know that, during puberty, reproductive hormones (oestrogen and testosterone) cause secondary sex characteristics to develop.			
b	I know that oestrogen is the main female reproductive hormone produced in the ovaries.			
c	I know that, at puberty, eggs begin to mature in the ovaries and that one is released approximately every 28 days. This is called ovulation.			
d	I can describe how hormones are involved in the menstrual cycle of a woman: <ul style="list-style-type: none"> • follicle stimulating hormone (FSH) causes maturation of an egg in the ovary; • luteinising hormone (LH) stimulates the release of the egg; • oestrogen and progesterone are involved in maintaining the uterus lining. 			
e	I can explain the interactions of FSH, oestrogen, LH and progesterone, in the control of the menstrual cycle. (HT Only)			
f	I know that testosterone is the main male reproductive hormone produced by the testes and that it stimulates sperm production.			

4.5.3.5. Contraception

a	I know that fertility can be controlled by a variety of hormonal and non-hormonal methods of contraception.			
b	I can describe how oral contraceptives contain hormones to inhibit FSH production so that no eggs mature.			
c	I can describe how injection, implant or skin patchwork (by the slow release progesterone which inhibits the maturation and release of eggs for a number of months or years).			
d	I can describe how barrier methods such as condoms and diaphragms prevent the sperm reaching an egg.			
e	I can describe how intrauterine devices prevent the implantation of an embryo or release a hormone to prevent pregnancy.			
f	I know that spermicidal agents kill or disable sperm to prevent pregnancy.			
g	I can describe how abstaining from intercourse when an egg may be in the oviduct may prevent pregnancy.			
h	I can describe surgical methods of male and female sterilisation.			
i	I can evaluate the different hormonal and non-hormonal methods of contraception.			
j	I can discuss why issues around contraception cannot be answered by science alone.			



4.5.3.6. The Use of Hormones to Treat Infertility (HT Only)

a	I can explain the use of hormones in modern reproductive technologies to treat infertility, including giving FSH and LH in a 'fertility drug' to a woman so that she may then become pregnant in the normal way.			
b	I can describe the process of In Vitro Fertilisation (IVF) treatment, including: <ul style="list-style-type: none"> • IVF involves giving a mother FSH and LH to stimulate the maturation of several eggs; • the eggs are collected from the mother and fertilised by sperm from the father in the laboratory; • the fertilised eggs develop into embryos; • at the stage when they are tiny balls of cells, one or two embryos are inserted into the mother's uterus (womb). 			
c	I can discuss some of the social and ethical issues associated with fertility treatment, including: <ul style="list-style-type: none"> • it is very emotionally and physically stressful; • the success rates are not high; • it can lead to multiple births which are a risk to both the babies and the mother. 			
d	I can explain how developments of microscopy techniques have enabled IVF treatments to develop.			
e	I can evaluate (from the perspective of patients and doctors) the methods of treating infertility.			

4.5.3.7. Negative Feedback (HT Only)

a	I know that thyroxine is produced by the thyroid gland and that it stimulates the basal metabolic rate and plays an important role in growth and development.			
b	I know that thyroxine levels are controlled by a negative feedback mechanism.			
c	I know that adrenaline is produced by the adrenal glands in times of fear or stress and that it increases the heart rate and boosts the delivery of oxygen and glucose to the brain and muscles, preparing the body for 'flight or fight'.			

4.5.4. Plant Hormones (Biology Only)

4.5.4.1. Control and Coordination

a	I know that plants produce hormones to coordinate and control growth and responses to light (phototropism) and gravity (gravitropism or geotropism).			
b	I know that unequal distributions of auxin cause unequal growth rates in plant roots and shoots.			
c	I know that gibberellins are important in initiating seed germination. (HT Only)			
d	I know that ethene controls cell division and ripening of fruits. (HT Only)			
e	I can describe an experiment to investigate the effect of light or gravity on the growth of newly germinated seedlings.			

4.5.4.2. The Use of Plant Hormones. (HT Only)

a	I know that plant growth hormones are used in agriculture and horticulture.			
b	I know that auxins are used as weed killers, rooting powders and for promoting growth in tissue culture.			
c	I know that ethene is used in the food industry to control ripening of fruit during storage and transport.			
d	I know that gibberellins can be used to end seed dormancy, promote flowering and increase fruit size.			