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Support Pack | Grade 12

CAPS

Life Sciences

Life processes in plants and animals

This support pack for the **Life processes in plants and animals** strand in the **Life Sciences Grade 12 CAPS curriculum** provides revision summaries on the topic to help prepare for the examinations. Learners can work through these individually at home or these could form the basis of a catch-up class or online lesson. You have permission to print or photocopy this document or distribute it electronically via email or WhatsApp.

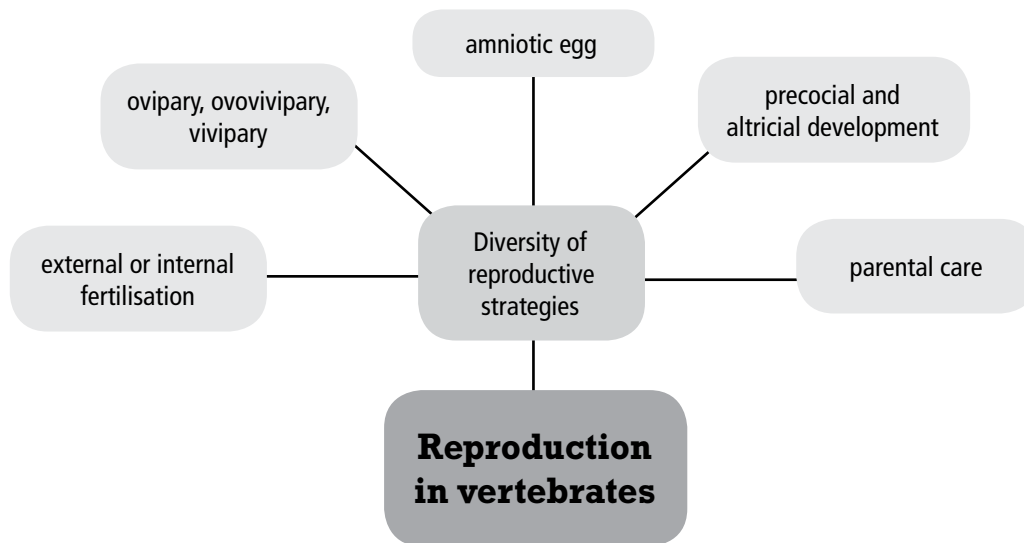
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UNIT 1 Reproduction in vertebrates



UNIT 1 Reproduction in vertebrates

Diversity of reproductive strategies

- Different groups of animals have different strategies to maximise their reproductive success.

External or internal fertilisation

- External fertilisation takes place when eggs and sperm are released outside the parents' bodies. Most species that use external fertilisation are aquatic.
- In external fertilisation, eggs and sperm fuse outside the parents' bodies.
- Species that use external fertilisation produce large numbers of eggs and sperm and large numbers of young hatch. Many of these young do not reach maturity.
- In internal fertilisation, eggs and sperm fuse inside the mother's body. This takes place in nearly all terrestrial animals.
- Species that use internal fertilisation produce small numbers of eggs and fewer young hatch. Most of these young survive to maturity.

Ovipary, ovovivipary, vivipary

- Ovipary is a method of reproduction in which eggs are laid and embryos develop outside the mother's body within the egg.
- Ovovivipary is a method of reproduction in which young develop from eggs that are kept within the mother's body, but separated from her body by the egg membranes and are then "born live".
- Vivipary is a method of reproduction in which the foetus develops in the mother's uterus and is nourished through an umbilical cord.

Amniotic egg

- The amniotic egg is the type of egg that is produced by oviparous birds and egg-laying mammals.
- In the amniotic egg the embryo develops inside a fluid-filled amnion and is surrounded by the shell of the egg. The shell can be hard and calcified or leathery.

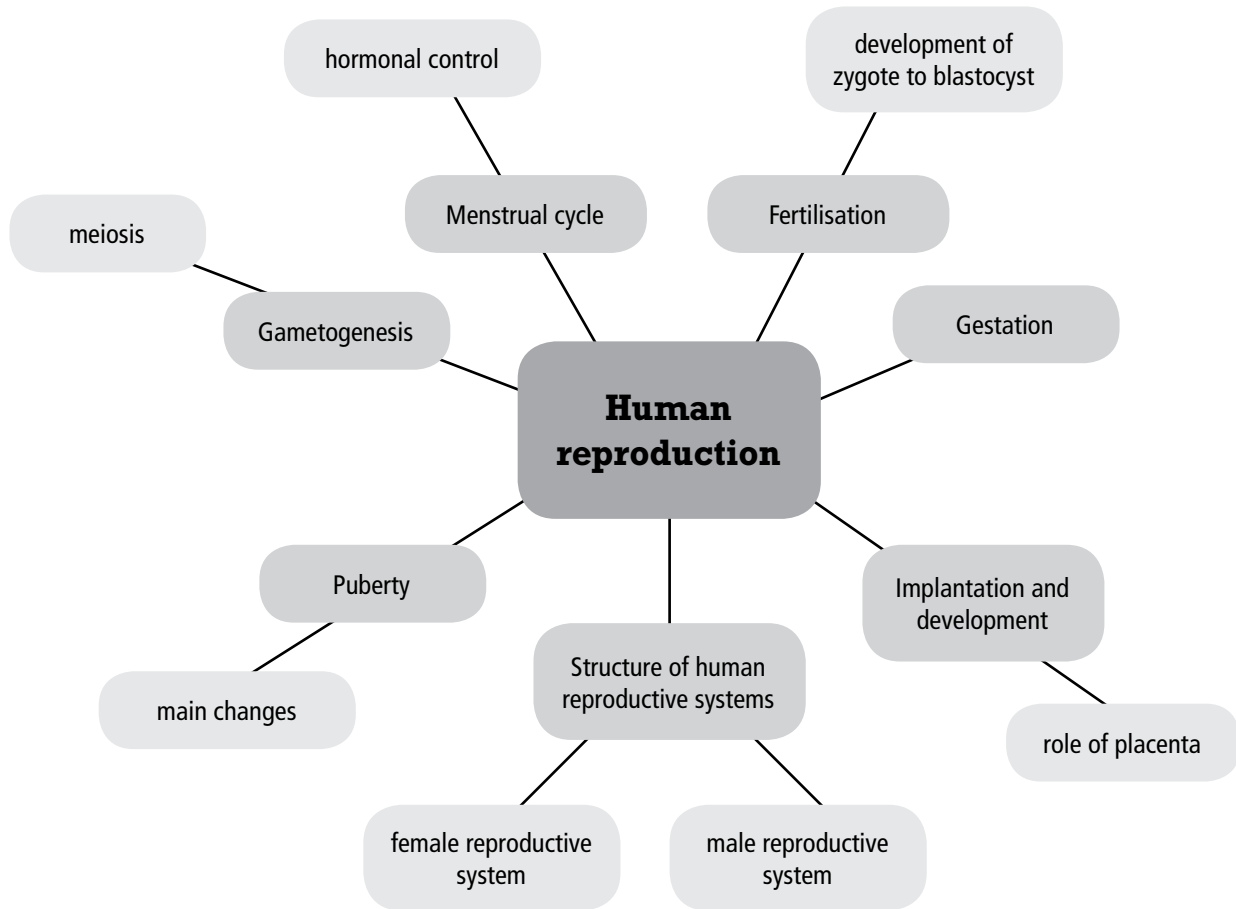
Precocial and altricial development

- A precocial hatchling is capable of moving around on its own soon after hatching.
- An altricial bird is one that cannot move around on its own after hatching. Most birds are altricial.

Parental care

- Species that show parental care usually produce fewer offspring and the offspring require a lot of care before they become independent.
 - Most mammals show parental care.
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UNIT 2 Human reproduction



UNIT 2 Human reproduction

Structure of the human reproductive system

- The male reproductive organs consist of the penis and two testes.
- Male gametes, called sperm, are made in the two testes.
- The female reproductive organs consist of the ovaries, Fallopian tubes, uterus and vagina.

Puberty

- Humans do not become sexually mature until puberty, when men and women start to develop secondary sexual characteristics.

Gametogenesis

- Gametogenesis is the process in which gametes (sperm and eggs) are produced by the testes and the ovaries.
- There are two types of gametogenesis: spermatogenesis and oogenesis.

Menstrual cycle

- The menstrual cycle is a 28-day cycle that takes place in mature women and which is under hormonal control.
- Ovulation takes place between approximately day 10 and day 15 of the menstrual cycle.
- Menstrual bleeding occurs if the oocyte has not been fertilised.

Fertilisation

- If the oocyte has been fertilised, the resulting zygote develops into a ball of cells called a blastocyst and implants into the lining of the uterus (the endometrium).
- After implantation the embryo undergoes major development, including the development of a placenta and an umbilical cord.

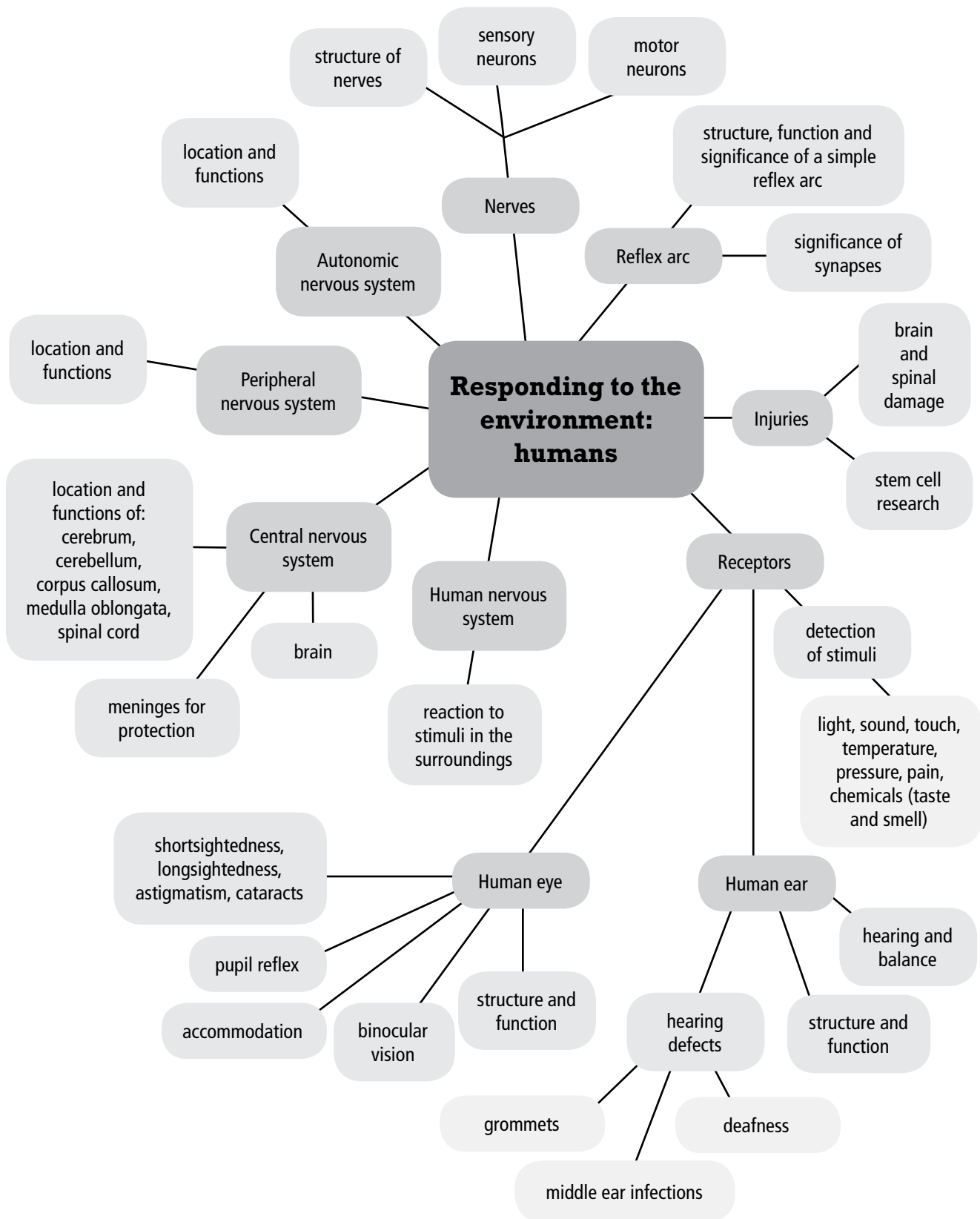
Gestation

- Gestation is the process in which the embryo develops into a foetus that is eventually born.

Implantation and development

- The embryo is called a foetus from about eight weeks of development.
 - Contraception is used to control human fertility.
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UNIT 3 Responding to the environment: humans



UNIT 3 Responding to the environment: humans

Human nervous system

- The nervous system is made up of nerve cells or neurons.
- It is divided into three parts: the central nervous system (brain and spinal cord), peripheral nervous system (spinal and cranial nerves) and the autonomic nervous system (sympathetic and parasympathetic).

Nerves

- There are three types of neurons: sensory (afferent), motor neurons (efferent) and connector neurons or interneurons (conduct impulses through brain and spinal cord).
- Neurons are made up of dendrites and axons.
- Nerves are made up of a bundle of axons and/or dendrites.
- Axons and dendrites are called nerve fibres.
- The cell bodies of the neurons are found mainly in the brain and in the spinal cord or near the brain and spinal cord in ganglia. In the brain, these cell bodies make up the white matter. In the spinal cord, the cell bodies make up the grey matter.
- A single nerve, which looks like a long white string, is made up of a bundle of nerve fibres that are held together by a sheath of connective tissue.
- A synapse is a space found at the junction of two or more neurons.
- Impulses are transmitted from one neuron to another across the synapse by a chemical transmitter substance called a neurotransmitter.

Central nervous system

- The central nervous system is made up of the brain and the spinal cord.
- The brain is protected by three membranes – the dura mater, the arachnoid layer and the pia mater – called meninges.
- The cerebrum is the largest part of the brain and controls all higher functions and all voluntary activities.
- The cerebrum is divided into two hemispheres by the corpus callosum.
- The cerebellum controls the co-ordination of voluntary muscular movement and contains the centre of balance and equilibrium.
- The medulla oblongata controls reflexes such as breathing and heartbeat.
- The spinal cord lies within the vertebral canal and runs from the medulla oblongata to the end of the lumbar region of the vertebral column.

Reflex arc

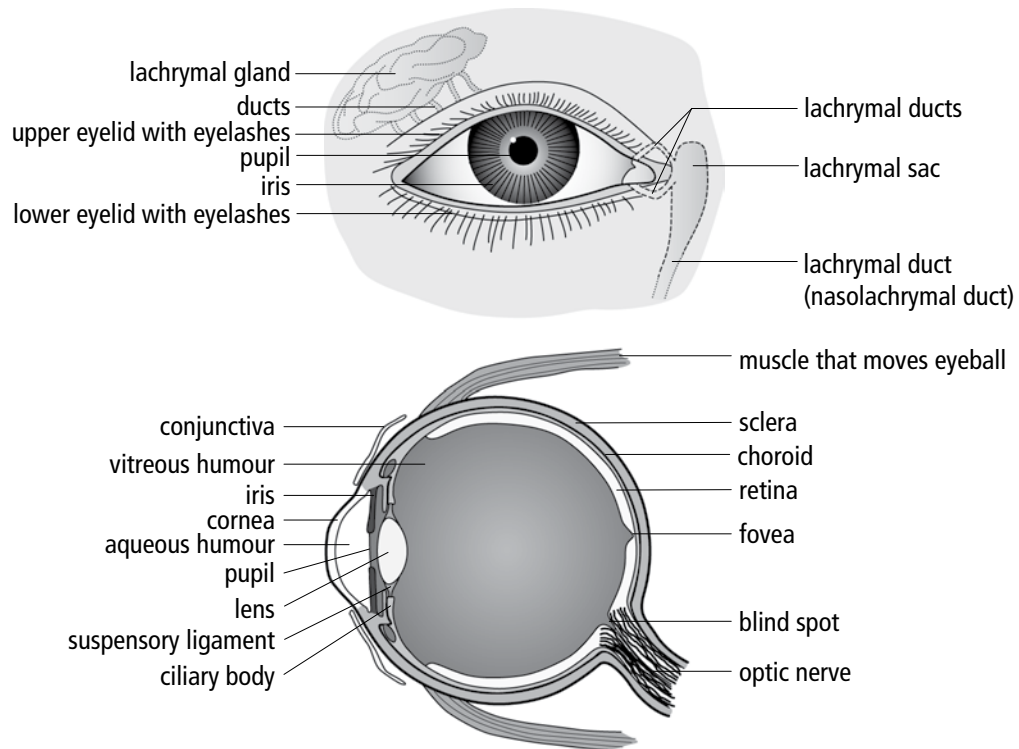
- The functional unit of the nervous system is the reflex arc.
- A reflex arc is the pathway that an impulse is transmitted along to bring about a stimulus during a reflex action.

Diseases and injuries

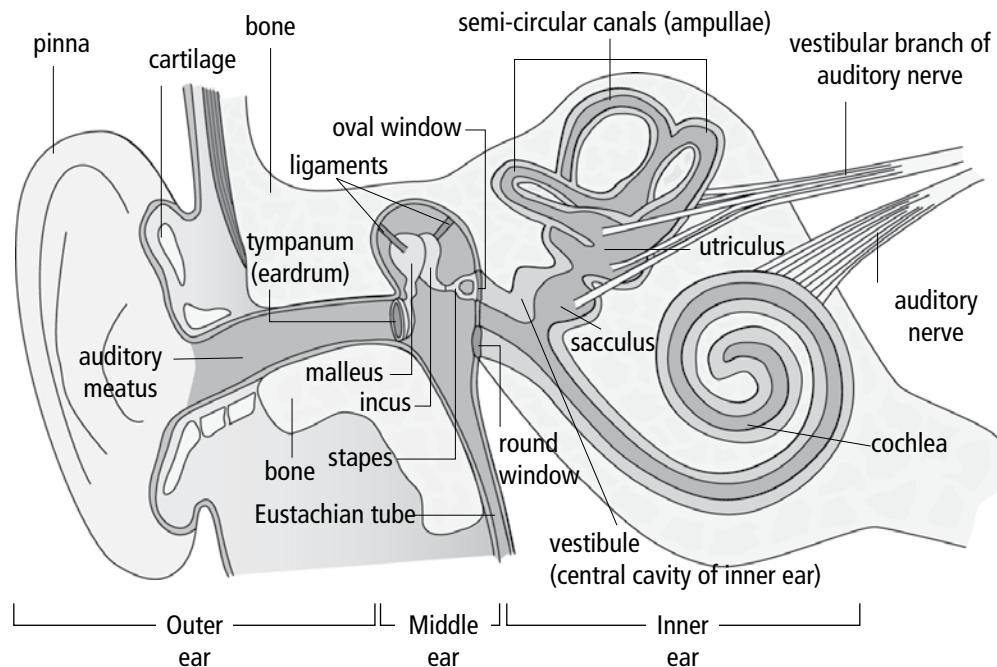
- The nervous system can be affected by diseases such as Alzheimer's disease and multiple sclerosis.
 - The brain and spinal cord can be damaged by injury.
 - Drugs of abuse damage and affect the nervous system.
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Sense organs

- Sense organs (the eye and the ear) and sense receptors detect a variety of different stimuli: light, sound, touch, temperature, pressure, pain and chemicals (taste and smell).

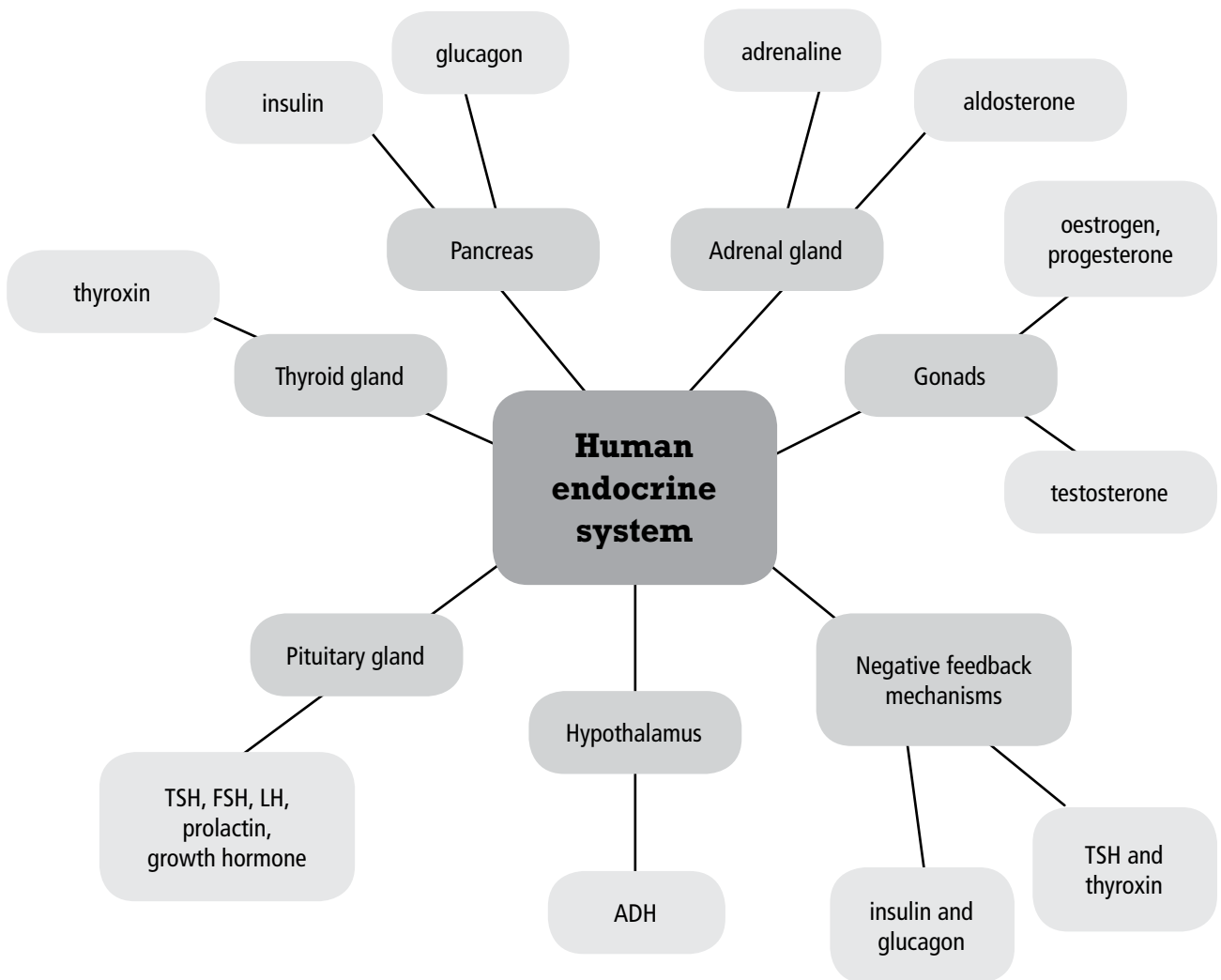


External and internal structure of the human eye



Structure of the human ear

UNIT 4 Human endocrine system



UNIT 4 Human endocrine system

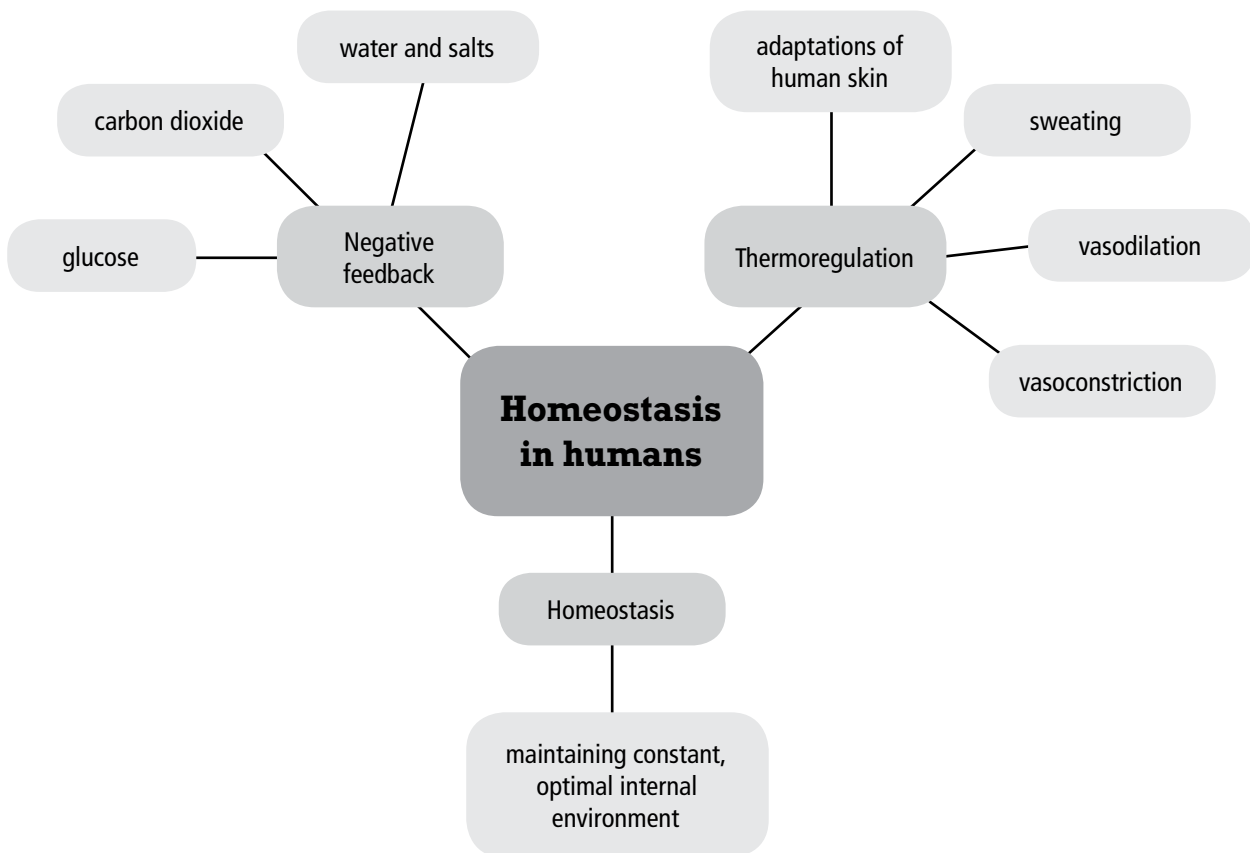
- Hormones are complex, organic chemical substances.
- Hormones are produced by the endocrine glands of the body.
- Endocrine glands release hormones directly into the bloodstream, which transports them to target organs where they have specific effects.
- The table below summarises the glands, their hormones and the function of these hormones.

Gland	Hormone	Function
Pituitary gland – anterior lobe (hypophysis)	Growth hormone (GH)	Stimulates growth of long bones and skeletal muscles (lack of hormone causes dwarfism; too much causes giantism).
	Thyroid stimulating hormone (TSH)	Regulates growth of thyroid gland and secretion of its hormones, such as thyroxin.
	Follicle stimulating hormone (FSH)	Stimulates follicle development in the ovaries (see Strand 2 Unit 2).
	Luteinising hormone (LH)	Stimulates ovulation and formation of corpus luteum in ovaries.
	Prolactin (PRL)	Stimulates mammary glands to secrete milk.
Posterior pituitary lobe – hypothalamus	Antidiuretic hormone (ADH)	Promotes reabsorption of water in the kidneys.
Thyroid gland	Thyroxin	Raises and controls basal metabolic rate, particularly cellular respiration in mitochondria. Regulates tissue growth and development, particularly in the reproductive and nervous systems. Accelerates heart beat. (Iodine is necessary in the production of thyroxine and a shortage may lead to goitre).
Pancreas (beta cells of islets of Langerhans)	Insulin	Lowers blood glucose level. Stimulates absorption of glucose by body cells. Stimulates conversion of glucose into glycogen for storage in liver and muscles (insufficient insulin, or resistance to insulin, causes diabetes mellitus – types 1 and 2).
Pancreas (alpha cells of islets of Langerhans)	Glucagon	Raises blood glucose level. Stimulates conversion of glycogen into glucose in the liver and muscles.
Adrenal cortex	Aldosterone	Regulates the concentration of sodium and potassium ions in the blood. Contributes to the long-term stimulation of the immune system when the body is under stress.
Adrenal medulla	Adrenaline	Prepares the body for fight and flight (action).
Testes	Androgens (e.g. testosterone)	Control development of male sex organs and secondary sexual characteristics (see Strand 2 Unit 2).
Ovaries	Oestrogen and progesterone	Control development of female sex organs and secondary sexual characteristics. Control menstrual cycle and pregnancy (see Strand 2 Unit 2).

Negative feedback mechanisms

- A negative feedback mechanism is one where any change in a factor (for example: level of thyroxin in the blood or level of glucose in the blood) produces an opposite response, which then reverses the change.
- Negative feedback mechanisms constantly monitor change in this factor and any change is adjusted to maintain a constant level of this factor.
- Thyroid function and the control of blood glucose in the body are two examples of negative feedback systems.

UNIT 5 Homeostasis



UNIT 5 Homeostasis

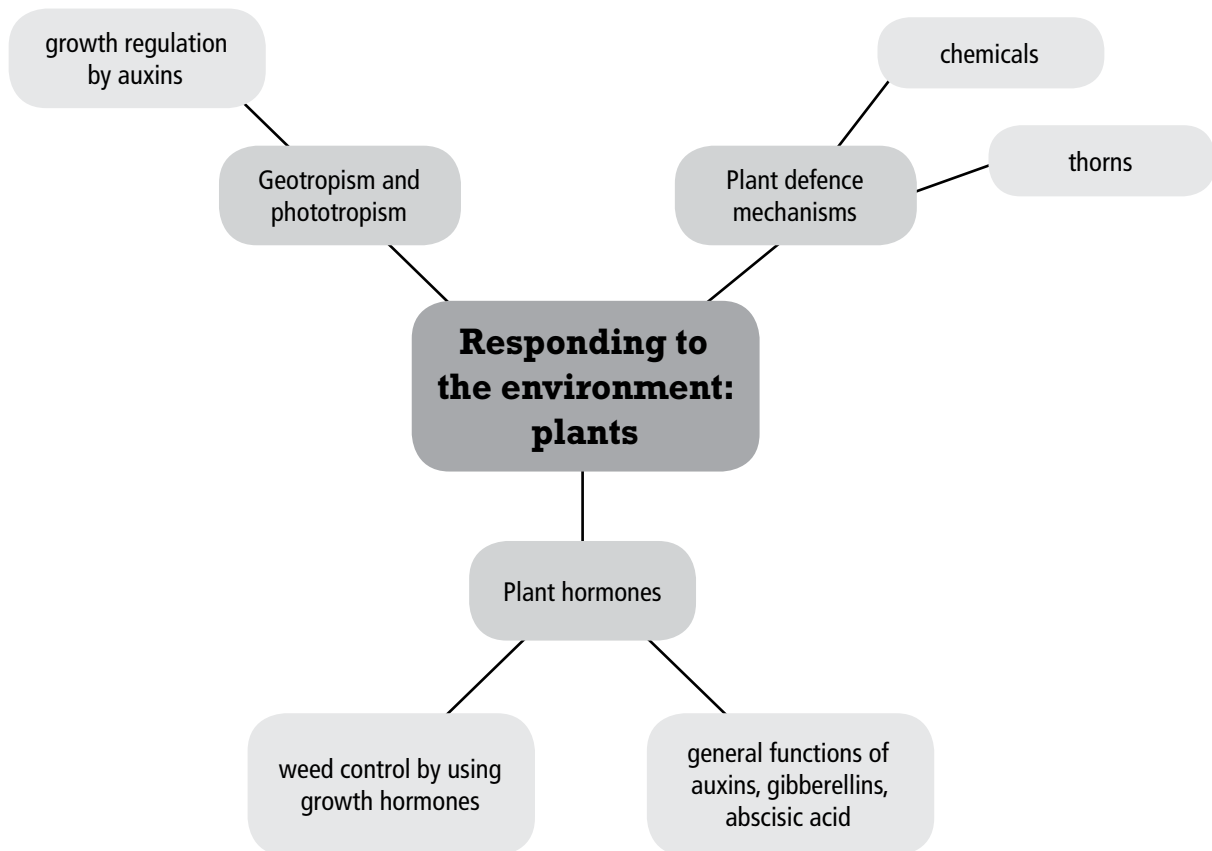
Maintaining the internal environment

- Homeostasis is the maintenance of the internal environment of the body within certain limits.
- These limits are factors such as temperature, blood pressure, glucose levels, and carbon dioxide concentrations in the blood.
- Changes in these factors affect the homeostatic balance of tissue fluids.
- The nervous system and the endocrine system are able to detect changes in both the internal and the external environment and relay impulses to the brain to restore homeostasis.
- The internal environment is the blood, the cells and the spaces between and around the cells. These spaces are filled with tissue fluid.
- Tissue fluid is the fluid surrounding the cells of the body. When tissue fluid drains into lymph vessels, the fluid is called lymph. When it drains back into capillaries, it is called plasma.
- Osmoregulation is the control of water balance in the body, which is maintained by receptors in the hypothalamus.

Thermoregulation

- Temperature is regulated through receptors in the skin.
 - Vasoconstriction (narrowing of the blood vessels) occurs in response to a cold environment.
 - Vasodilation (widening of the blood vessels) occurs in response to a warm environment or a fever.
 - Heat is lost through evaporation of sweat on the skin.
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UNIT 6 Responding to the environment: plants



UNIT 6 Responding to the environment: plants

Plant hormones

- Plant hormones are different from animal hormones because they are substances that cause a reaction in the part of the plant in which they are produced.
- Auxins are produced by the meristem, which is an area of dividing cells just behind the tips of stems and roots.
- Auxins are responsible for tropic movements in plants.

Geotropism and phototropism

- Geotropism is the movement of plants in response to gravity.
- Phototropism is the movement of plants in response to light.
- Apical dominance describes the effect of the auxin produced by the apex of the plant, which diffuses downwards and prevents the growth of lateral buds below it.
- Gibberellins are plant hormones that promote the elongation of stems so that the plant grows tall.
- Abscisic acid (ABA) inhibits plant growth by promoting seed and bud dormancy in times of environmental stress, such as drought.

Plant defence mechanisms

- Plant defence mechanisms include chemicals and thorns.
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