OCR (B) Biology A-level

5.3.1 - Principles and importance of homeostasis

Flashcards

What is homeostasis?

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The maintenance of the body's internal environment within set limits around an optimum:

- **temperature**: 36.1°C - 37.2°C
- **blood pH**: 7.35 - 7.45
- **blood pressure**: 90/60 mmHg - 120 mmHg
- **blood glucose concentration**: 4 - 7 mmol/L fasting, 8.5 - 9 mmol/L 2 hours after eating

Define negative and positive feedback.

Define negative and positive feedback.

negative feedback: self-regulatory mechanisms return internal environment to optimum when there is a fluctuation

positive feedback: a fluctuation triggers changes that result in an even greater deviation from the normal level

What are receptors and effectors?

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receptors: specialised cells located in sense organs that detect a specific stimulus

effectors: usually muscles or glands which enable a physical response to a stimulus

Explain the role of oxytocin as an example of positive feedback.

Explain the role of oxytocin as an example of positive feedback.

Uterine contractions during labour stimulate hypothalamus to secrete the peptide hormone oxytocin. Oxytocin increases uterine contractions, resulting in the production of even more oxytocin.

What is the autonomic nervous system?

What is the autonomic nervous system?

System that controls involuntary actions of glands and muscles.

2 subdivisions: sympathetic & parasympathetic

Name the receptors involved in changing heart rate and state their location.

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Baroreceptors (detect changes in blood pressure): carotid arteries and aorta.

Chemoreceptors (detect changes in blood pH e.g. due to increase in CO_2 concentration): walls of carotid arteries.

How do the nervous and endocrine systems decrease heart rate?

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1. **Receptors** send **more impulses to cardioinhibitory centre** in the **medulla oblongata**.
2. More impulses to SAN down vagus nerve via **parasympathetic nervous system**.
3. Stimulates release of **acetylcholine**, which decreases heart rate.

How do the nervous and endocrine systems increase heart rate?

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1. **Receptors** send **more impulses to cardioacceleratory centre** in the **medulla oblongata**.
2. More impulses to SAN via **sympathetic nervous system**.
3. Stimulates release of **noradrenaline**, which increases heart rate and strength of contraction.

How do endotherms thermoregulate?

How do endotherms thermoregulate?

Negative feedback mechanism of autonomic nervous system. Peripheral thermoreceptors detect changes in skin temperature. Thermoreceptors in hypothalamus detect changes in blood temperature.

Hypothalamus sends impulses to effectors in skin (vasodilation/ constriction, piloerection, sweating) & muscles (shivering).

Explain the role of the skin in thermoregulation.

Explain the role of the skin in thermoregulation.

Vasodilation/ constriction of arterioles supplying skin capillaries controls heat loss to skin surface.

Hair erector muscles contract & follicles protrude to trap air for insulation.

Evaporation of sweat cools skin surface.

What is thyroxine?

What is thyroxine?

A hormone secreted by the thyroid gland that increases metabolic rate.

Excess thyroxine can cause weight loss, increased appetite, rapid heartbeat.

How is the release of thyroxine regulated?

How is the release of thyroxine regulated?

Negative feedback.

Increased thyroxine levels stop hypothalamus from secreting thyrotropin-releasing hormone (TRH) & stop pituitary gland from releasing thyroid-stimulating hormone (TSH). Lowers thyroxine level in bloodstream.

Decreased thyroxine levels stimulate release of TRH & TSH. Increases thyroxine level in bloodstream.

How can core body temperature be measured?

How can core body temperature be measured?

- **oral**: convenient, but inaccurate if patient has recently consumed something hot/ cold
- **tympanic** (insert into ear): quick, but repeated readings may vary & inserting the probe too far may damage the membrane
- **rectal**: reliable measurement, but uncomfortable & could injure rectum
- **axillary** (place under armpit): noninvasive but slow

What does a body temperature reading outside of the usual temperature range signify?

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Too low: hypothermia

Too high: hyperthermia (heat stroke/ heat exhaustion)

Outline the causes, symptoms and treatment of hypothermia.

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causes: insufficient clothing, falling into cold water, fuel poverty (inability to afford adequate heating)

symptoms: shivering, cold & pale skin, slurred speech, passing out, slow & shallow breaths

treatment: gradually increase body temperature using blankets & warm food/ drink, change into dry clothes

Outline the causes, symptoms and treatment of hyperthermia.

Outline the causes, symptoms and treatment of hyperthermia.

Causes: prolonged exposure to hot conditions

Symptoms: nausea, muscle cramps, dizziness, potentially seizures or coma

Treatment: cool the body e.g. immersion in tepid water, sponge skin with cool water, air conditioning enhances evaporation of sweat

How does climate affect the incidence of hypo/hyperthermia?

How does climate affect the incidence of hypo/hyperthermia?

Strong correlation between temperature-related conditions & climate. Climate change may therefore increase incidence of hypo/hyperthermia, especially in areas where people are not acclimated to extreme weather/ under-resourced areas with insufficient infrastructure to handle temperature changes.