



Name: _____

Topic: Homeostasis



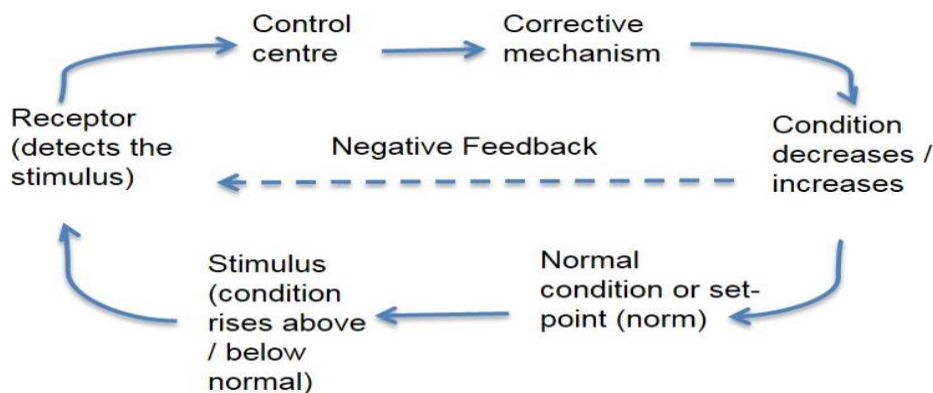
LO: Define homeostasis as the maintenance of a constant internal environment

Homeostasis is the maintenance of a constant internal environment.

Eg. Regulation of blood glucose level (insulin and glucagon)
Regulation of water potential in blood plasma (ADH)
Regulation of body temperature

LO: Explain the basic principles of homeostasis in terms of stimulus resulting from a change in the internal environment, a corrective mechanism and negative feedback

- A stimulus is a change from the normal condition of the internal environment.
- Receptors detect these changes in the internal environment and are stimulated. Nerve impulses generated from the receptors are transmitted to the control centre or regulator, triggering an appropriate response (corrective mechanism) to restore internal environment back to the norm.
- A response counteracts the changes and returns the internal environment back to the norm.
- This response to return the internal environment to its normal levels is known as negative feedback.



Negative feedback is a set of corrective mechanism triggered due to a change in the internal environment detected by receptor to bring about the reverse effect of the stimulus to restore normal conditions.

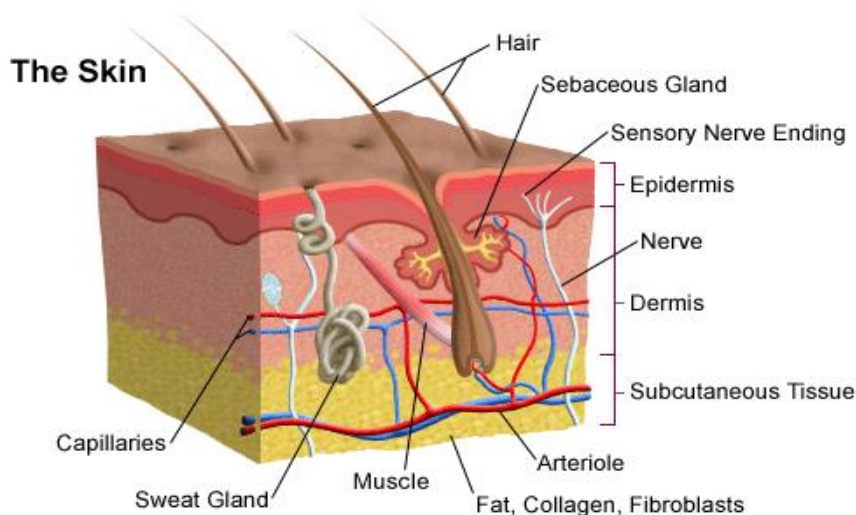
Examples;

- Regulation of blood glucose level
Stimulus – Change in the blood glucose level
Receptor – Islets of Langerhans of the pancreas
Corrective mechanism – Secretion of more insulin/ glucagon



- Regulation of water potential in blood plasma
Stimulus – Change in water potential in blood plasma
Receptor – Hypothalamus
Corrective mechanism – Secretion of more or less anti-diuretic hormone (ADH) from pituitary gland to reabsorb more/less water from collecting duct into the blood capillaries.

LO: Identify on a diagram of the skin: hairs, sweat glands, temperature receptors, blood vessels and fatty tissue



Layers of skin	Layers of cells	Type of cells/structure	Function of cells
Epidermis	Cornified layer	Flattened and dead keratinised cells	- Protects body from water loss - Protects body from invasion by microbes - Protects body from mechanical, thermal & chemical damage
	Granular layer		New cells undergo cell division
	Malpighian layer	Pigment cells	To replace dead cells from the cornified layer



Name: _____

Topic: Homeostasis



			Brown pigment, melanin shields genetic material from UV radiation.
Dermis		- Blood supply - Elastic fibres - Sebaceous glands - Sweat glands - Hair - Erector muscle - Receptors - Lymphatic vessels	- Arterioles, shunt vessels and blood capillaries involved in temperature regulation - Gives the skin its elastic nature - Secrete sebum which is a lubricant - Produce sweat as an excretory waste, cools the body & removes excess salt - Involved in thermoregulation - Involved in thermoregulation - Controls the position of the hair, upright or flattened - Detect environmental changes such as temperature, pressure, pain & touch - Transport excess fluid out of the skin
Subcutaneous fat	Adipose tissue	Adipose cells	Insulating layer reducing heat loss

LO: Describe the maintenance of a constant body temperature in humans in terms of insulation and the role of: temperature receptors in the skin, sweating, shivering, blood vessels near the skin surface and the co-ordinating role of the hypothalamus

Thermoregulation is important to maintain the body's temperature and prevent it from overheating or from freezing by storing and producing as much heat within the body as possible.



Name: _____

Topic: Homeostasis



Rise in temperature:

- Thermoreceptors in the skin detect the rise in temperature of the environment and are stimulated.
- Change in the blood temperature is detected by hypothalamus in the brain which is stimulated. Brain transmits nerve impulses to effectors to carry out responses that restore the normal body temperature.
- Sweat glands located in the dermis of the skin are more active and secrete more sweat and more heat is lost through latent heat of vaporisation when more water in sweat evaporates.
- Vasodilation of arterioles and shunt vessels constrict so that more blood flows to the blood capillaries on the skin surface, resulting in increased heat loss by conduction, convection and radiation.
- Metabolic rate decreases and less heat energy is released via respiration.
- Blood temperature decreases and core body temperature returns to normal.

Drop in temperature:

- Thermoreceptors in the skin detect the decrease in temperature of the environment and are stimulated.
- Change in the blood temperature is detected by hypothalamus in the brain which is stimulated. Brain transmits nerve impulses to effectors to carry out responses that restore the normal body temperature.
- Skeletal muscles contract and relax repeatedly called shivering, resulting in the release of heat energy due to increased rate of respiration.
- Sweat glands are less active and produce less sweat to reduce further loss of body heat through the evaporation of water in sweat, less latent heat of vapourisation is removed.
- Vasoconstriction of arterioles and shunt vessels dilate resulting in less blood flowing to the blood capillaries on the skin surface, so that less heat is lost through conduction, radiation and convection.
- Metabolic rate increases and more heat energy is released via respiration.
- Blood temperature increases and core body temperature returns to normal.

Role of hypothalamus:

- detects change in blood temperature
- stimulated and generates nerve impulses
- nerve impulses are transmitted to the effectors to carry out responses to bring the blood temperature back to norm