

Co-ordination & Control

voluntary action

deliberate
under conscious control
involving nerve impulses generated by the brain
always co-ordinated by brain

involuntary action

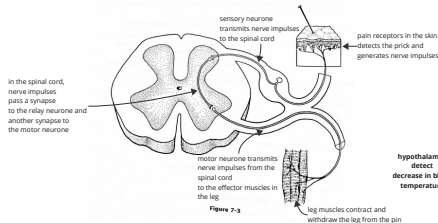
reflex action

immediate response to a specific stimulus
not under conscious control
involve nerve impulses generated by receptors
co-ordinated by brain or spinal cord

homeostasis

is the
maintenance of a constant internal environment

reflex arc co-ordinating response to a pin prick on the leg



nervous control

requires
receptors to detect
a change in the
internal
environment

and signal

effectors to carry
out the corrective
mechanism

could be part of

restores the
internal
environment to set
point

that prevents over-correction by
reducing intensity of

triggering negative
feedback

nervous control

nerve impulses are electrical in nature
nerve impulses are transmitted along neurones
nervous control is fast-acting
nervous control is localised
nervous control is short-lived

for example

hypothalamus co-ordinating thermoregulation

that prevents over-correction by reducing the
intensity of the corrective mechanism

arterioles under the skin to vasoconstrict;
decreasing blood flow to capillaries near the skin;
reducing heat loss via conduction, convection, radiation;
sweat glands to secrete less sweat;
less water evaporate from the skin;
reduce heat loss as latent heat of vaporisation;
skeletal muscles contract and relax uncontrollably in a shiver;
increase rate of respiration to release heat to warm body up

triggering negative
feedback

increases body
temperature to set
point

pancreas detect
increase in blood
glucose
concentration

secretes insulin that

increase uptake of glucose from the bloodstream
convert excess glucose into glycogen for storage

decreases blood
glucose
concentration to
set point

triggering negative
feedback

pancreas co-ordinating blood glucose regulation

that reduces the secretion of insulin

stimulates liver cells to

convert excess glucose into glycogen for storage

decreases blood
glucose
concentration to
set point

triggering negative
feedback

hypothalamus co-ordinating osmoregulation

that increases secretion of ADH

walls of collecting duct
become less permeable to water;
slower reabsorption of water
from the nephron into the blood capillaries;
formation of larger volume of dilute urine;

decreases water
potential of blood
plasma to set point

triggering negative
feedback

hypothalamus
detect increase in
blood plasma water
potential

stimulates pituitary gland
to secrete less ADH

hypothalamus
detect decrease in
blood plasma water
potential

stimulates pituitary gland
to secrete more ADH

walls of collecting duct
become more permeable to water;
faster reabsorption of water
from the nephron into the blood capillaries;
formation of smaller volume of concentration urine;

increases water
potential of blood
plasma to set point

triggering negative
feedback

that reduces the secretion of glucagon

stimulates liver cells to
convert glycogen stores into glucose
gluconeogenesis
release glucose into the bloodstream

increases blood
glucose
concentration to
set point

triggering negative
feedback

pancreas detect
decrease in blood
glucose
concentration

secretes glucagon that

that reduces the secretion of ADH

triggering negative
feedback