



# LO: Define a hormone as a chemical substance, produced by a gland, carried by the blood, which alters the activity of one or more specific target organs and is then destroyed by the liver

Hormones are <u>chemical substances</u> produced by <u>endocrine glands in minute quantities</u>, <u>transported by blood plasma</u>, which <u>alters the activity of one or more target organs</u> and is <u>destroyed by the liver</u> and <u>excreted by the kidneys</u>.



LO: Explain what is meant by an endocrine gland, with reference to the islets of Langerhans in the pancreas



• Endocrine glands are <u>ductless</u> <u>glands</u> that <u>produces and releases</u> <u>hormones directly into the blood</u>.

• Eg. <u>Islets of Langerhans in the</u> <u>pancreas</u> are endocrine gland that produces and releases <u>insulin</u> and <u>glucagon</u> directly into the <u>blood</u> <u>plasma</u> to be transported to the <u>target</u> <u>organs</u> (e.g. <u>liver and muscles</u>) to <u>regulate blood glucose concentration</u>.





### LO: State the role of the hormone adrenaline in boosting blood glucose levels and give examples of situations in which this may occur

- Stimulus: Situations that encounter fear, anger and anxiety
- Stimulates sensory receptors and transmit nerve impulses to the brain which transmits nerve impulses to the <u>effector</u>, <u>adrenal gland</u> which <u>produces and</u> <u>releases adrenaline</u> into the blood to prepare the body for fight/ flight response



# Effects of adrenaline:

- Stimulates <u>liver and muscle cells to convert stored glycogen to glucose</u>, <u>increasing the blood glucose levels</u>
- <u>Increase in heart rate and blood pressure</u>, hence <u>more oxygen and glucose</u> is supplied to <u>muscles for higher rate of respiration to release more energy</u>
- Constriction of arterioles in skin to allow more blood to the muscle tissues
- <u>Rate of ventilation is increased</u> for <u>increased oxygen supply</u> for respiration and <u>removal of carbon dioxide</u>
- Increase in metabolic rate to release more energy during respiration
- Dilation of pupil to allow more light in to enhance vision





# LO: Explain how the blood glucose concentration is regulated by insulin and glucagon as a homeostatic mechanism

Changes in blood glucose concentration <u>stimulates islets of Langerhans of pancreas</u> to secrete <u>more insulin /glucagon</u>



# After a heavy meal:

- <u>Blood glucose concentration increases above normal</u> (stimulus)
- Stimulates islets of Langerhans of pancreas to secrete more insulin
- Insulin stimulates liver and muscle cells to convert excess glucose to glycogen
- Increase permeability of cells for glucose uptake
- Blood glucose concentration <u>decreases back to normal</u>

# Starvation:

- <u>Blood glucose concentration decreases below normal</u> (stimulus)
- <u>Stimulates islets of Langerhans of pancreas to secrete more glucagon</u>





- Glucagon <u>stimulates liver and muscle cells</u> to convert stored <u>glycogen back to</u> <u>glucose</u>
- Stimulates conversion of lactic acid/amino acids/fats to glucose
- Blood glucose concentration increases back to normal



LO: Describe the signs, such as an increased blood glucose level and glucose in urine, and the treatment of diabetes mellitus using insulin

#### Signs of diabetes mellitus:

- Persistently high blood glucose level after a meal
- Presence of <u>high amount of glucose in urine</u>; increased in output of urine
- Slow healing of wounds

**Type 1 diabetes mellitus:** No/ insufficient insulin production **Type 2 diabetes mellitus:** Insulin resistance due to non-responsive receptors

# Treatment of diabetes mellitus:

- Monitor their blood glucose concentrations and test their urine regularly (Type 1 and 2)
- Regulate carbohydrate content in their diet (Type 1 and 2)
- Injection of insulin (Type 1)

# Compare the nervous system and endocrine system:



Name: \_

**Topic: Hormones** 



#### Similarities:

- Both have <u>receptors</u> that detect stimulus.
- Both involve transmission of a <u>signal</u> or <u>message</u>.
- Both involve an <u>effector/ target organ</u> that carries out a <u>response</u>.

#### Differences:

Nervous control	Endocrine control
Involves neurones	Involves hormones
Electrical and chemical transmission	Chemical transmission
Nerve impulses are transmitted by neurones	Hormones are transmitted by the blood
Rapid transmission and response	<b>Slower</b> transmission and relatively slow-acting
Often causes <b>short-term</b> effects	Can cause long-term or short-term effects
Voluntary or involuntary	Always involuntary
Usually localised response (to effector muscles only)	Usually widespread effects (many organs affected)