

Homeostasis

Part D – The Big Question – Communication (10 marks), Application (15 marks)

Homeostasis is a mechanism to keep the body's internal environment working at optimal conditions. There are many systems interacting for this purpose. If the environment is not at optimal conditions, the body utilizes several components to detect, respond to, and correct changes regarding the situational conditions.

Outline an example a stimulus-response in the body. You must include nervous and endocrine pathways, feedback, and a resulting disease/disorder if the pathways do not work optimally.

Criteria:

- You will submit your own list of 25 (or more) terms that you will use in your answer. Your list must be submitted for feedback prior to the test. You will also bring a typed master list of your terms (only the terms, no explanations) to class on the day of the test, to attach to your paper.
- Discuss a combination of both endocrine and nervous control.
- You do not need to include details of action potentials.
- Your answer must include diagrams, including a feedback loop pathway.
- Your answer must have clear, HIGHLIGHTED, correct and effective use of your listed terms.
- Your answer must fit on one sheet of ledger paper, but you may use both sides.

Homeostasis - the ability of an organism to remain in internal balance when an internal/external change is applied

↳ this is done through feedback pathways; the change is communicated to the nervous system then the changes are opposed

Nervous system - Receives information (the stimulus applied) and sends info on how to Regain Homeostasis

Stimulus - a detectable change applied to organism (changing homeostasis)
 ↳ the message of the stimulus is sent to the **central nervous system** where it decides what message is relayed to effectors

Nerves - bundles of neurons
 ↳ info sent by nerves to CNS

Sensory neuron
 ↳ afferent neuron
 ↳ take info regarding stimulus to CNS

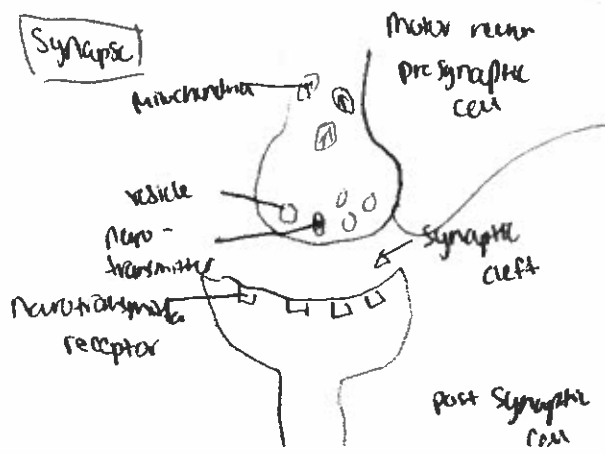
Motor neuron
 ↳ efferent neuron
 ↳ takes the info (opposing change) from CNS to effectors

Synapse; Junction between neurons

↳ located between motor neuron and muscle cell

2 types

Chemical synapse
 ↳ electrical signal changes to chemical signal then back to electrical signal in postsynaptic cell



but how is all this nervous stuff related to your endocrine pathway (insulin)?

* the body will use sympathetic system to overcome the inhibition due to glucose

Peripheral nervous system
 ↳ communicates messages between CNS and organs/cells

* When a stimulus like Glucose is applied to the body (changing homeostasis by increasing blood glucose levels)

the peripheral nervous system uses autonomic nerves (involuntary ones)

↳ Sympathetic to stimulate

↳ Parasympathetic to inhibit

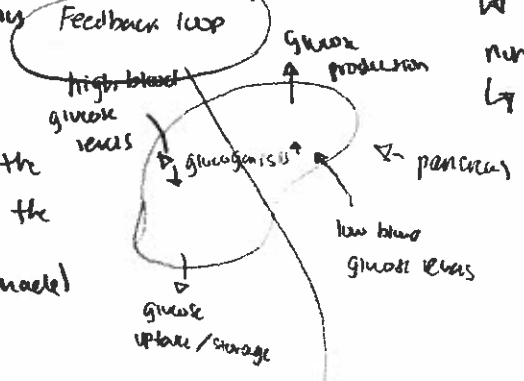
Endocrine system - secretes hormones into the blood stream in order to change the activity of another cell (to regain balance)

Hormone - chemical that is released into the blood stream with the aim to target a cell (then change its activity)
 - can be secreted by primary gland or other endocrine glands

Hypothalamus is important link between nervous/ endocrine system

Primary gland is regulated by the hypothalamus

Endocrine glands - ductless glands that secrete hormones into the blood stream
 ↳ hormones towards a specific cell target
 ↳ affect many cells non-target



pancreas - an endocrine gland
 ↳ both the receptor (identifies the stimulus) and effector (applies the changes that need to be made)
 ↳ contains cells called islets of Langerhans which produce 2 hormones

(1) **Insulin**

↳ produced in beta cells which are used when blood glucose level is high
 ↳ promotes conversion of glucose to glycogen

(2) **Glucagon**

↳ produced in alpha cells which are used when blood glucose level is low
 ↳ promotes conversion of glycogen to glucose and promotes production of glucose

unclear! how does it shut off?

~~check the feedback loop~~

ex. Insulin
 ↳ when a stimulus (glucose) is placed on the body the homeostasis balance (blood glucose levels are disrupted) to the endocrine gland releases insulin to signal liver/muscle, fat tissue to absorb sugar from blood

I'm looking for the nervous signals involved in this pathway and the endocrine signaling pathway

Diabetes Mellitus - chronic disease
 ↳ occurs when patient does not produce enough insulin or when receptors not working properly

type (1) - When patients do not produce enough insulin due to early beta cell degeneration

type (2) - when production of insulin & or receptors do not function correctly - associated w being overweight

Gestational - temporary for pregnant woman because babies hormones block mothers receptors

Hormones involved with blood glucose?

Insulin

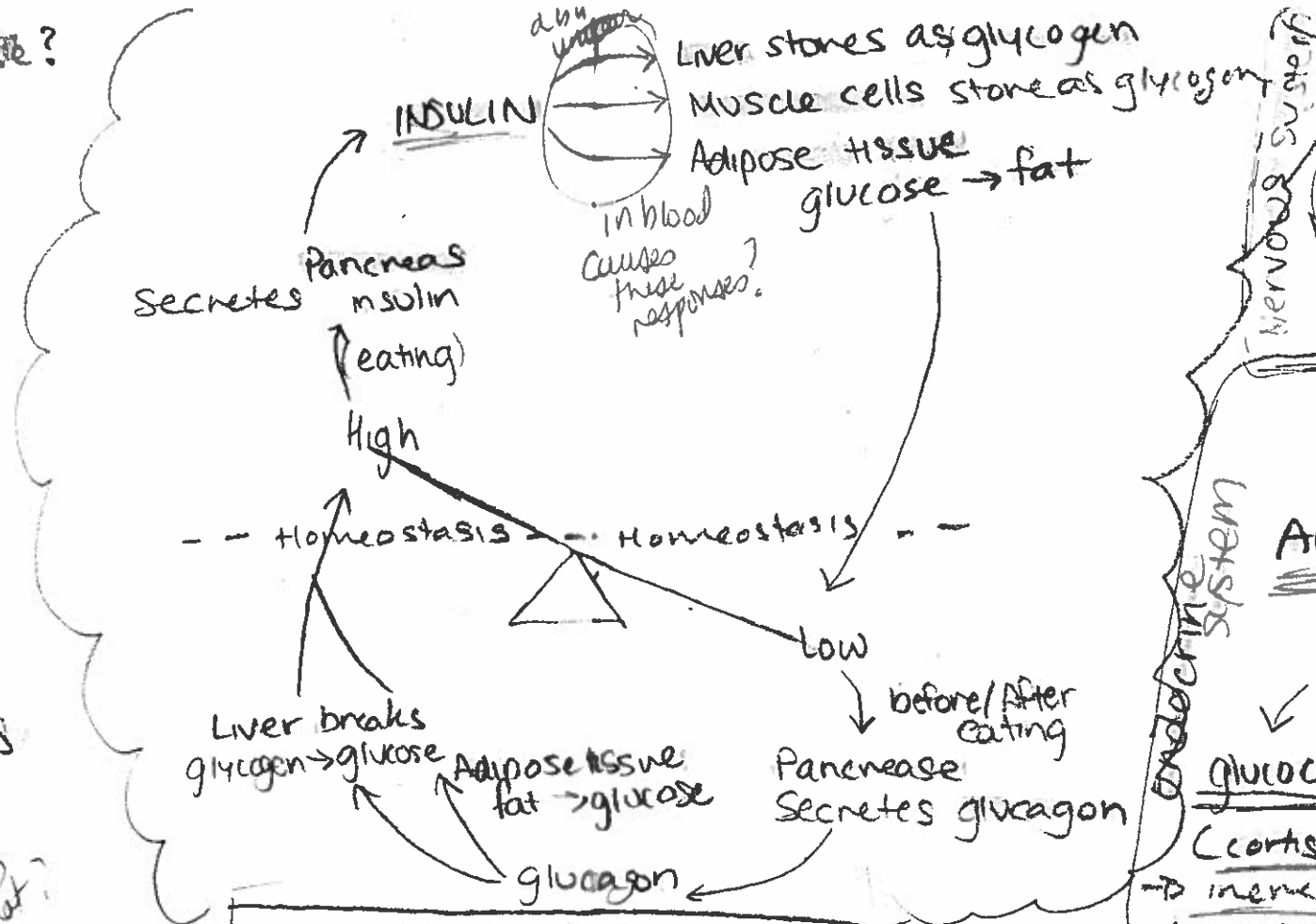
Glucagon

→ Both are released by the pancreas

→ α cells from the islets of Langerhans

→ β cells from the islets of Langerhans

→ regulated by a negative feedback system *which means what?*



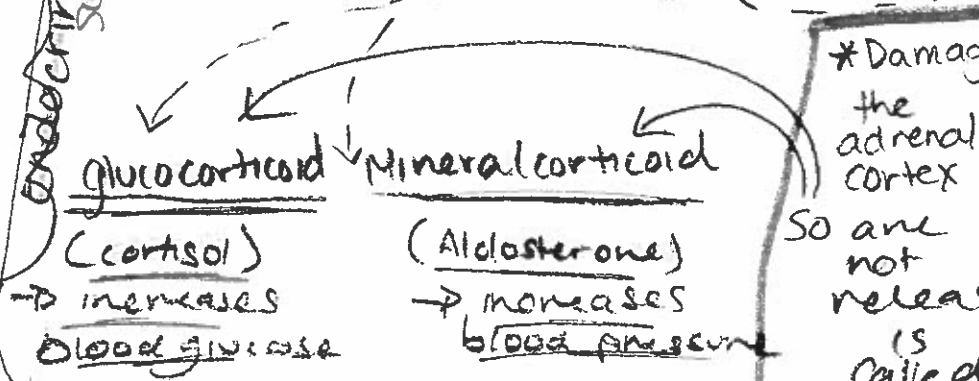
Homeostasis
A healthy body is able to regulate the body's blood glucose levels.

Central Nervous System
(Brain) (Spinal Cord)

Hypothalamus → regulates what? *this connection is unclear*

Pituitary gland - "master gland" *CRH?*

ACTH → releases from Adrenal cortex *what does this have to do with insulin?*



What happens when blood glucose is not maintained?

* Note: Blood glucose raises → insulin
Blood glucose drops → glucagon

Hyperglycemia

↳ blood glucose levels too high

Hypoglycemia

↳ blood glucose levels too low

Diabetes

Type 1: β cells are destroyed by body's immune system

Type 2: β cells are inefficient, body does not respond

Further Affects of this

This is a bit disjointed. I find it hard to follow the flow. not all terms explained

Nervous System damage

Peripheral Nervous System

↳ Peripheral Neuropathy

* - damage to nerves in feet, hands

Autonomic Nerves

↳ Autonomic Neuropathy

* - damage to organs

* good nerve → bad nerve



Blood vessels are strong



blood vessels break
Nerve deteriorates

how/why? how related to insulin or diabetes