

Health and Social Care Transition Work Unit 3 - Homeostasis

This work pack should be completed in full.

It covers the key areas of homeostasis, which you would have studied at GCSE Biology.

The purpose of this pack is to revise and remind you of the key aspects of homeostasis. You can use any resource you wish to help you complete the pack. There are some websites on the last page of this booklet that may help you.

T

LEARNING OUTCOME:

By the end of this topic you will:

Understand the functioning of body systems in association with energy metabolism.

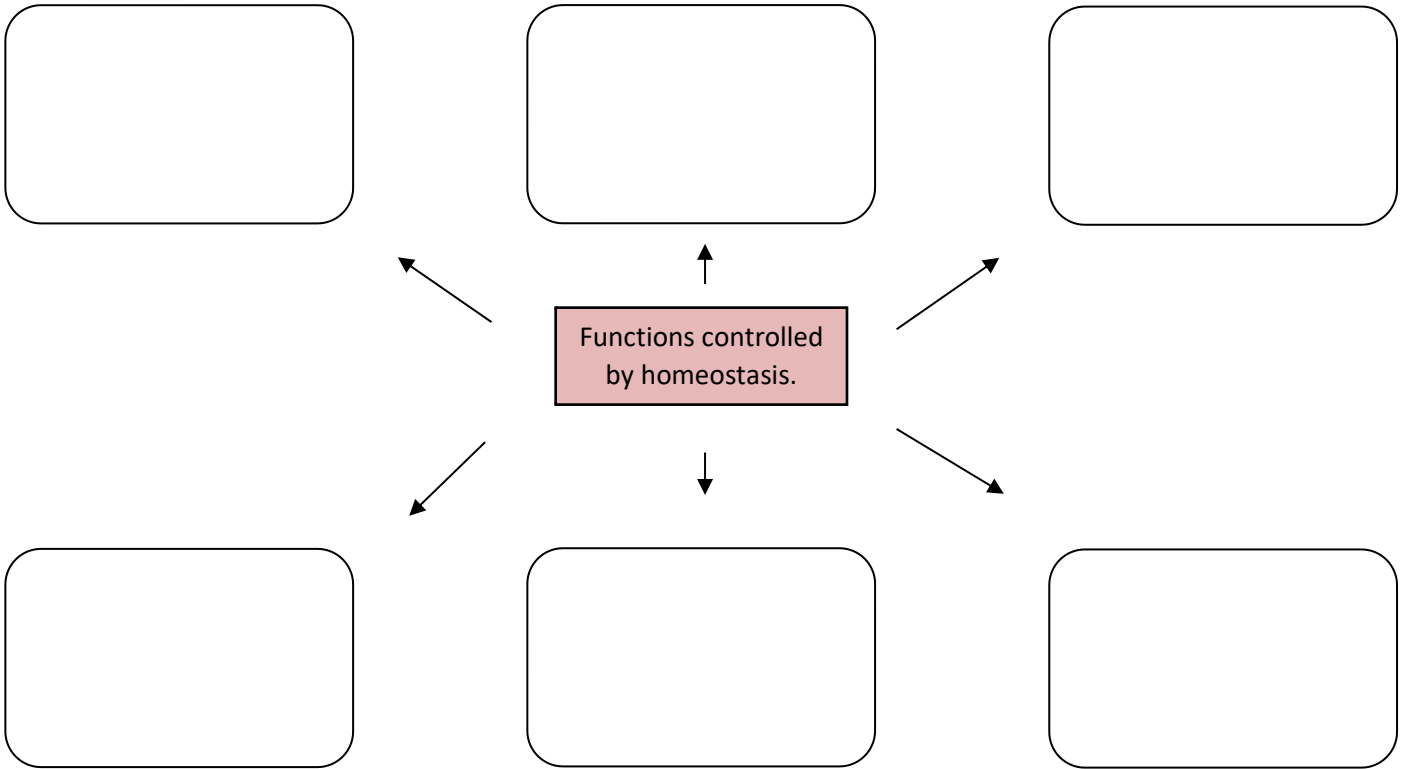
This includes:

1. Homeostasis
2. Homeostatic Mechanisms for Regulation of Heart Rate
3. Homeostatic Mechanisms for Regulation of Breathing Rate
4. Homeostatic Mechanism for Regulation of Body Temperature
5. Homeostatic Mechanisms for Regulation of Blood Glucose Levels



What is homeostasis?

What body functions is homeostasis is responsible for?



Why does waste need to be removed from the body?

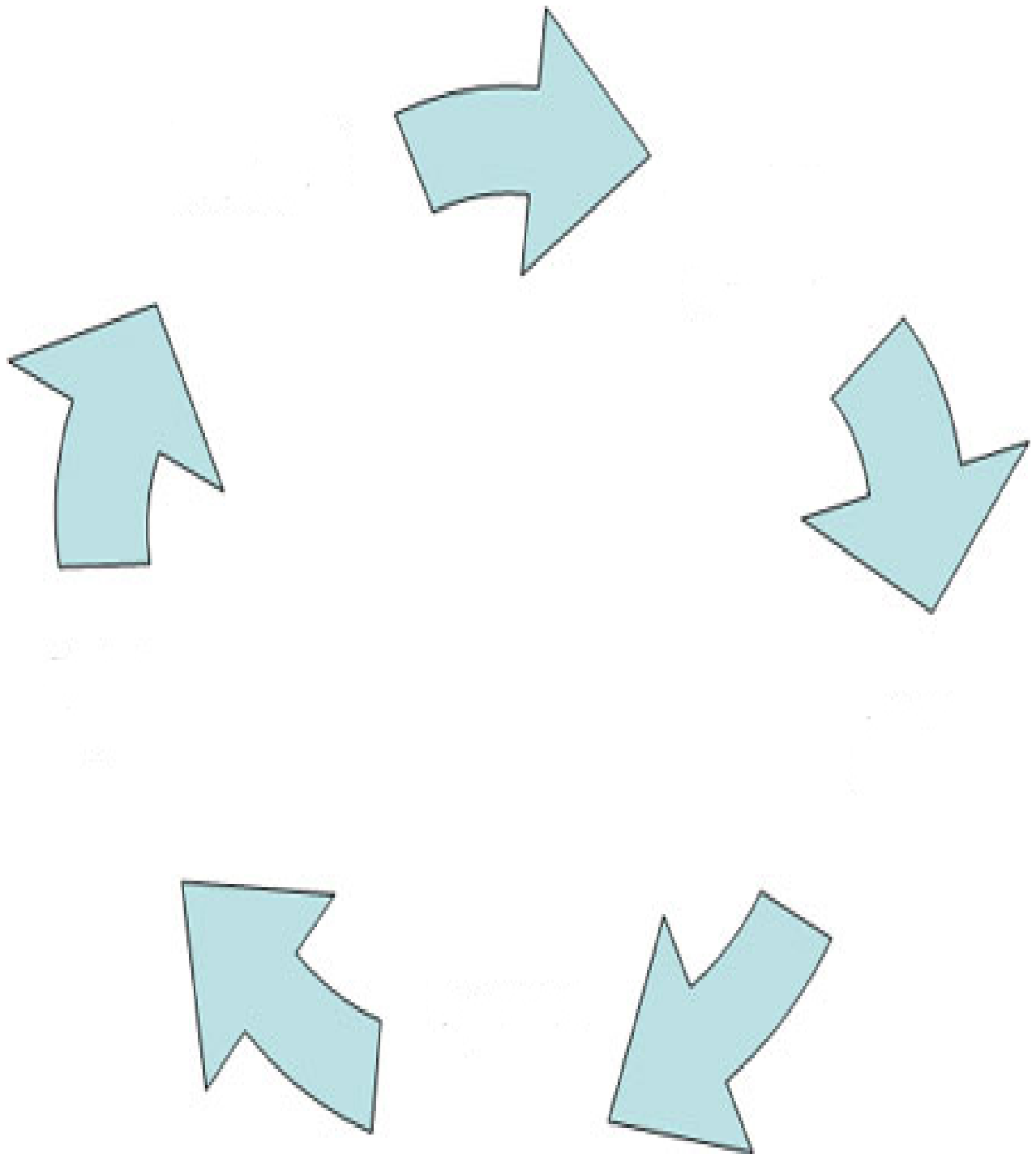
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Homeostasis is often described as a negative feedback system, what does this mean?

Carbon dioxide		
Urea		

Give an example of negative feedback:

Describe the process using the diagram below:



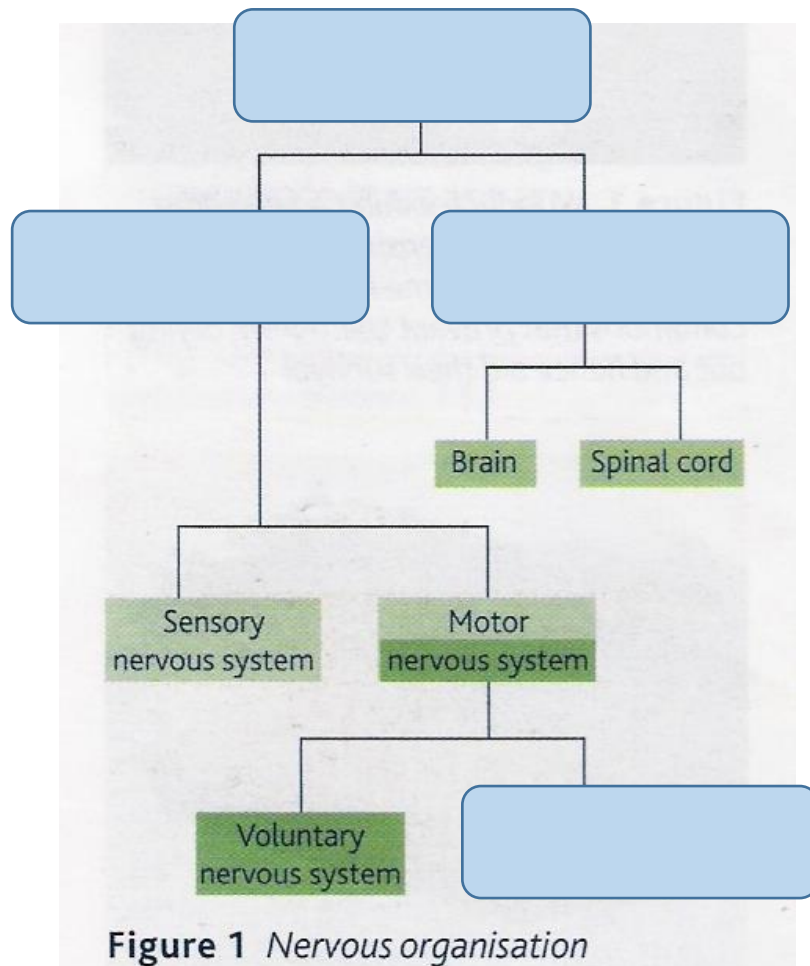
Homeostatic mechanisms for the regulation of heart rate:

What is the autonomic nervous system?

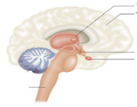
It has two divisions:

1. The sympathetic nervous system
2. The parasympathetic nervous system

Complete the diagram below:



Explain what happens to your heart rate when you are frightened - make sure you discuss the sympathetic and parasympathetic control of the heart.

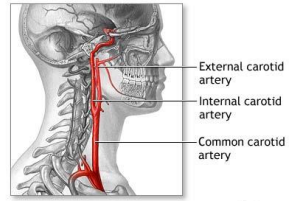


What role do chemical receptors play in the process?

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Homeostatic mechanisms for the regulation of breathing rate:

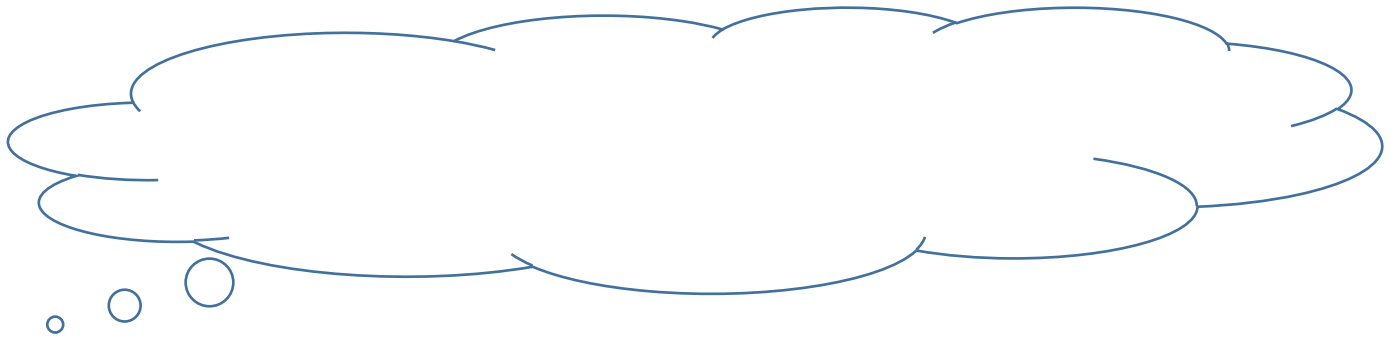
How is ventilation controlled in humans?



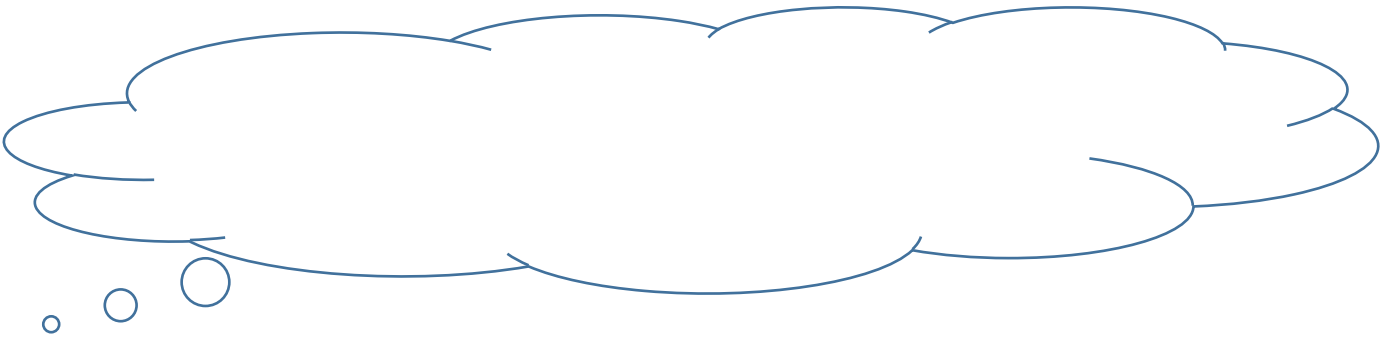
How is ventilation increased in humans?

Homeostatic mechanisms for the regulation of temperature:

What actions do we take to keep ourselves warm?



What actions do we take to cool ourselves down?



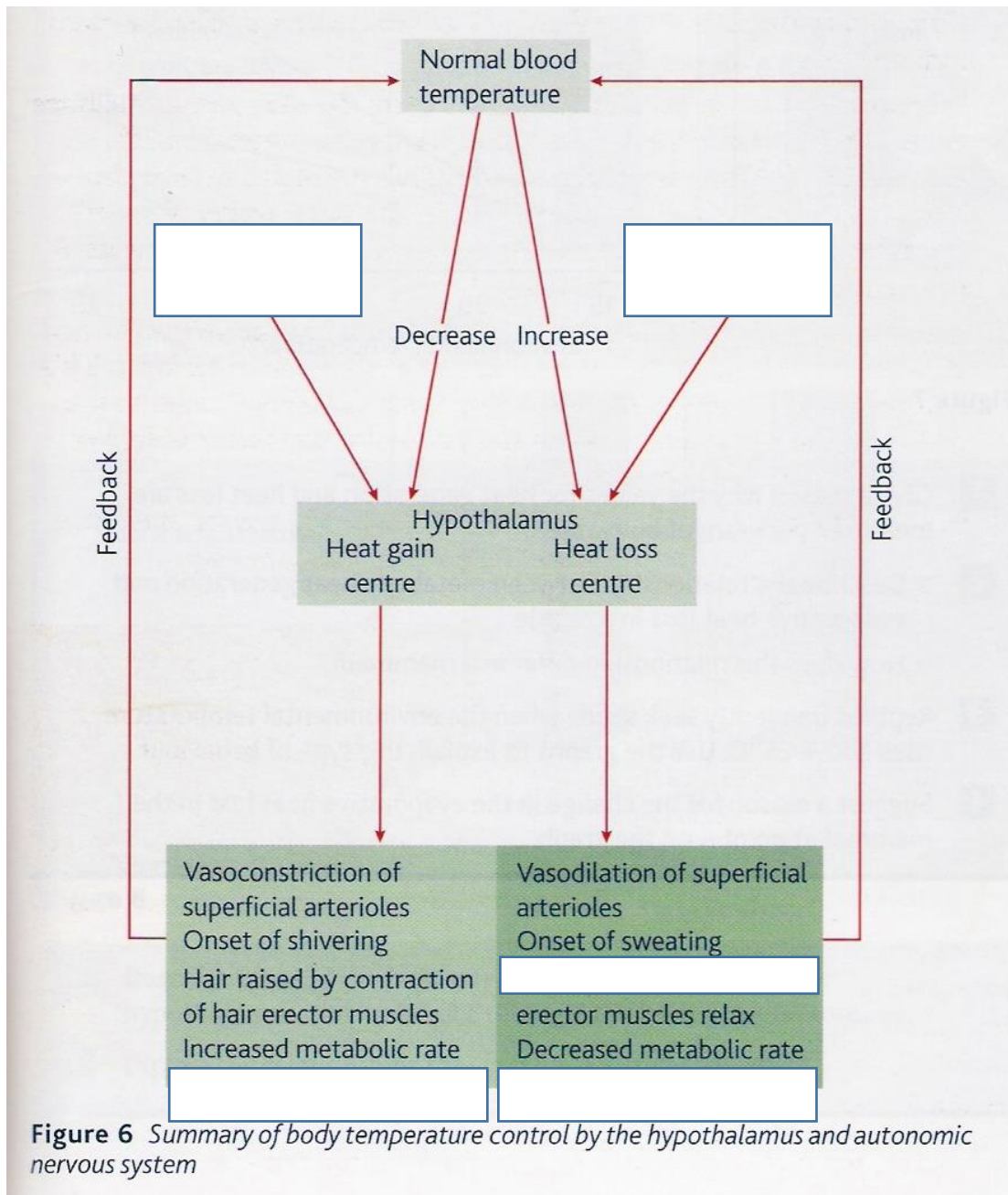
Within the hypothalamus there is a thermoregulatory centre which has two parts, explain both parts:



What does the hypothalamus do?

What do the thermoreceptors in the skin measure?

What do these thermoreceptors in the skin do?



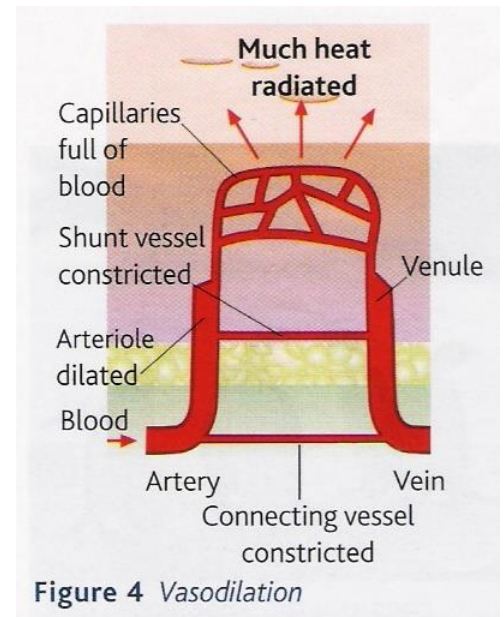
Why do organisms have to regulate their temperature?

Rapid responses that enable heat to be lost when the environmental temperature is high include:

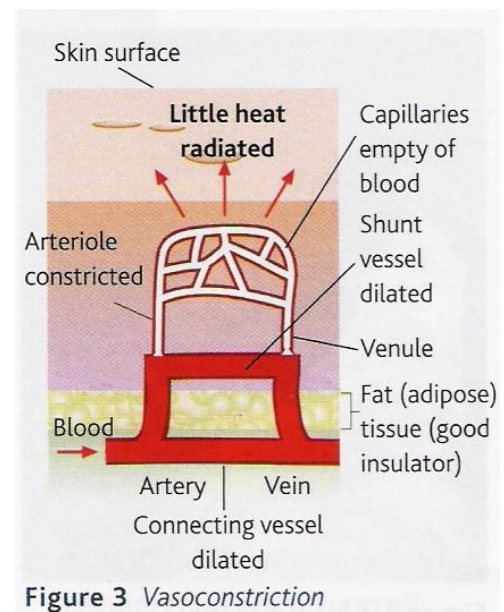




What is Vasodilation?



What is Vasoconstriction?



How do humans lose heat in response to a warm environment?

Homeostatic mechanisms for the regulation of blood glucose levels:

Why do we need to regulate blood glucose levels?

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What is the role of the pancreas in regulating blood glucose?

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What are **islets of Langerhans**?

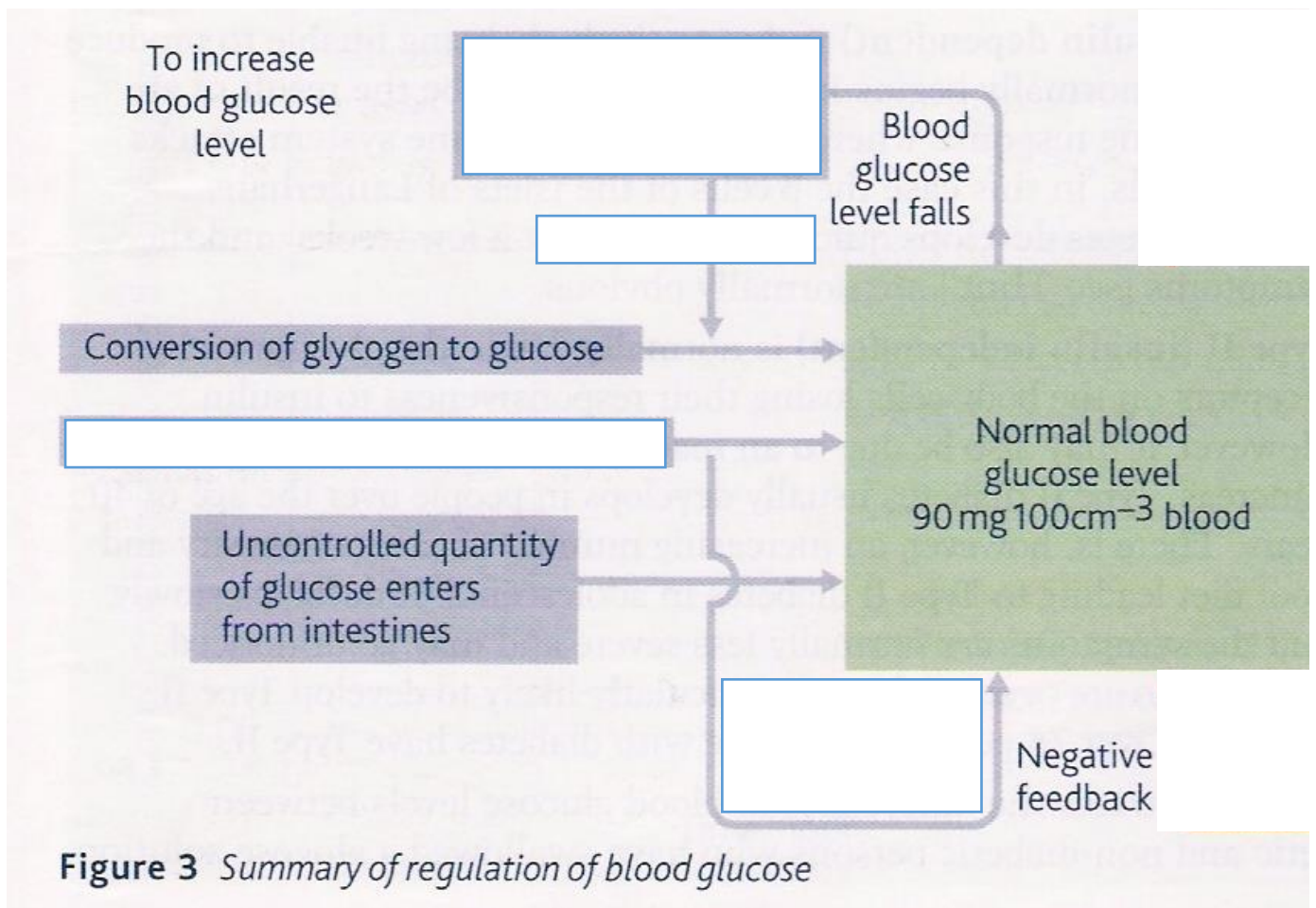
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Only the cells of the liver have receptors that bind to glucagon so only liver cells respond.

They do this by:



What is the role of glucagon in regulating blood glucose?



What is the role of adrenaline in regulating blood glucose?

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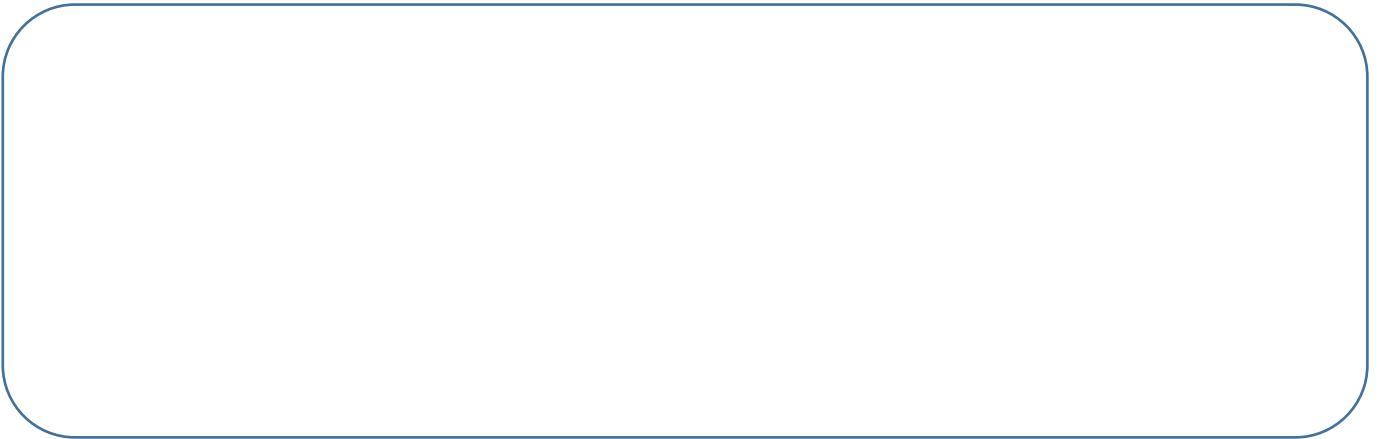
Why is homeostasis important?

Homeostasis is essential for the proper functioning of organisms for the following reasons:

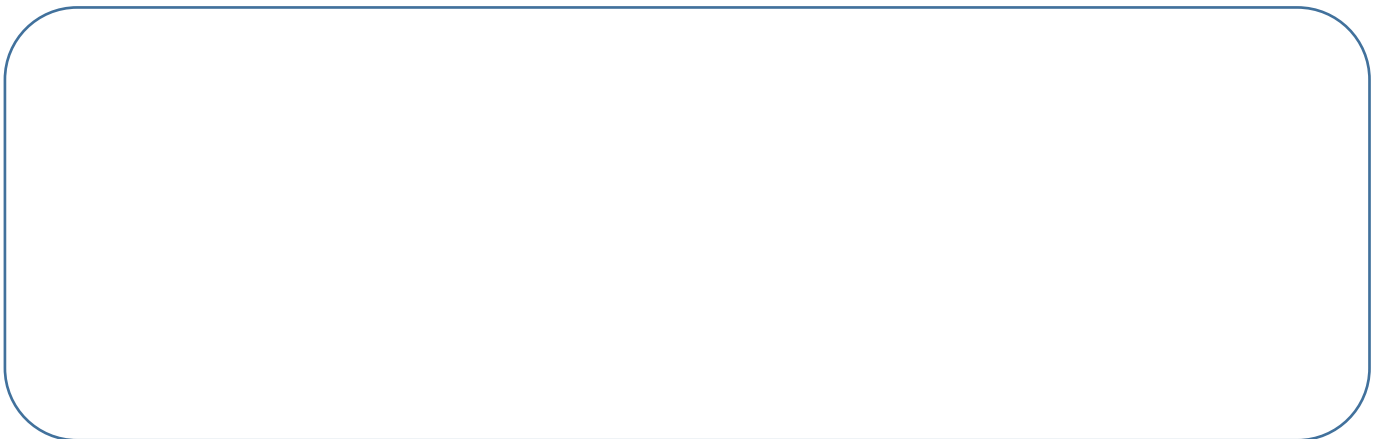
1.



2.



3.



Start with a definition of homeostasis, and what it is responsible for.

Explain how it regulates the internal environment of the body.

Explain the concept of negative feedback as a regulatory mechanism.

Go on to explain how homeostasis regulates breathing rate, heart rate, temperature and blood glucose. Include pictures and diagrams to illustrate the points you are making.

<http://www.s-cool.co.uk/gcse/biology/homeostasis/revise-it/what-is-homeostasis>

<http://www.biology-innovation.co.uk/pages/human-biology/homeostasis/>

http://www.bbc.co.uk/schools/gcsebitesize/science/add_ocr_pre_2011/homeostasis/homeostasisrev1.shtml

► **Discuss the probable homeostatic responses to changes in the internal environment during exercise. (M1)**

This is where you need to explain the regulation of heart rate, breathing, temperature and blood glucose further; say which homeostatic mechanisms are affected by exercise and explain how.

Explain what happens in each of the areas that homeostasis is responsible for regulating, include:

heart rate: roles of internal receptors, autonomic nervous system-sympathetic and parasympathetic nerve supply, cardiac centre, sinoatrial node;

breathing rate: roles of internal receptors, autonomic nervous system – sympathetic and parasympathetic nerve supply, respiratory centre, diaphragm and intercostal muscles

body temperature: production of heat by the body, eg through metabolic processes; loss of heat by the body – radiation, conduction, convection, evaporation; roles of hypothalamus, autonomic nervous system – sympathetic and parasympathetic, skin – role of arterioles and sweat glands; effects of shivering;

blood glucose levels: roles of pancreas, liver, insulin, glucagon

<http://www.nursingtimes.net/nursing-practice/clinical-zones/respiratory/homeostasis-part-1-anatomy-and-physiology/203292.article>

► **Evaluate the importance of homeostasis in maintaining the healthy functioning of the body. (D1)**

You need to show how important it is that your body keeps your blood pressure, breathing rate, temperature and glucose levels within a narrow range and say what happens when this goes wrong.

You need to look at the signs and symptoms associated with all of the disorders and the outcomes of it going untreated. (Hypothermia, Hyperthermia, hypoglycaemic and hyperglycaemic...etc)

Start each section by saying that **normal functioning is controlled by homeostasis**, give an example of normal functioning for each i.e. *normally our bodies shiver, our erector muscles pull up hairs to trap warm air and our metabolism speeds up in an attempt to warm up.*

However in extreme circumstances homeostasis can not maintain normal functioning and then problems can occur that can result in illness or death i.e. *if a marathon runner did not take in enough fluids on a hot day then their body temperature could rise, they may show signs of heat stroke and can pass out. Without adequate hydration the body cannot produce sweat for the body to evaporate and therefore homeostatic functioning will not work effectively. This can warp enzymes in the body and if it goes untreated then it can result in death.*

Hypothermia –what it is ? types, signs and symptoms associated with such problems and what could happen if they go untreated

Hyperthermia - what it is ? signs and symptoms associated with such problems and what could happen if they go untreated

Hypoglycaemia - what it is ? signs and symptoms associated with such problems and what could happen if they go untreated

Hyperglycaemia- what it is ? signs and symptoms associated with such problems and what could happen if they go untreated

Hypotension - low blood pressure - what is it? -signs and symptoms associated with such problems and what could happen if they go untreated

Hypertension- high blood pressure what is it? -signs and symptoms associated with such problems and what could happen if they go untreated

Hyperventilation - what it is ? -signs and symptoms associated with such problems and what could happen if they go untreated

Hypoventilation and [COPD \(Chronic Obstructive Pulmonary Disease\)](#) - what it is ? -signs and symptoms associated with such problems and what could happen if they go untreated.