

GCSE 9-1 Biology Revision Topic 7 – Thermoregulation, blood glucose control and the thyroid gland

Thermoregulation is an important part of homeostasis, definition of homeostasis:

Thermoregulation

It is essential that endotherms maintain their body temperature within narrow limits, by removing excess heat when hot and retaining heat when cold.

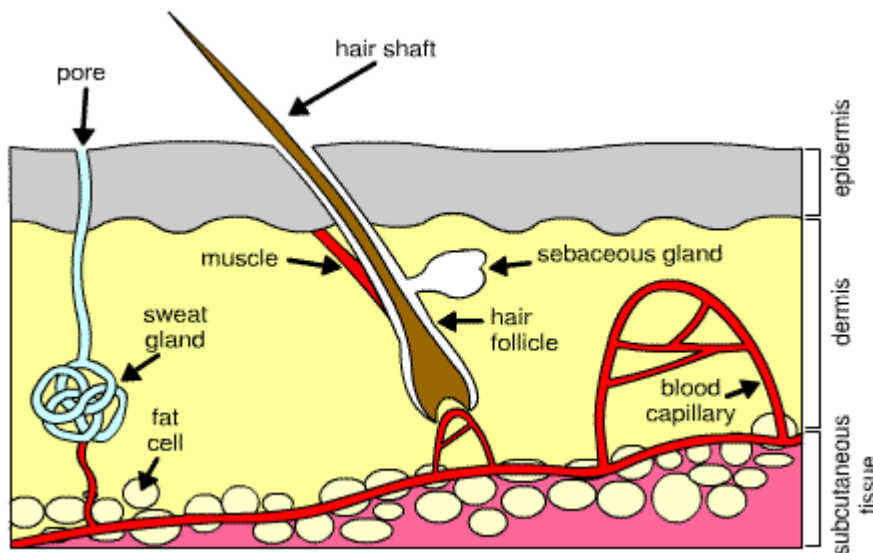
This is to maintain the optimum temperature for _____ controlled reactions of the body

The part of the brain that controls thermoregulation is the _____

Central _____ receptors in the body and peripheral _____ receptors in the _____ send electrical impulses to this part of the brain which coordinates the response

Human body temperature is maintained at around _____

The skin – you need to know its structure as it has a very important role in thermoregulation

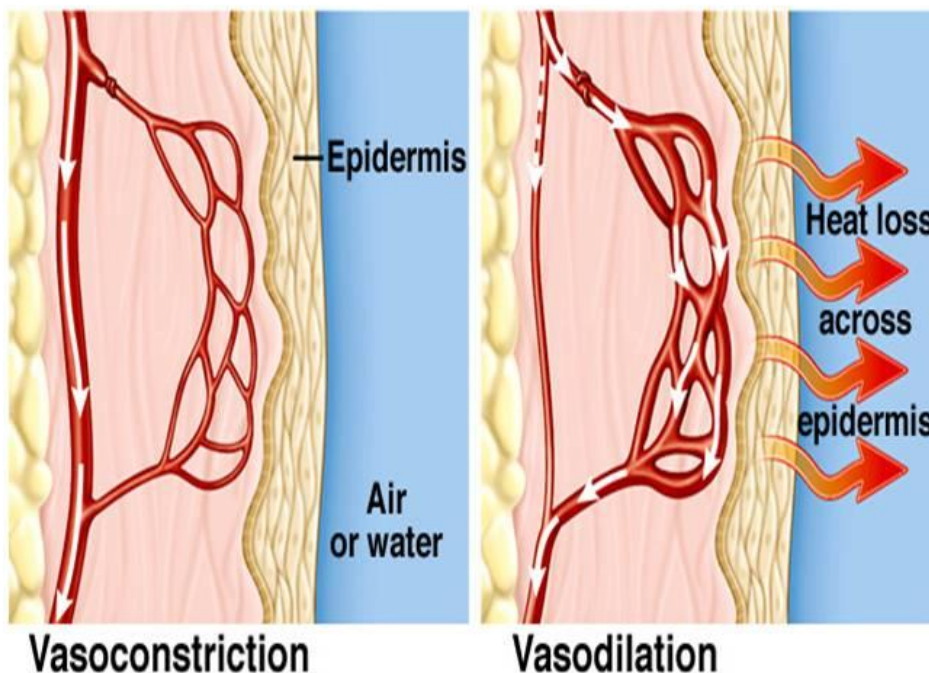


Remember to state that hair traps air which is an **insulator**, reducing heat loss by radiation

When sweat is evaporated it _____ the body as heat from the skin is lost in the evaporation

Heat loss is by _____ into the air and _____ if into a solid

Note sebaceous glands (produce oil) are attached to hair follicles, don't mix them up with sweat glands!

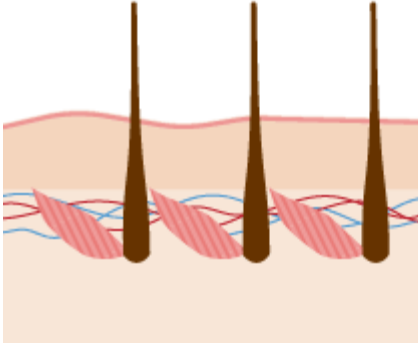
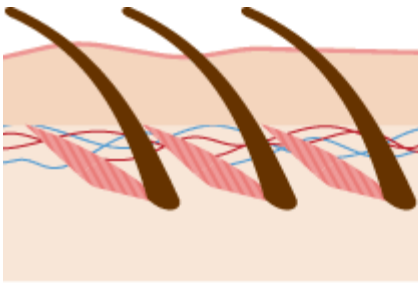


On the diagram label: arteriole, capillary loop, increased blood flow, decreased blood flow

Remember it is the **arterioles** that leads to the capillaries that vasoconstrict or vasodilate, not the capillary (capillaries do not have smooth muscle to allow this)

This changes the blood flow near the skin surface (epidermis)

The capillaries DO NOT MOVE closer to the skin surface (they can't move!)



On the diagram label: hair follicle, relaxed erector pili muscles, contracted erector pili muscle, erect hairs, flat hairs

On the diagram label which one shows the response to cold conditions and which shows hot conditions

Shade in where trapped insulating air would be

Fill in the boxes:

	When body temperature rises above 37°C	When body temperature drops below 37°C
Erector pili muscles attached to hair follicle		
Hair position on body		
Sweat production		
Blood vessels (arteries & arterioles) close to the skin		
Blood flow to skin surface in capillaries and heat loss by radiation		
Involuntary muscles		

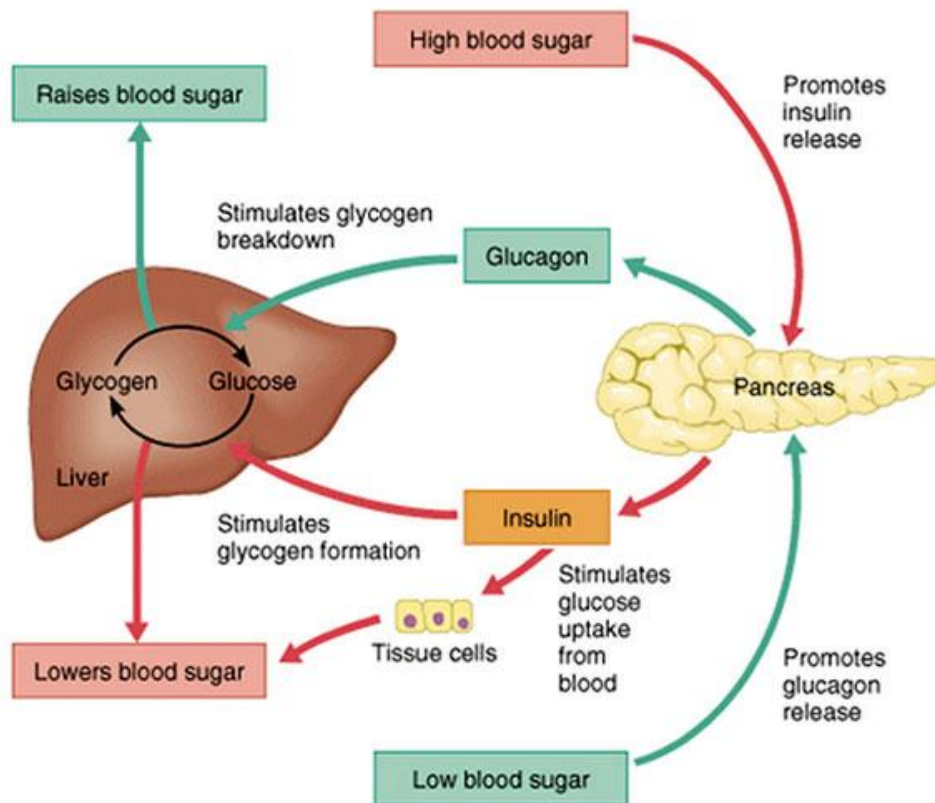
What structures are in the dermis that are involved in thermoregulation?

How is the epidermis involved in thermoregulation?

Once the core temperature is restored after being too hot or too cold what mechanism prevents a further response?

Blood glucose control – another form of homeostasis

Hormones are chemicals secreted by endocrine _____ and transported in the _____ to act on target organs. Their secretion is controlled by _____ **feedback**, which allows control mechanisms to fluctuate and self-adjust.



Blood glucose is controlled by 2 hormones _____ and _____

Both hormones are produced in the _____

The hormones are transported in the _____

Excess glucose can be converted into _____ which is stored in _____ cells and _____ cells

High glucose concentration in the blood (eg from having eaten carbohydrates), fill in the gaps:

- High blood glucose detected by cells in the _____
- The hormone _____ is secreted by the pancreas
- This causes muscle and _____ cells to take up more glucose from the blood and it is converted into _____ and stored in the cells
- This lowers the blood glucose level, so there is _____ feedback and _____ production decreases to prevent a further lowering of blood glucose (hypoglycaemia)

Low glucose concentration in the blood (eg from having exercised, not eaten _____ for a while)

- Low blood glucose detected by cells in the _____
- The hormone _____ is secreted by the _____
- This causes stored _____ to be converted into _____ and released into the blood
- This raises the blood glucose levels, so there is _____ feedback and production of _____ decreases to prevent a further rise in glucose (Hyperglycaemia)

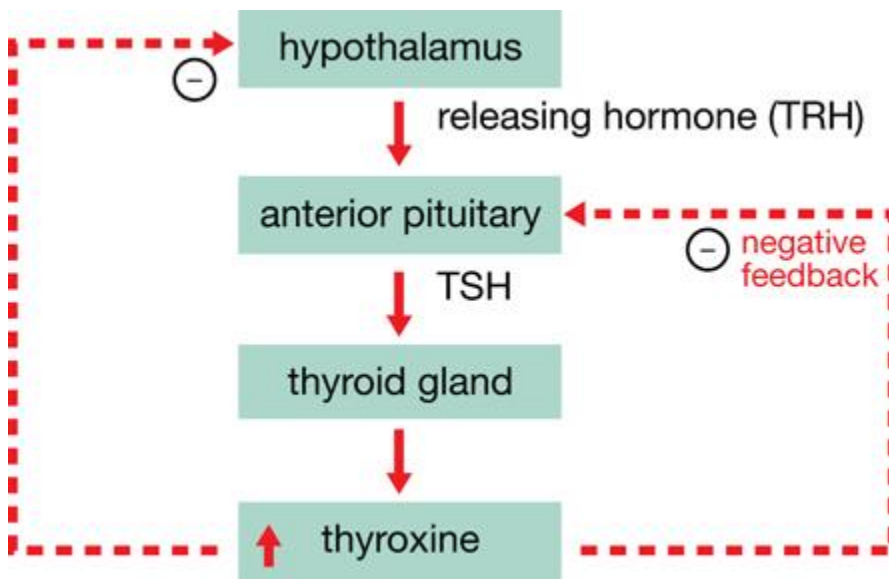
Uncontrolled high blood glucose levels is called **Diabetes** and can kill – you need to know the difference between type 1 and type 2

	Type 1 diabetes	Type 2 diabetes
Cause	_____ production of insulin	_____ to insulin (cells do not respond to insulin) or very little

	Destruction of insulin producing cells in pancreas, commonly autoimmune Genetic cause – gene mutation	insulin produced Increased risk with high BMI**
Treatment	Injections of _____ at mealtimes Limit intake of _____ Increased amount of _____ that will use more glucose in respiration	Diet _____ in carbohydrates Increased amount of exercise that will use more _____ in respiration Losing weight to lower _____ Insulin injections/other diabetic treatment to control blood glucose
Symptoms	Tiredness, constant thirst, glucose in urine, feeling faint. Long term: blindness, kidney failure, heart disease	

The Thyroid gland and metabolism

The thyroid gland is in your _____ and secretes the hormone _____ into the blood, this hormone controls your _____ rate, which controls how quickly you respire, releasing _____. The secretion of _____ is controlled by _____ other hormones (_____ and _____) and by _____ feedback.



With low levels of thyroxine secretion what happens to the negative feedback on the hypothalamus and anterior pituitary? Go through step by step

Thyroxine also affects other cells: heart cells contract more rapidly, it increases the rate of protein and carbohydrate breakdown in cells

People who have an over active thyroid gland (hyperthyroidism) tend to eat a lot but do not get fat, they tend to feel very warm most of the time, explain why

What effect will an underactive thyroid have on someone?

Past paper questions to practice – mark schemes on W drive :

B1 nov 2011 Q6

***(c) Explain how blood glucose levels are controlled in people who do **not** have diabetes.**

(6)

B1 june 2015 Q6

***(c) The human body prevents blood glucose levels from becoming too high or too low.**

Explain how the human body maintains blood glucose levels within a narrow range.

(6)

B1 may 2012 Q5

***(c) In the UK, the external temperature can drop below 0 °C.**

Explain how the human body maintains a stable internal temperature when the external temperature is 0 °C.

(6)

B1 may 2013 Q5

***(b) Explain how the human body responds to an external temperature of 40 °C.**

(6)