

# OCR (B) Biology GCSE

Topic B5.4: Why do we need to maintain a constant internal environment?

Flashcards

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# What is homeostasis?



# What is homeostasis?

The maintenance of a stable internal environment in the body despite fluctuations in internal and external conditions.



# Why is homeostasis important?



# Why is homeostasis important?

To ensure optimum conditions for enzymes and cellular processes in the body



State three conditions within the body that must be controlled by homeostasis



State three conditions within the body that must be controlled by homeostasis

- Blood glucose concentration
- Temperature
- Water levels



# Why must body temperature be controlled?





# Why must body temperature be controlled?

Enzymes work best at their optimum temperature. Deviations from this optimum temperature decrease the rate of enzyme-controlled reactions.



What is the optimum temperature for enzymes in the human body?



What is the optimum temperature for enzymes in the human body?

37°C



Outline the responses of the body to an increase in temperature above  $37^{\circ}\text{C}$  (3)



Outline the responses of the body to an increase in temperature above  $37^{\circ}\text{C}$  (3)

- Vasodilation
- Sweating
- Hair erector muscles relax, hairs lie flat



# How does sweating help to reduce body temperature?



How does sweating help to reduce body temperature?

Heat energy is used to evaporate sweat.  
Increased heat transfer from the skin to the environment decreases body temperature.



# What is vasodilation?





# What is vasodilation?

- Dilation of blood vessels near the skin surface
- Blood flows closer to the skin surface
- Greater heat loss to the surroundings



Outline the responses of the body to a decrease in temperature below  $37^{\circ}\text{C}$  (4)



Outline the responses of the body to a decrease in temperature below  $37^{\circ}\text{C}$  (4)

- Vasoconstriction
- Shivering
- Hair erector muscles contract
- Little sweat is produced



# How does shivering help to increase body temperature?



How does shivering help to increase body temperature?

Involuntary contraction of muscles generates heat energy from respiration



How does the contraction of hair erector muscles help to increase body temperature?



How does the contraction of hair erector muscles help to increase body temperature?

Hairs stand on end creating pockets of air between hairs and a layer of insulation.



# What is vasoconstriction?





# What is vasoconstriction?

- Constriction of blood vessels near skin surface
- Less blood flows close to the skin surface
- Less heat loss to the surroundings



What does the maintenance of an ideal  
body temperature depend on?  
(biology only/higher)



What does the maintenance of an ideal body temperature depend on? (biology only/higher)

A negative feedback system involving:

- Receptors in the skin and in the hypothalamus
- Hypothalamus
- Effectors e.g. sweat glands, hair erector muscles



What is the function of receptors in the skin and in the hypothalamus?  
(biology only/higher)



What is the function of receptors in the skin and in the hypothalamus? (biology only/higher)

They detect changes in blood temperature and send information to the hypothalamus.



What is the function of the  
hypothalamus? (biology only/higher)



What is the function of the hypothalamus?  
(biology only/higher)

It coordinates information from the receptors and sends instructions to the effectors.



What is the function of the effectors?  
(biology only/higher)





What is the function of the effectors?  
(biology only/higher)

They produce a response to counteract the change in blood temperature and return it to the set point.



What is osmoregulation? (biology only)



What is osmoregulation? (biology only)

The maintenance of constant water levels in the body fluids of an organism.



Describe what happens to an animal cell if it is placed into a solution with a higher water concentration **(biology only)**



Describe what happens to an animal cell if it is placed into a solution with a higher water concentration **(biology only)**

- Higher concentration of water in surrounding solution
- Water molecules move down their water concentration gradient into the cell by osmosis
- Pressure inside the cell increases, cell bursts (lysis)



Describe what happens to an animal cell if it is placed into a solution with a lower water concentration **(biology only)**



Describe what happens to an animal cell if it is placed into a solution with a lower water concentration (biology only)

- Lower concentration of water in surrounding solution
- Water molecules move down their water concentration gradient out of the cell by osmosis
- Pressure inside the cell decreases, cell shrinks (crenation)



Describe what happens to an animal cell if it is placed into a solution with an equal water concentration **(biology only)**





Describe what happens to an animal cell if it is placed into a solution with an equal water concentration (biology only)

No net movement of water molecules into or out of the cell



# Describe the function of the kidneys (biology only)



## Describe the function of the kidneys (biology only)

- Maintain the water levels of body fluids  
(to prevent damage to cells by osmosis)
- Remove toxic waste substances from the body
- Control the volume and concentration of urine



# What is urine? (biology only)



What is urine? (biology only)

Waste product of the kidney that contains urea, excess water and excess ions



# Describe the structure of the kidneys (biology only)



## Describe the structure of the kidneys (6)

(biology only)

- Outer cortex
- Inner medulla
- Composed of millions of nephrons (kidney tubules)



What is the function of the renal artery?  
(biology only)





What is the function of the renal artery?  
(biology only)

Delivers blood to the kidneys



What is the function of the renal vein?  
(biology only)



What is the function of the renal vein?  
(biology only)

Drains blood from the kidneys



What is the function of the ureter?  
(biology only)



What is the function of the ureter?

(biology only)

Carries urine from the kidneys to the bladder



# Describe filtration in the kidneys (biology only)



## Describe filtration in the kidneys (biology only)

- Blood flows through the glomerulus under high pressure
- Small molecules (e.g. urea, glucose), water and ions are filtered out of the blood and into the capsule of the nephron



Why do large molecules (e.g. red blood cells, proteins) remain in the blood?  
(biology only)





Why do large molecules (e.g. red blood cells, proteins) remain in the blood? **(biology only)**

They are too large to fit through the pores in the capillary walls.



Which substances are selectively reabsorbed from the nephron tubule?  
(biology only)



Which substances are selectively reabsorbed from the nephron tubule? (biology only)

- All sugars
- Some water
- Some ions



What happens to the molecules not selectively reabsorbed? (biology only)



What happens to the molecules not selectively reabsorbed? (biology only)

They travel down the kidney tubule as urine and are transported to the bladder via the ureter. Here they are stored and eventually excreted.



How is the concentration and volume of urine controlled? (biology only/higher)



How is the concentration and volume of urine controlled? (biology only/higher)

Controlled by the secretion of anti-diuretic hormone (ADH)



What produces ADH? (biology only)





What produces ADH? (biology only)

Pituitary gland



Describe how ADH affects the reabsorption of water from the kidney tubules (biology only/higher)



Describe how ADH affects the reabsorption of water from the kidney tubules (biology only/higher)

ADH increases the permeability of kidney tubules enabling more water to be reabsorbed into the blood.



What is required to maintain the ideal  
water content of blood?  
(biology only/higher)



What is required to maintain the ideal water content of blood? (biology only/higher)

A negative feedback system involving:

- Receptors in the hypothalamus
- Hypothalamus
- Effector i.e. pituitary gland



What may cause the water content of blood to decrease? (biology only/higher)



What may cause the water content of blood to decrease? (biology only/higher)

Sweating due to exercise



Describe the negative feedback loop  
which occurs when low blood water  
concentration is detected  
**(biology only/higher)**





# Describe the negative feedback loop which occurs when low blood water concentration is detected

(biology only/higher)

- Receptors detect low blood water content and send information to the hypothalamus. This coordinates the information and sends instructions to the pituitary gland.
- Pituitary gland increases ADH secretion. ADH increases kidney tubule permeability so more water is reabsorbed.
- Blood water content increases. More concentrated urine is produced.



How else does the body try to restore water balance? (biology only/higher)



How else does the body try to restore water balance? (biology only/higher)

The brain activates the thirst reflex



What may cause the water content of blood to increase? (biology only/higher)



What may cause the water content of blood to increase? (biology only/higher)

Excess water consumption



Describe the negative feedback loop  
which occurs when high blood water  
concentration is detected  
**(biology only/higher)**



# Describe the negative feedback loop which occurs when high blood water concentration is detected

(biology only/higher)

- Receptors detect high blood water content and send information to the hypothalamus. This coordinates the information and sends instructions to the pituitary gland.
- Pituitary gland secretes less ADH. Kidney tubules become less permeable so less water is reabsorbed.
- Blood water content decreases. More dilute urine is produced.

