

# GCSE Biology (Separate Science)

## Success Criteria: Homeostasis



### Glucose control

<b>I can...</b>	
<b>Describe</b> Homeostasis as the mechanisms involved in keeping internal conditions of the body constant. 'same state'	
<b>Explain</b> the importance of homeostatic mechanisms to allow metabolic reactions to proceed at appropriate rates (optimal conditions for enzymes temp and pH, as well as a constant supply of dissolved food and water.) For our cells to function properly the environment that surrounds them needs to be controlled at an optimum level. (37°C, Isotonic for Water and Sugar concentration and toxic substances need to be removed.)	
<b>Recognise</b> that these automatic control systems may involve nervous responses or chemical responses.	
<b>Explain</b> why the <u>concentration of glucose</u> in the blood needs to be controlled to ensure there is enough for efficient respiration, but not too much as to negatively affect cells (osmosis)	
<b>Describe</b> how glucose levels rise after eating and fall during exercise.	
<b>Describe</b> how blood glucose concentration of the body is monitored and controlled by the PANCREAS. The pancreas is a gland that produces and secretes two hormones INSULIN and GLUCAGON.	
<b>Identify</b> the control of blood glucose as negative feedback mechanism (change is detected and corrected back to normal levels)	
<b>Describe</b> what happens when glucose levels are high; <ul style="list-style-type: none"><li>• Insulin is secreted.</li><li>• Insulin targets cells in the LIVER and muscles causing glucose to be absorbed from the blood and converted to insoluble GLYCOGEN for storage.</li><li>• Blood glucose concentration is lowered.</li></ul>	
<b>Describe</b> what happens when glucose levels are low; <ul style="list-style-type: none"><li>• Glucagon is secreted.</li><li>• Glucagon targets cells in the LIVER and muscles causing glycogen to be converted back into GLUCOSE and released from cells.</li><li>• Blood glucose concentration is increased.</li></ul>	
<b>Describe</b> Diabetes as a disease where a person is unable to control their blood glucose concentration effectively.	
<b>Compare</b> the two main types of diabetes: <ul style="list-style-type: none"><li>• Type 1 is where insulin is not made or not made correctly by the pancreas (people are usually born with Type 1, or develop it following a virus)</li><li>• Type 2 is where insulin is made but either not enough or the body becomes insensitive to it (this form is associated with obesity and the elderly)</li></ul>	
<b>Explain</b> how Diabetes may be controlled by careful attention to diet and exercise. Type 1 diabetics may also be treated by injecting insulin.	

# Temperature control

<i>I can...</i>	
<b>Describe</b> how core body temperature is controlled by the brain (thermoregulatory centre in hypothalamus) sending electrical impulses to effectors (muscles and glands).	
<b>Use</b> temperature regulation as an example of negative feedback (change is detected and corrected back to normal level)	
<b>Describe</b> what happens if the core body temperature is too high: <ul style="list-style-type: none"><li>• blood vessels supplying the skin capillaries dilate (get wider) so that more blood flows through the capillaries and more heat is lost by RADIATION from the skin surface VASODILATION.</li><li>• sweat glands release more sweat which cools the body as it EVAPORATES.</li></ul>	
<b>Describe</b> what happens if the core body temperature is too low: <ul style="list-style-type: none"><li>• blood vessels supplying the skin capillaries constrict (get narrower) to reduce the flow of blood through the capillaries VASOCONSTRICTION</li><li>• muscles rapidly contract 'shiver' – their CONTRACTION requires ATP/energy from respiration, which releases some heat energy to warm the body.</li></ul>	

# Water control

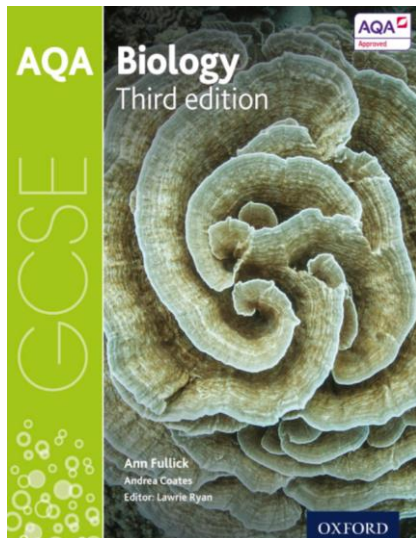
<b>I can...</b>	
<b>Make links</b> between excretion and homeostasis explaining that for our cells to function properly the environment that surrounds them needs to be controlled at an optimum level including removing toxic substances from metabolic processes.	
<b>Identify</b> the main waste products that have to be removed from the body including: EXCRETION <ul style="list-style-type: none"> <li>• carbon dioxide, produced by all cells during respiration (removed from blood by lungs)</li> <li>• urea, produced in the liver by the breakdown of excess amino acids (removed by kidneys)</li> </ul>	
<b>Explain</b> the effect of on cells of osmotic changes in body fluids. If cells are surrounded by fluids that are too watery they will swell/burst. If cells are surrounded by body fluids that are too concentrated they will shrivel/crenate.	
<b>Identify</b> ways that water is lost from the body. eg. in lungs during exhalation, via skin in sweating, and in urine.	
<b>Describe</b> how a healthy kidney produces urine by: <ul style="list-style-type: none"> <li>• First FILTERING ALL the sugar, salt, water and urea out of the blood under high pressure. (the pores in the filtering unit are small so blood cells and proteins are not filtered out).</li> <li>• ALL of the sugar is then actively REABSORBED</li> <li>• As much salt needed by the body is reabsorbed (diffusion)</li> <li>• As much water as is needed is reabsorbed (osmosis)</li> <li>• Excess ions and water, and ALL the urea are then released from the kidney as urine.</li> </ul>	
Evaluate data relating to kidney function looking at glucose, ions and urea before and after filtration.	
<b>Explain</b> the response of the body to different temperature and osmotic challenges, including response to dehydration/high sweating, effects of over hydration/excessive water intake, effects of high salt intake.	
<b>Describe</b> how the brain (hypothalamus) monitors blood water levels and sends a chemical message (Anti-diuretic hormone, ADH) in the bloodstream to the kidneys to control how much water they send out of the body and how much they conserve in the body.	
<b>Describe</b> the effect of ADH on the permeability of the kidney tubules, referring to the amount of water reabsorbed back in to the body and negative feedback (more ADH, more water reabsorbed = less urine)	
<b>State</b> methods of treating kidney damage/failure including dialysis treatment and organ transplant.	
<b>Describe</b> the basic principles of kidney dialysis (using a machine to artificially 'clean' the blood. Urea and excess water/salt diffuse out of the blood across a partially permeable membrane into dialysis fluid)	
<b>Evaluate</b> the advantages and disadvantages of treating organ failure by mechanical device or organ transplant (when provided with information)	

- 4.5.3. Hormonal coordination in humans
- 4.5.2.4 Control of body temperature

**Additional support:**



Access the appropriate textbook on kerboodle.com, create your own revision notes of the key points of the topic and attempt the summary questions.



Separate Biology GCSE textbook  
**Homeostasis and Glucose Control**

pages 162-166

**Homeostasis- temperature and water control**

pages 182-192

**Write your own summary notes** (bullet points of the key ideas /keywords list with definitions/ annotated diagrams/ mind-maps or flash cards) to go over the main content of the topic.

Attempt the textbook summary questions.

Utilise online revision resources to support your class notes, such as...



Attempt past paper questions using [www.physicsandmathstutor.com](http://www.physicsandmathstutor.com) and self-mark your answers using the official exam mark schemes.



**Extension work/extra challenge:**

Ask your teacher for extension tasks...

- Amazing thermoregulation
- Sweet Dreams Monotremes- Platypus Venom and Diabetes