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# **A2 Biology Unit 5**

## **Homeostasis**

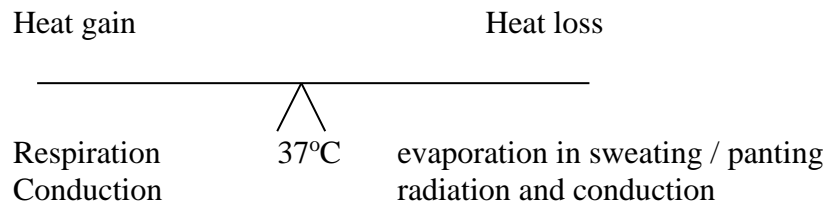
## Homeostasis

= the maintenance of the internal environment within restricted limits

### Why is it important?

- Blood pH and core temperature must be kept constant because ..
- Blood glucose levels must be kept constant because ..

### Temperature control



### Endotherms and ectotherms compared

Both need to keep a constant body temperature. **Endotherms** (birds and mammals) have physiological control systems, **ectotherms** (e.g. reptiles) do not.

Give 5 possible strategies for warming or cooling the body for a lizard.

- 1.
- 2.
- 3.
- 4.
- 5.

### Mechanisms for conserving heat in cold conditions

**Vasoconstriction**

**Shivering**

**Hair erection**

**Increased metabolic rate**

**Behaviour**

**Mechanisms for losing heat in hot weather**

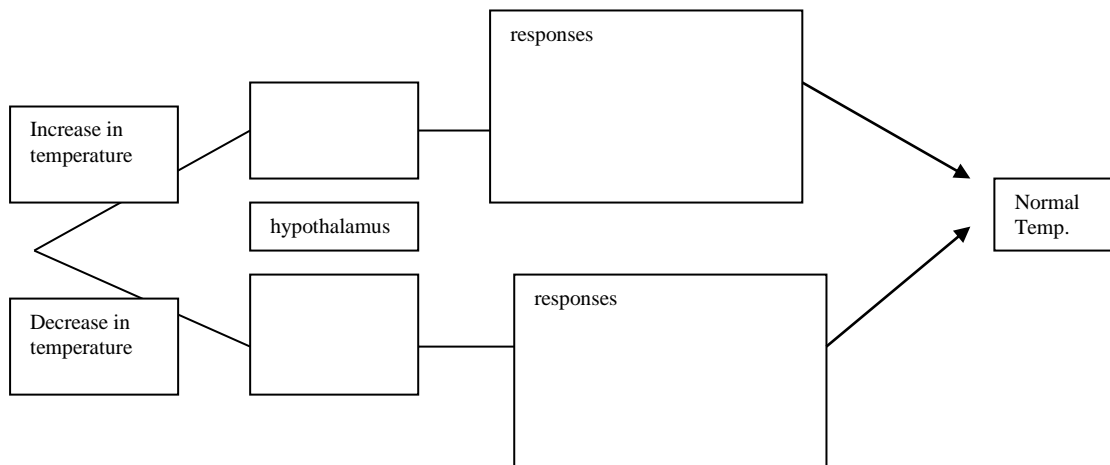
**Vasodilation**

**Sweating**

**Behaviour**

**The role of the hypothalamus**

Complete the flow diagram



**Control of blood sugar**

The normal level of glucose in the blood is  $90\text{mg}/100\text{cm}^3$

Glucose enters the blood by:

- Food intake. All carbohydrates: sugars are fast release, starch is slow release.
- **Glycogenolysis** – the breakdown of glycogen in the **liver** and **muscle** cells
- **Gluconeogenesis** – the production of new glucose by the **liver** from nutrient sources other than carbohydrates e. glycerol, amino acids

### Hormonal control

The **pancreas** has both **exocrine** and **endocrine** functions (exocrine = chemicals secreted into ducts e.g. enzymes trypsin and lipase; endocrine = secreted directly into the blood e.g. hormones)

Insulin and glucagon are produced and secreted from an endocrine tissue in the pancreas called the Islets of Langerhans.

The **adrenal** gland secretes **adrenaline** into the blood in times of stress. It is under the direct control of the autonomic nervous system. This kind of hormone production is called **neurosecretion**. *Complete the table:*

Features	Insulin	Glucagon	adrenaline
Secreted by	Beta cells Islets of Langerhans pancreas	Alpha cells Islets of Langerhans pancreas	Adrenal gland
In response to	Low blood sugar level	High blood sugar level	Low blood sugar level
Mode of action on target cell	Bind to receptor on membrane of liver and muscle cells Affect shape and function of glucose transmembrane transport proteins Activates enzymes which catalyse <b>glycogenesis</b>	<b>Second messenger model:</b> Bind to receptor of target cell	<b>Second messenger model:</b>
Effects	Glucose taken up into liver and muscle cells and converted to the non-osmotic storage compound, glycogen		

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### Diabetes

	Type 1	Type 2
Causes		
Control		

### Feedback mechanisms

Use the space below to draw diagrams illustrating **negative feedback control** using the following two examples

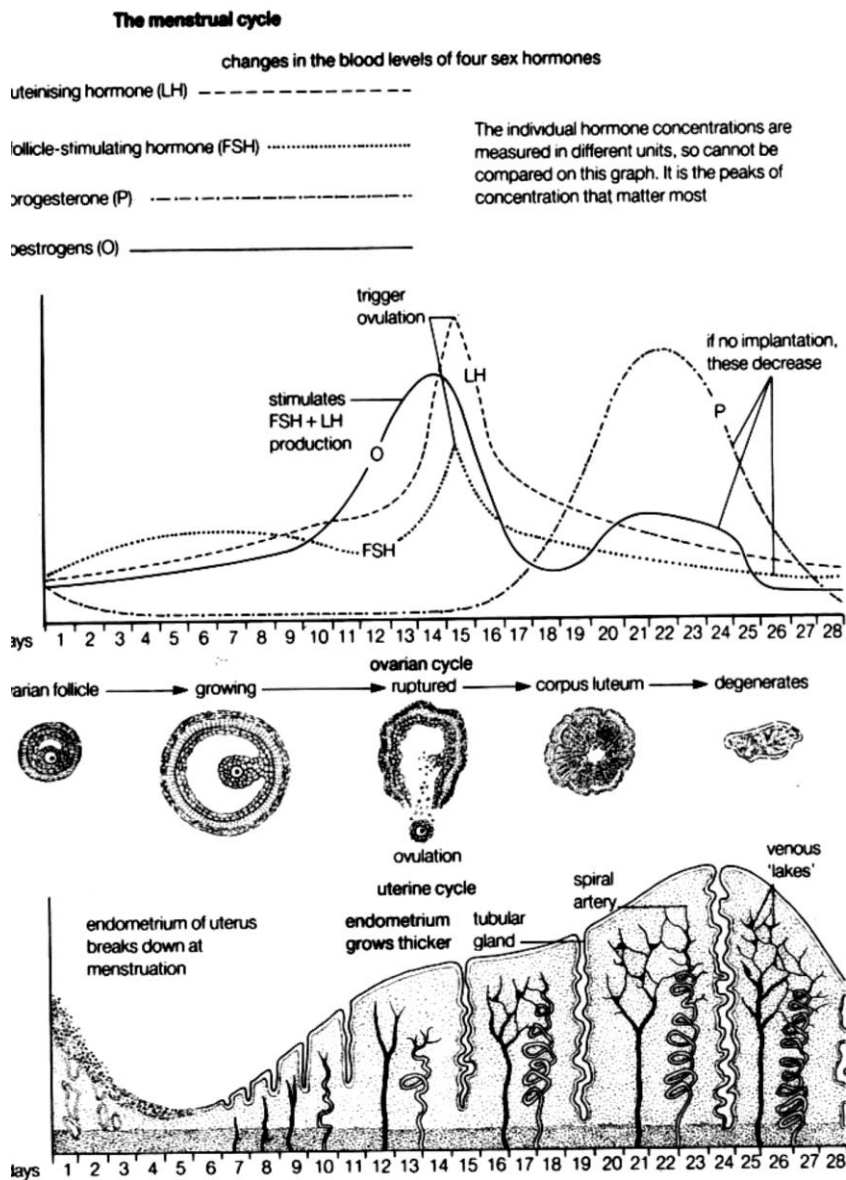
1. a rise in blood temperature
  
  
  
  
  
  
  
  
  
  
2. a fall in blood sugar concentration
  
  
  
  
  
  
  
  
  
  
3. a loss of water in the blood through sweating

### Positive feedback

The more the response the greater the stimulation to keep going. The corrective measures stay turned on.

- e.g. 1. at depolarisation in neurones, when  $\text{Na}^+$  channels open, the in-rush of ions causes an increase in membrane permeability.
- 2. typhoid fever causes a breakdown in temperature control resulting in hyperthermia

### Control on the oestrous / menstrual cycle.



Fill in the table

Hormone	FSH	LH	Oestrogen	Progesterone
Produced by				
Effects				