

# Y10 Biology (F) Homeostasis and Response 1

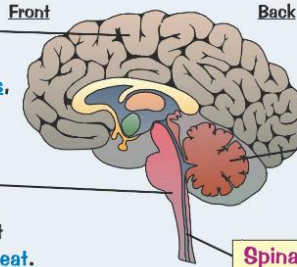
## The Brain

### Cerebral cortex

This is the outer wrinkly bit. It's responsible for things like **consciousness**, **intelligence**, **memory** and **language**.

### Medulla

Controls **unconscious activities** (things you don't have to think about doing) like **breathing** and your **heartbeat**.



### Cerebellum

Responsible for **muscle coordination**.

### Spinal Cord

## Studying patients with brain damage

If a small part of the brain has been damaged, the effect this has on the patient can tell you a lot about what the damaged part of the brain does. E.g. if an area at the back of the brain was damaged by a stroke and the patient went blind, you know that that area has something to do with vision.

## Electrically stimulating the brain

The brain can be stimulated electrically by pushing a tiny electrode into the tissue and giving it a small zap of electricity. By observing what stimulating different parts of the brain does, it's possible to get an idea of what those parts do. E.g. when a certain part of the brain (known as the motor area) is stimulated, it causes muscle contraction and movement.

## MRI scans

A magnetic resonance imaging (MRI) scanner is a big fancy tube-like machine that can produce a very detailed picture of the brain's structures. Scientists use it to find out what areas of the brain are active when people are doing things like listening to music or trying to recall a memory.

## The Eye

**Sclera** — the tough, supporting wall of the eye.

**Cornea** — the transparent outer layer found at the front of the eye. It refracts (bends) light into the eye.

**Pupil** — the hole in the centre of the eye, through which light enters.

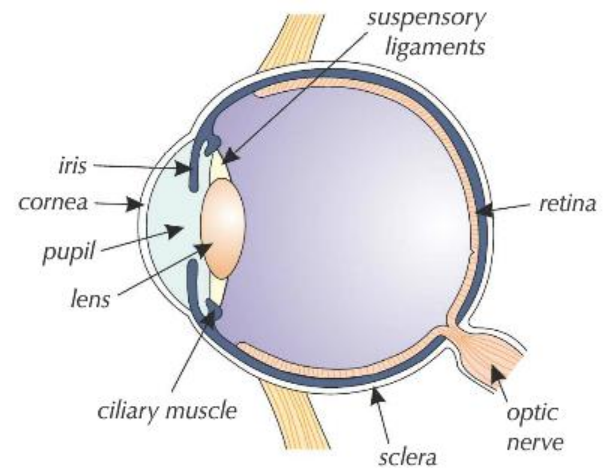
**Iris** — contains muscles that allow it to control the diameter of the pupil and therefore how much light enters the eye.

**Retina** — the layer at the back of the eye that contains two types of light receptor cells. One type is sensitive to light intensity and the other is sensitive to colour.

**Lens** — focuses the light onto the retina.

**Ciliary muscles** and **suspensory ligaments** — control the shape of the lens — see next page.

**Optic nerve** — carries impulses from the receptors on the retina to the brain.

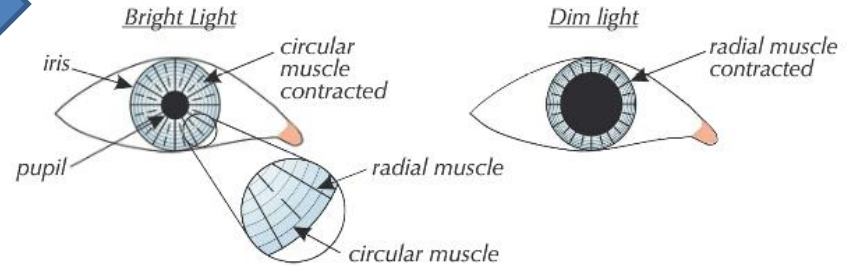


# Y10 Biology (F) Homeostasis and Response 2

## The Iris Reflex

**Very bright** light can **damage** the retina — so you have a reflex to protect it.

- 1) When **light receptors** in the eye detect very bright light, a **reflex** is triggered that makes the pupil **smaller**. The **circular muscles** in the iris **contract** and the **radial muscles relax**. This reduces the amount of light that can enter the eye.
- 2) The opposite process happens in dim light. This time, the **radial muscles** contract and the **circular muscles** relax, which makes the pupil **wider**.



Wearing glasses isn't for everyone. You need to know about these alternatives:

### Contact lenses

Contact lenses are thin lenses that sit on the surface of the eye and are shaped to compensate for the fault in focusing. They're popular because they are lightweight and almost invisible. They're also more convenient than glasses for activities like sports. The two main types of contact lenses are hard lenses and soft lenses. Soft lenses are generally more comfortable, but carry a higher risk of eye infections than hard lenses.



### Laser eye surgery

Bad eyesight can sometimes be corrected with laser eye surgery. A laser can be used to vaporise tissue, changing the shape of the cornea (and so changing how strongly it refracts light into the eye). Slimming it down makes it less powerful and can improve short sight. Changing the shape so that it's more powerful will improve long sight. The surgeon can precisely control how much tissue the laser takes off, completely correcting the vision.

However, like all surgical procedures, there is a risk of complications, such as infection or the eye reacting in a way that makes your vision worse.



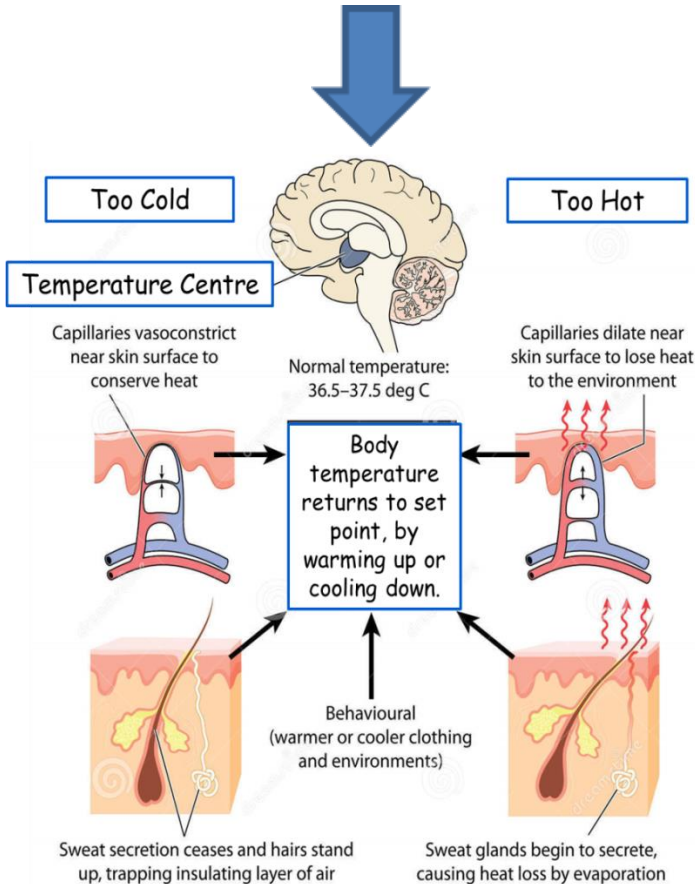
### Replacement lens surgery

Sometimes long-sightedness may be more effectively treated by replacing the lens of the eye (rather than altering the shape of the cornea with laser eye surgery). In replacement lens surgery, the natural lens of the eye is removed and an artificial lens, made of clear plastic, is inserted in its place.

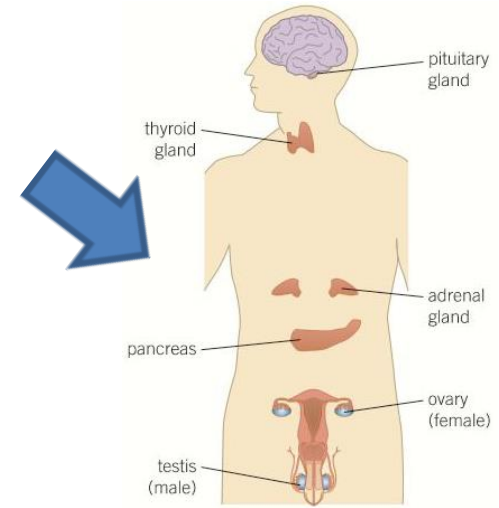
As it involves work inside the eye, replacing a lens carries higher risks than laser eye surgery, including possible damage to the retina (which could lead to loss of sight).

# Y10 Biology (F) Homeostasis and Response 3

**Homeostasis:** Maintaining a constant internal environment e.g. temperature control and blood glucose control.



## The Endocrine System



Endocrine gland	Role of the hormones
Pituitary	<ul style="list-style-type: none"> <li>Controls the growth of children</li> <li>Stimulates the thyroid gland to produce thyroxine to control metabolism</li> <li>In women stimulates ovaries, produce and release eggs and make oestrogen</li> <li>In men stimulates the testes to make sperm and testosterone</li> </ul>
Thyroid	Controls the metabolic rate of the body
Pancreas	Controls the levels of glucose in the body
Adrenal	Prepares the body for stressful situations for 'fight of flight' and releases adrenaline
Ovaries	Controls the development of the female secondary sexual characteristics and is involved in the menstrual cycle
Testes	Controls the development of the male secondary sexual characteristics

# Y10 Biology (F) Homeostasis and Response 4

Insulin: Glucose → Glycogen  
 Glucagon: Glycogen → Glucose

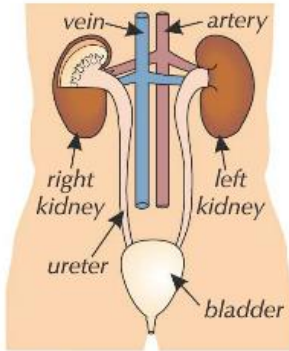


- When glucose is higher insulin is released
- This caused glucose to be stored as glycogen
- When blood glucose levels drop too low glucagon is released
- Glucagon converts stored glycogen back into glucose

	<u>Type 1 Diabetes</u>	<u>Both types of Diabetes</u>	<u>Type 2 Diabetes</u>
<b>Risk factors</b>	Causes not known for sure.	People who have a relative with diabetes are more likely to develop the condition.	People who are overweight women who have had diabetes during pregnancy. People who are Asian or African-Caribbean.
<b>Onset age</b>	Mainly young people.		Mainly older people.
<b>Symptoms</b>	Symptoms appear suddenly and are obvious.	Symptoms include: increased thirst; frequent urination; tiredness; feeling sick; weight loss; blurred vision.	Symptoms develop slowly and may not be noticed. Symptoms include: increased appetite; tingling in hands and feet; wounds that are slow to heal.
<b>Cause</b>	Cells that make insulin in the pancreas are destroyed.		The body no longer responds to its own insulin, or does not make enough insulin.
<b>Treatment</b>	Insulin injections.	Regular testing of blood sugar levels; healthy diet; exercise.	Tablets either to increase insulin production or to help the body make better use of the insulin it does produce.
<b>Prevention</b>	Prevention is not yet possible.		A better diet, increased physical activity and modest weight loss can greatly cut the risk.

# Y10 Biology (F) Homeostasis and Response 5

## The Kidneys



The body has to constantly balance the water coming in against the water going out.

We lose water from the skin in sweat and from the lungs when we exhale (breath out). We can't control how much we lose in these ways, so the amount of water is balanced by the amount we consume and the amount removed by the kidneys in urine.

### Examples

On a cold day, if you don't sweat, you'll produce more urine which will be pale and dilute.

On a hot day, you sweat a lot, and you'll produce less urine which will be dark-coloured and concentrated. The water lost when it is hot has to be replaced with water from food and drink to restore the balance.

At the moment, the only cure for kidney disease is to have a kidney transplant. Healthy kidneys are usually transplanted from people who have died suddenly, say in a car accident, and who are on the organ donor register or carry a donor card (provided their relatives agree too). Kidneys can also be transplanted from people who are still alive (as we all have two kidneys, but can survive with just one) but there is a small risk to the person donating the kidney.

Proteins (and the amino acids that they are broken down into) can't be stored by the body — so any excess amino acids are converted into fats and carbohydrates, which can be stored. This occurs in the liver and involves a process called deamination. Ammonia is produced as a waste product from this process.

Ammonia is toxic so it's converted to urea in the liver. Urea is then transported to the kidneys, where it's filtered out of the blood and excreted from the body in urine.

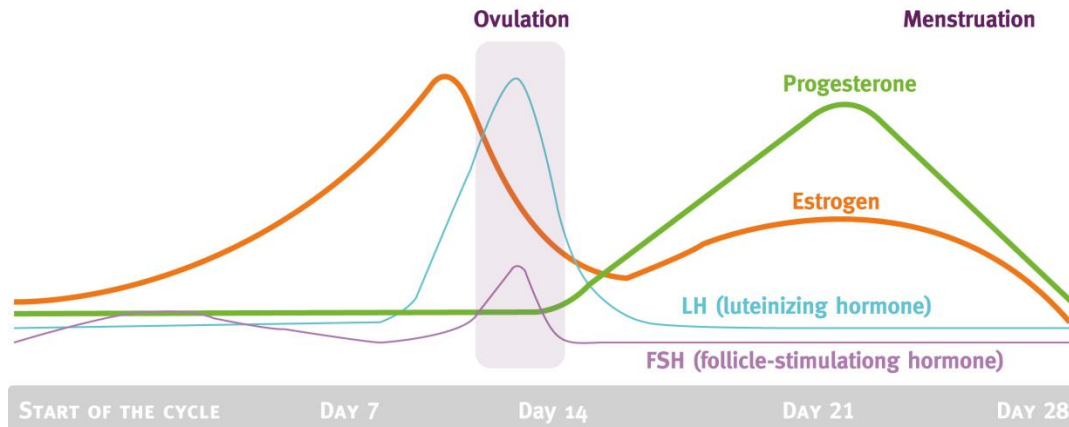
## When the kidneys are not working properly:

1. Having **dialysis** treatment — where machines do the job of the kidneys.
2. Having a **kidney transplant** — where the diseased kidney is replaced by a healthy one.

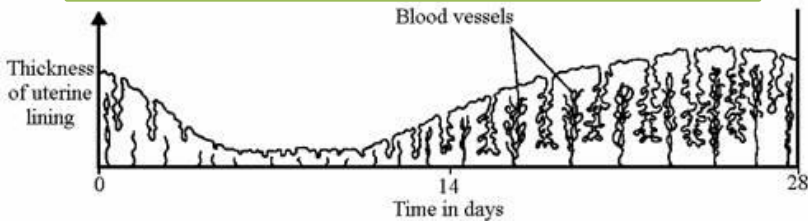
# Y10 Biology (F) Homeostasis and Response 6

## Hormones of the menstrual cycle

1. FSH – Causes the egg to mature
2. LH – Causes the release of the egg
3. Oestrogen & Progesterone – Maintain the lining of the womb



Oestrogen & progesterone increase which cause the thickening of lining of the uterus



Progesterone and oestrogen continue to rise during pregnancy to maintain and thicken the lining of the womb. HCG is also produced



## Homeostasis and Response Questions

1. Define homeostasis.
2. Explain how your body temperature is monitored.
3. Describe and explain what happens when you are too hot.
4. Describe and explain what happens when you are too cold.
5. Draw a rough outline of a brain. Label the 4 main parts and state what they are for.
6. What is the brain made of?
7. Why is it difficult to study the brain, and what are the main ways that scientists can do it?
8. List the parts of the eye and state what they do.
9. A doctor shines a torch into a patient's eye. Describe what the doctor expects to see and explain how it happens.
10. What is diabetes?
11. Compare and contrast type 1 and type 2 diabetes.
12. Describe the roles of the 4 hormones in the menstrual cycle.
13. Describe how the 4 hormones change during the menstrual cycle.
14. Compare the hormones of the normal menstrual cycle to that of pregnancy.