

What is homeostasis?

Name three things that are controlled by homeostasis.

1. _____
2. _____
3. _____

Choose the correct word and fill in the blanks:

Homeostasis is a voluntary/involuntary control system that involves _____ or _____ responses.

All control systems include receptors, effectors and coordination centres. Describe what the role of each is and state the parts of the body that carry out the role.

receptors: _____

coordination centres: _____

effectors: _____

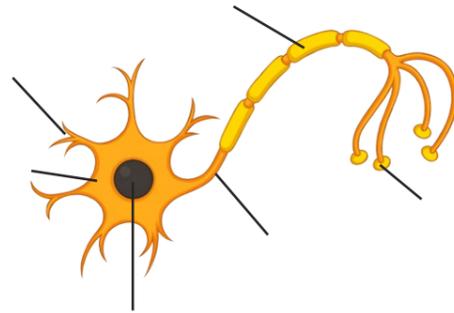
What is the role of the nervous system?

What does CNS stand for?

Which two organs make up the CNS?

What is the function of the nerve cell?

Label the nerve cell diagram with the nucleus, cell body, dendrites, axon, myelin sheath and synapse.



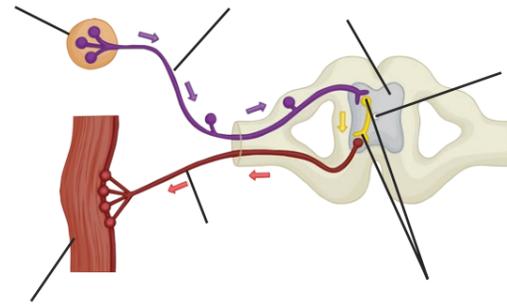
Explain how the nerve cell is adapted to its function.

Put the following terms into a flow diagram to summarise how the nervous system works.

effector, stimulus, response, CNS, receptor

Why are reflexes important?

Label the diagram below with the following key parts of a reflex arc: receptor, spinal cord, motor neurone, sensory neurone, relay neurone, synapse, effector



Explain how the reflex arc works.

Which hormone is produced by the adrenal gland?

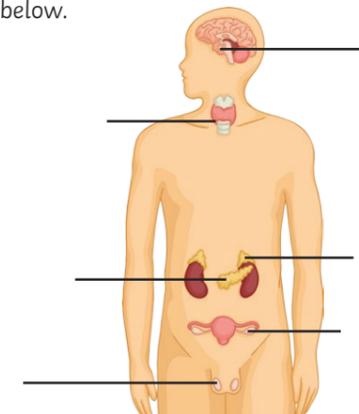
When is it produced?

What are its effects?

Explain how the endocrine system produces a response to a stimulus.

Compare these hormonal effects with the response of the nervous system.

Label the main endocrine glands shown in the diagram below.

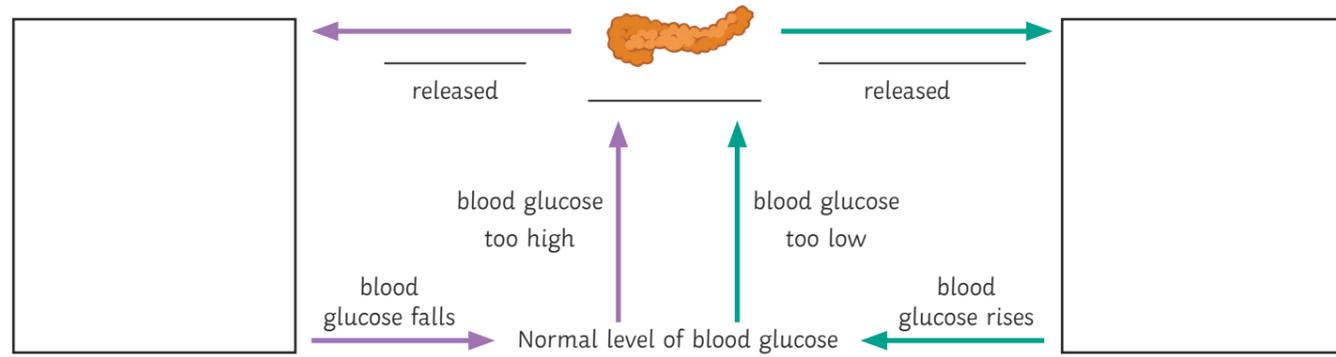


Where is the hormone thyroxine produced?

What is its role in the body?

How is the level of thyroxine controlled?

Complete the boxes and fill in the blanks to show how blood glucose levels are controlled.



Control of blood sugar is an example of a _____ loop. What does this mean?

What causes type 1 diabetes? _____

When does type 1 diabetes usually start?

How is type 1 diabetes treated?

What causes type 2 diabetes?

What are the risk factors for type 2 diabetes?

How is type 2 diabetes treated?

What is the main reproductive hormone in the female?

What is ovulation?

What is the main reproductive hormone in the male?

What does this hormone do?

What is the role of each of the following hormones in the menstrual cycle?

Follicle stimulating hormone (FSH): _____

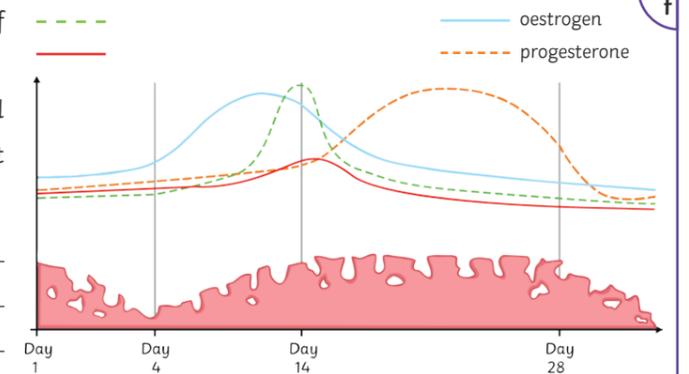
Luteinising hormone (LH): _____

Oestrogen: _____

Progesterone: _____

Label the two remaining lines on the graph with the names of the hormones they represent.

Use the diagram to explain the stages of the menstrual cycle. Make links to the hormone interactions that happen at each stage.



Explain how each method of contraception works.

Oral contraceptives:

Injection, implant or skin patch of progesterone:

Barrier methods, such as condoms and diaphragms:

Intrauterine devices:

Spermicidal agents:

Abstinence:

Surgical methods:

Some women are infertile because they do not ovulate.

Explain how artificial hormones can be used to treat infertility.

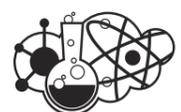
Describe the process of in vitro fertilisation (IVF).

Give three disadvantages of IVF.

1. _____

2. _____

3. _____



a Describe how the temperature of the body is monitored.

d The body cannot control the loss of waste products from some organs.

Water is lost from the _____ during _____.

Water, mineral ions and urea are lost from the _____ in _____.

f Describe two ways that kidney failure can be treated.

h Give three ways that auxins are used in agriculture and horticulture.

1. _____

2. _____

3. _____

b Explain how the body responds if the body temperature becomes too high.

Explain how the body responds if the body temperature becomes too low.

e The illustration shows a kidney.

Describe how the kidneys function to maintain the water balance of the body.



g The response of plants to light is called _____.

The response of plants to gravity is called _____ or _____.

These responses are controlled by the hormone _____.

Explain how the hormone works.

i Describe the role of ethene in plants.

How is ethene used in the food industry?

j Describe the role of gibberellins in plants.

Give three ways that gibberellins are used in agriculture and horticulture.

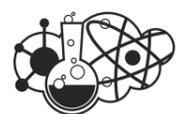
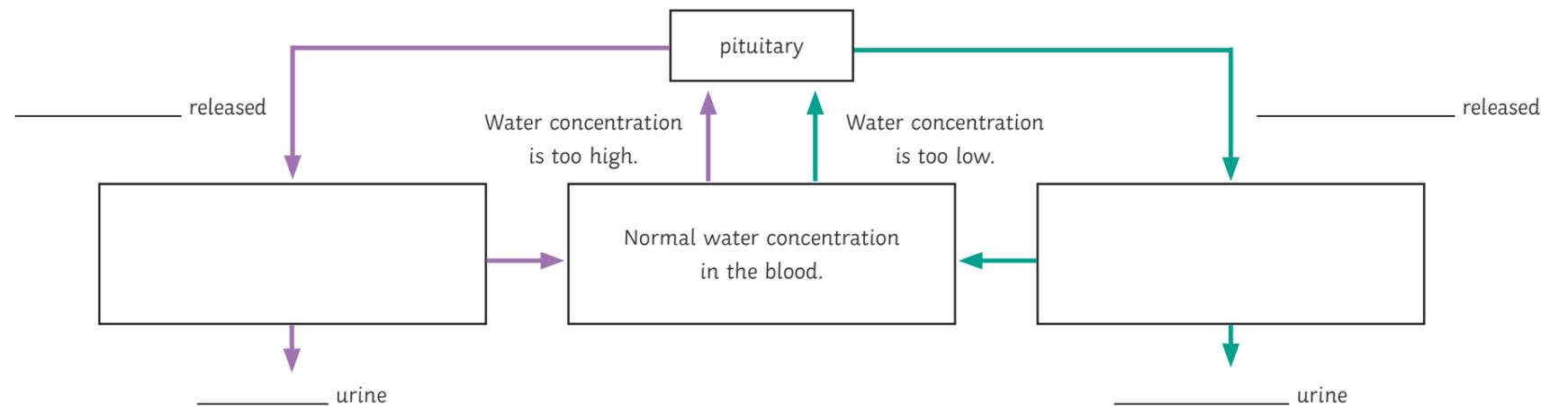
1. _____

2. _____

3. _____

c Explain what happens to excess protein in the diet.

k Complete the boxes and fill in the blanks to show how water concentration in the blood is controlled via negative feedback.



a
 What is homeostasis?
The regulation of the internal conditions of a cell or organism to maintain optimum conditions for function. This is in response to internal and external changes.

b
 Name three things that are controlled by homeostasis.
 1. **blood glucose concentration**
 2. **body temperature**
 3. **water levels**

Choose the correct word and fill in the blanks:
 Homeostasis is an **involuntary** control system that involves **nervous** or **chemical** responses.
 All control systems include receptors, effectors and coordination centres. Describe what the role of each is and state the parts of the body that carry out the role.
 Receptors: **detect stimuli - specialised cells.**
 Coordination centres: **receive and process information - brain, spinal cord and pancreas.**
 Effectors: **bring about responses to restore optimum levels - muscles or glands.**

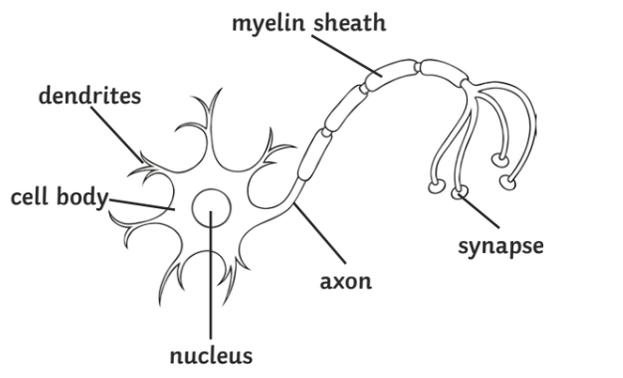
c
 What is the role of the nervous system?
To enable us to react to our surroundings and coordinate our behavior.

What does CNS stand for?
central nervous system

Which two organs make up the CNS?
brain and spinal cord

d
 What is the function of the nerve cell?
To carry electrical impulses rapidly around the body.

Label the nerve cell diagram with the nucleus, cell body, dendrites, axon, myelin sheath and synapse.



Explain how the nerve cell is adapted to its function.

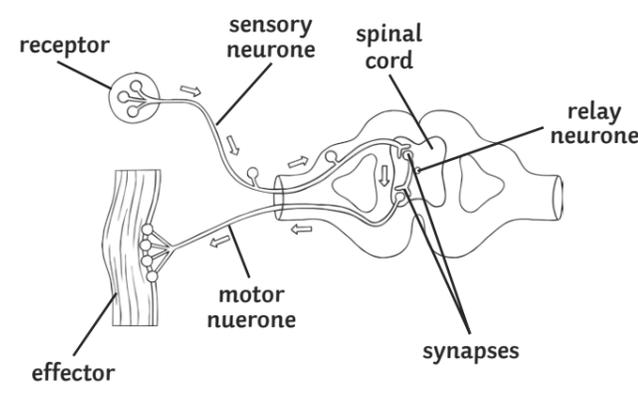
- **It has lots of dendrites so that it can make lots of connections to other nerve cells.**
- **The axon is very long to carry the nerve impulse a long way.**
- **The axon is insulated so the impulses travel rapidly.**
- **The synapses have lots of mitochondria to transfer the energy needed to make transmitter chemicals.**

e
 Put the following terms into a flow diagram to summarise how the nervous system works.
 effector, stimulus, response, CNS, receptor

stimulus → receptor → CNS → effector → response

f
 Why are reflexes important?
They happen automatically and rapidly so they help you to avoid harm. They take care of your body systems, like breathing and circulating blood, so you don't have to think about them all the time.

g
 Label the diagram below with the following key parts of a reflex arc: receptor, spinal cord, motor neurone, sensory neurone, relay neurone, synapse, effector



Explain how the reflex arc works.

- **The receptor is stimulated.**
- **An electrical impulse travels along the sensory neurone to the CNS.**
- **At the synapse, a chemical is released. It diffuses across the synapse and triggers an electrical impulse in the relay neurone.**
- **When the impulse reaches the next synapse, a chemical is released which travels across the synapse and triggers an electrical impulse in the motor neurone.**
- **The impulse reaches the effector which is stimulated to respond.**

h
 Which hormone is produced by the adrenal gland?
adrenaline

When is it produced?
If you are scared or stressed.

What are its effects?

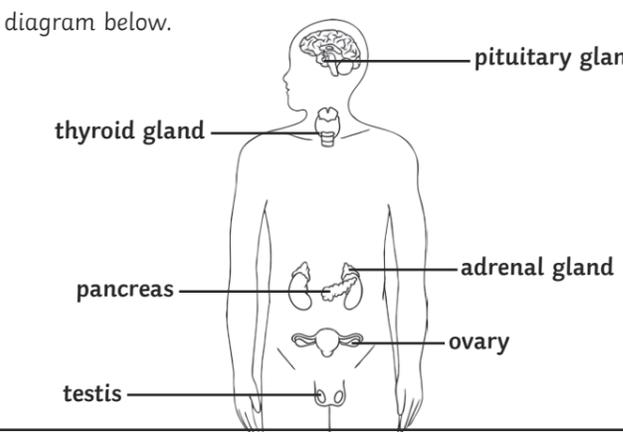
- **Increases the heart rate.**
- **Increases the breathing rate.**
- **Prepares your body for flight or fight.**

i
 Explain how the endocrine system produces a response to a stimulus.
The endocrine system produces a chemical response to a stimulus. The glands of the endocrine system secrete hormones into the blood stream.

The blood carries hormones to target organs which have receptors to pick up the hormone, this causes them to respond.

Compare these hormonal effects with the response of the nervous system.
Hormonal effects are slower than the nervous system but last for longer.

i
 Label the main endocrine glands shown in the diagram below.

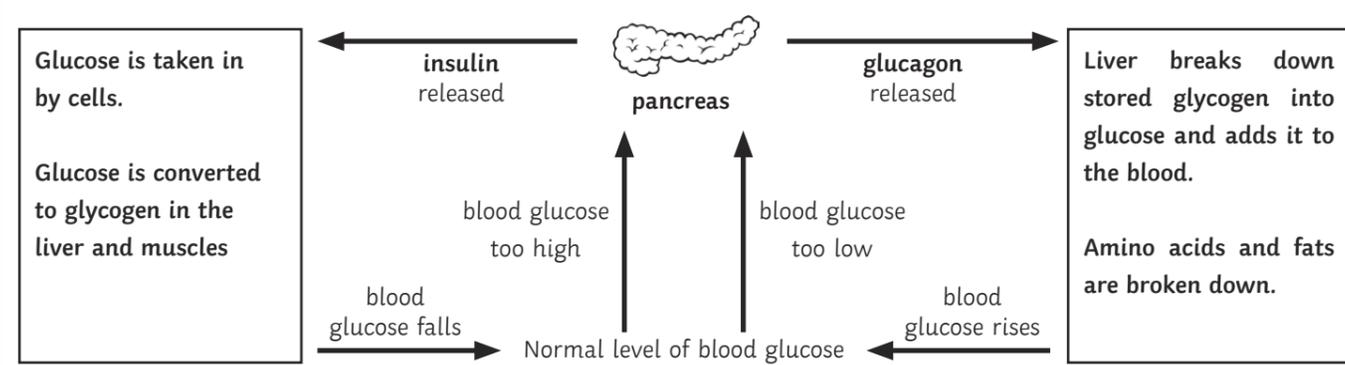


k
 Where is the hormone thyroxine produced?
thyroid gland

What is its role in the body?
It controls the basal metabolic rate. It is important in growth and development.

How is the level of thyroxine controlled?
A negative feedback loop involving the pituitary gland and the hormone TSH/thyroxine stimulating hormone.

Complete the boxes and fill in the blanks to show how blood glucose levels are controlled.



Control of blood sugar is an example of a **negative feedback** loop. What does this mean?

Negative feedback maintains a steady state by ensuring that any changes in the system are reversed and returned back to the normal level.

What causes type 1 diabetes? **The pancreas does not make enough insulin, so blood glucose isn't controlled and it gets very high after eating a meal.**

When does type 1 diabetes usually start?

In children and teenagers.

How is type 1 diabetes treated?

With insulin injections.

What causes type 2 diabetes?

The cells in the body no longer respond to the insulin that is produced by the pancreas.

What are the risk factors for type 2 diabetes?

Obesity and lack of exercise.

How is type 2 diabetes treated?

A carbohydrate-controlled diet and an exercise routine.

What is the main reproductive hormone in the female?

oestrogen

What is ovulation?

When a mature egg is released from an ovary.

What is the main reproductive hormone in the male?

testosterone

What does this hormone do?

Stimulates sperm production.

What is the role of each of the following hormones in the menstrual cycle?

Follicle stimulating hormone (FSH): **causes maturation of an egg in the ovary.**

Luteinising hormone (LH): **stimulates the release of an egg.**

Oestrogen: **maintains the uterus lining.**

Progesterone: **maintains the uterus lining.**

Label the two remaining lines on the graph with the names of the hormones they represent.

Use the diagram to explain the stages of the menstrual cycle. Make links to the hormone interactions that happen at each stage.

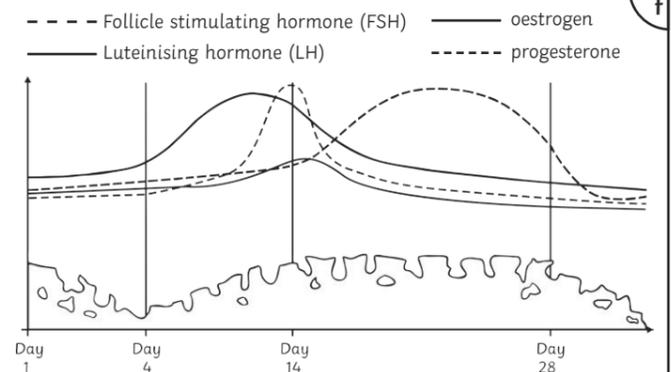
Day 1-4: The uterine lining breaks down causing a period. Oestrogen and progesterone levels are at their lowest.

Day 4-14: Oestrogen increases and the uterine lining rebuilds. FSH increases and an egg in the ovary starts to mature. It also stimulates the ovaries to produce oestrogen. High levels of oestrogen at the end of this period inhibit the production of FSH and stimulate the release of LH.

Day 14: A peak in LH causes ovulation.

Day 14-28: Progesterone and oestrogen increase to maintain the uterine lining in preparation for fertilisation. Progesterone inhibits LH and FSH.

Day 28: The cycle restarts unless pregnancy has occurred.



Explain how each method of contraception works.

Oral contraceptives:

these contain hormones that inhibit FSH production so that eggs don't mature.

Injection, implant or skin patch of progesterone:

inhibits the maturation and release for a number of months or years.

Barrier methods, such as condoms and diaphragms:

these prevent the sperm reaching an egg.

Intrauterine devices:

prevents the implantation of the embryo or release a hormone.

Spermicidal agents:

these kill or disable sperm.

Abstinence:

avoiding intercourse when an egg might be in the oviduct.

Surgical methods:

sterilising the male or female by cutting, or tying, tubes to prevent the egg or sperm reaching their target area.

Some women are infertile because they do not ovulate.

Explain how artificial hormones can be used to treat infertility.

Artificial FSH is given to stimulate the maturation of eggs and the production of oestrogen. Then artificial LH is given to trigger ovulation. The woman can then (possibly) become pregnant in the normal way.

Describe the process of in vitro fertilisation (IVF).

The mother is given artificial FSH and LH to stimulate the maturation of several eggs.

The eggs are collected and fertilised by the fathers sperm in the laboratory.

The fertilised eggs develop into embryos.

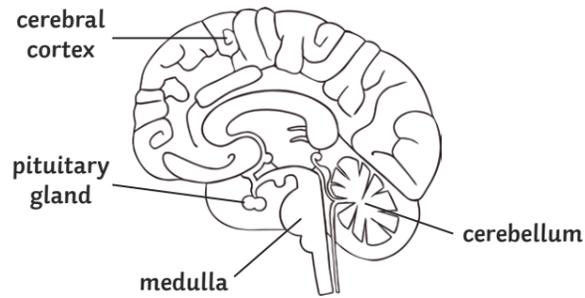
One or two embryos are inserted into the mothers uterus while they are still tiny balls of cells.

Give three disadvantages of IVF.

- 1. It is emotionally and physically stressful.**
- 2. The success rates are not high.**
- 3. It can lead to multiple births which are a risk to both the babies and the mother.**



Label the parts of the brain.



Describe the functions of each part of the brain.

Medulla: controls unconscious activities such as breathing, heartbeat and the movements of the gut.

Cerebral cortex: controls consciousness, intelligence, memory and language.

Cerebellum: coordinates muscular activity and balance.

Pituitary gland: produces hormones that control many body systems.

Describe the techniques that neuroscientists have used to map some areas of the brain to their functions.

By studying people with brain damage, they can link the damaged areas of the brain to changes in behaviour or memory of the patient.

They can electrically stimulate different parts of the brain of a conscious person by removing the top of their skull. The patient can describe how they feel when different areas of the brain are stimulated.

MRI scans can show which areas of the brain are affected by tumours or strokes. They can then link this damage to symptoms or changes in behaviour.

Explain how each of the structures below is related to its function.

Optic nerve: contains sensory neurones to send impulses to the brain.

Cornea: transparent to let light into the eye and curved to help focus the light on the retina.

Iris: made of muscles that contract or relax to change the size of the pupil and control how much light enters the eye.

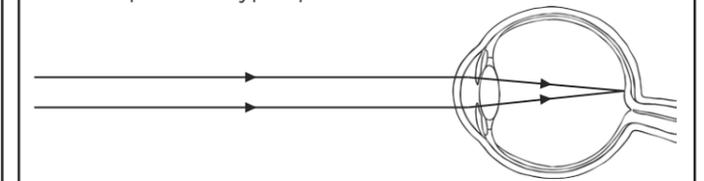
Retina: contains light-sensitive cells that are stimulated when light hits the retina.

Sclera: tough and strong so the eyeball is not easily damaged.

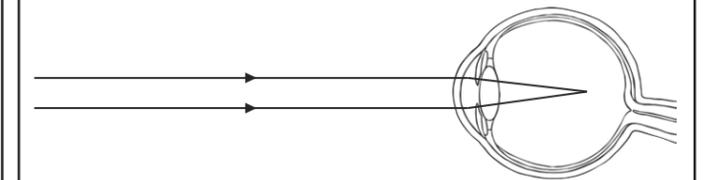
Ciliary muscles: contracts or relaxes to change the shape of the lens and focus the light from short or long distances.

Suspensory ligaments: hold the lens in place and help the lens to focus on near or distant objects.

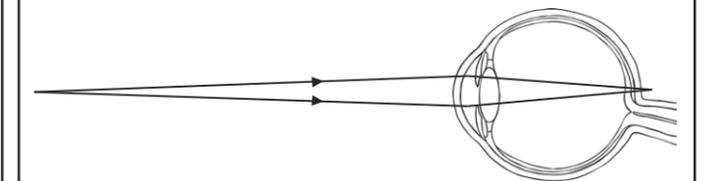
Label each diagram below to show which represents an eye with normal focus, which represents myopia and which represents hyperopia.



normal focus



myopia



hyperopia

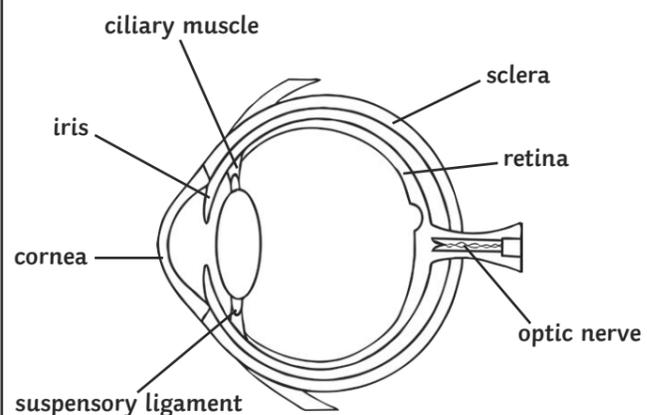
Explain why it is difficult to... investigate brain function.

The brain is very complex. Lots of neurones in different areas of the brain are involved in many processes. The brain is delicate and easily damaged.

treat brain damage and disease.

Drugs don't always reach the brain through the membranes that surround it. Surgery can cause damage to the brain and its difficult because we don't fully understand how the brain works.

Label the diagram with the structures of the eye.



Explain the difference in pupil size between bright light and dim light.

In bright light, the circular muscles of the iris contract to reduce the size of the pupil. This means less light enters the eye and protects it from damage.

In dim light, the radial muscles of the iris contract to enlarge the pupil. This allows as much light as possible to enter the eye.

Name two things that receptors in the eye are sensitive to.

1. light intensity
2. colour

What is the name of the process that changes the shape of the lens to focus on near or distant objects?
accommodation

Explain how the eye focuses on...

a near object:

- the ciliary muscles contract;
- the suspensory ligaments loosen;
- the lens is thicker and refracts rays strongly.

a distant object:

- the ciliary muscles relax;
- the suspensory ligaments are pulled tight;
- the lens is pulled thin and only slightly refracts light rays.

Explain how these defects in eyesight are treated.

Spectacle lenses refract the light to focus it on the retina. Contact lenses do the same job, but are placed on the surface of the eye.

Laser eye surgery is available to adults with stable vision. It changes the thickness or the curve of the cornea to refract light onto the retina.

Replacement lenses are added inside the eye to permanently correct the defect.



a
Describe how the temperature of the body is monitored.
Receptors in the thermoregulatory centre are sensitive to the temperature of the blood.
Temperature receptors in the skin send nervous impulses to the thermoregulatory centre.

d
The body cannot control the loss of waste products from some organs.
Water is lost from the **lungs** during **exhalation**.
Water, mineral ions and urea are lost from the **skin** in **sweat**.

f
Describe two ways that kidney failure can be treated.
Dialysis – the function of the kidney is carried out artificially. The dialysis fluid has the same concentration of glucose and mineral ions as a healthy person. This means that there is no net loss of glucose from the blood. The dialysis fluid contains no urea, so urea moves out of the blood and into the dialysis fluid.
Kidney transplant – the diseased kidney is replaced with a healthy donor kidney.

h
Give three ways that auxins are used in agriculture and horticulture.
1. **weed killers**
2. **rooting powders**
3. **promoting growth in tissue culture**

b
Explain how the body responds if the body temperature becomes too high.
Vasodilation occurs (blood vessels dilate) and sweat is produced from the sweat glands. This causes heat energy to be transferred from the skin to the environment.
Explain how the body responds if the body temperature becomes too low.
Vasoconstriction occurs (blood vessels constrict) and sweating stops which reduces the transfer of energy from the skin to the environment. Skeletal muscles contract to cause shivering. This means the muscles need lots of respiration to occur which transfers energy and raises the body temperature.

e
The illustration shows a kidney.
Describe how the kidneys function to maintain the water balance of the body.
Glucose, water, urea and mineral ions are filtered out of the blood and into the kidneys. All of the glucose is reabsorbed into the blood stream. Urine is moved to the bladder. Water and mineral ions undergo selective reabsorption. The amount of water reabsorbed into the blood depends on what is needed by your body and is controlled by the hormone ADH.



g
The response of plants to light is called **phototropism**.
The response of plants to gravity is called **gravitropism** or **geotropism**.
These responses are controlled by the hormone **auxin**.
Explain how the hormone works.
It causes an unequal growth rate in plant roots and shoots. When cells on one side of the plant grow faster than the other, the root or shoot bends in the right direction.

i
Describe the role of ethene in plants.
Ethene controls cell division and the ripening of fruits.
How is ethene used in the food industry?
Ethene is used to control the ripening of fruit during storage and transport.

j
Describe the role of gibberellins in plants.
Gibberellins initiate seed germination.
Give three ways that gibberellins are used in agriculture and horticulture.
1. **end seed dormancy**
2. **promote flowering**
3. **increase fruit size**

c
Explain what happens to excess protein in the diet.
The protein is broken down into amino acids. In the liver, these amino acids are deaminated to form ammonia. Ammonia is toxic, so it is immediately converted into urea for safe excretion.

k
Complete the boxes and fill in the blanks to show how water concentration in the blood is controlled via negative feedback.

