



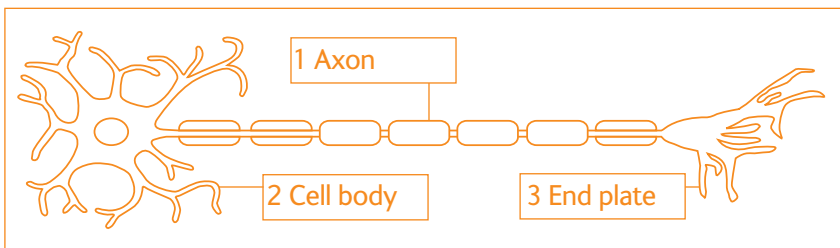
Today you are an Environmental Impact Assessment (EIA) consultant. You have been asked to report on the impact of an oil tanker spill at sea.

Teacher information

Gallery visited	 Human Biology
Suitable for	 Key Stage 4 (ages 14 to 16)
Curriculum links	Organisms and health.
Example page	www.nhm.ac.uk/nerves-and-hormones-ks4
Pre-visit preparation	<p>Vocabulary: neuron, axon, receptors, cortex, sensory, motor, association, retina, optic nerve, visual cortex, hormone, adrenalin, insulin, oestrogen, progesterone, testosterone, various glands.</p> <p>Concepts: processes controlled by hormones, nerve synapses passing on signals, reflex responses, colour-blindness.</p>
Post-visit work	Pupils can combine information gathered from the gallery with their own research work to complete the Final report task at the end of this guide.

1 Nerves and how they work

A nerve cell is called a ~~plant~~ / ~~muscle~~ / ~~neuron~~ / ~~synapse~~. The spaces between nerve cells are called ~~impulses~~ / ~~axons~~ / ~~synapses~~ / ~~gaps~~.



Signals can pass between nerve cells because stored chemicals in the end plates of one neuron can pass across the gap to trigger a new electrical signal in the next neuron.

In the passing on of signals between nerve cells, the controlling factor is the balance between the excitatory chemicals and inhibitory chemicals that are released by the end plates. Signals are only passed on to a neuron when it receives more excitatory chemicals than inhibitory chemicals.

- 1 The bones of the skull and spine.
- 2 A special shock-absorbing fluid.

Discussion on what might happen if nerves become damaged
Main point to consider is that damaged nerves will not be able to properly perform their function of passing on signals. Hence they may fail to receive or pass on sensory information and they may be unable to stimulate muscles to move.

2 How the brain receives signals

cortex

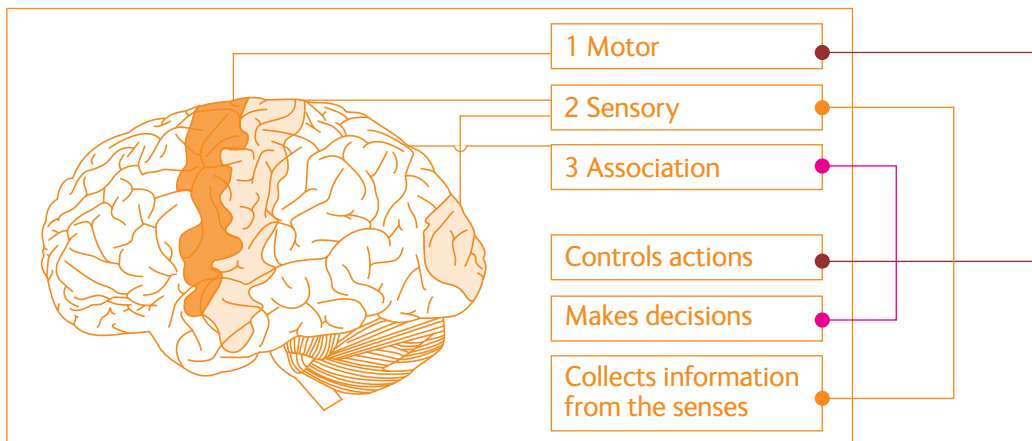
- 1 Sensory
- 2 Association
- 3 Motor

Sense cells are called receptors because their function is to receive information from the outside world.

Sense used	What information your brain is receiving
Smell	Own body scent including perfumes etc, and any such smells from others nearby.
Hearing	Own breathing, conversation and movement of people nearby, museum announcements, audio information from displays in gallery, general background noise.
Taste	People should not be eating in the gallery but they may still be able to detect strong flavours from before such as mouthwash or coffee.
Touch	Pupils should feel the paper of their guide and their writing implement. Those who focus should be able to feel the shoes and clothes they are wearing, pressure from the weight of any bags carried, pressure on their soles from standing, possible movement from their hair or jewellery, or of air from the ventilation system.
Sight	Pupils should see themselves, the displays and people in view. The more observant may notice the lighting and the structure of the gallery above the display panels.

3

How the brain processes signals and how signals can bypass the brain



Discussion point on whether the brains of other animals have large areas devoted to the association functions in the same way as human brains do

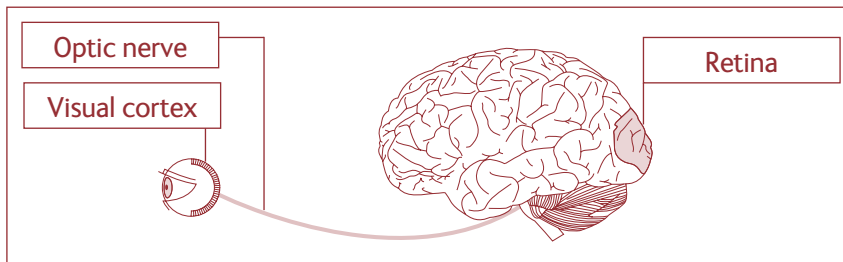
Pupils were not asked to record their thoughts but it is expected they think laterally and deduce that animal brains will not have developed in exactly the same way as human brains and so will not have the same association area that humans have. It is also interesting to note that some animals have certain areas of the brain that are very highly developed, to a greater extent than in humans. For example, the area of the brain concerned with space and navigation is highly developed in some migratory animals. Animals with a highly developed sense of smell also tend to have the corresponding sensory area of their brains developed to match.

Notes on how the reflex response works: an example is given of a cook who accidentally touches a hot object. Signals of heat and pain are sent to his spinal cord, then motor signals from the spinal cord trigger his arm muscles to instantly move away.

However, if the cook expects to feel heat by deliberately touching something hot, his brain can override this process and he can keep control of his arms.

In potentially dangerous situations the cortex can be bypassed by a reflex reaction in order to save time, thus minimising further pain and damage to tissues.

4 How eyes work

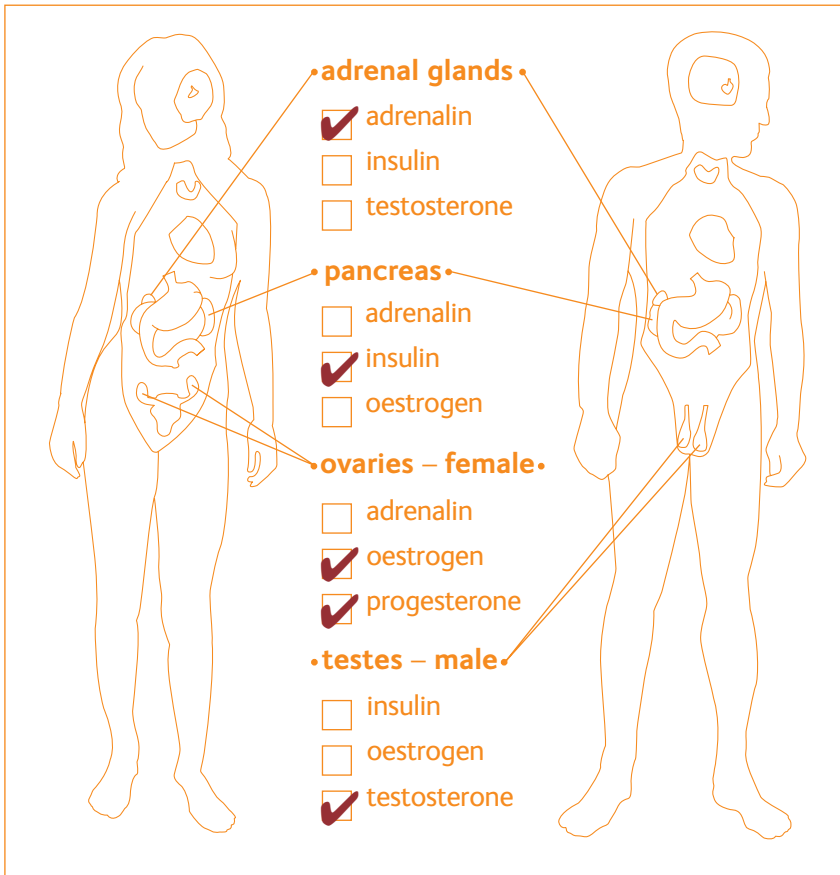


When impulses from the eye reach the brain, they are received by the visual cortex, which is found at the back of the brain.

There are certain forms of occupation that people with colour-blindness cannot take up such as: electrician and jobs in the electronics industry, railway driver or engineer, some branches of the armed services, fire service officers, hospital laboratory technicians and pharmacists, paint, paper and textile manufacture, photography and fine art reproduction, some forms of design work.

Severe colour-blindness also has other implications for daily activities such as reading maps, recognising ripeness of fruit and clothes-shopping. There are also safety issues when doing electrical jobs involving the old style of colour-coding for the wiring system. Hot and cold tap recognition may not be obvious if only colour coding is used. There are particular safety problems for driving road vehicles, since it may be harder to see brake lights of those ahead, and to see stop lights, especially in the dark or conditions of poor visibility.

5 How hormones work



	Hormones	Nerves
How do they work?	Hormones are chemicals sent out via the blood stream to all parts of the body.	Nerves pass electrical signals between the brain and precise locations in the body.
Which process do they control?	They control long, continuing processes which are not consciously regulated such as growth.	They control instant reactions and conscious movements.

6 The effects of hormones

adrenalin

Response	Reasons for your body to react in this way	Ranking (order of importance)
Skin starts to sweat	We need to dissipate heat as our muscles become active.	5
Breathing increases	Active muscles need extra oxygen so they can use more fuel to get more energy.	2
Skin goes pale	Blood is diverted from the skin to essential organs and muscles.	4
Heart beats faster	To increase the delivery rate of fuel and oxygen to muscles and remove their waste products quickly.	1
Muscles able to work harder	Muscles need to be more efficient as they prepare for 'fight or flight' situations.	3

Pupils may rank these responses as they wish, so long as they have reasons to support their decisions. One possible ranking is given above.

There are many possible situations that can shock us or cause us to panic, including accidents, perceived threats and even getting caught up in exciting situations such as following a football match or frightening situations such as watching a scary film.

Deliberate release of adrenalin can be caused by pursuing extreme sports such as parading, by taking certain drugs and by going on thrilling fairground rides.