

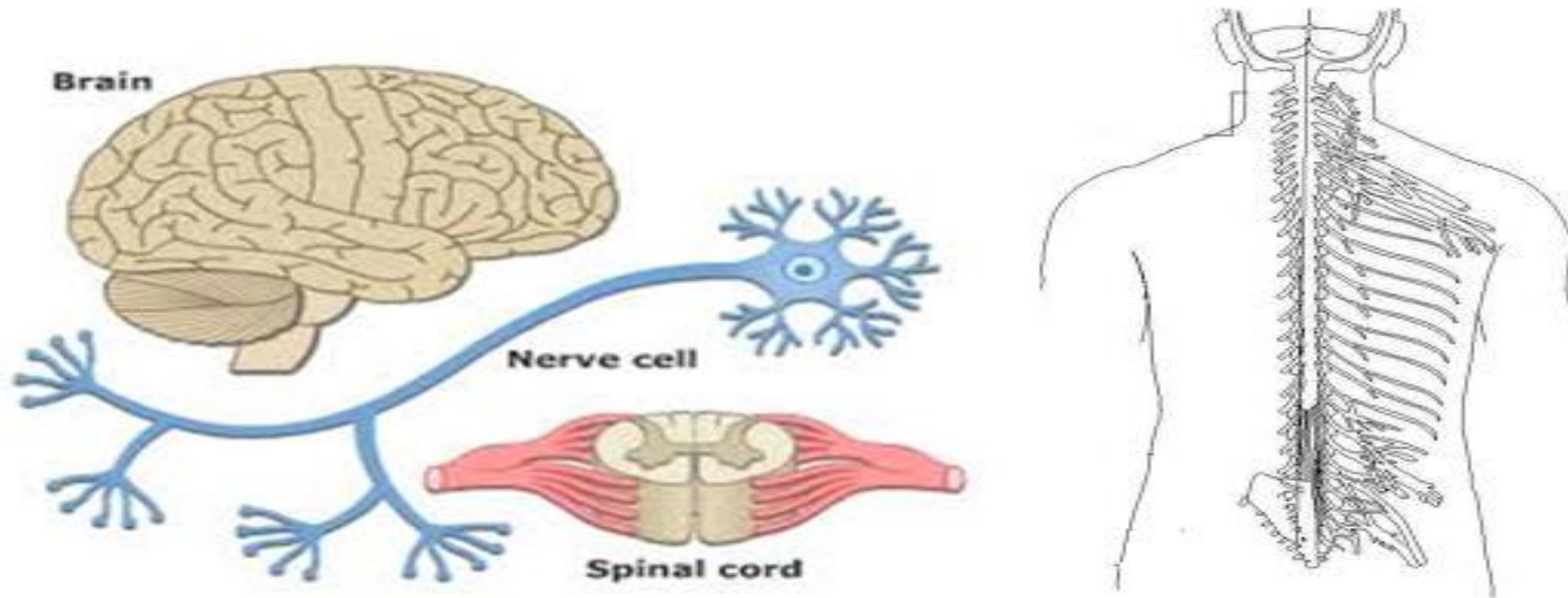
2.6 Biological actions in response to internal and external changes to maintain stable body systems

What you need to know...

- How our Nervous system works
- The definition of Homeostasis
- The basic principals of Homeostasis with regards to
 - Maintaining body temperature
 - Maintaining blood sugar levels

The Nervous System

- Is made up of the **brain, spinal cord, and nerves**
- The brain and the spinal cord make up the **Central Nervous System (CNS)**



The Sense Organs

- Parts of our body we use to sense things are called **SENSE ORGANS** – eye, ear, mouth, skin, nose.
- Each **SENSE ORGAN** has special cells called **RECEPTOR CELLS** that become **stimulated** by different things

Task

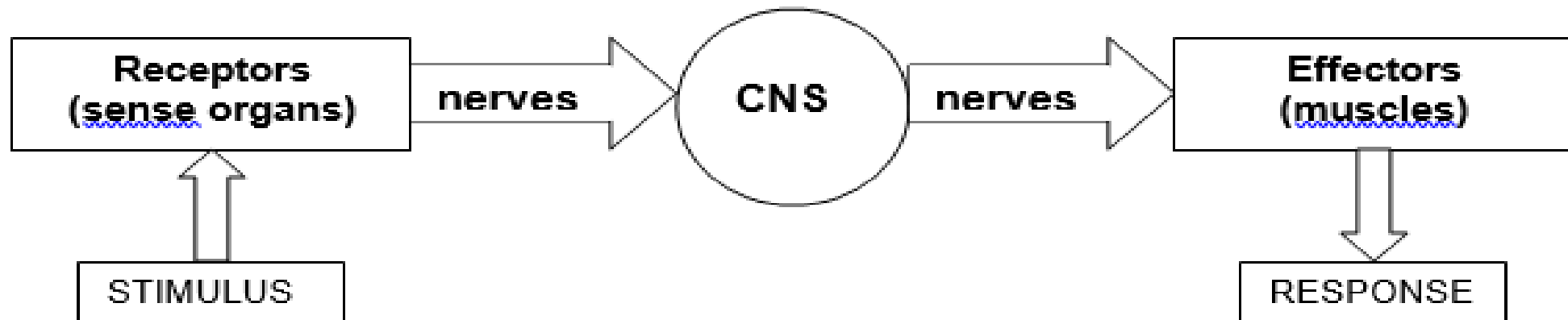
- Try to copy and complete the following sentences
 - Receptors in _____ are sensitive to light
 - Receptors in _____ are sensitive to sound
 - Receptors on the tongue are sensitive to chemicals
 - Receptors in nose are sensitive to chemicals
 - Receptors in the _____ are sensitive to touch, pressure, pain, temperature

Answers

- Receptors in eye are sensitive to light
- Receptors in ear are sensitive to sound
- Receptors on the tongue are sensitive to chemicals
- Receptors in nose are sensitive to chemicals
- Receptors in the skin are sensitive to touch, pressure, pain, temperature

Responding to a Stimulus

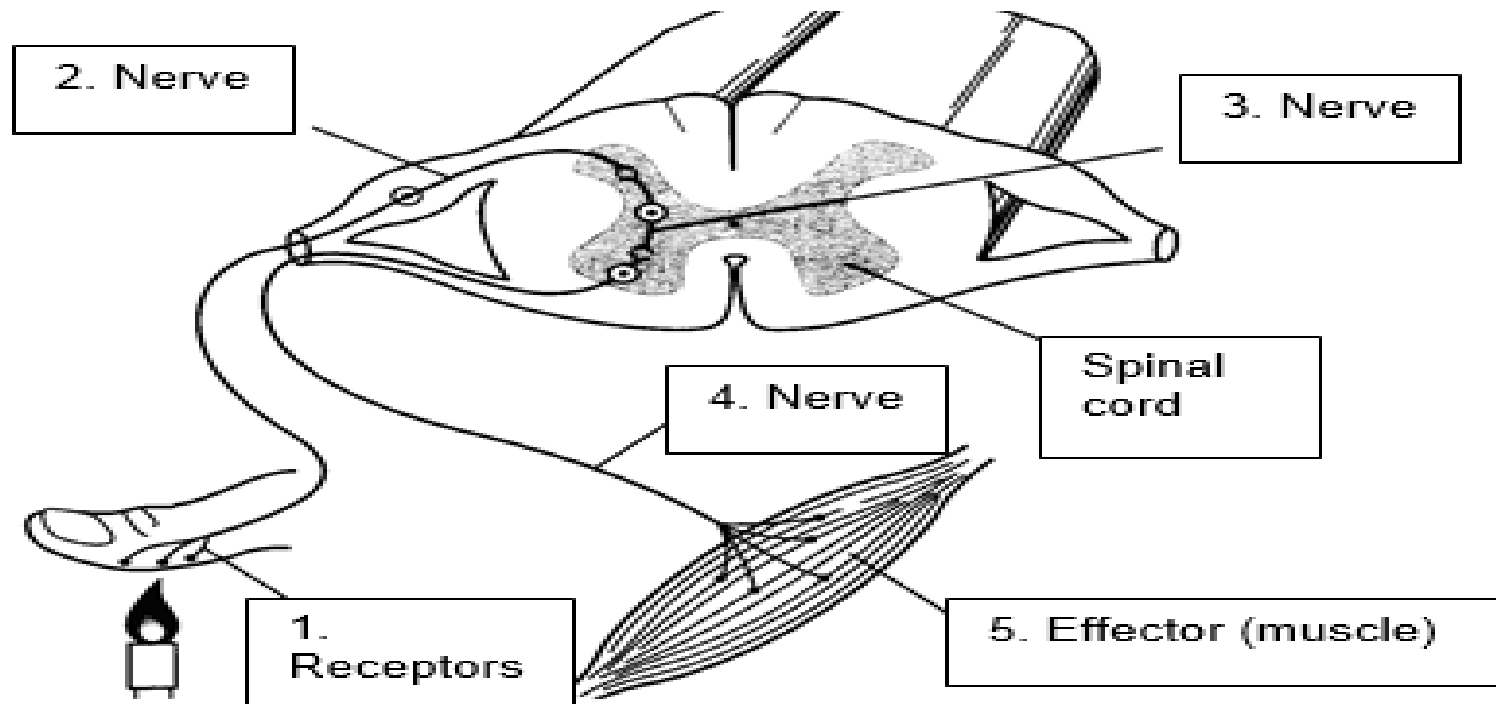
- When receptor cells become stimulated, information is sent along nerve fibres to the CNS to be **processed**.
- The processed information is then sent from the CNS along nerve fibres to **effectors** (such as muscle) to carry out a **response**.



Responding from Danger – Reflex Action

- **A reflex action** is a rapid, protective response carried out when nerve impulses pass to the **spinal cord rather than the brain**.

Examples include pulling away from a hot object and blinking



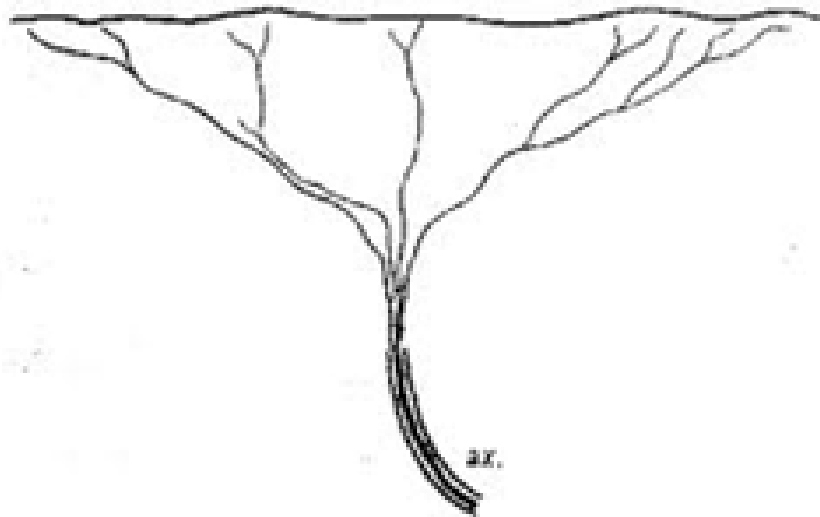
Reaction Time

- A person's reaction time is a measure of how fast they can respond to a situation or stimulus.
- Alcohol, certain drugs and excitement can affect a person's reaction time.
- Reaction time can be a useful indicator of a person's state of health. A long slow reaction time can indicate that the person is suffering one or more of the following:
 - Diabetes
 - Brain disorder
 - Nerve disorder
 - Arterial disease

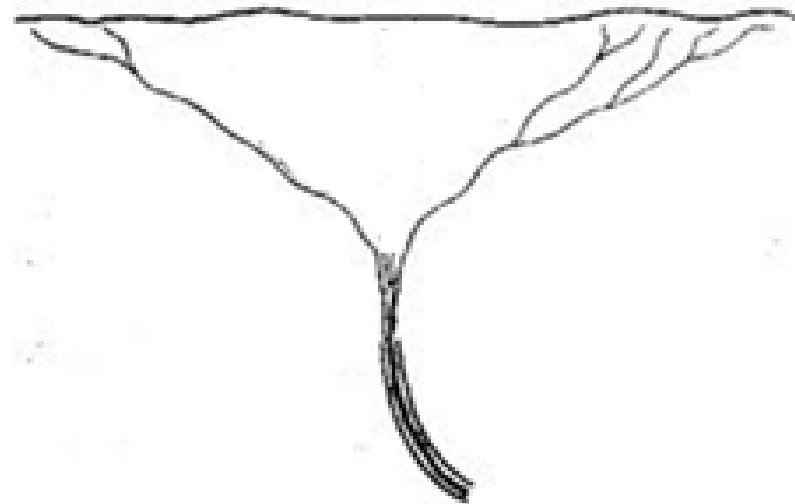
Skin Sensitivity

- Some areas of the skin are more sensitive than others. They “feel” more.
- The skin on a finger tip can detect smaller differences in the feel of an object than the skin on the back, so is said to be more sensitive.
- Sensitive areas of the skin are this way because they have many touch receptor cells (a large density) connected to larger nerves.

- For example...



Many skin touch receptors at a fingertip



Fewer skin touch receptors at the back

Questions

Create questions to help you remember the facts you have learned about the nervous system.

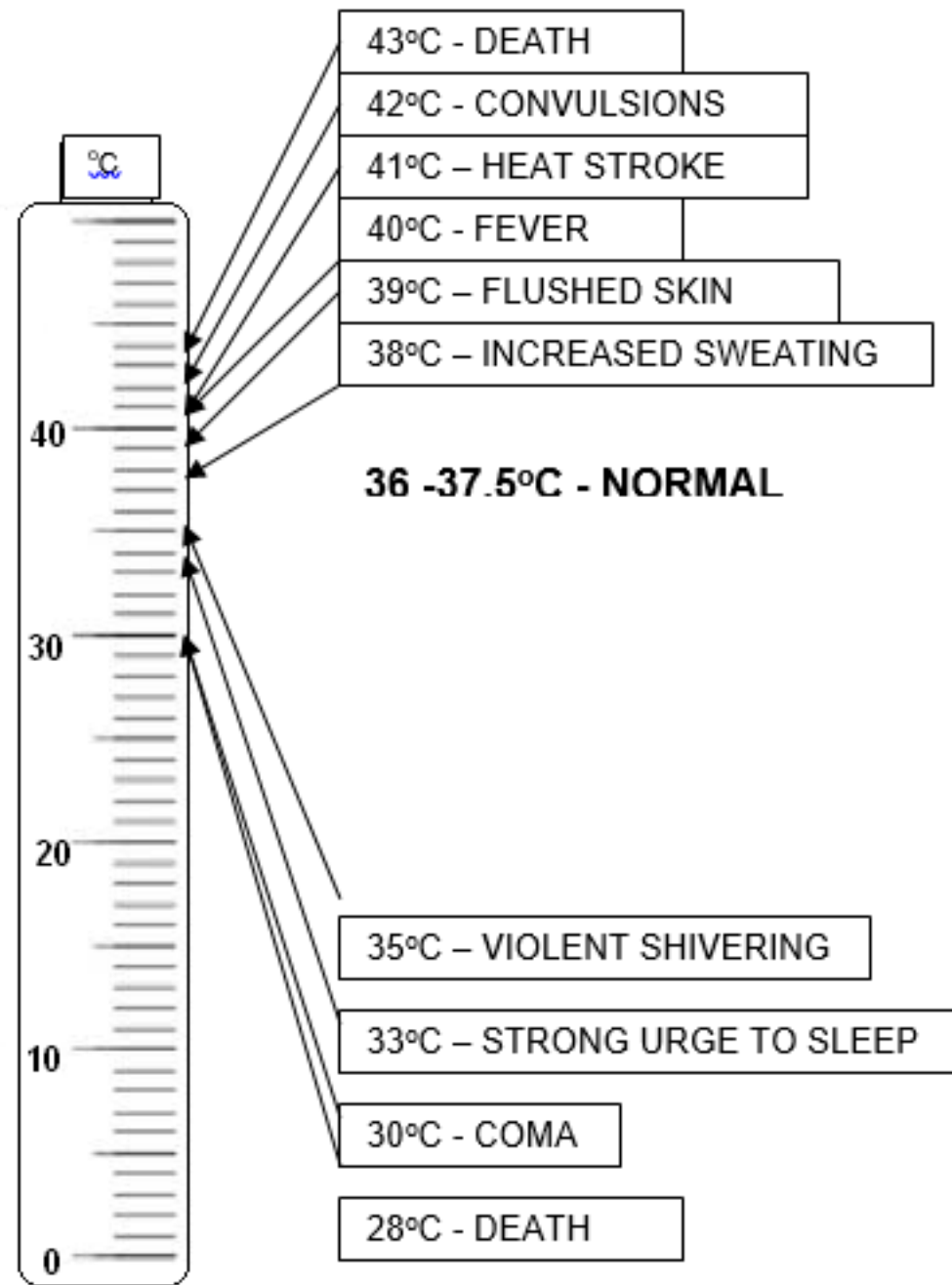
Share these questions with other groups

Homeostasis

- Homeostasis is the maintenance of a **constant environment** in the body.
- Homeostasis tries to make sure that our body has correct levels of **water, glucose** and is at the **correct temperature** no matter what situation we place ourselves in.

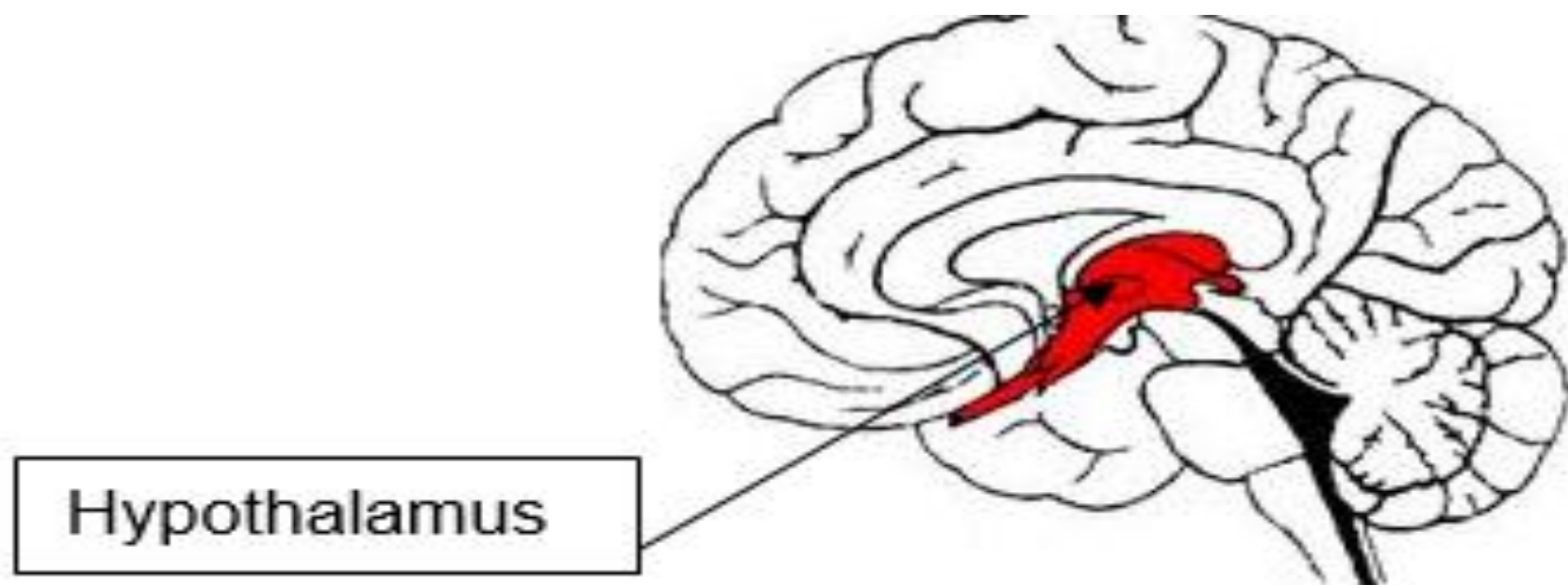
Maintaining Body Temperature by Homeostasis

- It is important that the core body temperature remains as close to **37°C** as possible. The normal range is 36-37.5°C
- Above or below the normal range can **prevent essential chemical reactions** from taking place inside the body's cells and can ultimately lead to death



Hypothalamus

- A part of the brain called the **hypothalamus** is the body's temperature monitoring centre
- Nerve impulses pass information regarding body temperature to this part of the brain to be processed
- Nerve impulses are sent to parts of the body (effectors) which will work to return body temperature to its normal level.



Task

- Use the resources available to you to find out what happens to your body when you are
 - Too Hot
 - Too Cold

When Body Temperature is too High

- Parts of the skin act as effectors to reduce body temperature.
- Sweat glands **increase the rate of sweating**. Water liquid turns to vapour on the skins surface and has a cooling effect.
- There **is increased blood flow** to the surface of the skin to allow heat to be lost by radiation. This is why a person's face may appear red when they become too hot!

When Body Temperature is too Low

- Parts of the **skin and the body's skeletal muscles** act as effectors to increase body temperature.
- Sweat glands **decrease the rate of sweating** to reduce cooling down.
- There is **decreased blood flow** to the surface of the skin to reduce heat loss by radiation
- **Hairs on the surface of the skin become raised** to trap a layer of air between the hair and the skin. The layer of air acts as insulation to reduce heat loss from the body
- Skeletal muscles rapidly contract for brief periods to generate heat. This process is called **shivering**.

Maintaining blood glucose level by homeostasis

- Glucose is a sugar needed to provide **energy** for living cells
- It is important that the concentration of glucose in the blood is kept at a constant level.

- Having **too much** glucose in the blood for long periods of time can cause serious health problems. The vessels that supply blood to vital organs can become damaged, which can increase the risk of **heart disease and stroke, kidney disease, vision problems, and nerve problems.**
- Having **too little** glucose in the blood is also dangerous. Effects can range **from moodiness to more serious issues such as seizures, unconsciousness, and (rarely) permanent brain damage or death.**
- Blood glucose levels **rise** after **eating** a meal.
- Blood glucose levels **fall** after **exercise** because the glucose has been used to provide energy for activity.

The action of Insulin

- The **pancreas** monitors the level of blood glucose
- **Excess** blood glucose causes the pancreas to produce the hormone **insulin**.
- Insulin will allow **excess glucose to become glycogen** – a molecule that can be stored by the liver

Questions

1. What is Homeostasis?
2. Explain why our body temperature has to stay between 36 and 37.5 degrees?
3. What part of the brain monitors temperature?
4. What happens to our body when:
 - a. Our temperature is too low
 - b. Our temperature is too high
5. Why does our body need glucose?
6. What happens when:
 - a. Our temperature is too low
 - b. Our temperature is too high
7. What organ monitors sugar level?
8. What is the name of the hormone which controls sugar levels?

Diabetes

- A person is said to have diabetes when the body **can't control excess glucose with insulin**. Blood glucose levels can become dangerously high
- There are two types of diabetes- **type 1 and type 2**.

Task – Try to find out the differences between type 1 and type 2 Diabetes.

Did you find this out??

- In Type 1 diabetes, the pancreas is unable to make enough insulin.
The cause of type 1 diabetes is believed to be:
 - **Genetics**– The genes that come from a person’s Mum and Dad
 - **Self-allergy**-When the body attacks a part of itself
 - **The environment in which we live**– Coming into contact with a virus or chemical
- In Type 2 diabetes, the pancreas still makes insulin but the insulin doesn’t work very well.
- In type 2 diabetes, our genes and our culture can play an important role but it is also linked with being overweight and not getting enough exercise
- As a result of the high blood sugar, the person might feel thirsty, tired, and hungry, pass urine frequently and have blurry vision.

Good News

- The good news about diabetes is that it can be treated. Having a healthy eating plan and doing regular exercise are keys to staying well with diabetes.
- In type 1 diabetes, insulin injections are needed to control the blood sugar levels.
- In type 2 diabetes, it may be tablets and / or insulin injections that may be required.
- In both types of diabetes, daily blood sugar checks using a meter helps a person to know whether the treatment plan is working or needs adjusting.

Questions

1. What is diabetes?
2. What is the difference between:
 - a. Type 1 diabetes
 - b. Type 2 diabetes
3. How is diabetes treated in:
 - a. Type 1 diabetes
 - b. Type 2 diabetes

Maintaining internal body conditions through behaviour

- Behaviour also plays a part in maintaining internal body conditions. Unlike homeostasis, actions that are carried out are thought about (conscious)
- Body temperature can be raised by wearing warm clothes, exercising, moving to a warm area or having a warm drink. Body temperature can be lowered by removing clothes, moving to a cooler area or having a cool drink.
- Blood glucose levels can be regulated by a person's diet.

Behaviour can Increase the Chance of Survival



Animal	Environmental stimulus	Behavioural response	How this increases chance of survival
Maggot	Range of humidity	Maggots gather in a damp area	Skin is prevented from drying out.
Swallow	Decreasing day length	Swallows migrate to a warmer climate	Avoids cold temperatures and shortage of food in winter
Kangaroo rat	Range of temperature	Is nocturnal	Avoids extreme desert daytime heat



Choice Chamber Activity

- Perform a Choice Chamber activity and note your findings in your jotter

