Hello, I'm Dr Alex Lathbridge and this is Bitesize Biology.

This series is all about homeostasis.

You're in luck because that means we're covering everything from the nervous system and hormones to blood glucose levels and the menstrual cycle.

First things first in this episode – what actually is homeostasis?

You know how, when a computer or laptop or games console starts getting a bit too hot and its fans starts spinning up to cool it down? So, it doesn't end up overheating and suddenly switching off, or worse, getting damaged. And the hotter the computer is, the faster the fans spin?

Well, the same thing goes on in your body, but on a wider scale.

And it's not just temperature, it's really important that your body keeps all of its internal conditions at the right levels.

So remember this definition of homeostasis:

Homeostasis is the maintenance of a constant internal environment in the body.

So in really simple terms, when external conditions change, homeostasis allows your body to get internal conditions back to where they should be.

So homeostasis isn't really just one "thing". It's all the different collective processes that an organism carries out to maintain the internal conditions necessary for survival, and you and I are going to go through them in this series.

There are 3 main conditions that you need to know :

1. blood glucose concentration, how much sugar is in our blood

2. water levels in cells

3. our internal body temperature

So why is homeostasis so important?

Think back to our previous series on The Cell. I pretty much said that we're just big containers of cells where chemical reactions are happening all the time. Well, those chemical reactions need to happen.

The best example are probably enzymes.

They need really specific conditions to do their important job of speeding up (or catalysing) chemical reactions in the body.

If internal conditions are too hot or too acidic, or too alkaline, enzymes will be denatured.

This means they stop functioning, and so the chemical reactions slow down or just stop. If you want a recap of enzymes, go back and listen to our episode on them in our series on the Organisation of Plants and Animals on BBC Sounds.

There are so many things in the external environment that constantly change, and your body responds to them without you thinking thanks to homeostasis.

We call these changes in the environment stimuli (or if it's one, it's a stimulus).

Examples of stimuli that change all the time include temperature, light, sound, pressure, pain, a chemical change, or you move about, so a change in position.

What does that look like in the real world? Well, one day I was making dinner, and I was removing a hot tray filled with chips from the oven. And I only put one oven glove on, because I'm an idiot, but I got distracted by someone talking to me and picked up the pan with both hands, burning my ungloved hand and dropping the pan (and my chips just everywhere.)

That is homeostasis in action, I'll explain more in a bit, after you've jotted down these key terms.

So grab a pen and make a note:

In order to maintain a constant internal environment at the right levels, our body has automatic control systems.

These control systems involve nervous responses, regulated by our nervous system, or chemical responses, regulated by the endocrine system.

Don't worry, we'll going to more in-depth on those two automatic control systems later in this series.

But for now, you need to know that these automatic control systems have three main components that all work together to maintain constant internal conditions.

You need to know the names of these and how they work:

1. Receptors - these detect changes in the environment, or stimuli

2. The coordination centre – these are things like the brain, which processes information from receptors around the body

3. Effectors – these are things like muscles or glands, which the coordinator generates a response in

The receptors of an automatic control system detect a stimulus when something in our internal conditions might be too high or low, like temperature.

They then pass that information to the coordination centre, which has a think, (or if you want to pass your exams) processes the information and generate a response in the effectors.

The effectors work to regulate internal conditions back to their optimum level.

So remember the order is receptors, the coordination Centre and effectors.

This process where optimum levels are restored is called a negative feedback loop.

Constantly maintaining the optimum internal conditions is a bit like always making sure everything is perfectly balanced. What the body doesn't want is an imbalance of anything, for example where our internal conditions are either too hot or too cold.

And at optimal conditions, the temperature in the body is usually around 37 degrees Celsius, which enables enzymes and cells to work at their best.

So with what you've just learnt about the negative feedback loop in mind, let's go back to my terrible cooking.

An external stimulus (the hot pan) was detected by receptors on the palm of my hand, they detected the pain and the change in temperature.

The coordination centre, my brain in this instance, received and processed that information from the receptors.

Signals were sent to muscles in my arm and hand (the effectors) to respond by dropping the pan, thus preventing even more damage to my body, and attempting to bring that part of my body back to optimal conditions.

This is an extreme example. The same thing can be said for being in a hot environment, you have heat receptors detecting that change, it gets processed by the coordination centre (the brain), and the effectors cause you to do something like sweating.

So basically, a negative feedback loop responds to any changes away from the optimum level, in order to bring the levels back to this optimum state. It's a continuous, looping process.

Just like a fan on a computer, laptop or gaming console.

In terms of temperature, if the scales are tipped too far the other way, and the internal body temperature gets too cold, receptors will detect this too, and send information to the coordination centre, which will generate a response in the effector.

This negative feedback loop happens without you even thinking about it, you don’t have to do anything consciously. It’s all automatic.

Just because it's called negative that doesn’t mean it refers to not having enough of something, it's both if something is too high or too low.

I’m Dr Alex Lathbridge and this is Bitesize Biology – all episodes available now on BBC sounds.