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

This is the seventh episode of a nine-part series on the cell.

This episode is all about how things move in and out of cells through the cell membrane. There are three main ways that this happens and we're going to cover them all today: diffusion, osmosis and active transport.

Things need to move in and out of the cell to keep the organism alive. It helps keep the balance of molecules needed for survival, such as oxygen and water.

You're going to need to be able to identify which kind of movement is happening in a cell and to help you work that out there are two questions you should be asking yourself: what is the direction of travel and which molecules are doing it?

Process number one is called diffusion.

Imagine you're at a party. A gathering of people in a generally fun space.

You're in the corner of the room because it's a bit too crowded, so you want to move across the room to where there are fewer people.

This is basically diffusion, it's the gradual movement of things from places where there are lots of them, to places where there are fewer of them, until it all evens out.

For you to be able to party, of course you need to pass your exams so, in biological terms, the people at this party are called particles, things like molecules and ions.

And the room that you're in is a liquid or gas.

The movement is happening all the time, and while one particle can go to an area where there are lots of other particles if it really wants to, over time they naturally move from crowded areas to less busy areas.

This is basically what's known as a concentration gradient, an environment where you have a high concentration of particles in one area, but a lower concentration in another.

In basic terms, its going from a place where there's lots of a particle, to a place where there's not so many.

This movement, this process of diffusion is important, because it's how glucose and oxygen move into the cells, and the cells need glucose and oxygen because they react to release energy.

And once they've released that energy, there is left over: carbon dioxide. And the cell needs diffusion to make that leave the cell. (That energy stuff is waiting for you in episode 9).

This is important so I'm going to recap that.

Grab a pen so you can write this down.

Diffusion is how particles, molecules and ions, move from higher concentration to lower concentration so they can spread out evenly through a liquid or gas.

This is for carbon dioxide, water, urea, food and waste.

Diffusion is how glucose and oxygen move into cells so they can release energy.

The process of releasing energy also makes carbon dioxide, which leaves the cell using diffusion.

Diffusion can't occur in solids because the particles are not free to flow like liquids and gases.

Alright, so that's diffusion done.

The second type of movement you need to know is osmosis

But first, let's talk about orange squash for a bit. It is relevant, I promise.

If you add lots of water to your orange squash, it becomes lighter in colour. You're diluting it.

A dilute solution contains a lot of water. But if you only add a tiny amount of water, then it's concentrated.

This you can think of as a solution, which is water plus other stuff.

Why is squash relevant to osmosis?

Well, osmosis is all about water molecules in solutions. It's a special type of diffusion just for water. Imagine it as diffusion through a sieve.

So, in animals your cells have dilute solutions of ions, sugars and amino acids.

The cells need these things and when they are mixed with water it means that they can enter and leave the cell when they are needed.

The same principle as diffusion applies: ions, sugars and amino acids move from areas where there are lots of them to areas where there are fewer, making it all even out.

This happens through something called a selectively or partially permeable membrane.

This is a membrane that allows some things to pass through but not others, small things but not big things, like a sieve.

Remember that plants have a cell wall keeping them upright? (If you don't, have a listen again to episode 1 to refresh your memory of the basics.)

Well, the cell wall is fully permeable, which means that it lets in and out all molecules that the cell needs or doesn't need any more.

But when it comes to animal cells, including human cells, we don't have cell walls, which means that water makes our cells change size and shape and they could burst if they take in too much water by osmosis.

So it has to be strictly controlled otherwise they can shrink or worse, they can burst and become permanently damaged.

To recap: in osmosis, water moves from high to low concentration through a semi-permeable membrane.

So, from a dilute solution with lots of water in it, to a concentrated solution with less water in it.

Our third and final process is known as active transport.

It's called active because it needs energy to make it happen.

The other types of movement, diffusion and osmosis, are called passive transport, which means they happen without the cell needing any energy to do it.

Active transport happens when molecules need to move from a place of lower concentration to a place of higher concentration.

Think back to plants. They've got root hair cells that take minerals up from the soil into the plant.

So, at a certain point, there are going to be more minerals inside the plant rather than outside.

But active transport allows the plant to keep taking those minerals in.

But what about in animals?

The carbohydrates in your food are digested into glucose. The glucose then needs to be moved from the small intestine to the blood.

All the glucose needs to go, but sometimes you might not have that much left, meaning there is more glucose in the blood, than remains in the small intestine.

So here the cell uses energy, active transport, to help get that glucose out over the cell membrane and into the blood.

I'm Dr Alex Lathbridge and this is Bitesize Biology. All episodes available on BBC Sounds.