

BBC Bitesize – Physics

Episode 1 - Energy stores and systems

JAMES: Hello and welcome to the BBC Bitesize Physics podcast.

ELLIE: The series designed to help you tackle your GCSE in Physics and combined science.

JAMES: I'm James Stewart, I'm a climate science expert and TV presenter.

ELLIE: And I'm Ellie Hurer, a bioscience PhD researcher.

JAMES: And in this podcast, we're going to be your physics guides. Yes, we are. From forces to electricity, energy to gravity, we are going to explore some of the most important facts you need to know to revise for your exams.

ELLIE: And if you want to really get into it, be sure to grab a pen and paper so you can make notes and try out equations throughout the episode.

JAMES: This is episode one of our eight-part series all about energy, and today we'll be talking about energy stores and systems.

ELLIE: So let's begin.

JAMES: Energy is converted in a variety of ways, but the three most common ways are through heating, work done by forces, and work done when a current flows.

ELLIE: There is one key fact that you definitely need to know about energy.

Energy can't be created or destroyed. It can only be transferred usefully, stored, or dissipated.

JAMES: Dissipated means it's wasted, usually by being lost to the surroundings. So let's explore what that actually means when it comes to how we interact with energy on a daily basis.

ELLIE: So let's say you want to make a cup of tea. You go to the tap to fill the kettle up with water, plug the kettle into the wall, then switch it on until the water begins to boil.

JAMES: How is energy being transferred as you boil that kettle? What effect does the heating have here?

ELLIE: Well, the kettle is powered by electric energy, and that store of electrical energy is transferred into the thermal energy store in the water that's in the kettle.

JAMES: Any other energy transfers happening in there?

ELLIE: Well, it's not just the water in the kettle that's getting hotter. The kettle releases steam and thermal energy that heats up the surrounding area.

JAMES: But because you didn't turn on the kettle for the purpose of heating up the room, that energy is dissipated, it means it's wasted.

ELLIE: Yep, correct. When we describe the way that energy is converted, we sometimes describe the objects that are part of this process as a system. And different systems store and transfer energy differently.

JAMES: Energy is also transferred through work done. We cover work done in much more detail in our Bitesize Physics 'forces' series, so be sure to go back and check that one out. But for a quick definition, work done is when a force causes an object to move through a distance, when a force transfers energy from one store to another. So let's look at an example of how work done by forces changes the energy in a system.

Imagine you're at the park and decide to go and sit down on the swings. What a nice day. You push yourself up and down until you're having fun on the swings. But as you are, you're causing an energy transfer.

ELLIE: When you push, you transfer energy from the chemical energy store in your leg muscles to the kinetic store in the swing.

JAMES: Yes, and when you're up really high in the air, that kinetic energy becomes part of the gravitational potential energy store in the swing. Before being transferred back into the kinetic energy store as you come back down again.

ELLIE: So let's talk about one final energy transfer. And for this one, we're heading to the seaside.

JAMES: Ellie, imagine you're on a boat.

ELLIE: Just a boat?

JAMES: Fine, a yacht. A super yacht. Whatever you want.

ELLIE: That's better.

JAMES: Alright, imagine you're on a full blown, glamorous, mega yacht with ten bedrooms on board, swimming pool, private chef, and what about a DJ playing along with your favourite songs? Sound better?

ELLIE: Sounds like my dream.

JAMES: Good.

ELLIE: Right, we're going to give you examples and get you to answer what energy transfer you think is going on. So grab your pen and paper.

JAMES: Okay, so if the motor that drives that yacht is powered by diesel, what energy transfer is going on? I'll give you a few seconds to think about it.

ELLIE: If the motor that drives the yacht is powered by diesel, the yacht transfers energy from the chemical energy store of the fuel into the kinetic energy store of the boat as it gains speed and travels.

JAMES: But are there other energy transfers happening in there as well?

ELLIE: Yeah, some energy would also be transferred into thermal energy, heat, which is wasted energy in this case.

JAMES: Okay, let's recap the three facts we covered today. Number one, energy can't be created or destroyed. It can only be transferred usefully, converted or dissipated.

Number two, a system is an object or group of objects and there are changes in the way energy is stored when a system changes.

And thirdly, energy is converted in a variety of ways. But the three most common ways are through heating, work done by forces, and work done when a current flows.

ELLIE: Thank you so much for listening to Bitesize Physics.

If you found this helpful, go back and listen again and make some notes so you can come back to them when you revise.

JAMES: Yeah, super helpful. In the next episode of Bitesize Physics, we are going to be talking all about kinetic energy and gravitational potential energy.

ELLIE: Until next time...

BOTH: Bye!