

BBC Bitesize – Physics

Episode 7 – Static charge

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 today we're going to be talking about static charge and how different objects repel and attract.

ELLIE: Well, I'm ecstatic to hear that. Let's begin.

JAMES: Have you ever taken a jumper out of the tumble dryer and felt a little electric shock when you've done it? Or maybe you've done that thing where you rub a balloon against your head to make your hair stand up in the air. If so, you've experienced something called static.

ELLIE: So static charge is an electric charge that accumulates on an insulated object, for example, because of friction. And just so you remember, something is insulated if it doesn't easily conduct electrical charge.

JAMES: Static charge occurs because the electrons are not free to move around in an insulator. So when they are transferred, they build up in one place. That's why we call it static charge. With static meaning stationary or simply can't move.

ELLIE: When certain insulating materials are rubbed against each other, for example, hair on a balloon, they become electrically charged.

JAMES: Secondly, negatively charged electrons are rubbed off one material and on to another. The material that gains electrons becomes negatively charged, and the material that loses electrons is left with an equal positive charge.

ELLIE: So in the hair and balloon example, the balloon would gain electrons and become negatively charged, whereas your hair would lose electrons and become positively charged.

JAMES: Exactly, so when you move the balloon away from your hair, you'll find that the two insulating materials, the balloon and the hair, would actually attract each other, making your hair stand up as it reaches towards the balloon. And the two objects exert equal and opposite forces on each other, even though they're no longer touching.

ELLIE: You can see a similar effect when it comes to clothes that have come out of a tumble dryer. Sometimes you'll notice a spark between different jumpers, or feel a little shock maybe as static electricity is produced between them through friction.

JAMES: Yeah, let's talk about the science behind that, shall we? So as static charge builds up, the potential difference between an object and the Earth, or something connected to the Earth, gets bigger. Now, in this example, it's actually you who's connected to the Earth.

ELLIE: If this difference gets big enough, then the charge can jump across the gap and cause a spark. Though, this is usually quite small and just felt as a static shock.

JAMES: Another good example is when you jump on a trampoline.

When you jump up and down on the trampoline, charge builds up as you rub your feet on the bottom of the trampoline with each jump.

ELLIE: But then, when you reach out to help someone else onto the trampoline, the charge jumps from you to them, and it causes a static shock.

JAMES: In the case of static charge, opposites attract. This is why the negative and positively charged objects would attract each other.

ELLIE: But if you were to bring together two objects with a negative charge, they would repel each other. This type of attraction between oppositely charged objects is called electrostatic attraction.

JAMES: Attraction and repulsion between two charged objects are examples of a non-contact force. In case you forgot what that means, I'll quickly explain for you. A non-contact force is a type of force applied to an object by another object that's not in direct contact with it.

ELLIE: So, if you want to learn more about contact forces and non-contact forces, be sure to listen to episode one of our series on forces to find out more.

JAMES: Okay, let's recap the three key lessons we've learned here. So, firstly, when certain insulating materials are rubbed against each other, they become electrically charged. Now, that's what we call static charge.

Secondly, negatively charged electrons are rubbed off one material and on to another. The material that gains electrons becomes negatively charged. The material that loses electrons is left with an equal positive charge.

And finally, like charged objects repel, but oppositely charged objects attract.

ELLIE: Thank you for listening to BBC Bitesize Physics. If you have found this helpful, go back and listen again and make some notes so you can come back to this as you revise.

JAMES: There's lots more resources available on the BBC Bitesize website, so be sure to check those out. In the next, and final, sadly, episode, we're going to be learning about the essentials of electric fields, so please do join us for episode eight.

ELLIE: I can't wait.

JAMES: That's it from us.

BOTH: Bye!