BBC Bitesize – Physics

Episode 8 – Electric fields

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

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

This is sadly the eighth and final episode of our series on electricity. If you haven't listened to the other seven, you can go back to episode one and listen all the way through to make sure you get the most out of the series.

JAMES: Alright, let's kick off with our final episode where we are going to be talking about electric fields, how attraction works in them and how to draw one.

ELLIE: A charged object creates an electric field around itself that can influence other charged particles in the surrounding area. The closer you get to the charged object, the stronger the electric field is.

JAMES: So the further you get away from the charged object, the weaker the field is?

ELLIE: Yep, absolutely correct. And when you place another charged object inside the electric field of the first object, it experiences a force.

JAMES: And the closer the second object gets to the first object, the stronger the force it experiences is.

ELLIE: Right, and if the field is strong enough, charges can be forced through insulators such as air. And in that case, a spark, or static discharge, might occur. This is actually what happens during a lightning strike.

JAMES: Okay, so what does an electric field actually look like? Let's draw some out together. So I want you to take your pen and your paper out, and I want you to draw two circles. So let's do one at the top of the page, and one at the bottom of the page. In the middle of that first circle, just write out the word 'positive' and draw a plus sign.

Then draw out a bunch of arrows starting from the circle and pointing out at the different corners of the page. And there you have a positive electric field coming from a positively charged sphere. Simple as that.

ELLIE: Alright, and let's move on to the other circle. I want you to write the word ‘negative’ and draw a minus sign in the middle of the circle. Then, draw a bunch of arrows around that circle, but this time, have the arrows pointing towards the circle, not away from it.

JAMES: And that will be an example of a negative electric field coming from a negatively charged sphere. The closer the field lines are, the stronger the forces. The further apart the field lines are, the weaker the force is.

Now the reason why we've drawn the arrows pointing out from the positive sphere and in towards the negative sphere, is because electric fields always go from positive to the negative.

ELLIE: Now, let's imagine how these two fields might interact. If the two spheres we just drew were brought closer to each other, they would attract as they have opposite charges. The closer they get, the stronger the force of attraction.

JAMES: Hopefully drawing that out helped you visualise this a bit better, but I definitely recommend checking out the BBC Bitesize website to have a look at what these fields actually look like, so then you can make your drawing more accurate.

ELLIE: Good idea, James. And finally, let's take a moment to talk about sparking.

The stronger the electric field around an object, the greater the potential difference between the charged object and Earth.

JAMES: If the strength of this field gets big enough, the air between the object and Earth can become ionized. Meaning a current flows, and that's what causes a spark.

ELLIE: Alright, so let's recap the three key lessons we've learned in today's episode.

Firstly, a charged object creates an electric field around itself. The closer to the charged object, the stronger the electric field.

Secondly, when another charged object is brought into an electric field, the force gets stronger as the distance between the objects decreases.

And finally, if an electric field is strong enough, charges can be forced through insulators such as air, and in that case, a spark or static might occur.

JAMES: And with that comes the end of our 8 part series all about electricity.

ELLIE: I hope you found it helpful, and if you didn't get the chance to listen to all of the episodes, be sure to go back so you can really dive in.

JAMES: Thank you for listening to Bitesize Physics. If you're preparing for your GCSEs, firstly, good luck, and secondly, why not also check out our Bitesize Biology podcast, or our range of Bitesize English Literature series.

ELLIE: And whilst you're in the BBC Sounds app, there's also the Bitesize Study Support podcast, which is full of tips to help you stay focused during revision and get the best out of your exam day.

BOTH: Bye!