



*Sofia, Bulgaria*



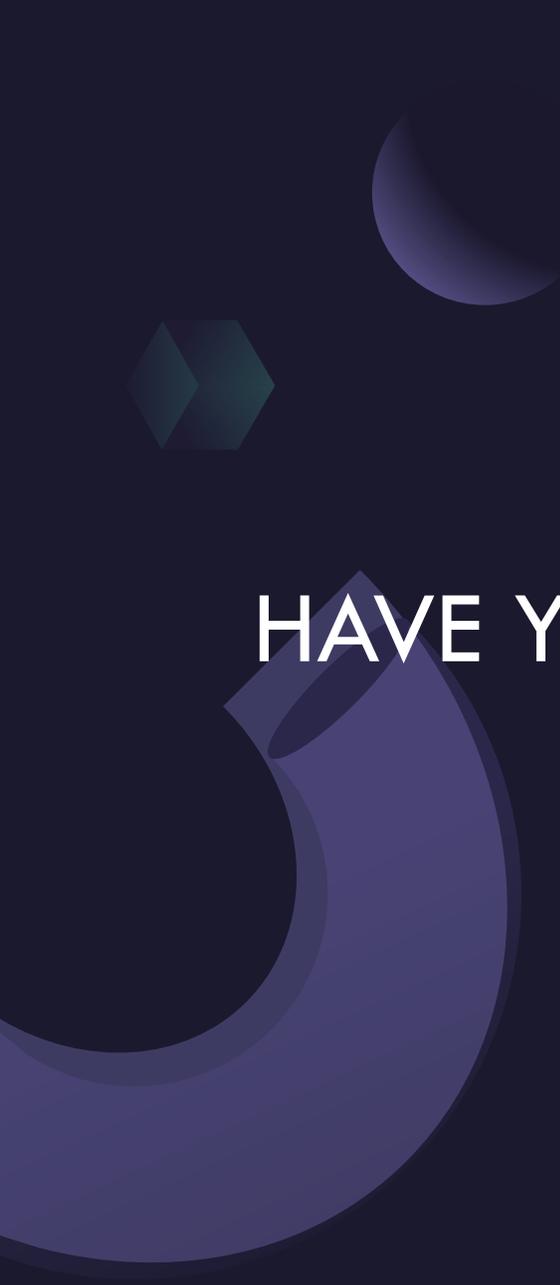
# ERA+INTEGRATED LEARNING CHALLENGES

SCIENCE LESSON, CREATED FOR THE PROJECT BY  
BORYANA RADULPOVA AND STUDENTS



# THE FOUNDERS OF THE ELECTRIC CURRENT



The background features several decorative elements: a sphere in the upper left, a hexagon below it, and a large, thick, dark blue ring on the left side. The text is centered in the middle of the frame.

HAVE YOU EVER WONDERED WHO DISCOVERED  
ELECTRICITY?

# THE START OF THE ELECTRICITY



Long before the advent of systematic knowledge of electricity, people were already observing certain electrical phenomena.



# Electric marine inhabitants

An ancient Egyptian text mentions an electric fish, which is called the "Thunderer of the Nile" and is considered the protector of all other fish. Electric fish are mentioned by ancient Greek, Roman and Arab authors who write about the numbing effect of the electric shock caused by electric catfish and electric stingrays.



# Amber

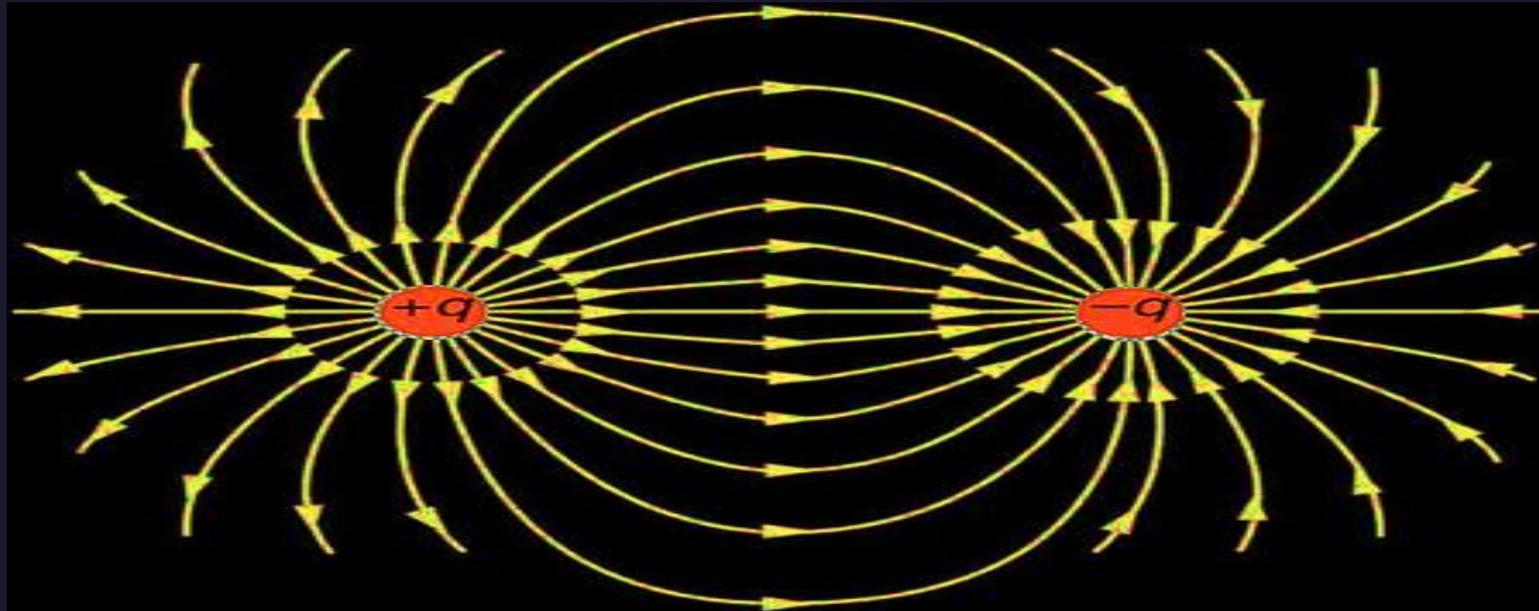
At the end of the 7th century BC Thales made a series of observations of static electricity, from which he came to the conclusion that amber is magnetized by friction, unlike minerals such as magnetite, which need no rubbing.

In the Mediterranean, it is also known that rods of amber, when rubbed with cat's fur, can attract light objects like feathers.



# ELECTRIC CHARGES

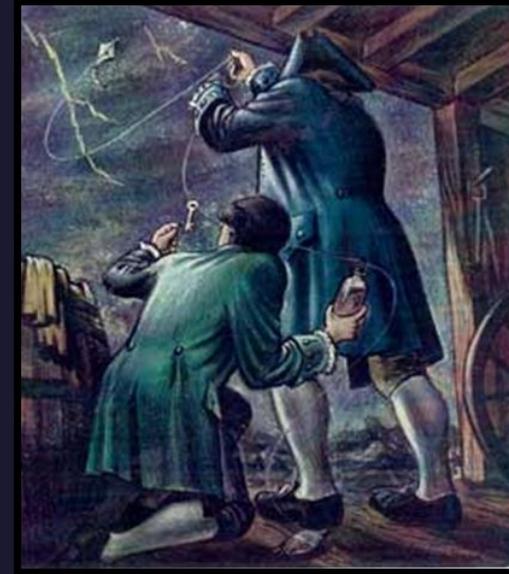
**Charles Du Fe** is the person who discovered the presence of different charges - positive and negative.



- In the mid-18th century, the American **Benjamin Franklin** conducted a series of experiments and managed to show that lightning has electrical characteristics.
- He also created a simple but effective protection against lightning strikes - lightning rod.

# THE EXPERIMENT WITH THE KITE

- He wanted to show everyone who didn't believe him that there really was electricity in lightning. He did something too risky. He tied a metal key to a kite which he launched during a thunderstorm. And as he had imagined, a succession of sparks jumping from the key to the back of his hand showed that lightning was indeed electrical in nature.





# BIOELECTRICITY

In 1791, Luigi Galvani published his discovery of bioelectricity and demonstrated that electricity was the means by which neurons transmitted signals to muscles.



- It was not until the end of the 19th century that the first electrical technologies were created, which found application in many industries and everyday life.
- In the following decades the rapid development in this field led to a complete change in economic and social life.
- With its exceptional flexibility as a source of energy, electricity is used for an almost unlimited range of purposes - in transport, heating, lighting, telecommunications, computers.
- Electricity is the backbone of modern industrial society and is expected to remain so for the foreseeable future.

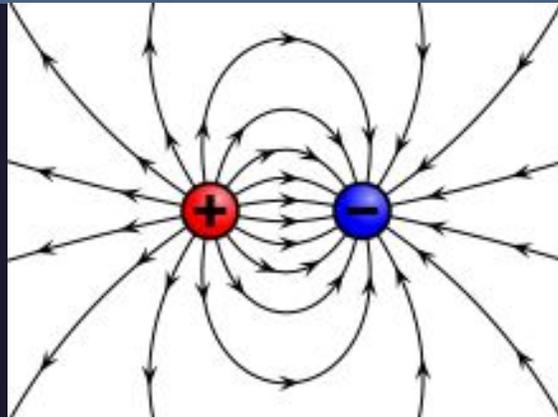
# ELECTROSTATIC GENERATOR



Изготвено от: Ивана Христова 11а и Криси Цветкова 9а

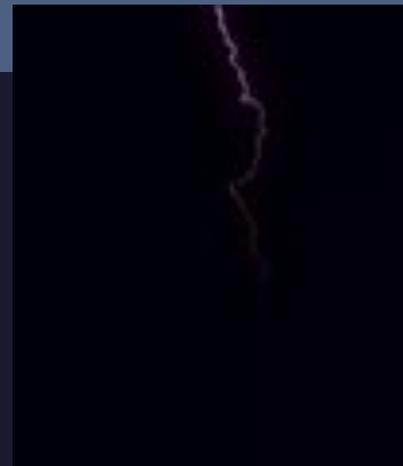
# THE CONCEPT OF ELECTROSTATICS

- Electrostatics is a science that studies the electric fields of fixed charges (positive or negative) and the interaction between them. There are different ways to electrify bodies - by friction, by contact or by induction.



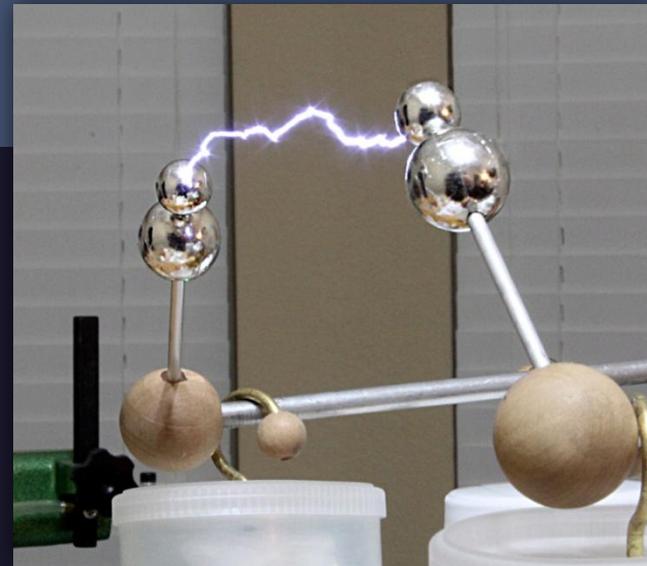
# ELECTROSTATICS IN THE NATURE

- In the summer we witness thunderstorms. Lightning is due to the rapid transfer of electrical charges from one cloud to another or from a cloud to the ground. The electrostatic generator mimics this natural phenomenon.



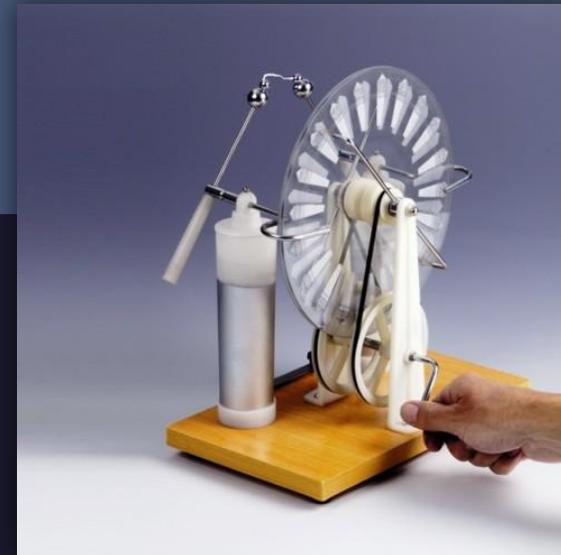
# ESSENSE OF THE GENERATOR

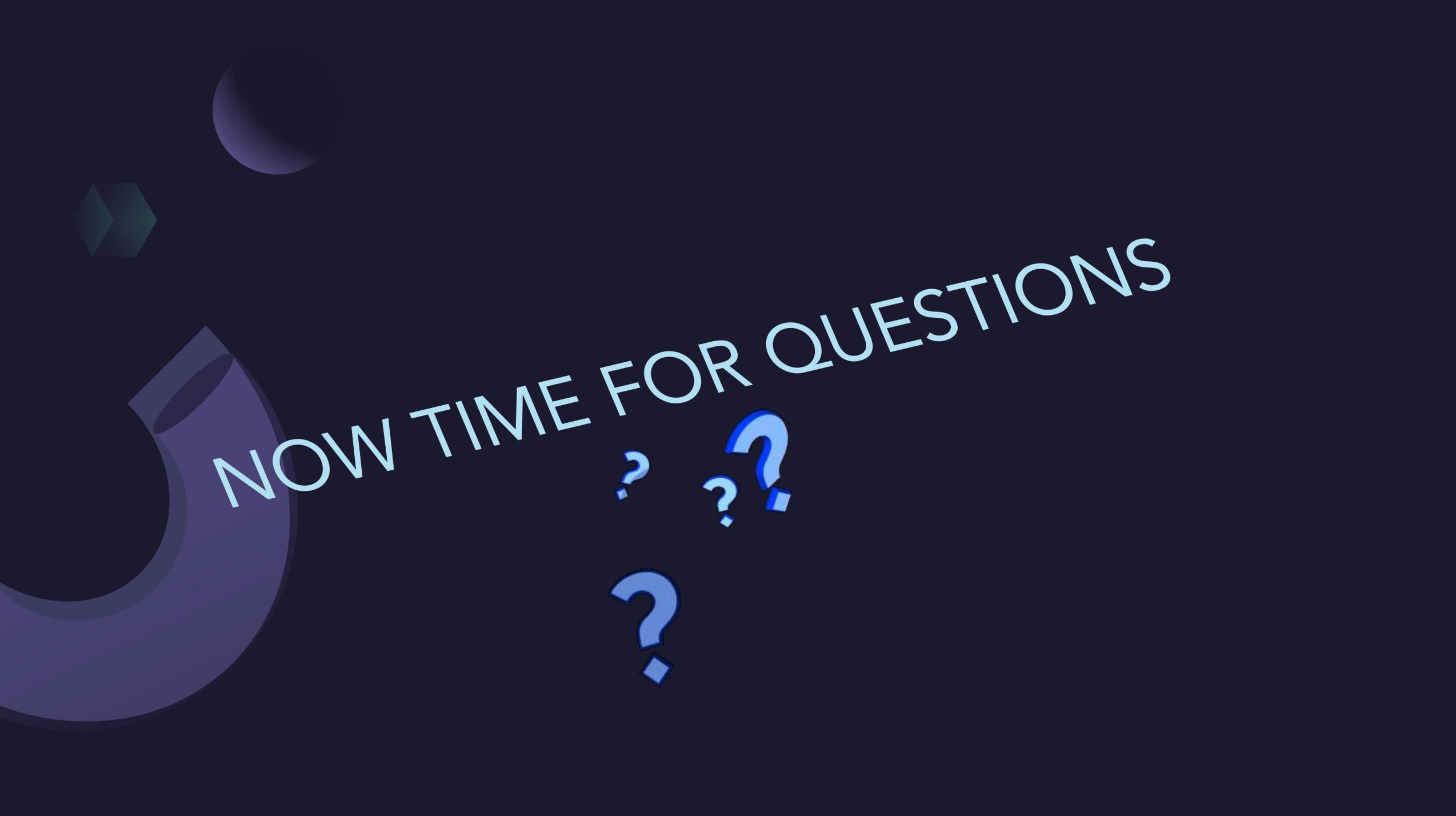
- An electrostatic generator is a mechanical device that generates static electricity or electricity with high voltage and low direct current. Generators use friction or electrostatic induction to create an electrostatic charge.



# OPERATING PRINCIPLE

- The Wimhurst generator type consists of two round plastic plates that rotate in opposite directions by a manually operated belt drive mechanism. When the machine rotates, the spheres begin to accumulate charge, and the transfer of charge between the two spheres takes place in the form of an electric spark. The spark is generated only as a result of the continuous rotational movement of the round plates.





NOW TIME FOR QUESTIONS



Which natural phenomenon mimics the electrostatic generator?

LIGHTNING



What does electrostatics study?

A) Electric fields



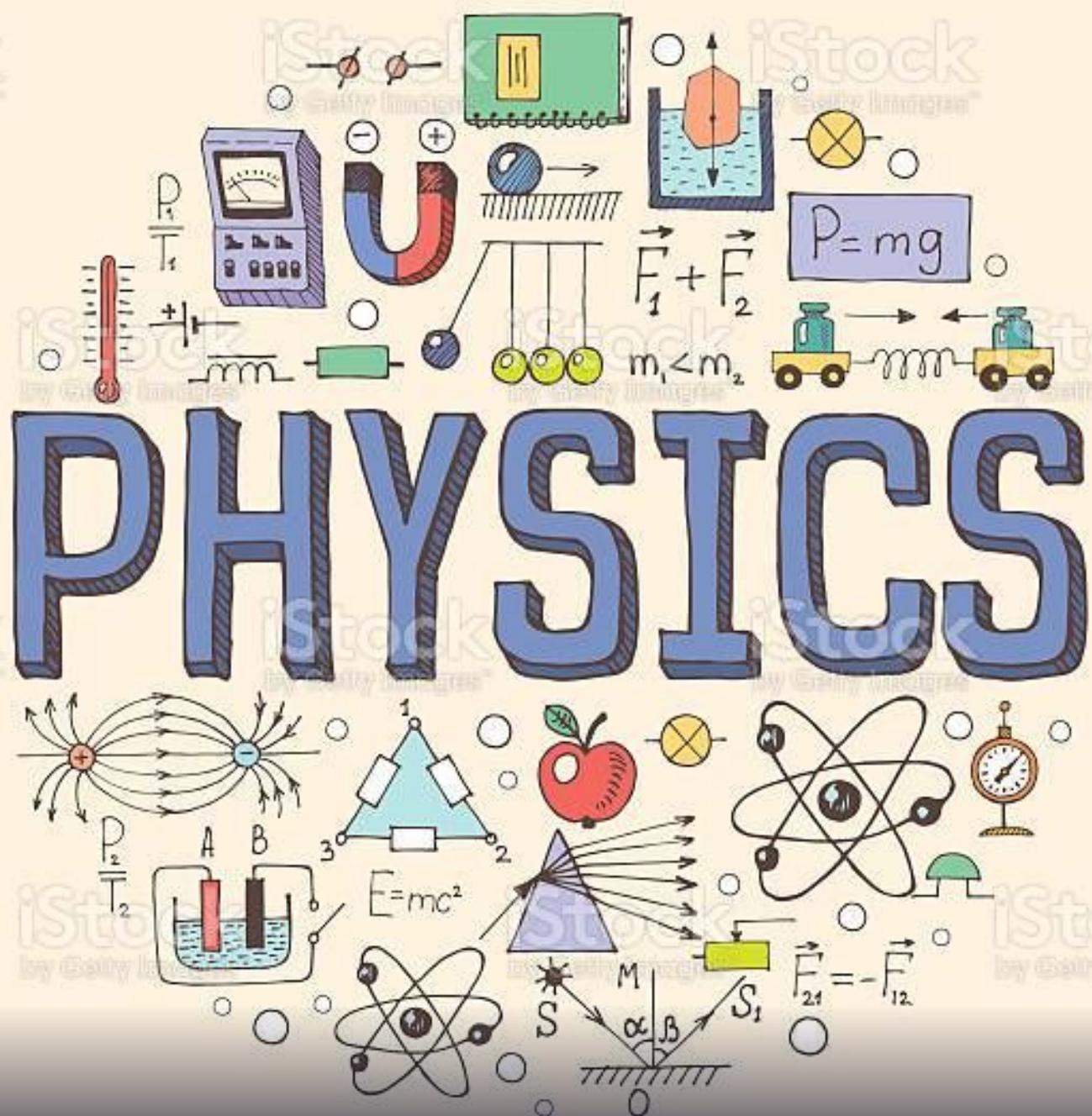
B) Magnetic fields

C) Electrostatic fields

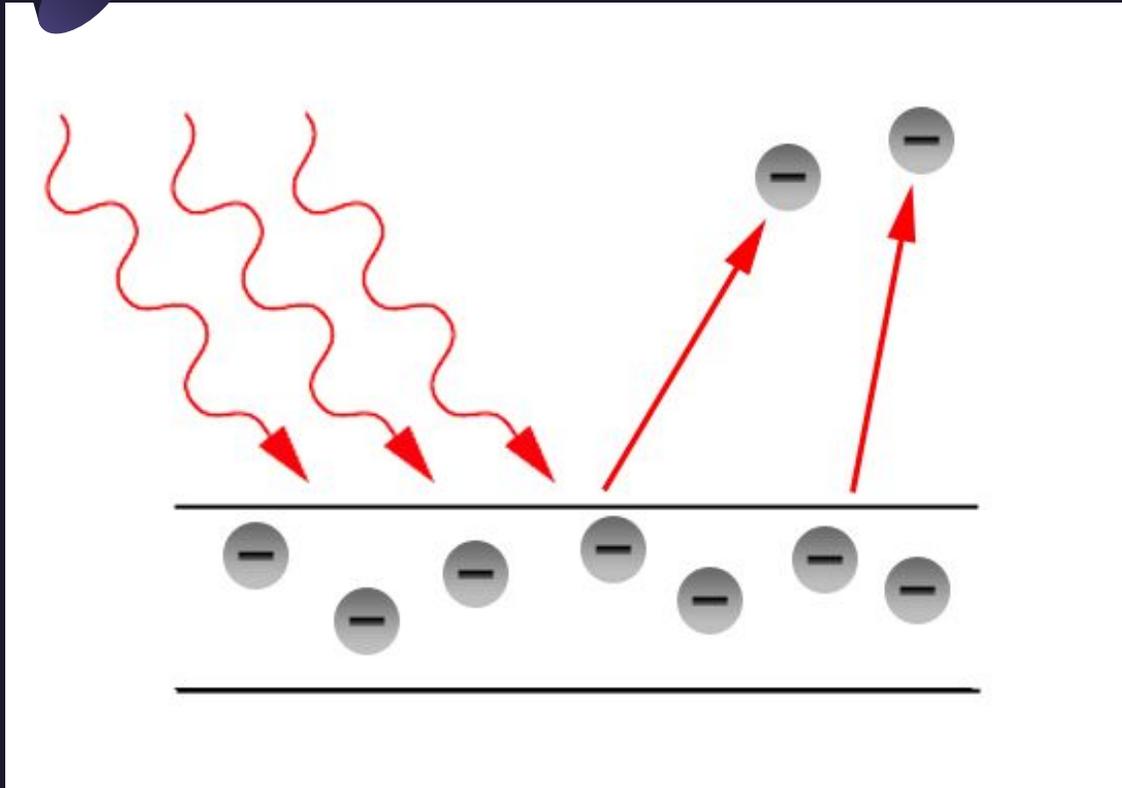


# Photoelectric effect

# PHYSICS



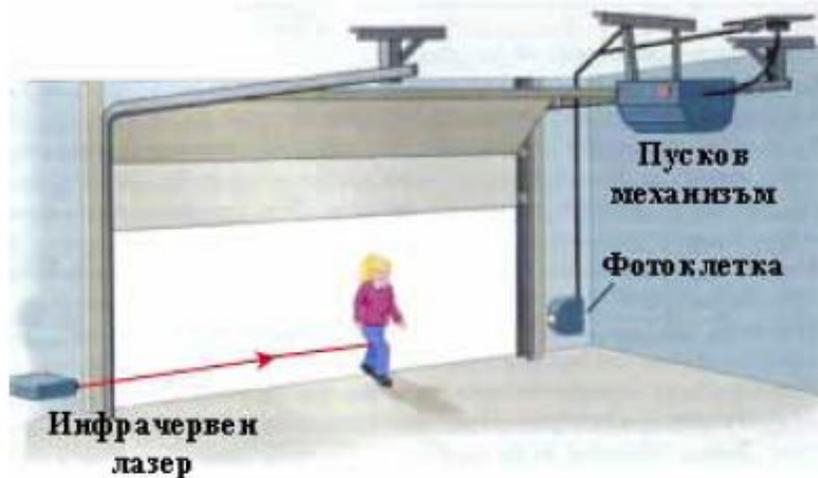
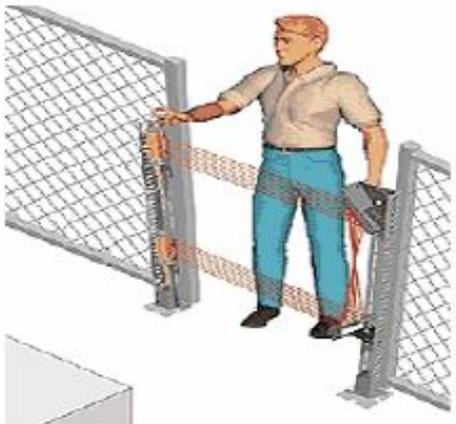
# Features of the phenomenon



- The photoelectric effect or photoeffect for short, is the interaction of light (one photon) with a substance, in which electrons are released from the atoms

# Application of the photoeffect

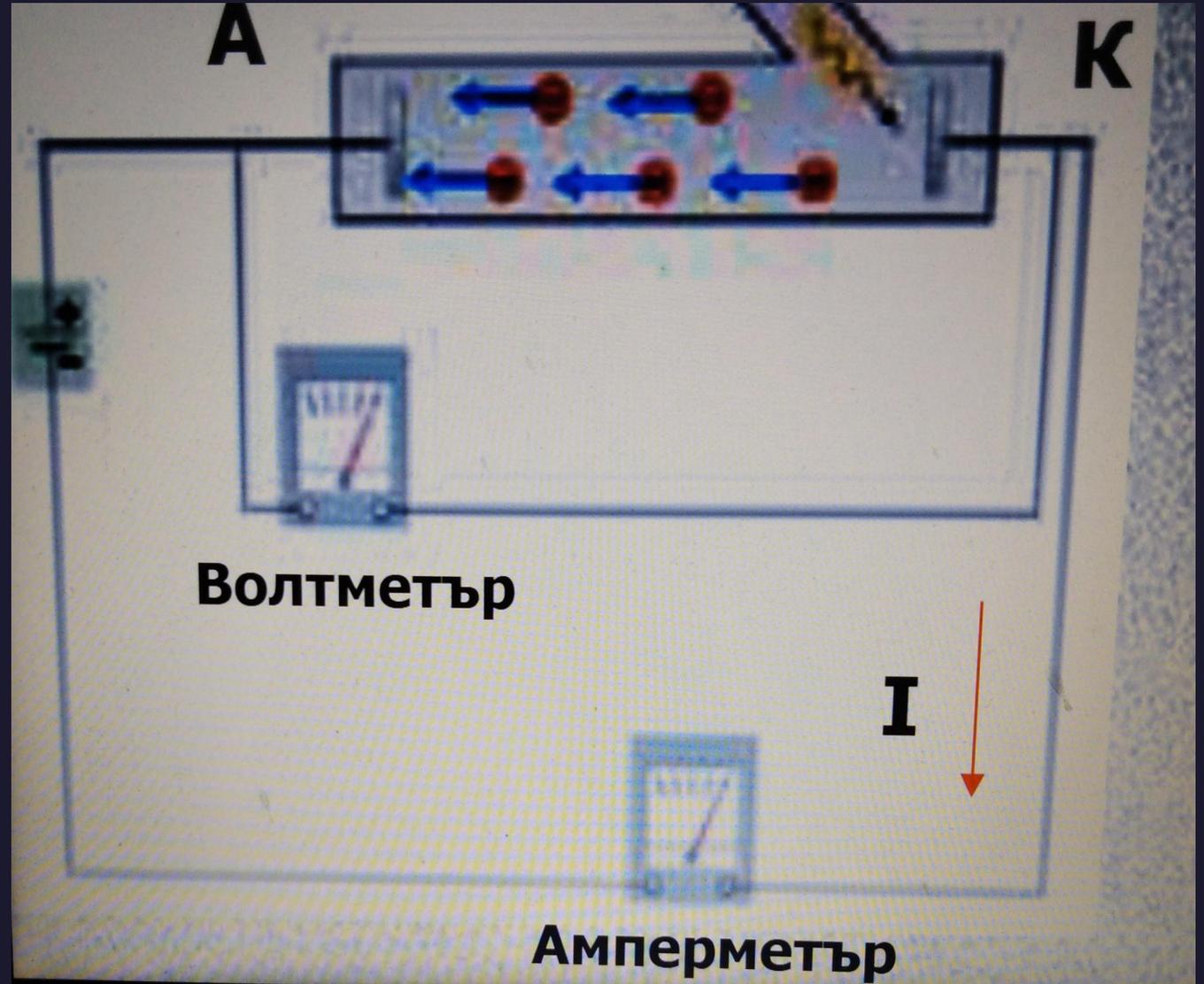
- Alarm systems and systems for automatic opening and closing of doors.



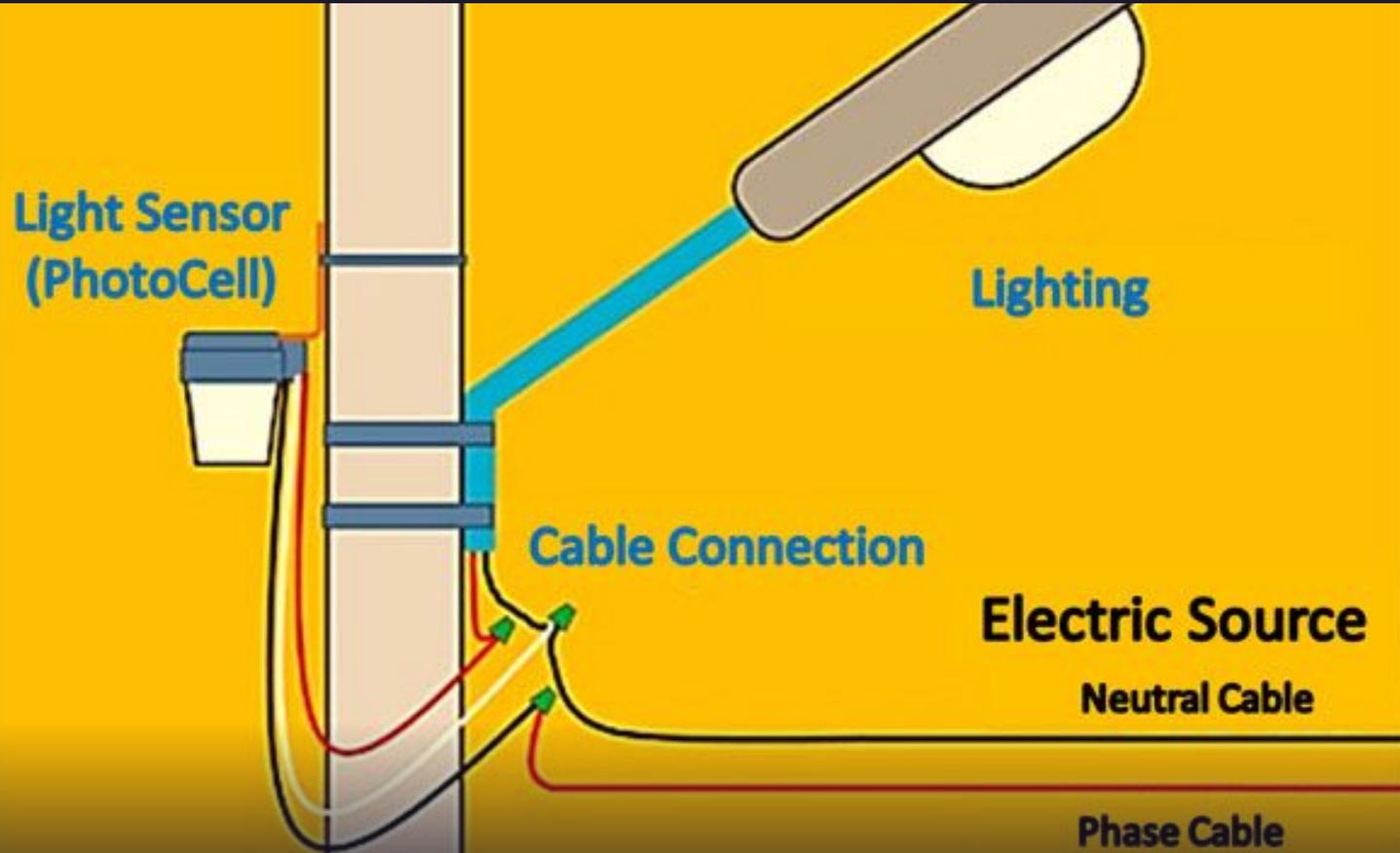
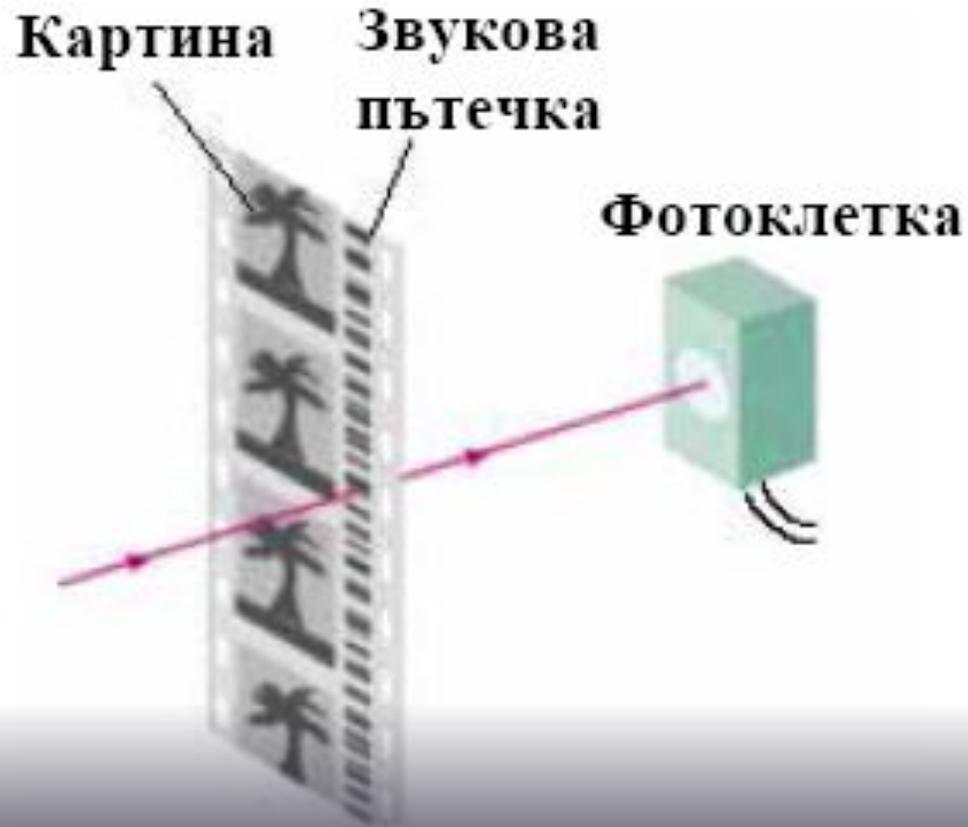
When the laser beam is interrupted current stops flowing in the photocell, closing an alarm or trigger mechanism to close or open a door.

# Photocells and their application

Photocells are electronic devices that convert the energy of light photons into electrical energy.



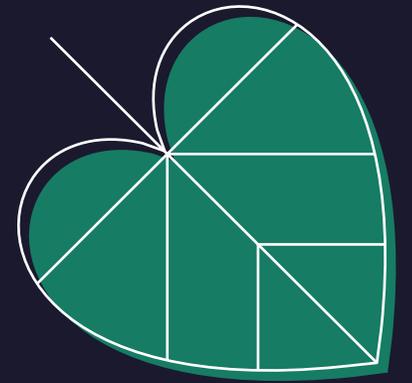
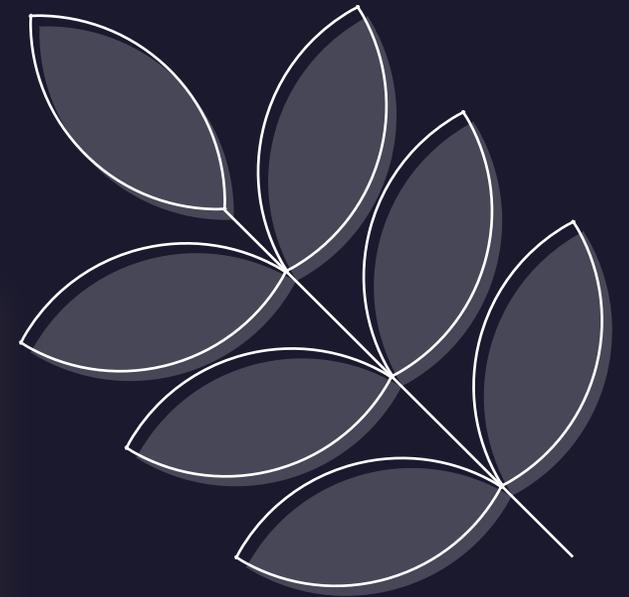
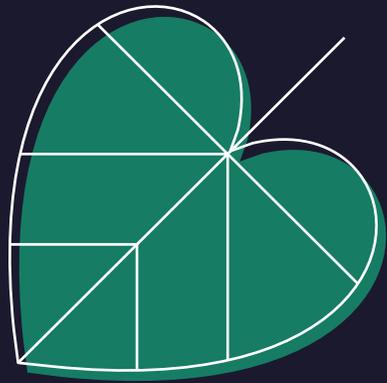
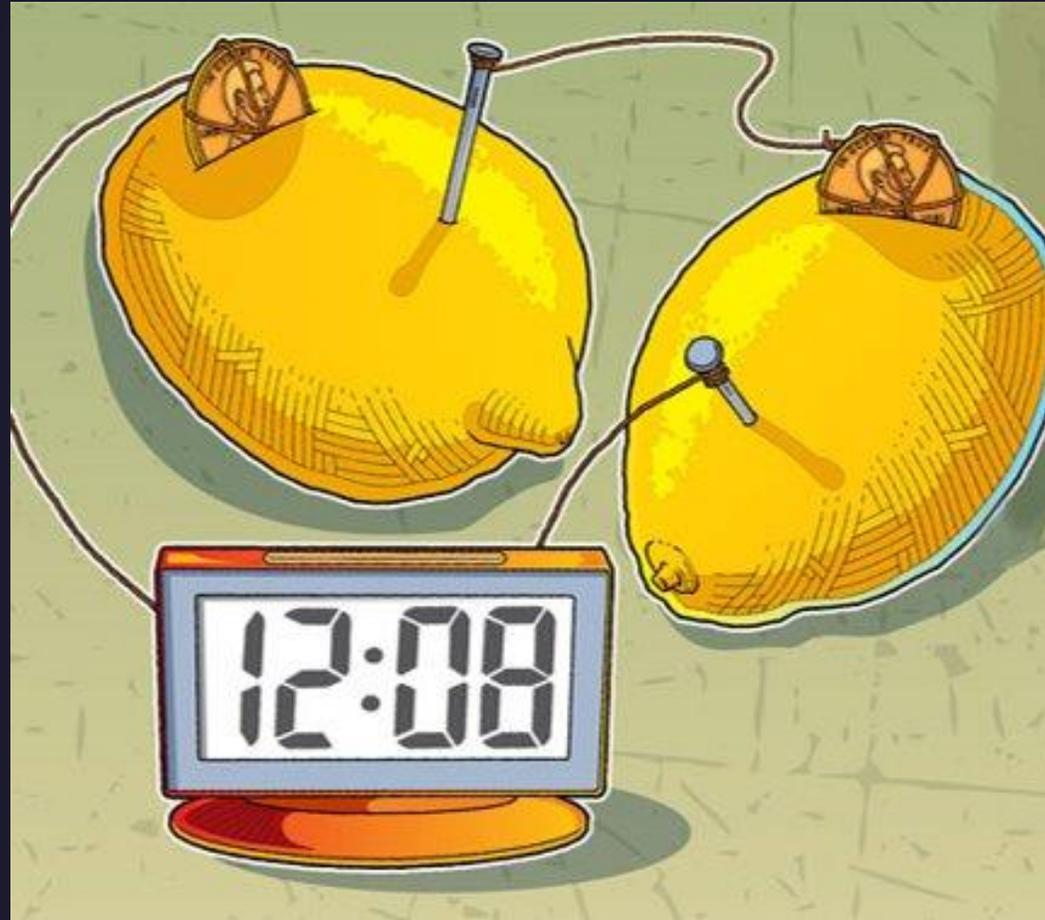
- Photocells are used to reproduce sound that can be recorded on a film. They are also used in automatic lights to activate when it gets dark and activating or deactivating street lighting depends mainly on the day, whether it is day or night.



Thank you for  
the attention!



# LEMON CLOCK



# HOW CAN YOU GET ELECTRICITY IN CRITICAL SITUATIONS?

- In recent years, there has been a lot of talk about the need to obtain electricity from alternative, environmentally friendly sources. It turns out that there are unexpected sources of electricity, which, unfortunately, are not suitable for mass practical application. In the forest, for example, there are many fruits. They can also produce electricity.
- On the trip you have an apple and other fruits and vegetables (potatoes). You also need to wear an iron nail and copper wire. The two metal objects are used for electrodes and the apple for electrolyte. The wire and the nail are inserted into the apple (lemon, potato) to a certain depth and at a certain distance from each other. The electrodes are connected to a phone battery or a watch.

- Galvanized nail (coted in Zn)
- (-)Anode

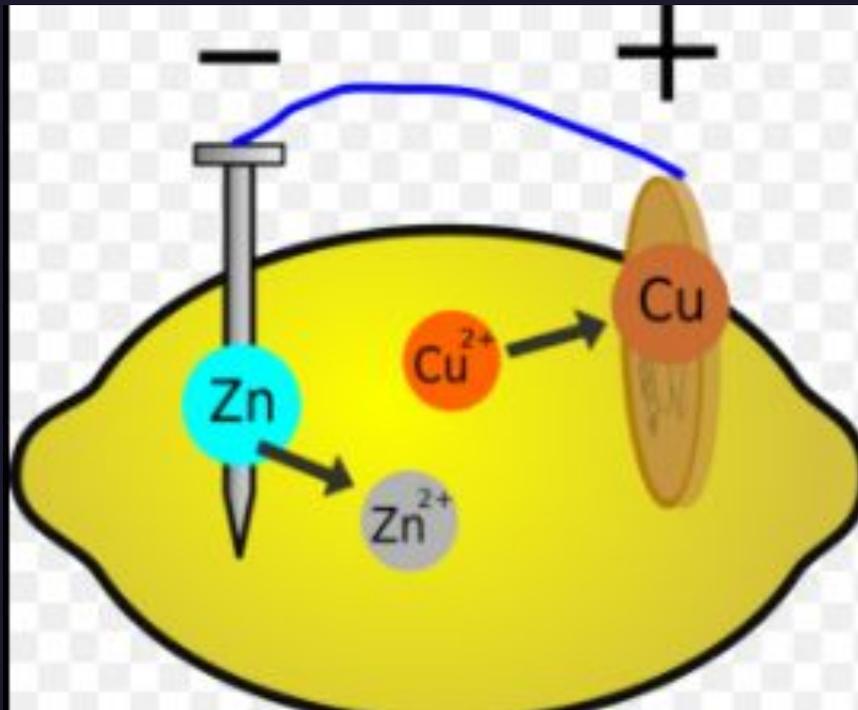


- Copper wire (Cu)
- (+)Cathode



# HOW DOES IT WORK?

- Why do we need a Zn coted nail and Cu wire?
- - Copper likes having electrons more than Zinc -> More electro negative



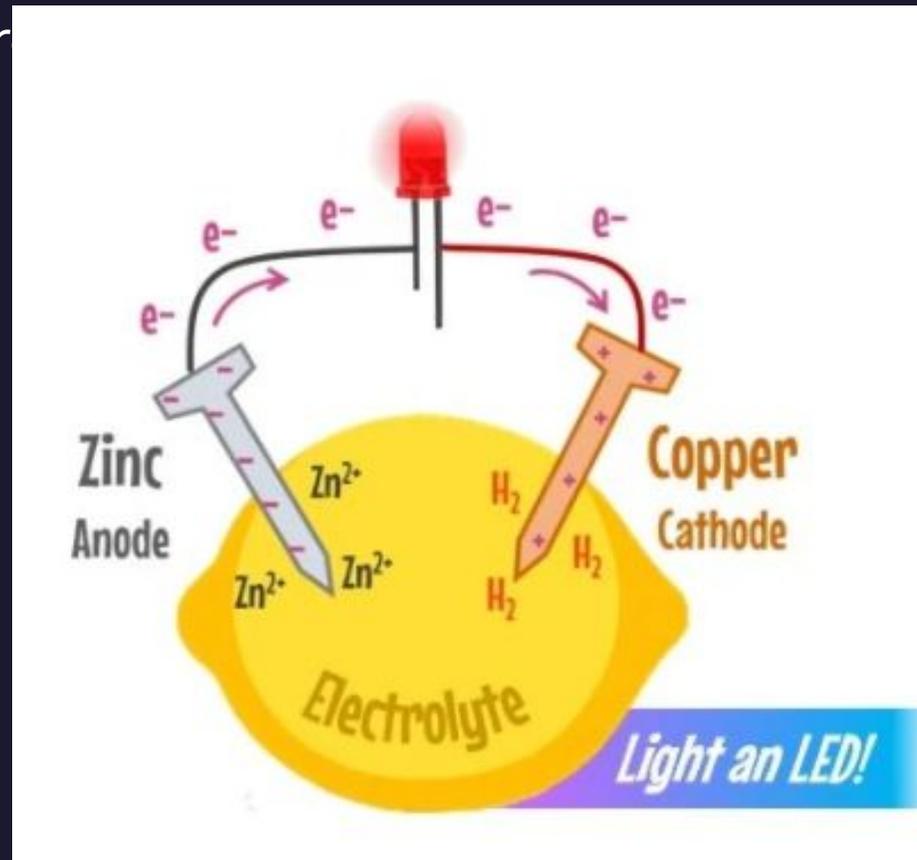
# WHAT'S THE POINT OF THE LEMON?

- - Protons are huge compare to electrons and can't move through wires but they can move into an ionic solution like a dilution of citric acid.
- - When Zinc is exposed to acid in the lemon juice the acid oxidizes or removes electrons from it and results in positively charged protons to move into the solution
- The resulting electrons collect in the metal and rush across in to the Copper, that if you remember wants them more than the Zinc.



# SUMMARY:

- Electricity is coming not from the lemon, but from a chemical reaction resulting from the difference between Zn and Cu



- Lemon-powered watches work by using the electrolysis process. Lemon juice is an acid electrolyte that is then linked in a chain by a metal electrode. There must be two different metals to produce an electric charge; zinc and copper are common. The two metals produce the current needed to charge the electrolytes, thus allowing the electrolysis (separation) process to take place and to obtain enough electricity to power the clock.
- Lemons are not the only ones that can be used to power a watch using electrolysis. Any liquid electrolyte, such as salt water, is effective.





Този продукт е създаден за разпространение на  
резултатите по проект Еразъм + ERA+ INTEGRATED  
LEARNING CHALLENGES



THANKS FOR YOUR  
ATTENTION!

