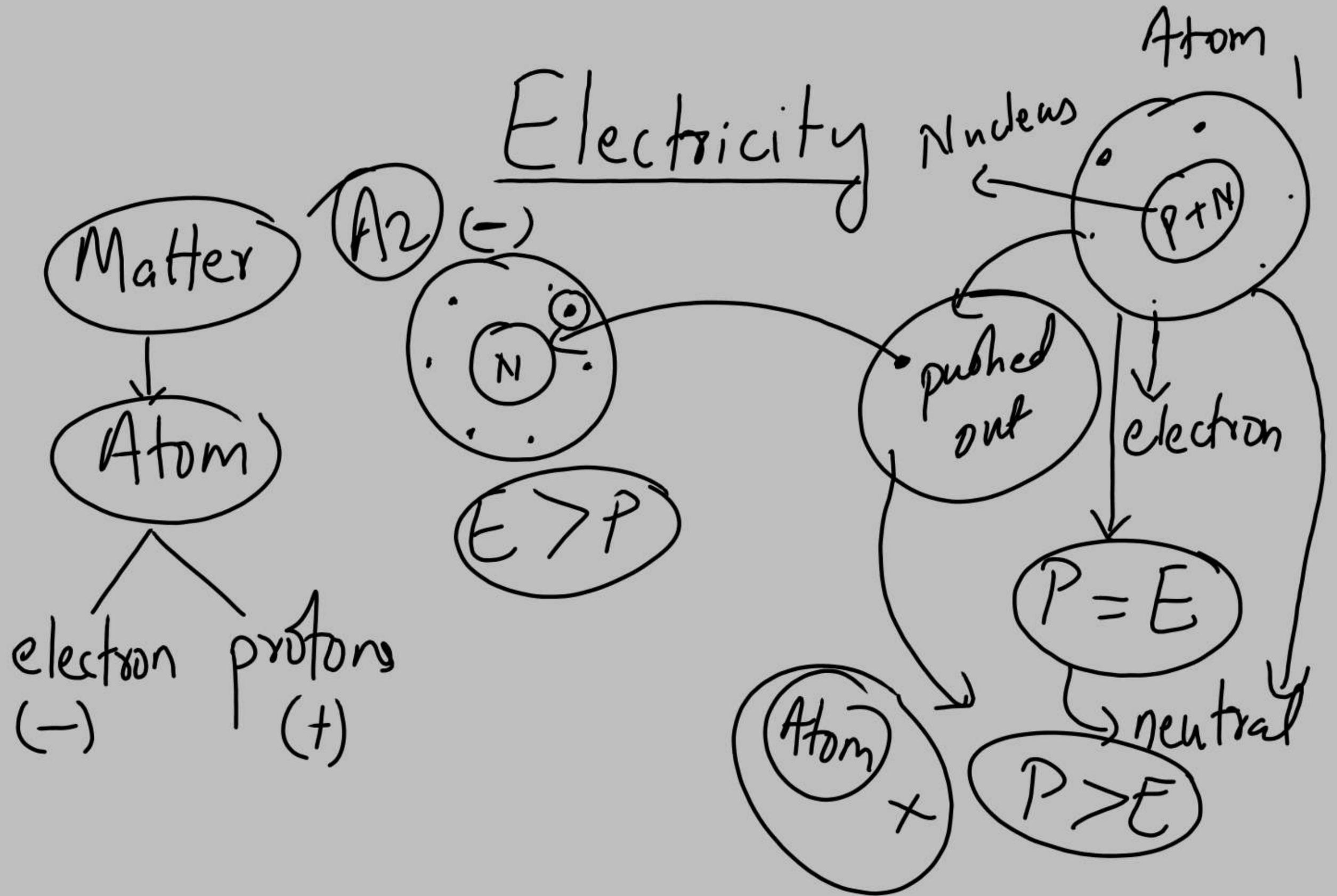


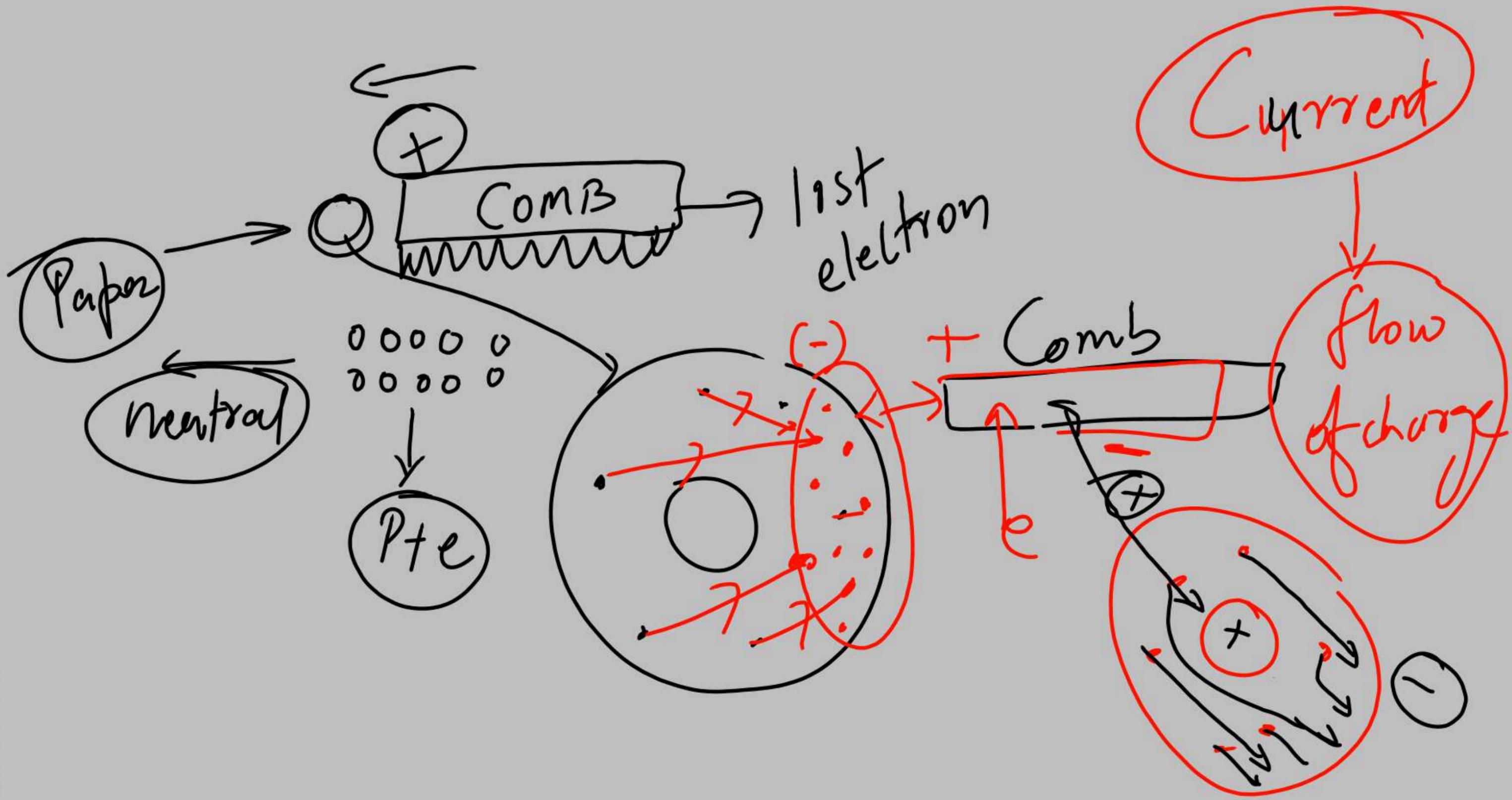


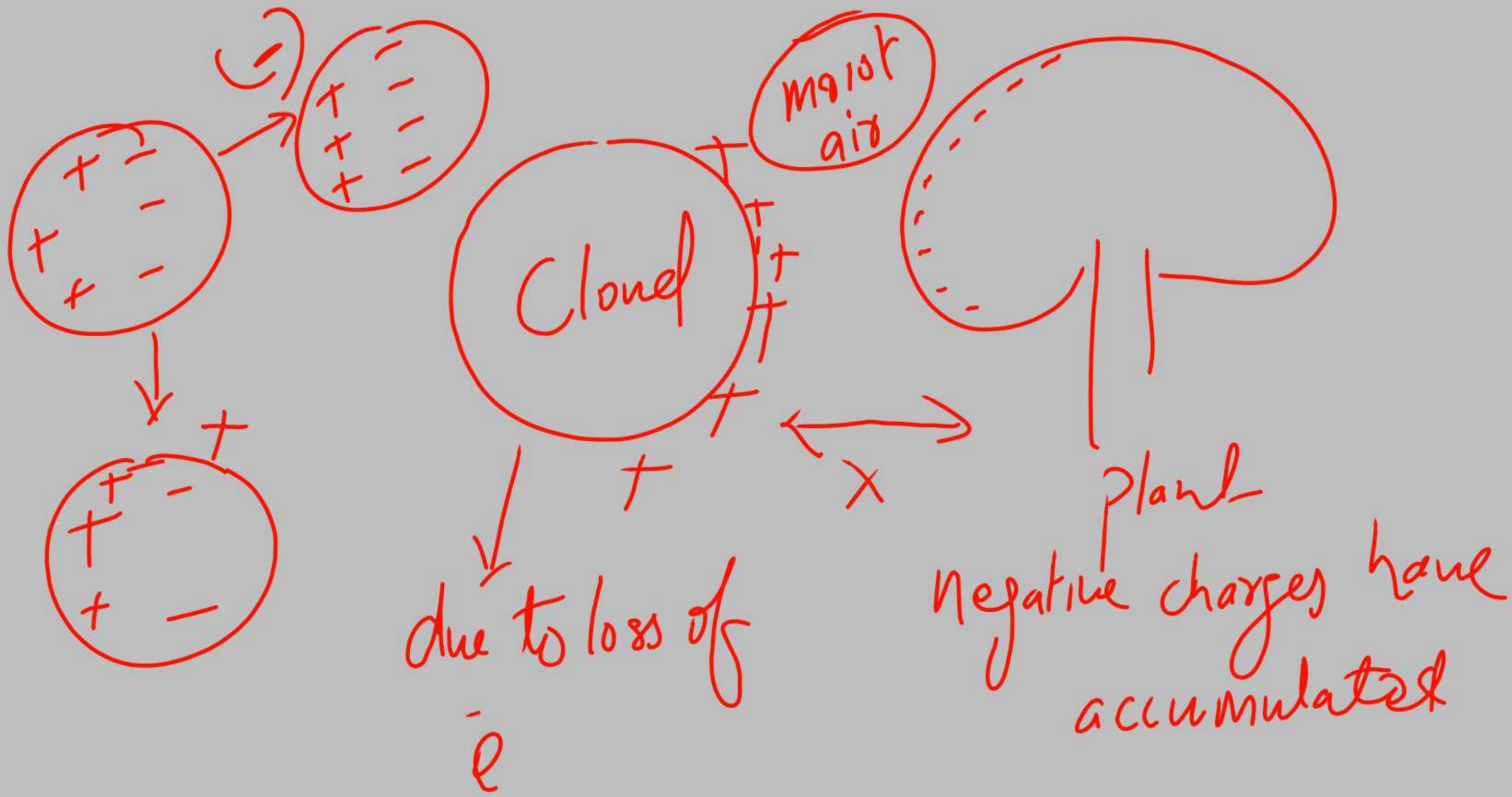
Most Trusted Learning Platform



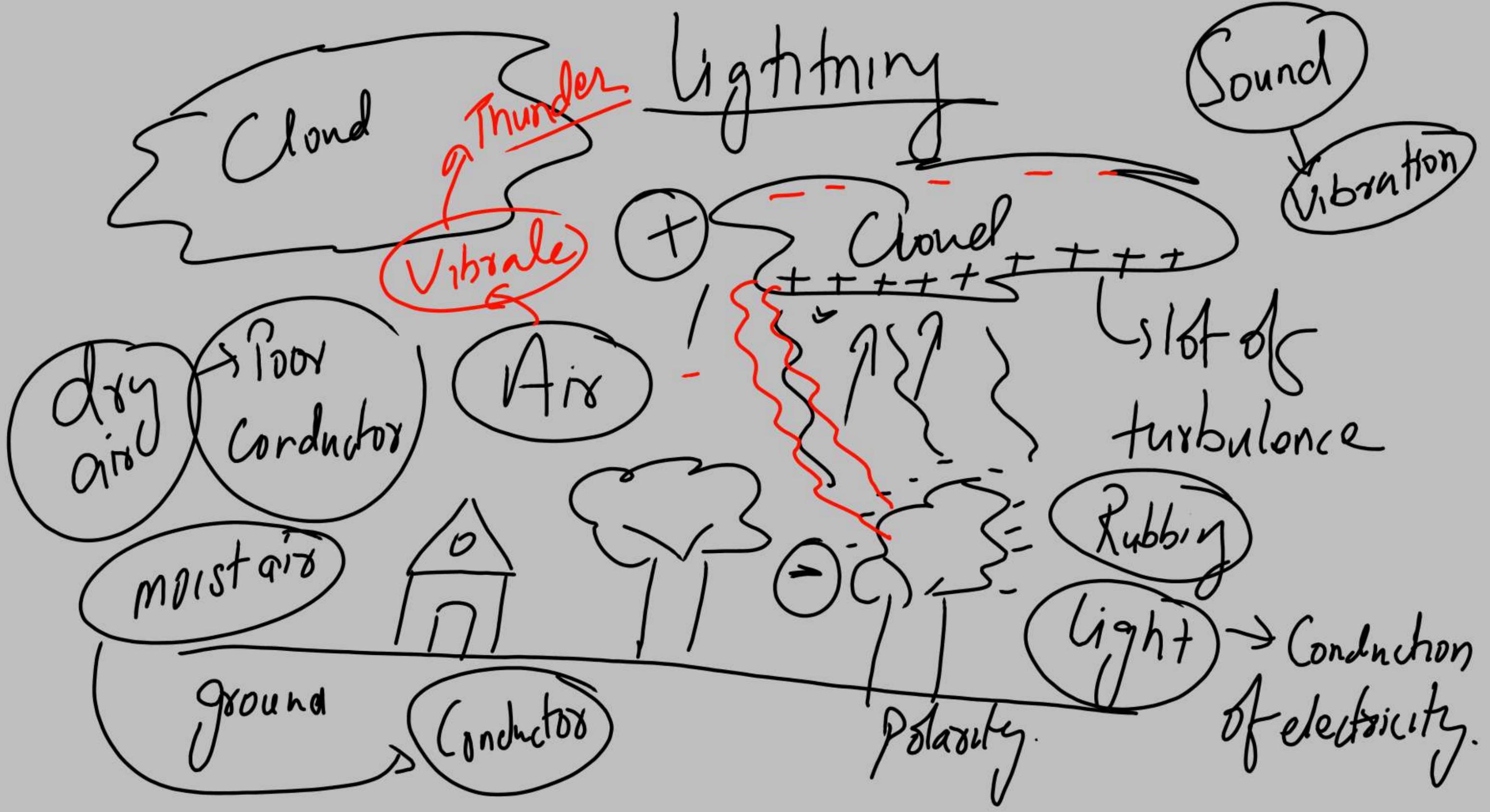
Electricity







Lightning

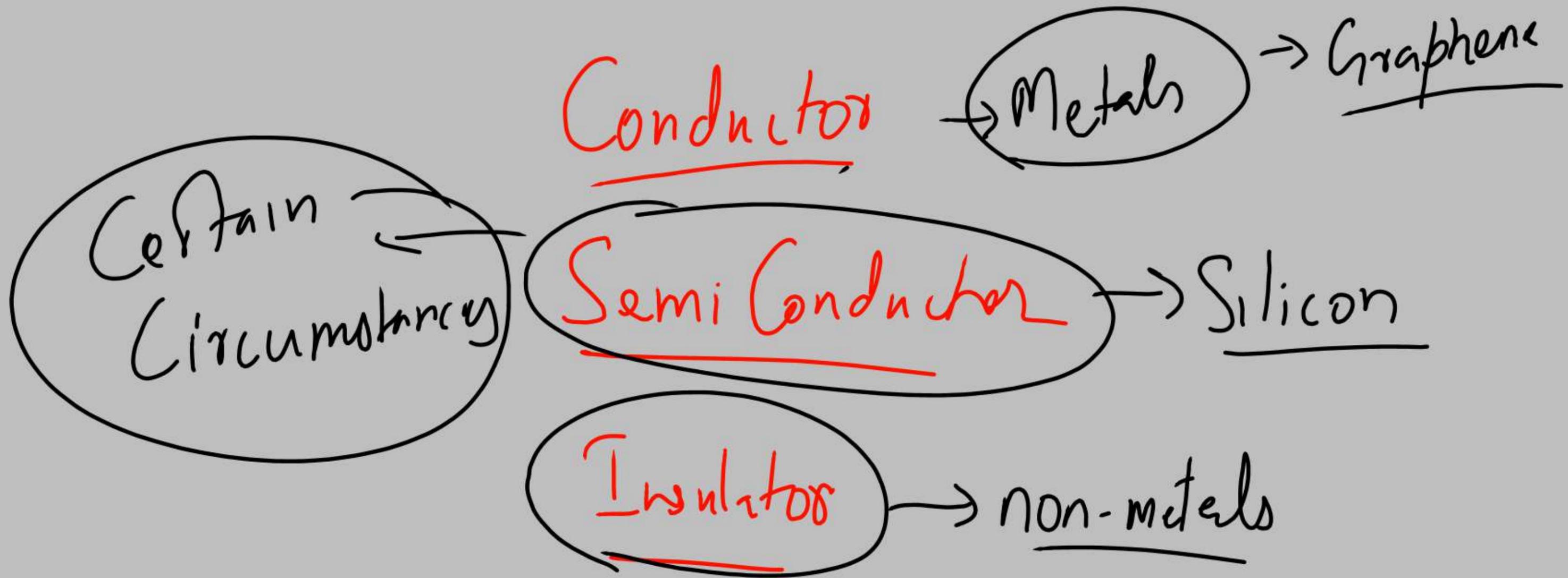


Electricity

Electron theory According to this theory, every object consists of extremely fine particles, which are called atoms. It was found by experiments that the atom itself is made up of two types of very fine electrical particles.

Out of this, one type of particle is called a proton, which has a positive electric charge and another type of particle is called an electron, which has a negative electric charge.

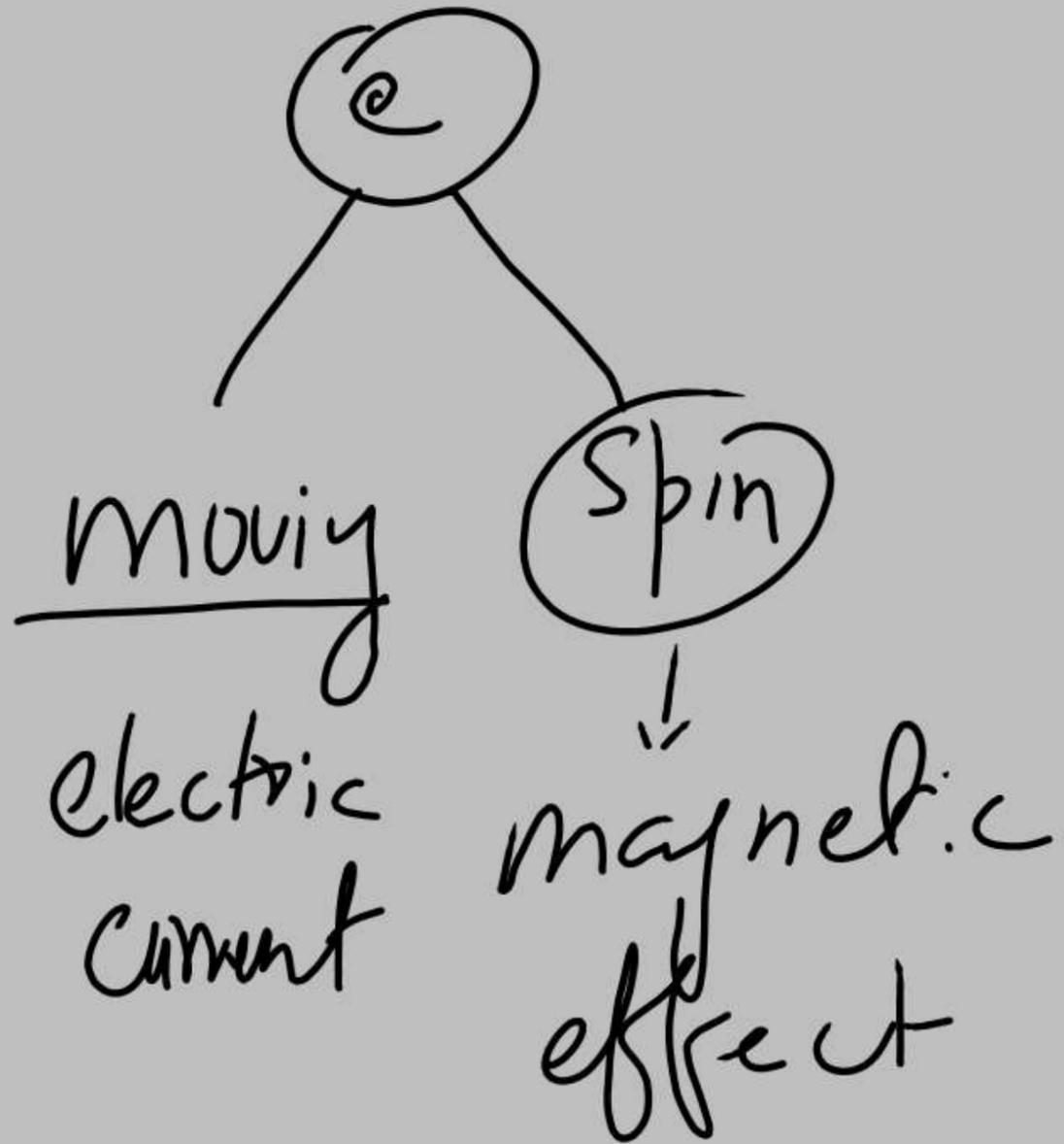
When we rub two objects together, the electrons of one object transfer to another. The object that loses the electron becomes positively charged. Conversely, the object on which electrons move becomes negatively charged. Thus we see that there are two types of charge - (1) positive charge and (2) negative charge

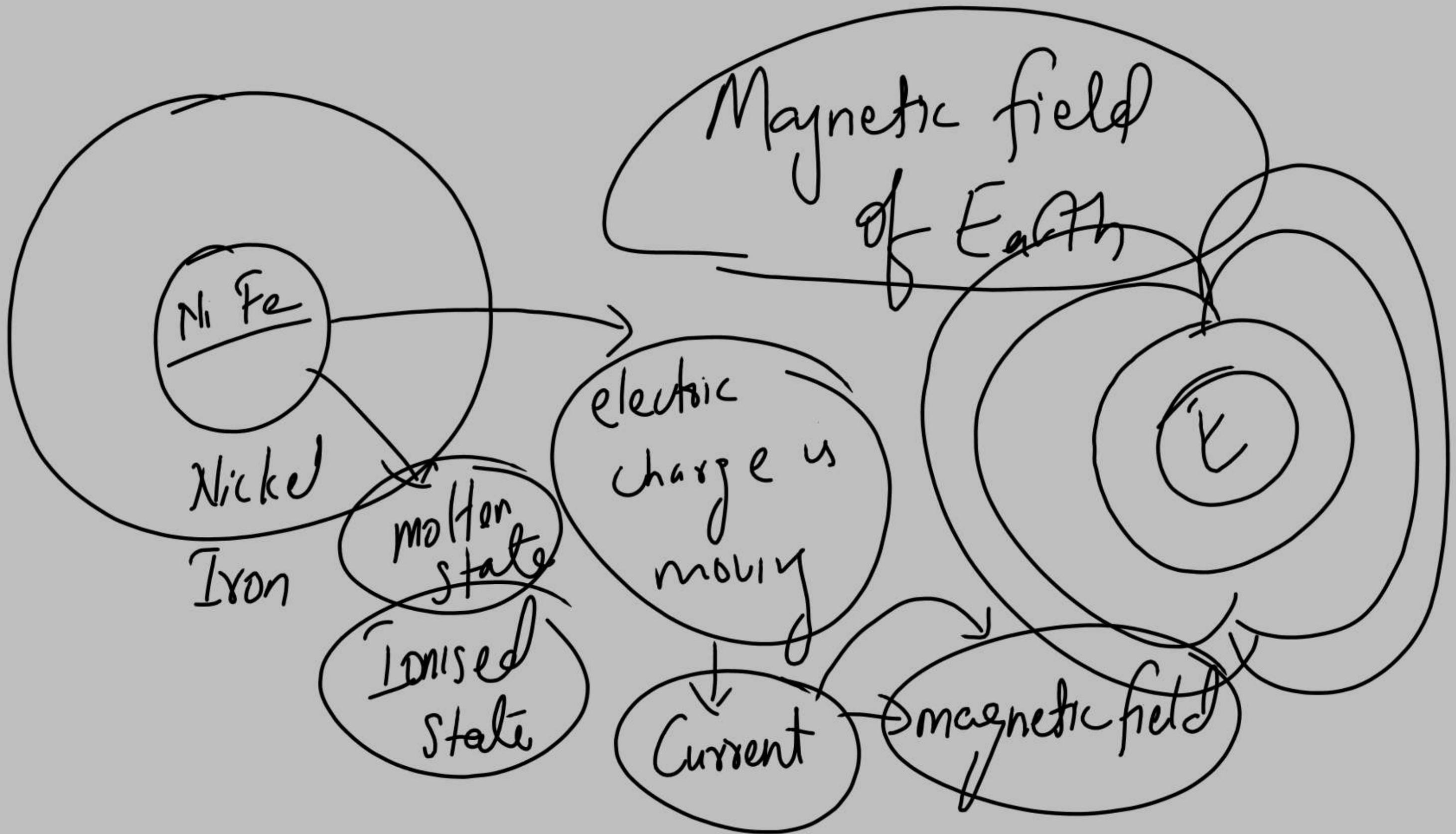


Magnetism

↳ Spin of electrons

↳ Electric current





Electricity

What are conductors?

The materials from which electric charge flows easily are called electric conductors. In contrast, these substances in which charge cannot flow are called insulators. All metals are electrical conductors. Our body is also an electrical conductor. Water and moisture are also electrical conductors. Rubber, plastic, dry wood, enamel paint are some examples of insulating materials. Dry air is insulated, while moist air is not insulated

Electricity

What are semi-conductors?

Semiconductors are materials which have a conductivity between conductors (generally metals) and non-conductors or insulators (such as most ceramics). Semiconductors can be pure elements, such as silicon or germanium, or compounds such as gallium arsenide or cadmium selenide. In a process called doping, small amounts of impurities are added to pure semiconductors causing large changes in the conductivity of the material.

Electricity

The Presence of Electricity in Clouds?

Thunderstorms are caused by small electrically-charged particles.

As water molecules in the cloud are heated and cooled and they move up and down against each other, there is a separation of charge. Forming 2 poles within the cloud. One part becomes negatively charged, and the other part becomes positively charged.

Objects on the ground then become oppositely charged to the lower part of the cloud.

This imbalance tries to resolve itself, by passing current between the differently charged poles.

Charged particles always flow in the direction where there are less particles of the same charge. This results in a lightning bolt.

The electrical arc of the lightning bolt heats the surrounding air to extreme temperatures. In fact, the air around it can be heated to 5 times hotter than the sun!

This heat causes the surrounding air to rapidly expand and vibrate. Which is the rumbling thunder that we hear.

Each bolt carries about 10 billion Watts. That's enough power for 32 million people a year!

10 billion watts per bolt, and given that 50 bolts strike the earth's surface every single second means the power of lightning is extraordinary.

Magnetism

Magnetic phenomena are universal in nature. Vast, distant galaxies, the tiny invisible atoms, humans and beasts all are permeated through and through with a host of magnetic fields from a variety of sources. The earth's magnetism predates human evolution. The word magnet is derived from the name of an island in Greece called magnesia where magnetic ore deposits were found, as early as 600 BC. Shepherds on this island complained that their wooden shoes (which had nails) at times stayed struck to the ground. Their iron-tipped rods were similarly affected. This attractive property of magnets made it difficult for them to move around.

Magnetism

Features:

(i) **Directive Property:** A small bar magnet, when suspended freely on its center of mass so as to rotate about a vertical axis, always stays in approximately geographical north-south direction.

(ii) **Attractive Property:** A magnet attracts small pieces of magnetic materials like iron, nickel and cobalt. The force of attraction is maximum at points near the ends of the magnet. These points are called poles of the magnet. In a freely suspended magnet, the pole which points towards the geographical north is called north pole and the one which points towards the geographical south is called south pole.

(iii) Unlike poles of two magnets attract each other and like poles repel.

(iv) The poles of a magnet are inseparable, i.e. the simplest specimen providing magnetic field is a magnetic dipole.

(v) When a magnet is brought close to a piece of iron, the nearer end of the piece of iron acquires opposite polarity and the farther end acquires same polarity. This phenomenon is called magnetic induction.

Magnetism

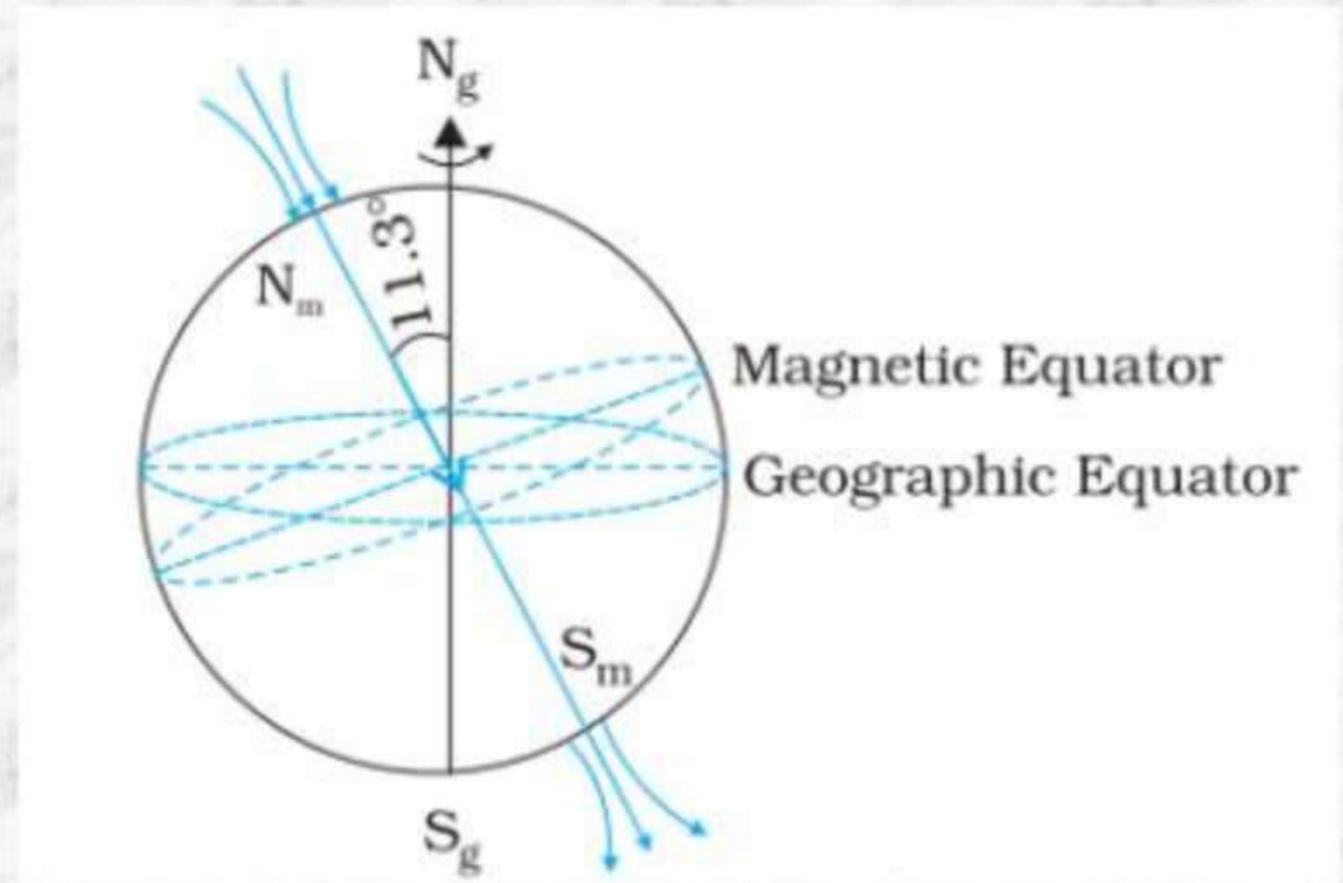
Earth's magnetic field is now thought to arise due to electrical currents produced by convective motion of metallic fluids (consisting mostly of molten iron and nickel) in the outer core of the earth. This is known as the dynamo effect.

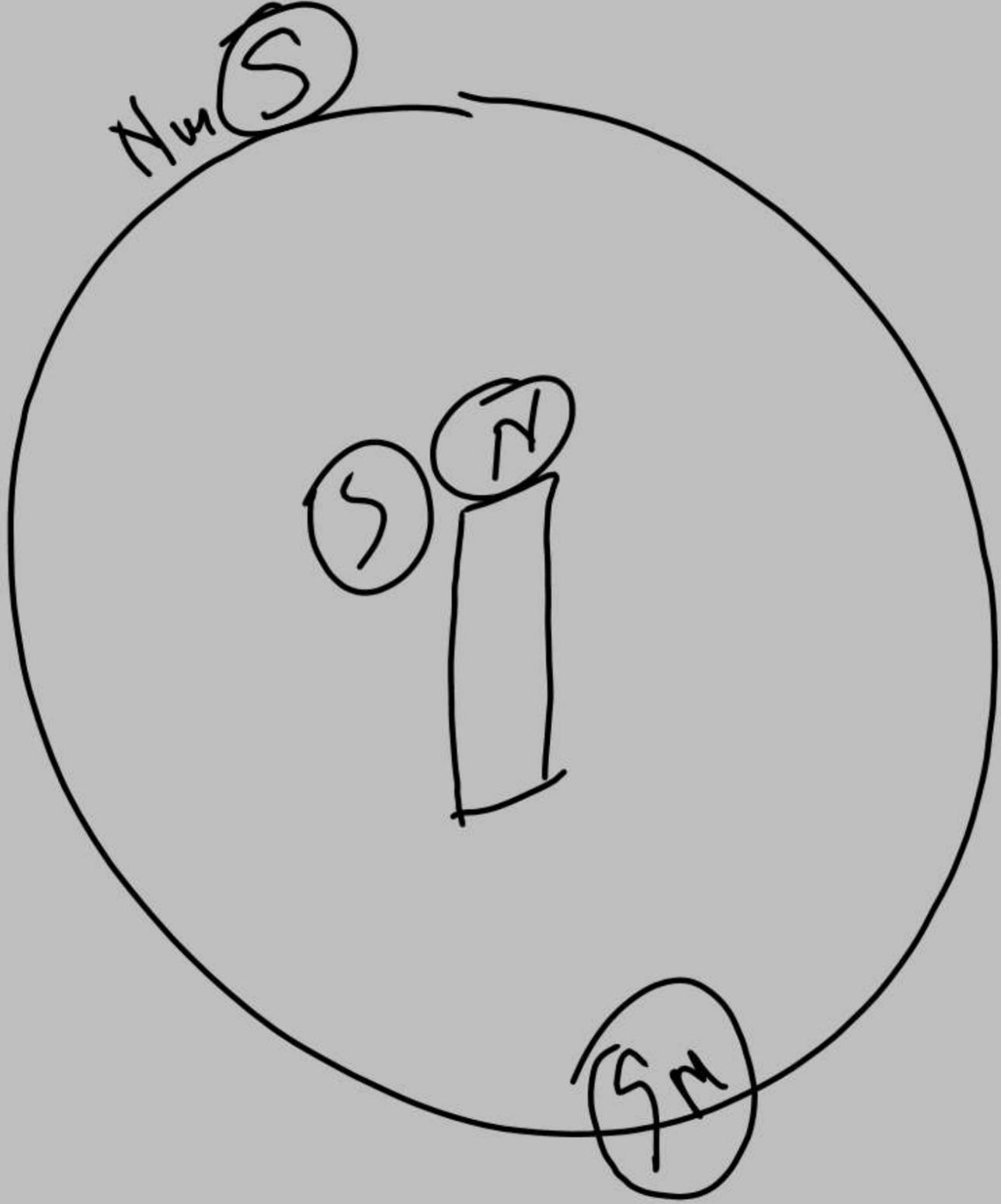
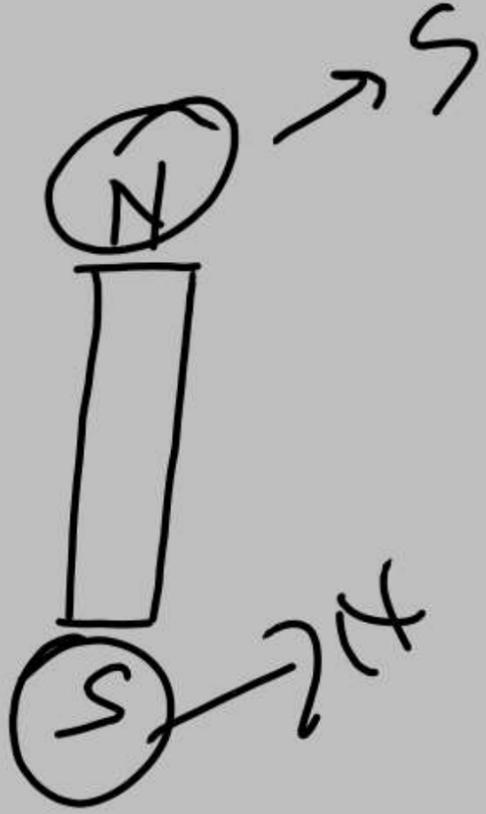
The magnetic field lines of the earth resemble that of a (hypothetical) magnetic dipole located at the centre of the earth. The axis of the dipole does not coincide with the axis of rotation of the earth but is presently tilted by approximately 11.3° with respect to the later.

Magnetism

In this way of looking at it, the magnetic poles are located where the magnetic field lines due to the dipole enter or leave the earth. The location of the north magnetic pole is at a latitude of 79.74° N and a longitude of 71.8° W, a place somewhere in north Canada. The magnetic south pole is at 79.74° S, 108.22° E in the Antarctica.

The pole near the geographic north pole of the earth is called the north magnetic pole. Likewise, the pole near the geographic south pole is called the south magnetic pole.

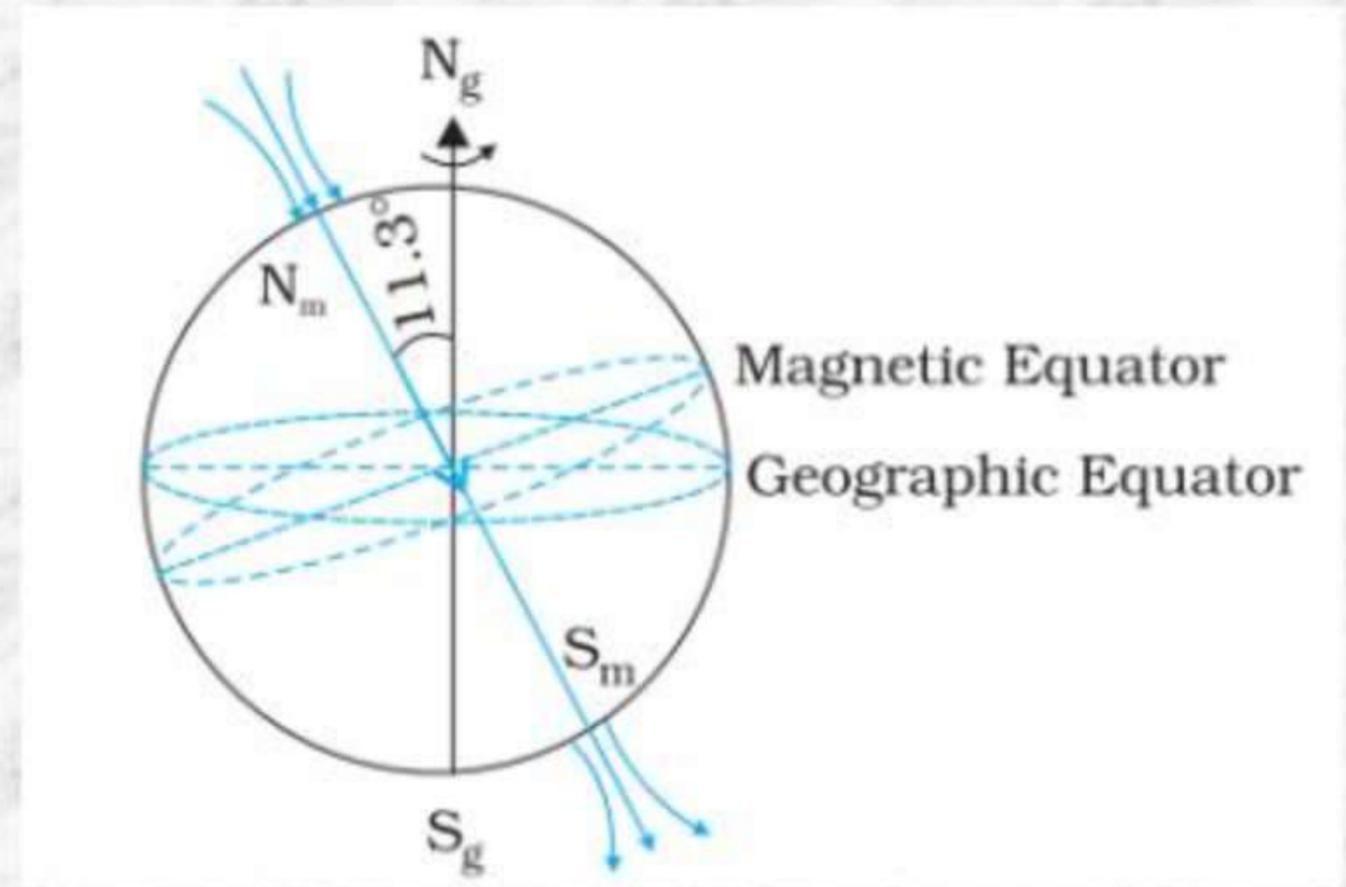




Magnetism

There is some confusion in the nomenclature of the poles. If one looks at the magnetic field lines of the earth, one sees that unlike in the case of a bar magnet, the field lines go into the earth at the north magnetic pole (N_m) and come out from the south magnetic pole (S_m).

The convention arose because the magnetic north was the direction to which the north pole of a magnetic needle pointed; the north pole of a magnet was so named as it was the north seeking pole. Thus, in reality, the north magnetic pole behaves like the south pole of a bar magnet inside the earth and vice versa.

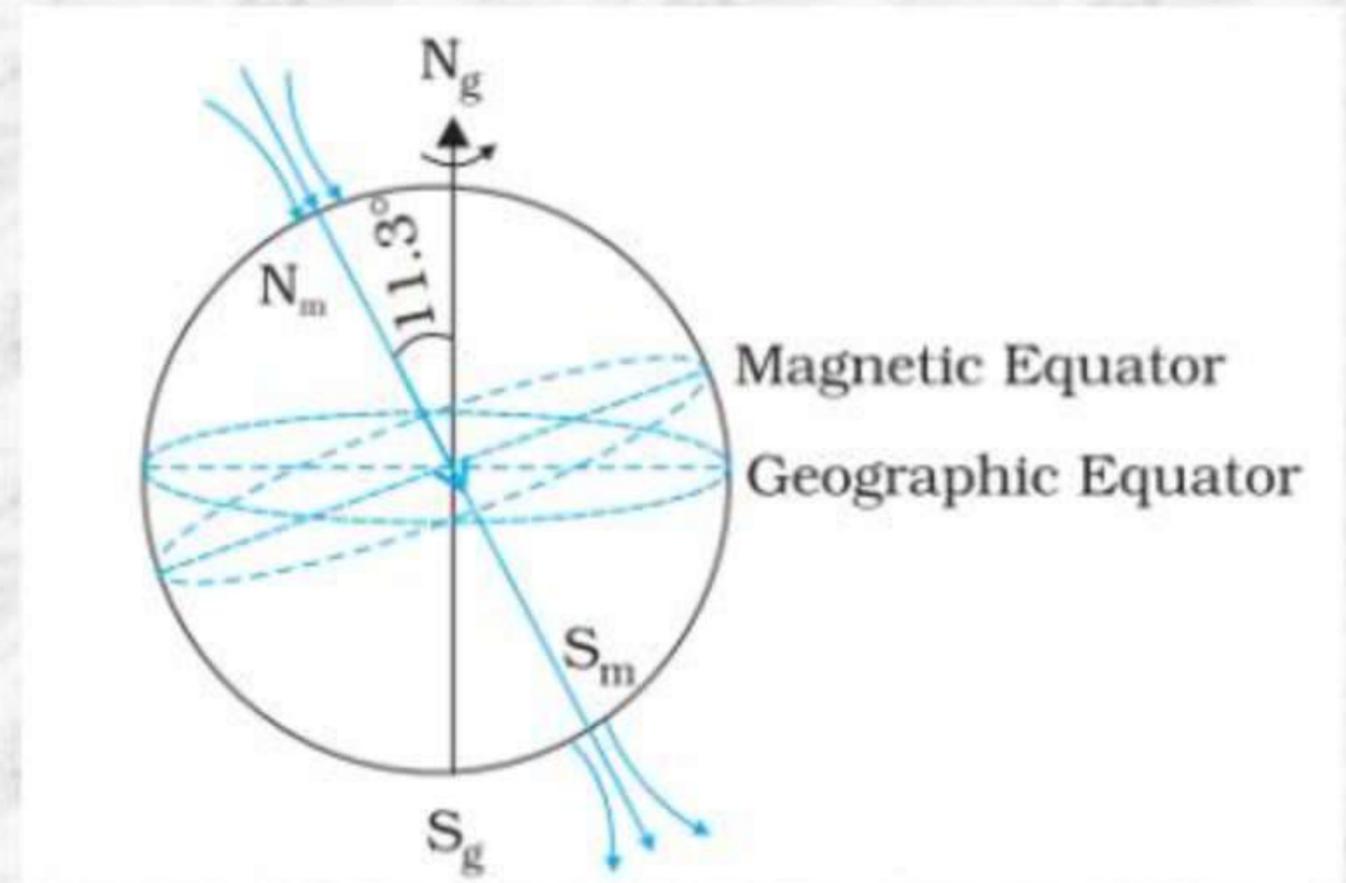


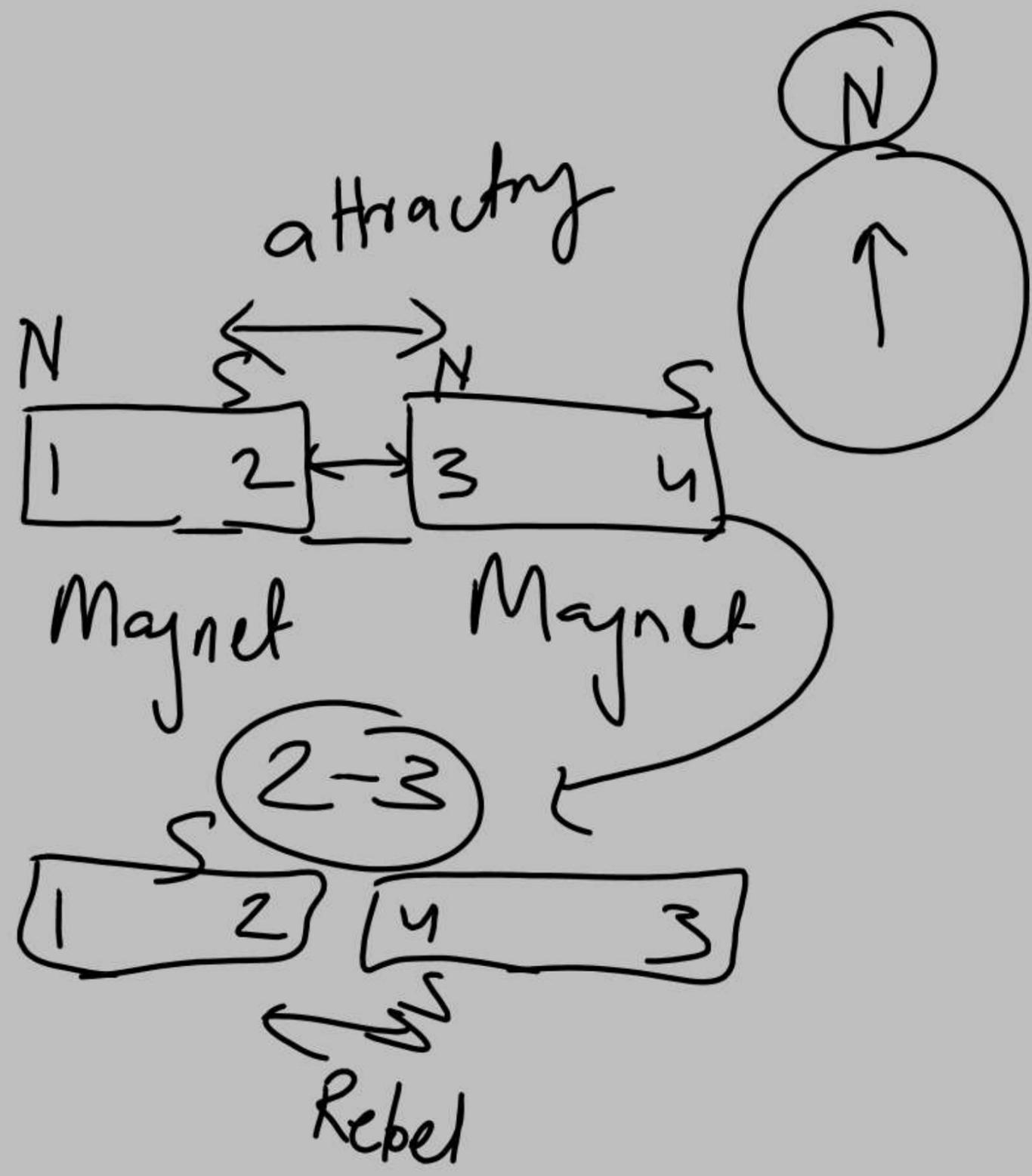
Magnetism

Variation in Magnetic Field of Earth:

The variation of earth's magnetic field with time is no less fascinating. There are short term variations taking place over centuries and long term variations taking place over a period of a million years.

In a span of 240 years from 1580 to 1820 AD, over which records are available, the magnetic declination at London has been found to change by 3.5° , suggesting that the magnetic poles inside the earth change position with time. On the scale of a million years, the earth's magnetic fields has been found to reverse its direction.





Universe

What is Universe?

The universe is everything.

It includes all of space and all the matter and energy that space contains.

It even includes dark matter and Dark Energy

It even includes time itself and, of course, it includes us.

The size of the entire universe is still unknown.

The Universe is expanding.

What are the different components in it?

Difficult to say, it is still unknown

However, we have planets, moons, asteroids, meteors, exoplanets, galaxies, stars, and so on.

Everything which we can see and feel around us and many more things which we are not even aware of.



Universe

Big Bang theory

How & when did the universe originate and its expansion?

Many of the experts believe that it involved a gigantic explosion of matter and Energy.

When?

About 13.8 billion years ago.

Big Bang Theory: Big denotes large matters and Bang means strike violently.

So Big Bang is that striking of big matters. It says the universe as we know it started with an infinitely hot and dense single point that inflated and stretched — first at unimaginable speeds, and then at a more measurable rate — over the next 13.7 billion years to the still-expanding cosmos that we know today.



Universe

What is Matter?

Anything that has weight and takes up space, as a solid, liquid, or gas.

What is Anti-matter?

Antimatter is the same as ordinary matter except that it has the opposite electric charge.

For instance, an electron, which has a negative charge, has an antimatter partner known as a positron.

A positron is a particle with the same mass as an electron but a positive charge.

Antimatter was created along with matter after the Big Bang.

But antimatter is rare in today's universe, and scientists aren't sure why.



Universe

What is Dark Energy?

Dark energy is the mysterious form of energy that makes up about 68% of the universe.

Dark energy is a mysterious force that is accelerating the expansion of the universe.

While dark matter attracts and holds galaxies together, dark energy repels and causes the expansion of our universe.

Both components are invisible.

It turns out that roughly 68% of the universe is dark energy.

Dark matter makes up about 27%.

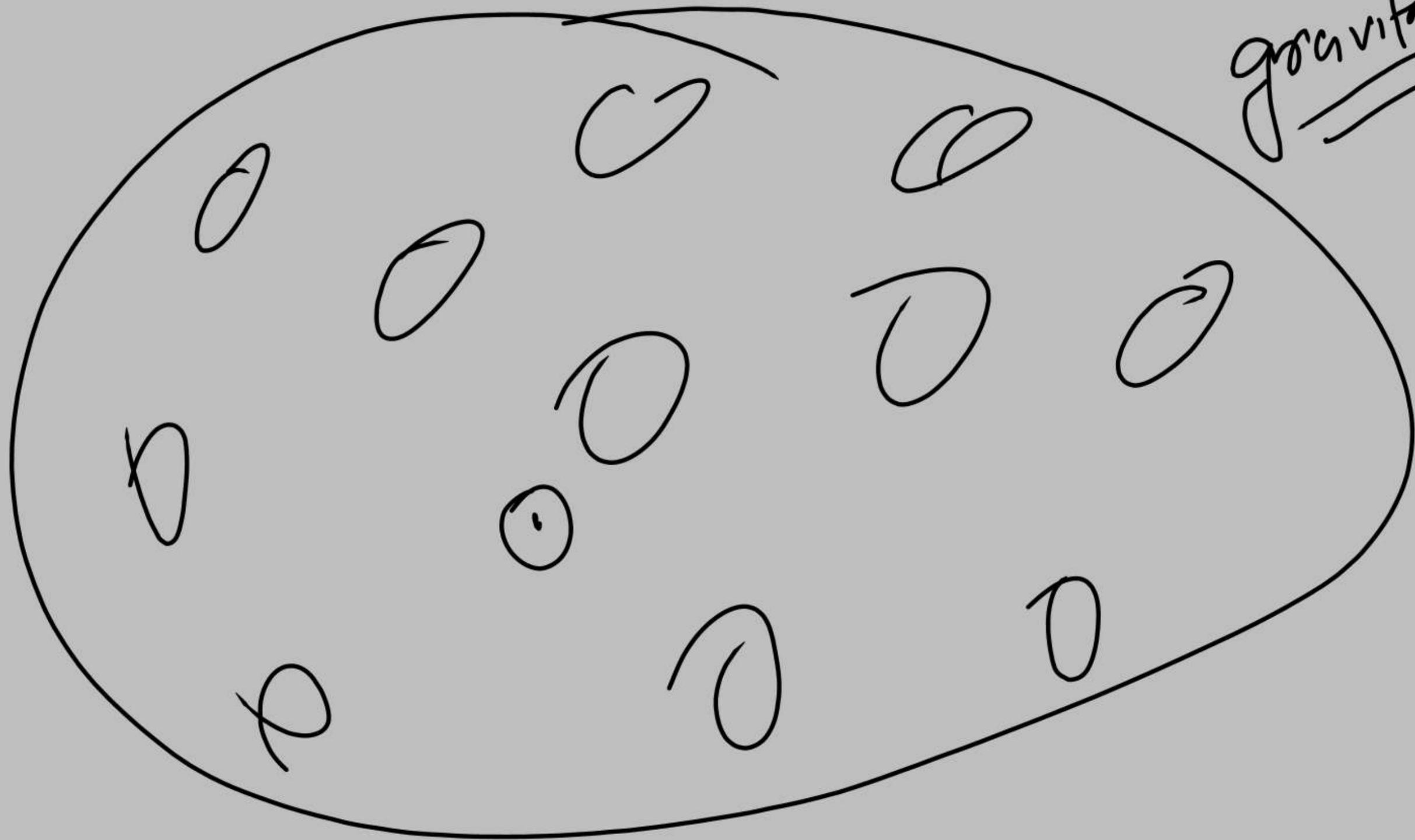
The rest - everything on Earth, everything ever observed with all of our instruments, all normal matter - adds up to less than 5% of the universe.

Universe

68% → Dark energy

27% ⇒ Dark matter

5% ⇒ Everything
which we know



granulation

Dark matter

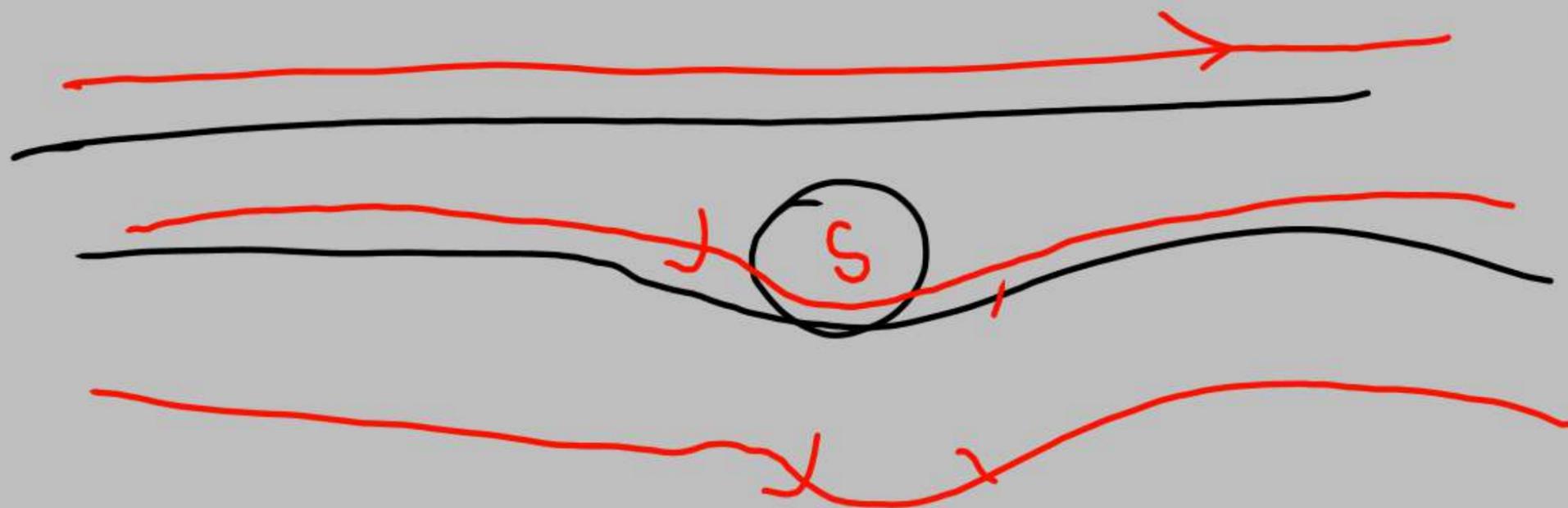


Matter



Dark matter

not interacting.



Universe

What is Dark Matter?

Roughly 80% of the mass of the universe is made up of material that scientists cannot directly observe.

Known as dark matter, this bizarre ingredient does not emit light or energy.

There is a certain amount of Dark Matter in each galaxy. This could be some exotic particles or just lots of stars too small to have ignited.

Universe

What is Galaxy?

The galaxy is a gravitationally bound system of stars, dust, interstellar gas, and dark matter.

Millions of stars in the universe together form a galaxy

One galaxy may contain 100 million stars

There are millions of galaxies in the world.

We belong to the Milky Way galaxy

It has 1,00,000 million stars.



Universe

How do stars originate?

Stars are constantly being born from clouds of dust and gas.

It happens over millions of years.

Stars are balls of gas mainly hydrogen & helium.

What are Planets?

It has been derived from the Greek word Planetai.

Planetai means wanderer.

Planets are so named as they revolve around the sun.

These celestial bodies don't have their light.

They shine due to the reflection of light from stars such as the Sun.

Planets are made up of solid material and gases



Universe

Process of Formation of Planets, Sun & Asteroids

Our solar system began about 4.6 billion years ago when a big cloud of gas and dust collapsed.

When this happened, most of the material fell to the center of the cloud and formed the sun.

Some of the condensing dust in the cloud became planets.

The objects in the asteroid belt never had the chance to be incorporated into planets.

Universe

Planets of Solar System

There are 8 planets in our solar system

Yes, Pluto is now considered a dwarf planet.

There are four inner planets often called terrestrial planets.

Mercury, Venus, Earth & Mars

They are called terrestrial as they have rocky surfaces.

Four other outer planets are called Jovian Planets.

Jupiter, Saturn, Uranus, and Neptune

They're also mostly made of gases

Like hydrogen, helium, and ammonia rather than of rocky surfaces

Universe

What is the definition of a Planet?

The IAU defines a true planet as a body that circles the sun without being some other object's satellite;

is large enough to be rounded by its own gravity (but not so big that it begins to undergo nuclear fusion, like a star); and

has "cleared its neighborhood" of most other orbiting bodies.

The problem with Pluto

its small size and offbeat orbit,

it doesn't clear its neighborhood of debris

it shares its space with lots of other objects in the Kuiper Belt.

Universe

Exoplanets?

An exoplanet is any planet beyond our solar system.

Exoplanets are made up of elements similar to those of the planets in our solar system.

However, their mixes of those elements may differ.

Most orbit other stars, but free-floating exoplanets, called rogue planets, orbit the galactic center and are untethered to any star.

What is Goldilocks Zone?

It is a region of space in which a planet is at just the right distance from its home star so that its surface is neither too hot nor too cold.

According to various reports, there are about 40 billion Earth-Sized planets orbiting in the habitable zone



Universe

Our star- Sun

The closest star to our planet.

It is a ball of hydrogen gas that radiates heat and light.

It generates power by nuclear fusion (smaller nuclei combined to form larger nuclei and produce energy).

Sun was born under five billion years (approximately) ago.

It is composed of about 74 percent hydrogen and 25 percent helium, with traces of iron, carbon, calcium, and sodium.

Like other planets in the solar system, the Sun spins on its axis.

The Sun takes up to 250 million years to complete one revolution around the Milky Way

Universe

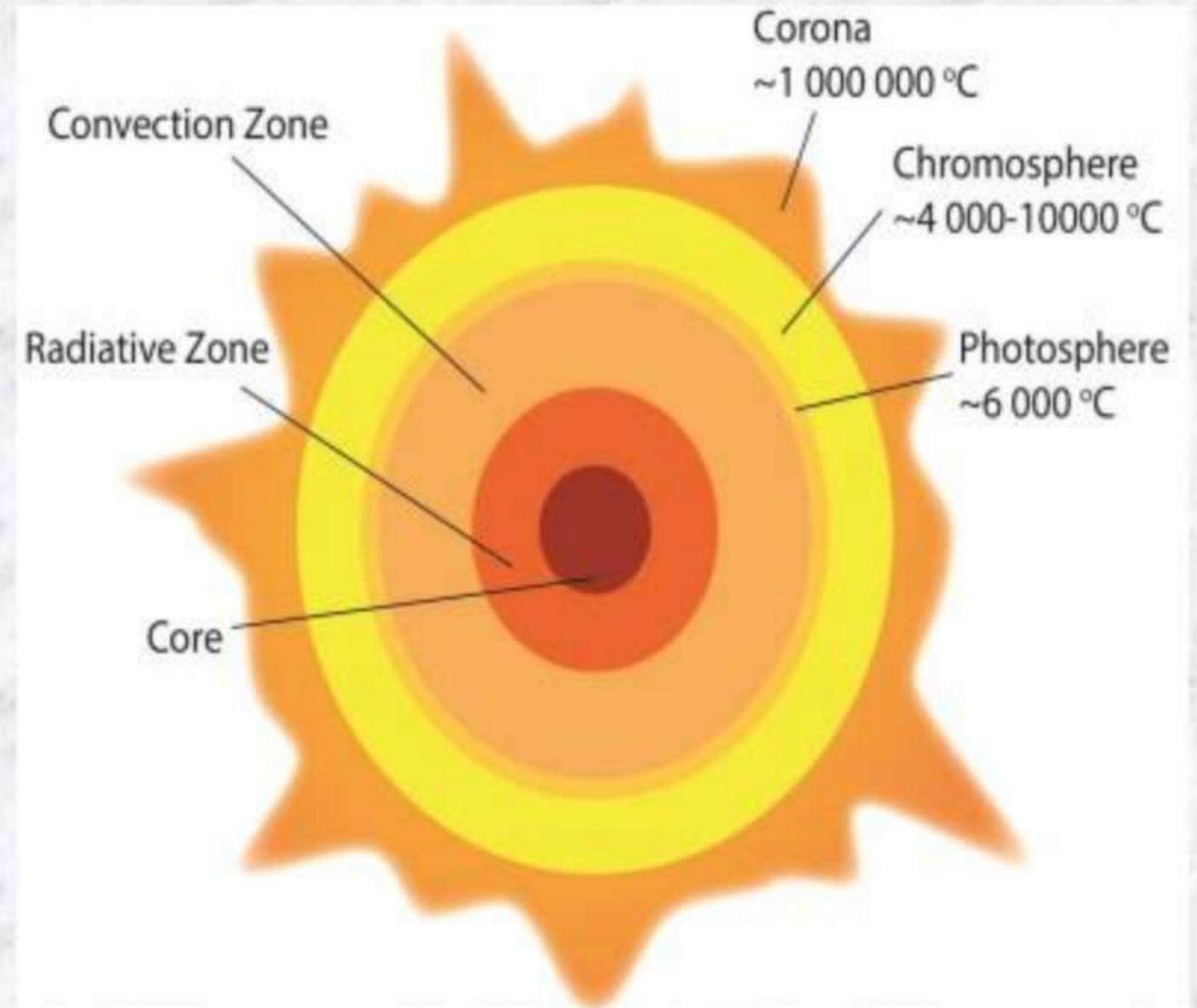
Layers of Sun

It has three layers - photosphere, chromospheres and corona

The photosphere is the visible surface of the Sun, from which the emitted sunlight reaches Earth.

The chromosphere is the layer above the photosphere and below the corona.

Corona is the outermost region of the Sun's atmosphere (consisting of plasma or hot ionized gas), which is visible as a white halo during a solar eclipse.



Universe

What is Solar Wind?

The solar wind is created by the outward expansion of plasma (a collection of charged particles) from the Sun's corona (outermost atmosphere).

This plasma is continually heated to the point that the Sun's gravity can't hold it down.

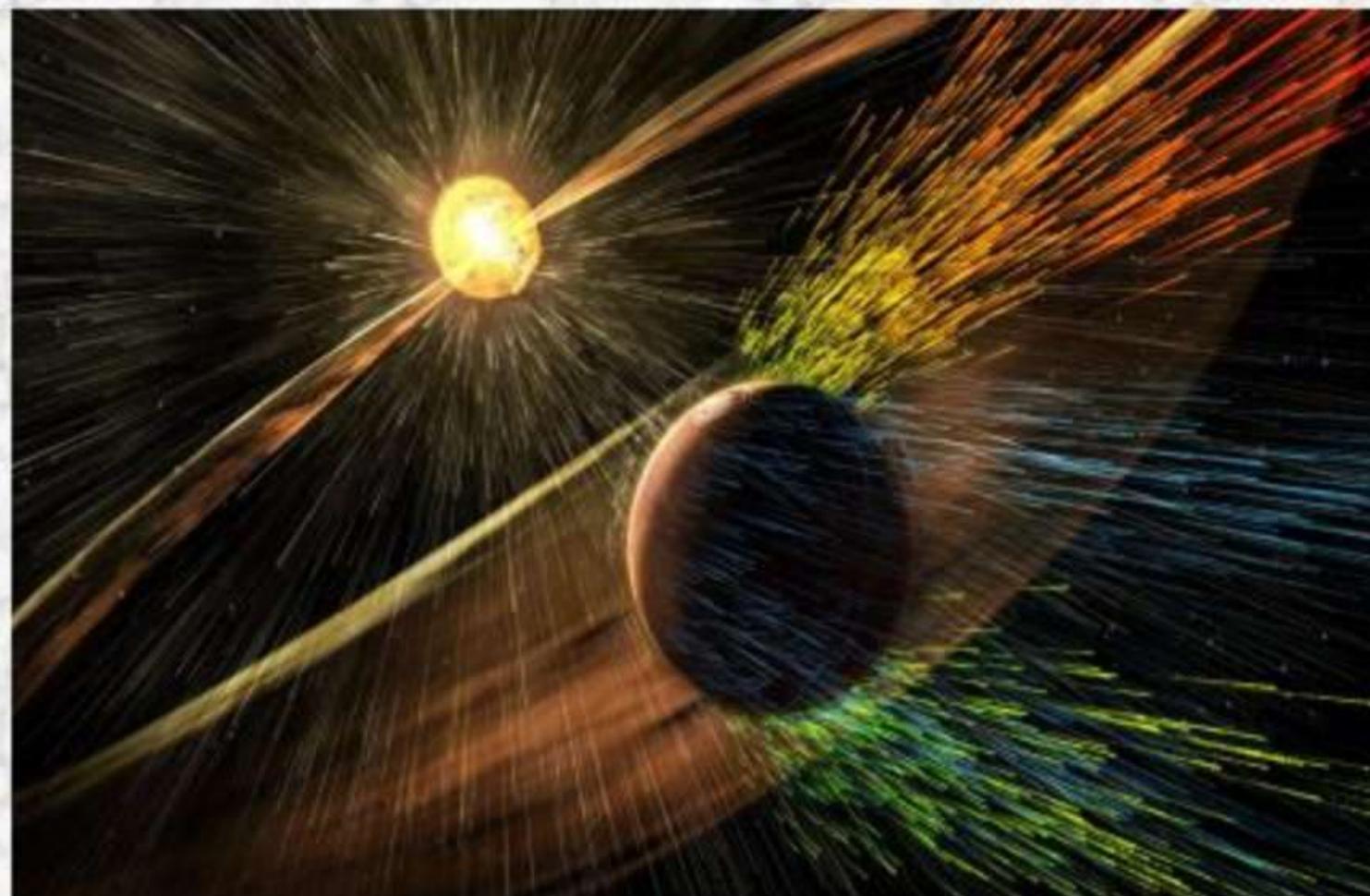
It then travels along the Sun's magnetic field lines that extend radially outward.

When the solar wind encounters Earth, it is deflected by our planet's magnetic shield, causing most of the solar wind's energetic particles to flow around and beyond us.

This region that meets and blocks the solar wind is called the magnetosphere.

The space around our atmosphere is alive and dynamic because Earth's magnetosphere reacts to the Sun's activity.

They can severely damage our communications, navigation, and electrical power systems; oil drilling processes and pipelines; and spacecraft and orbiting satellites.



Universe

Solar Tsunami?

A solar tsunami is a powerful shockwave on the Sun's surface.

It is triggered by explosions in the Sun's atmosphere

This explosion results in large amounts of superhot plasma, containing electrically charged particles, being expelled into space.

They can have a significantly disastrous impact on our communications, navigation, and electrical power systems; oil drilling processes and pipelines; and spacecraft and orbiting satellites.



Universe

Sun Spot?

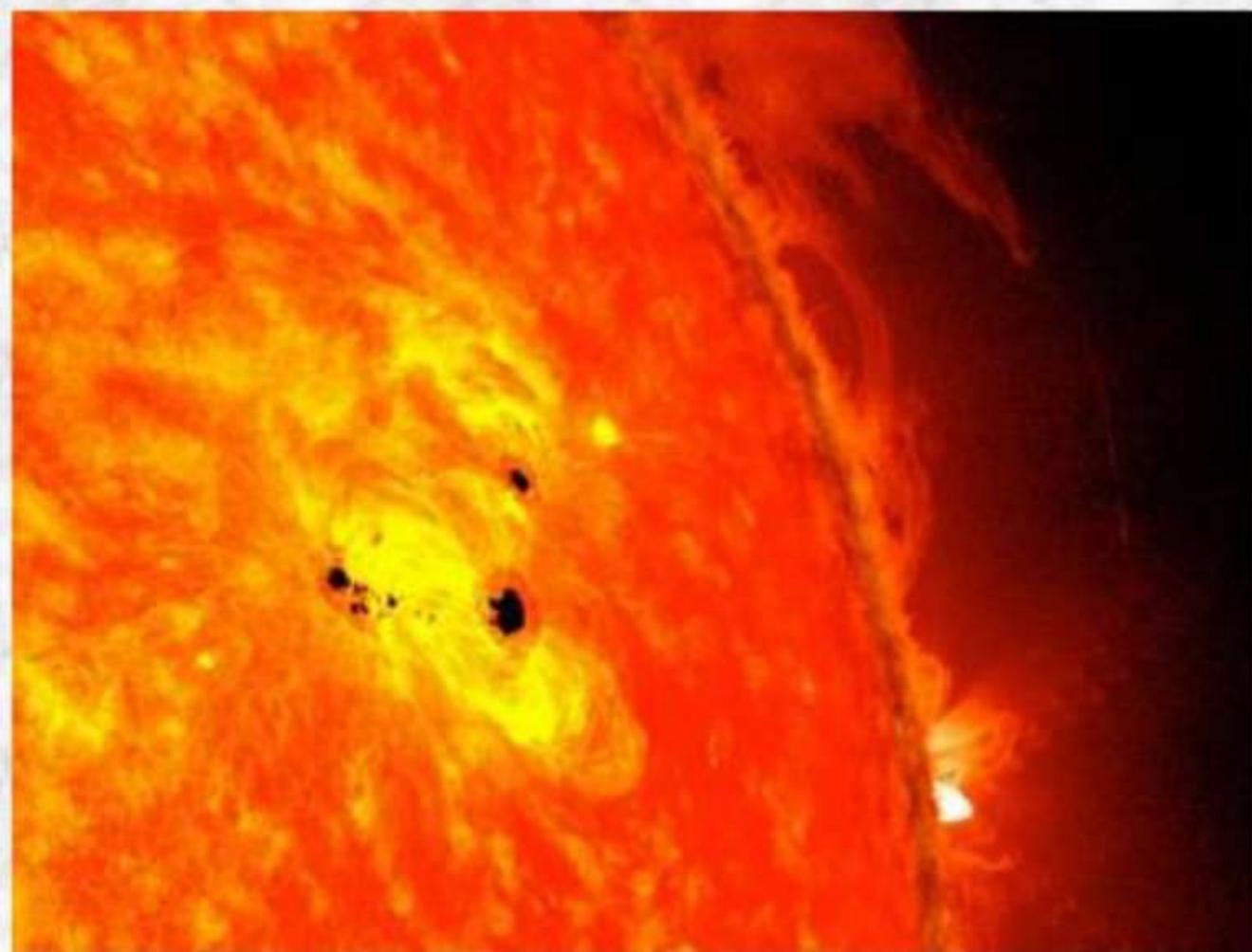
Sunspots are darker, cooler areas on the surface of the sun in photosphere

They look dark only in comparison with the brighter and hotter regions of the photosphere around them.

Sunspots can be very large, up to 50,000 kilometers in diameter.

They are caused by interactions with the Sun's magnetic field.

Sunspots occur over regions of intense magnetic activity, and when that energy is released, solar flares and big storms called coronal mass ejections erupt from sunspots.



Universe

What are asteroids?

Asteroids are small, rocky objects that orbit the Sun

Although asteroids orbit the Sun-like planets, they are much smaller than planets.

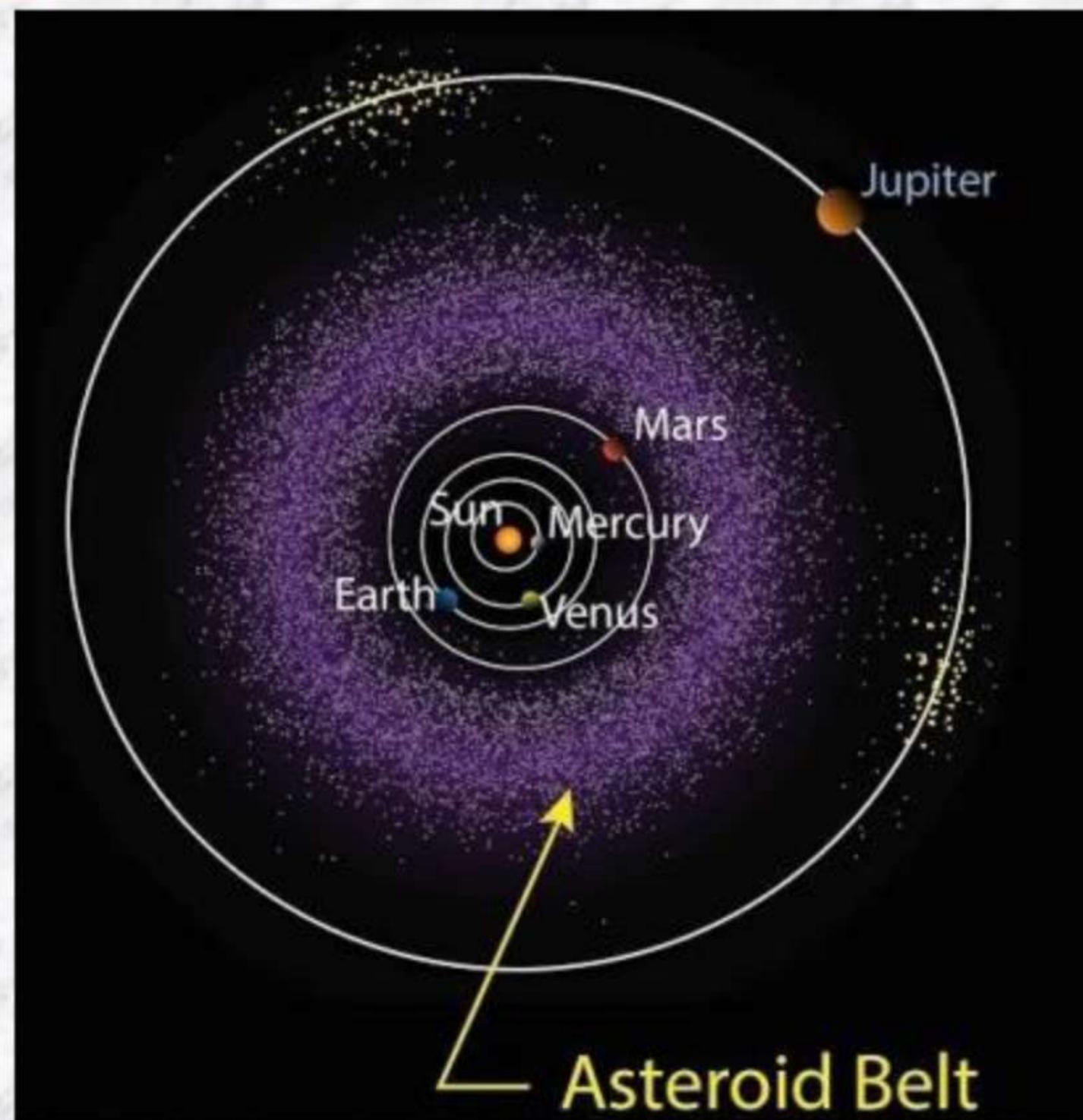
There are lots of asteroids in our solar system.

Most of them live in the main asteroid belt—a region between the orbits of Mars and Jupiter.

Some asteroids are found in the orbital path of planets.

This means that the asteroid and the planet follow the same path around the sun.

Asteroids are leftover from the formation of our solar system.



Universe

What are Meteors, Meteoroids, Meteorites?

Meteoroids are objects in space that range in size from dust grains to small asteroids. Think of them as “space rocks.”

When meteoroids enter Earth’s atmosphere (or that of another planet, like Mars) at high speed and burn up, the fireballs or “shooting stars” are called meteors.

When a meteoroid survives a trip through the atmosphere and hits the ground, it’s called a meteorite

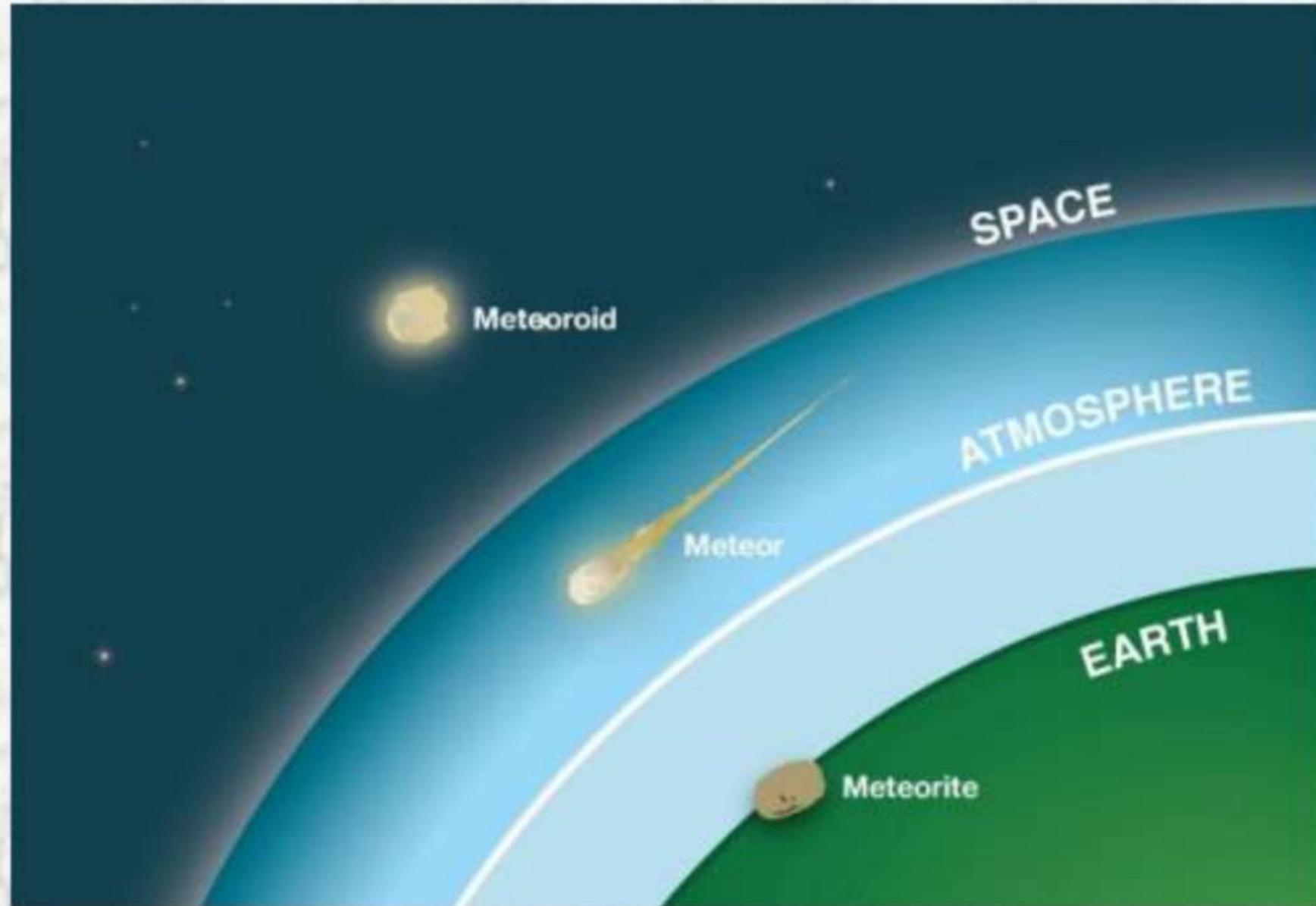
What are comets?

Comets are cosmic snowballs of frozen gases, rock, and dust that orbit the Sun.

When frozen, they are the size of a small town.

When a comet's orbit brings it close to the Sun, it heats up and spews dust and gases into a giant glowing head larger than most planets.

The dust and gases form a tail that stretches away from the Sun for millions of miles.



UPSC



KHAN GLOBAL STUDIES

Most Trusted Learning Platform

THANKS FOR WATCHING

