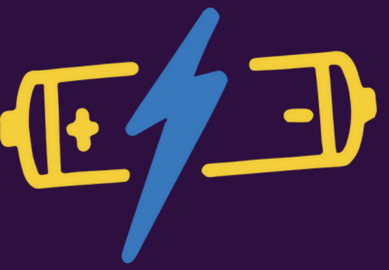
EXAM PAPERS PRACTICE



CHAPTER 17 STATIC ELECTRICITY

CIE IGCSE Physics for board 0625 and 0972

(For exam 2025+)

STATIC ELECTRICITY

Static electricity is the build-up of electric charge on the surface of objects, which can be discharged suddenly as a spark or shock upon contact with a conductor or another object of different electrical potential.

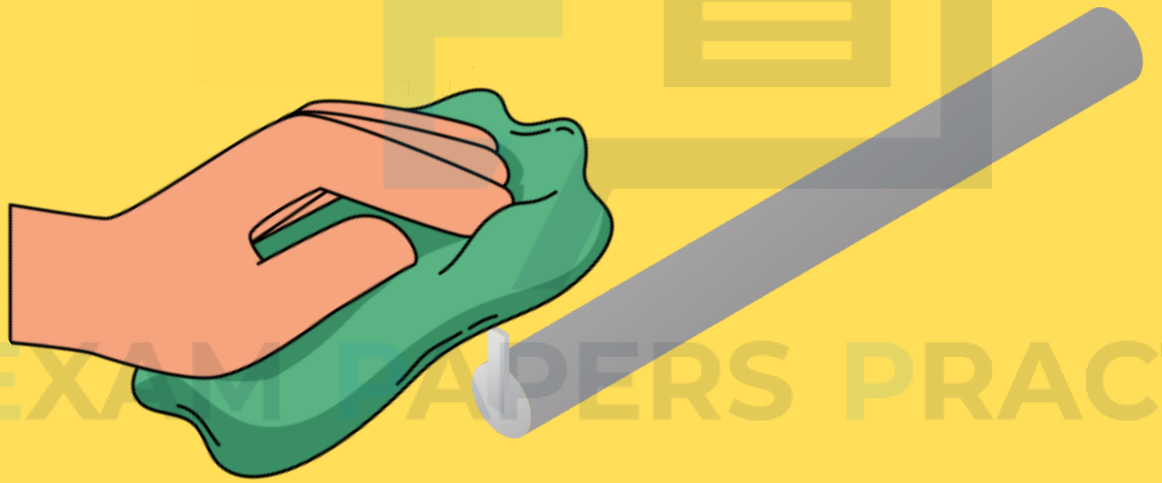
Charging and discharging

Explaining static electricity

Electric field

STATIC ELECTRICITY

One way to generate static electricity is via friction, for instance, rubbing a plastic object with a cloth.



Charging and discharging

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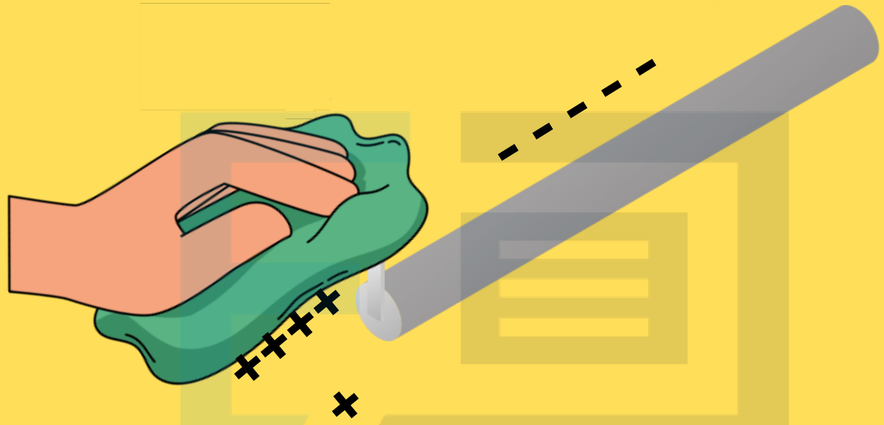
STATIC ELECTRICITY



Rubbing a plastic rod with a cloth causes both to become charged, with electrons transferring from the cloth to the rod.

Attraction -When the cloth is brought near the rod, they attracteach other.

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STATIC ELECTRICITY

Why do electrons move from the cloth to the plastic rod and not the other way round?

Electron Affinity: Different materials have different tendencies to gain or lose electrons. The plastic rod typically has a higher electron affinity than the cloth, meaning it has a greater tendency to attract and hold onto electrons.

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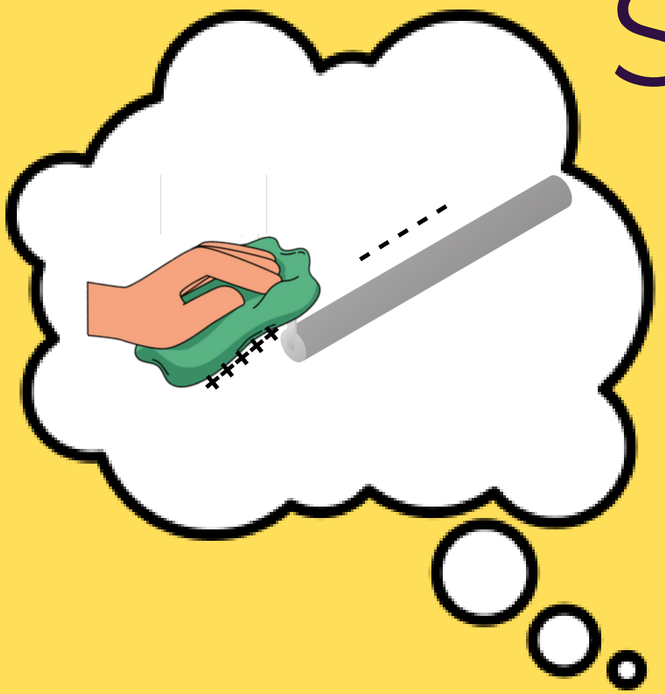
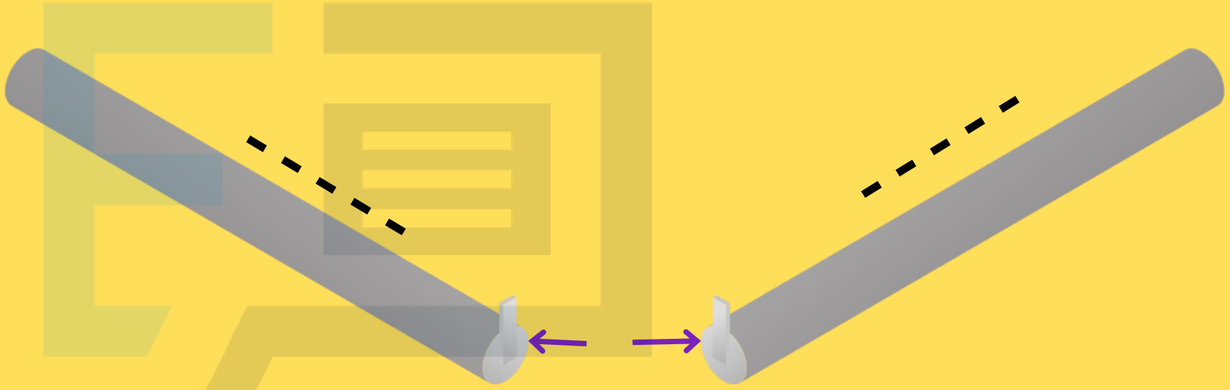
STATIC ELECTRICITY





Repulsion -If a second rod is rubbed similarly and brought close to the first, they repeleach other, causing the first rod to move away.

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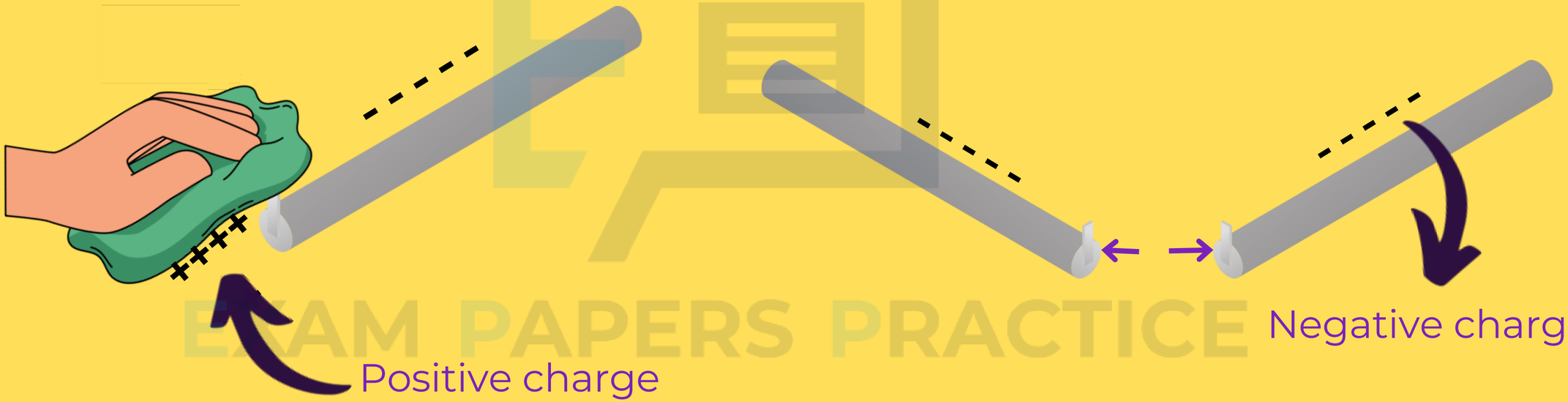
STATIC ELECTRICITY

We have seen both attraction and repulsion, this means that there are two types of static electricity there:



Charging and discharging

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STATIC ELECTRICITY

Charging and discharging

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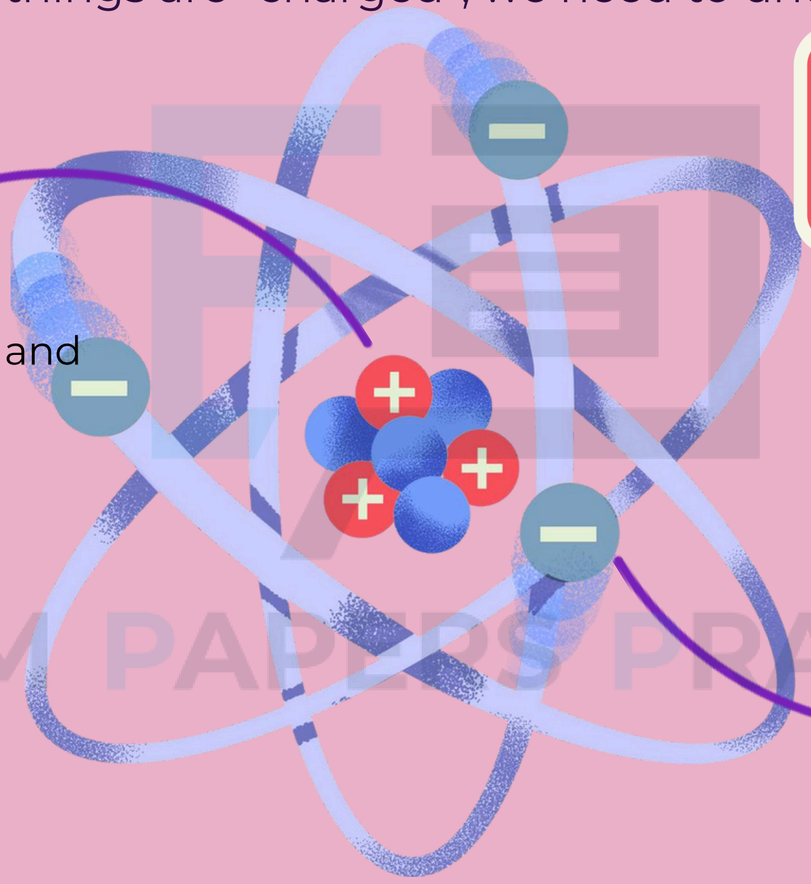
EXPLAINING STATIC ELECTRICITY

Before we understand how things are “charged”, we need to understand how an atom is like:



The Tnhucel enuusc olfe auns caotonmta cinosn tparionsto n and ns eauntdr on.

proton

neutrons, with protons being

Proostiotinve ilsy ach paorgseitdiv ely pcahrtaicrlegse.d particle.

Importantly, the positive charge from protons and the negative charge from electrons in an atom balance each other, resulting in the atom being electrically neutral overall.

Electrons are negatively charged particles that are relatively loosely held within the atom.

Charging and discharging

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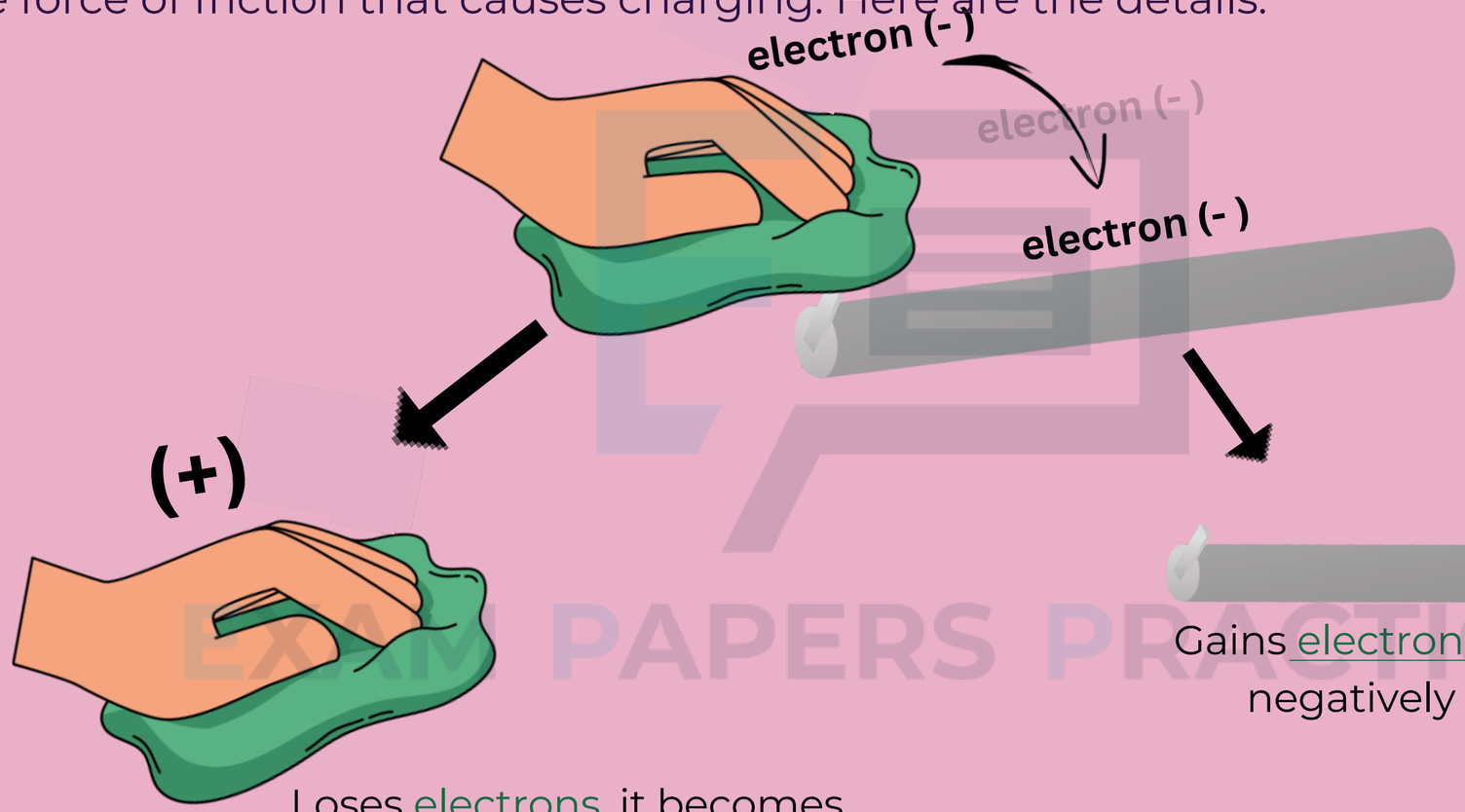
EXPLAINING STATIC ELECTRICITY

It is the force of friction that causes charging. Here are the details:



Loses electrons, it becomes positively charged

Gains electrons, it becomes negatively charged.

Charging and discharging

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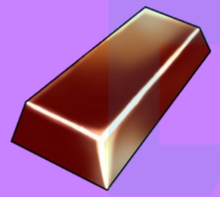
CONDUCTORS AND INSULATORS

CONDUCTORS

A substance that allows the flow of electrons. For examples:


Metal


Gold


Copper

INSULATORS

A substance that inhibits the flow of electrons. For examples:


glass


plastic


amber

Charge can move through conductors and not insulator.
Reason: In insulators, the electrons are tightly bound to their atoms and not easily removed.

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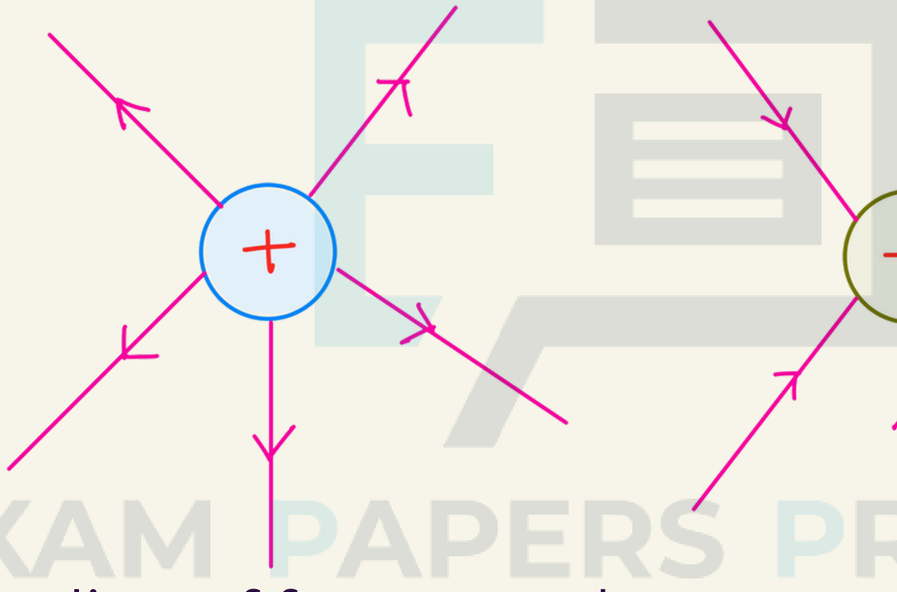
ELECTRIC FIELD

Definition: A region of space in which an electric charge will experience a force. Electric fields are created by electric charges.



The line of force are shown coming out of a positive charge into a negative charge.

Charging and discharging

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Electric field

ELECTRIC FIELD

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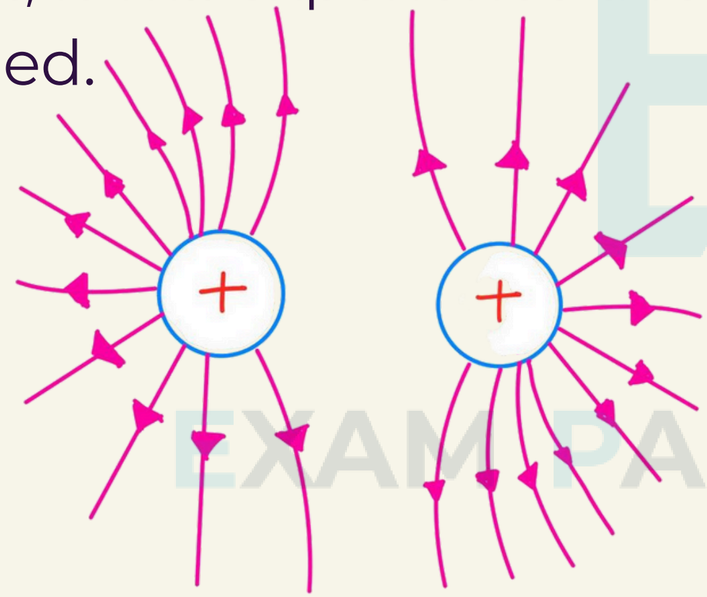
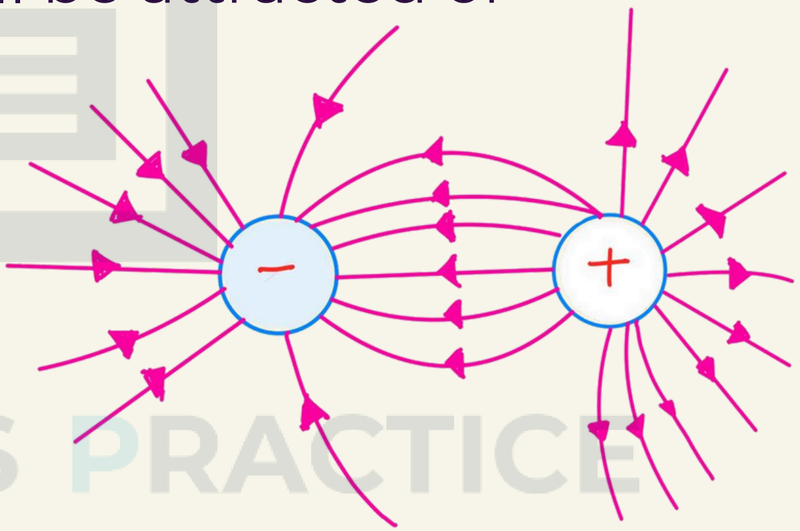
ELECTRIC FIELD

If a charged object moves into the electric field of a charged object, it will experience a force –it will be attracted or repelled.



Repulsion



Attraction

Charging and discharging

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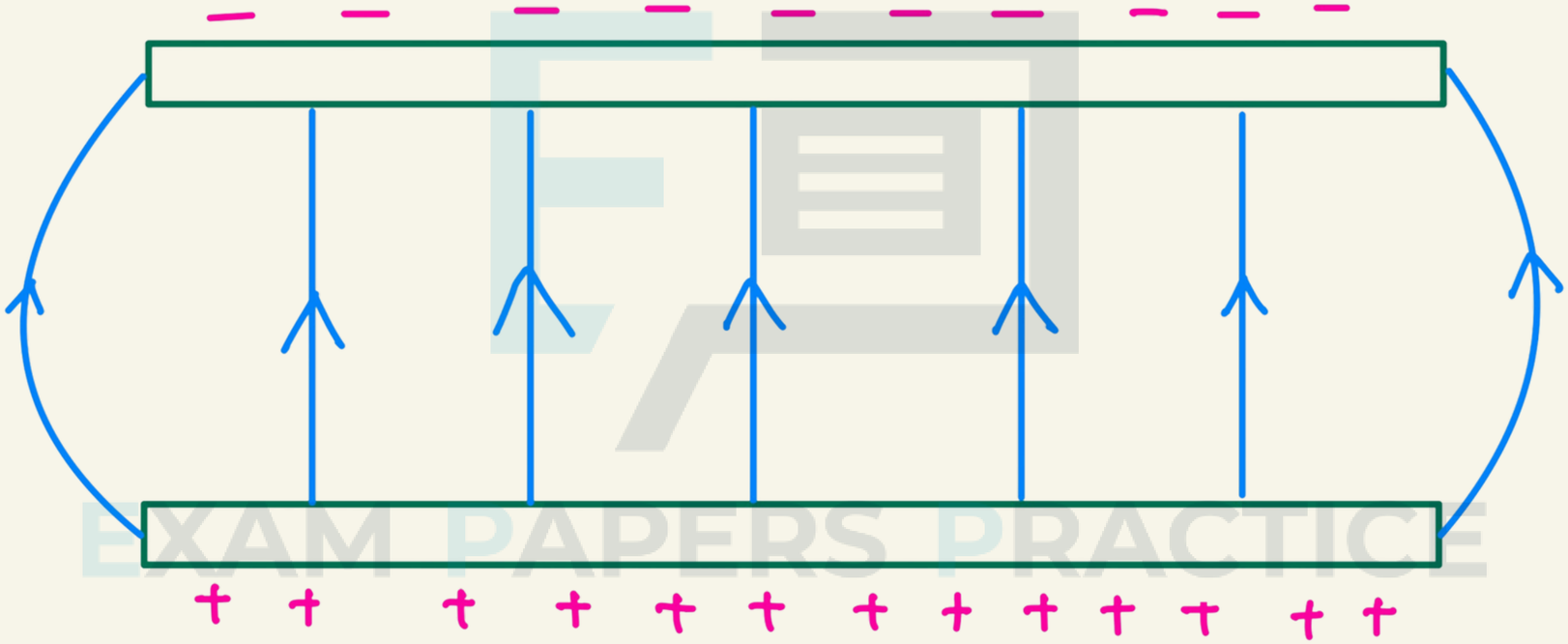
Electric field

ELECTRIC FIELD

Two parallel plates with opposite charges.



Charging and discharging

Explaining static electricity

Electric field

CHARGED PARTICLES

Electric charge is measured in coulombs (C), named after Charles-Augustin de Coulombs. He discovered that the force between two charged objects depends on how big their charges are and on how far apart they are.

One electron	*Will be used in the next chapter! -1.6×10^{-19} C
One proton	1.6×10^{-19} C

Charging and discharging

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Electric field

What is the definition of an electric field?

A A region in space in which a mass experiences a force due to the Earth's mass.

B A region in space through which electromagnetic radiation is passing.

C A region in space in which a compass needle experiences a force.

D A region in space in which an electric charge experiences a force.

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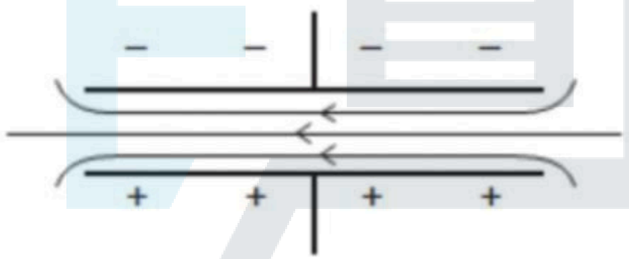
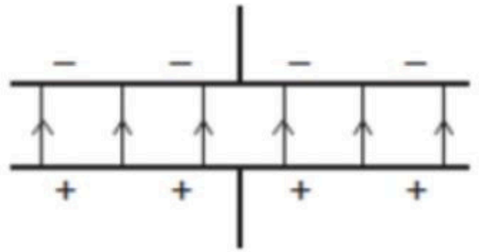
Which of the diagrams below shows the correct electric field pattern for oppositely charged parallel plates?

A



B



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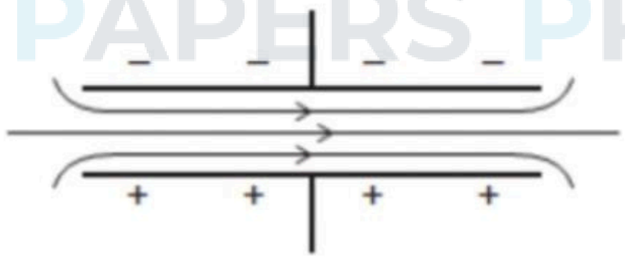

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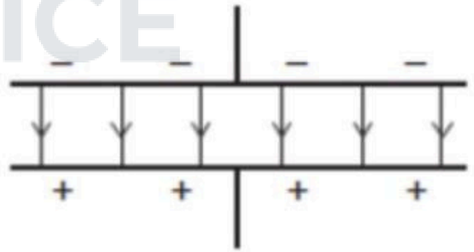

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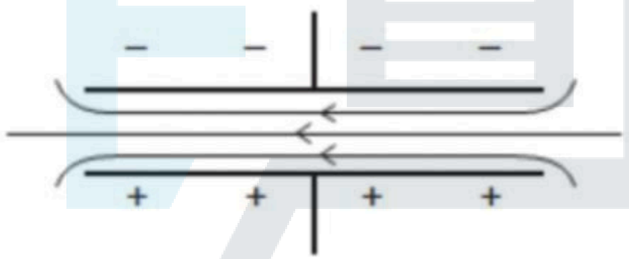

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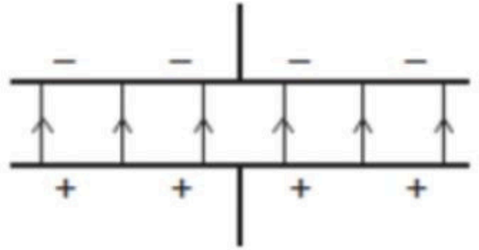

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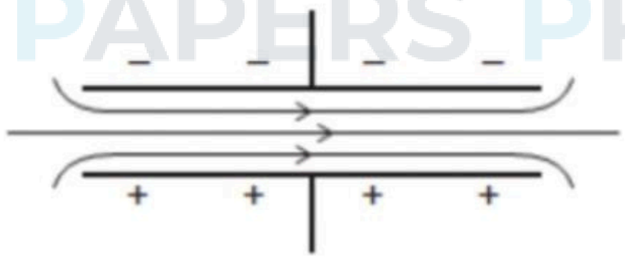

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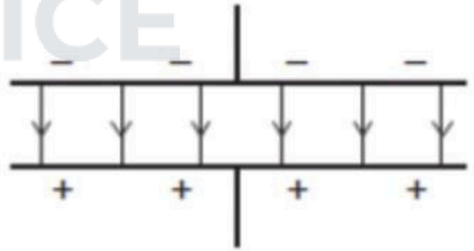

A PVC (plastic) rod is rubbed with a nylon cloth. This process causes electrons to be transferred between the rod and the cloth, causing both objects to become charged.

Which of the rows in the table below correctly gives the nature of the charges on both the cloth and the rod, and the effect the objects have on each other after becoming charged?

	charges on rod and cloth	effect
A	the same	repel
B	the same	attract
C	opposite	repel
D	opposite	attract

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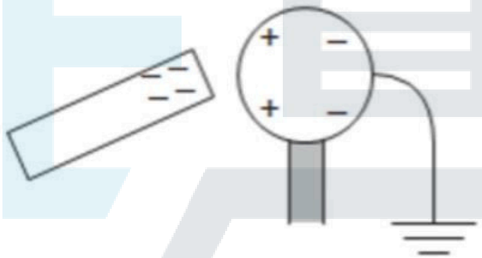
D	opposite	attract

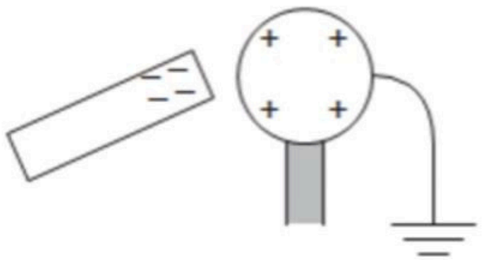
A student rubs a polythene rod with a cloth, giving it a negative charge. She then holds it near an earthed, conducting sphere as shown in the diagrams below.

Which of the diagrams shows the correct distribution of charges on the conducting sphere?

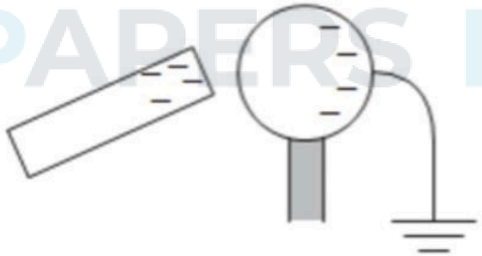
A



B



C



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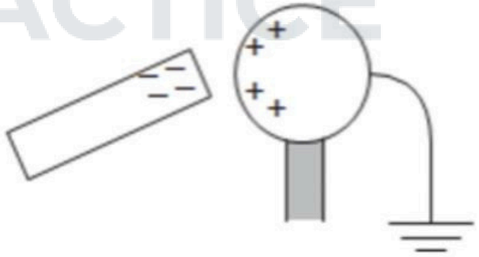

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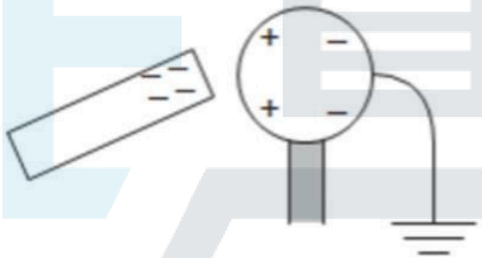

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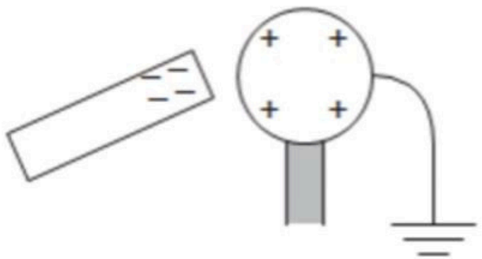

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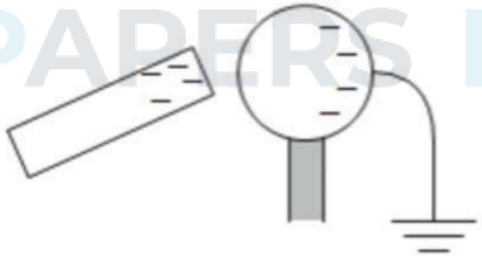

D