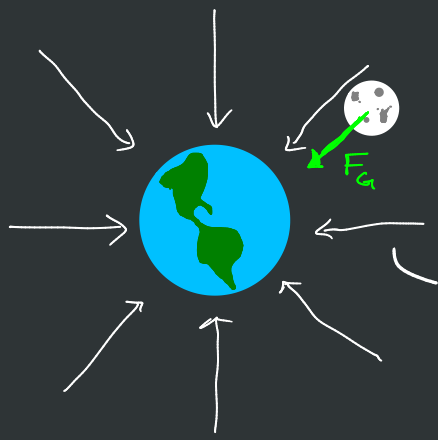
Chapter 12 - Electrostatics

Fundamental Forces

- Gravity
- Electromagnetic
  - * Electric Force
  - * Magnetic Force

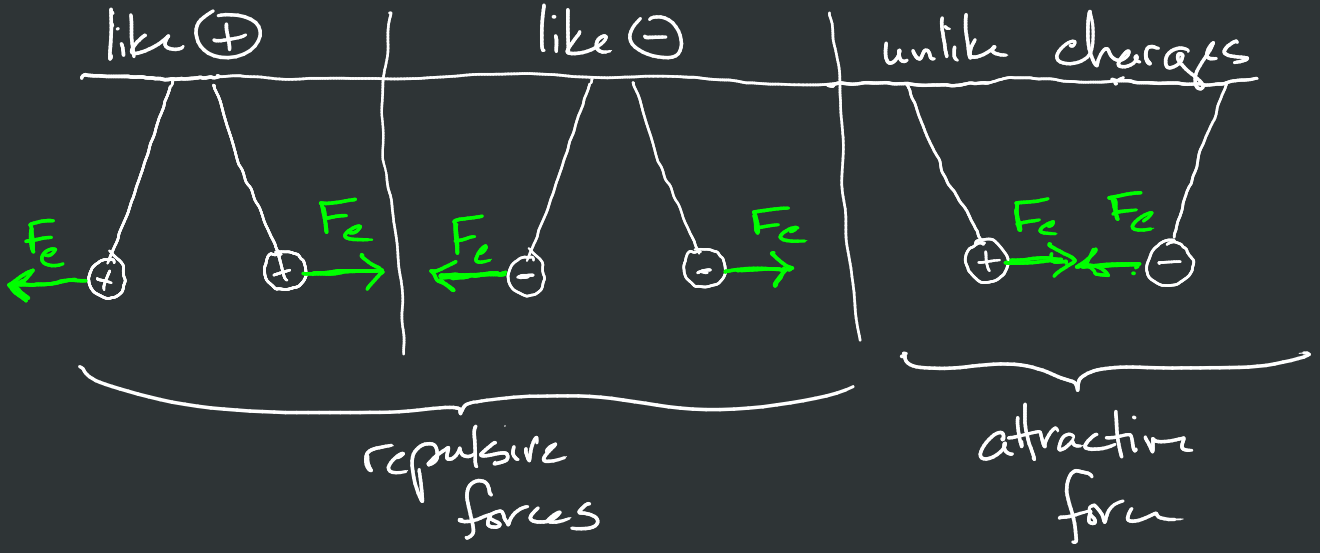


Gravitational Field Lines

Electric Force → electric field exerts the electric force

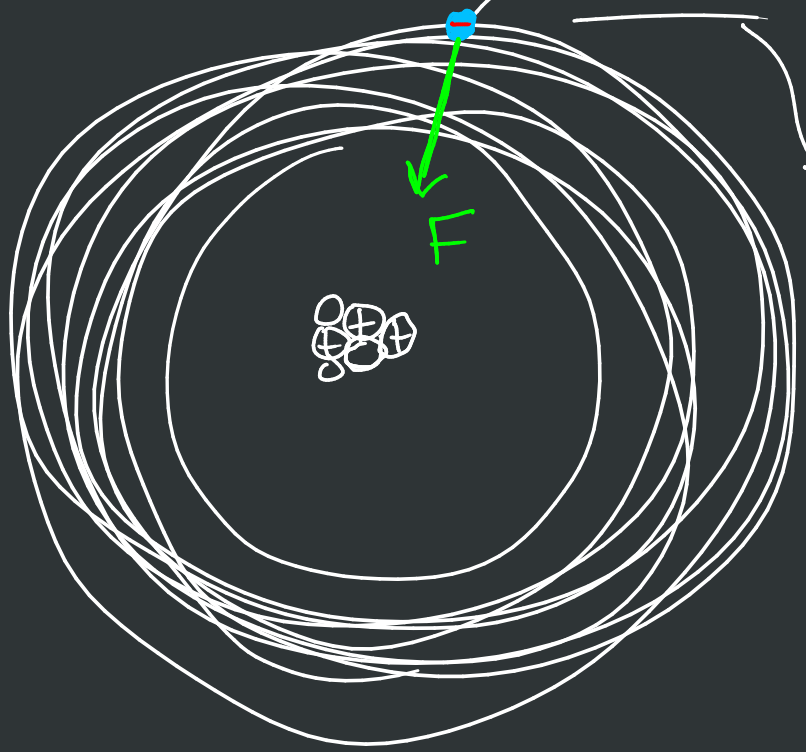
→ excited by the property of charge

→ two kinds
- positive
- negative



difference is in the direction of field they create.

Atom



nucleus
- proton → positive charge
- neutron → neutrally charge
  - charge of 0

negative charge → magnitude of charge on an electron and proton is the same.

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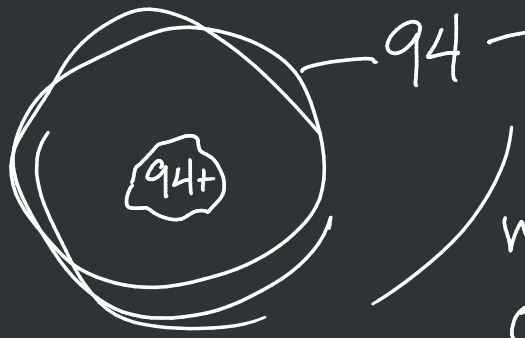
neutral atom – has the same number of electrons and protons

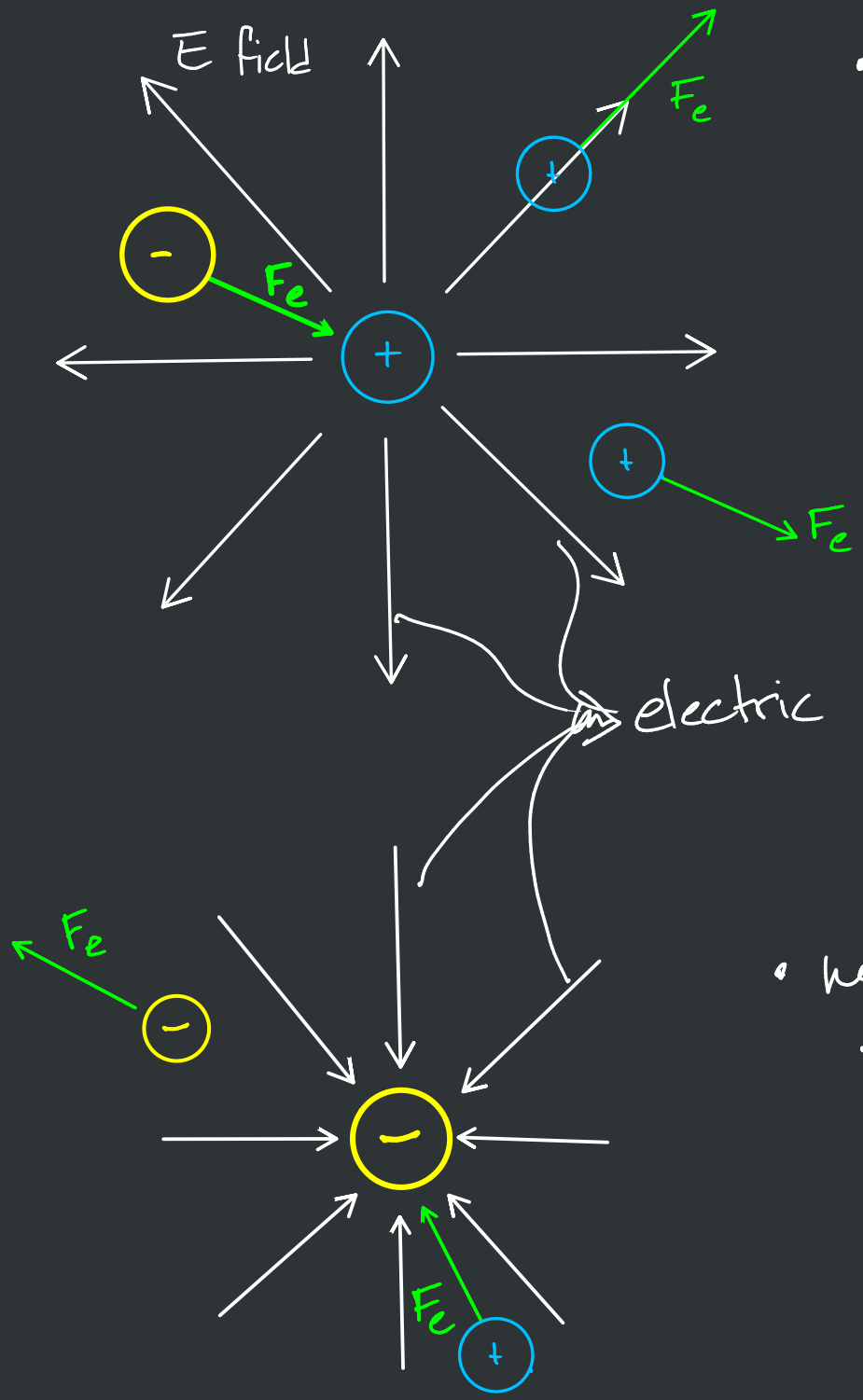
- ion – atom that has lost or gained some electrons

Uranium



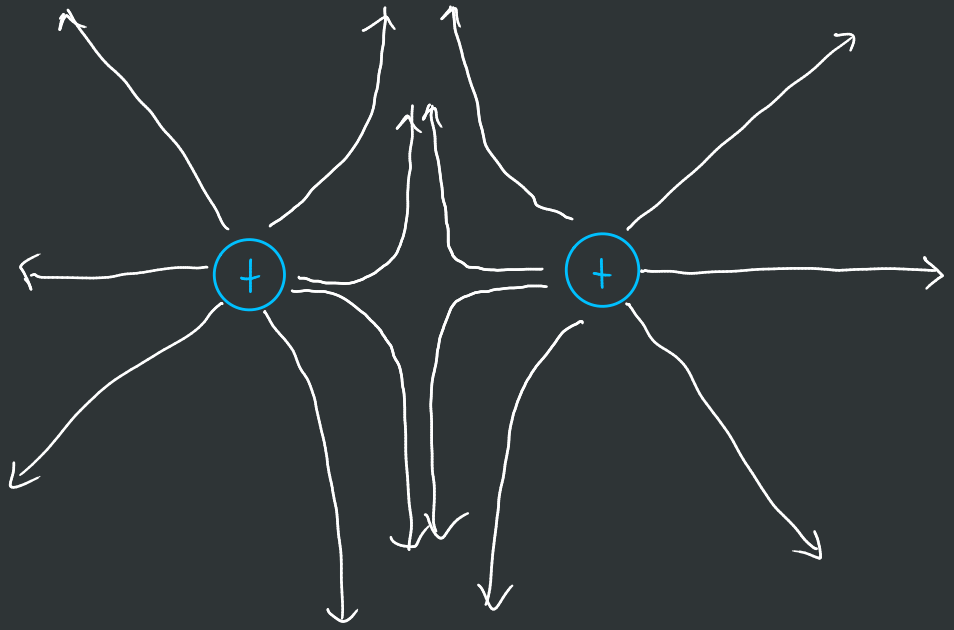
94 –

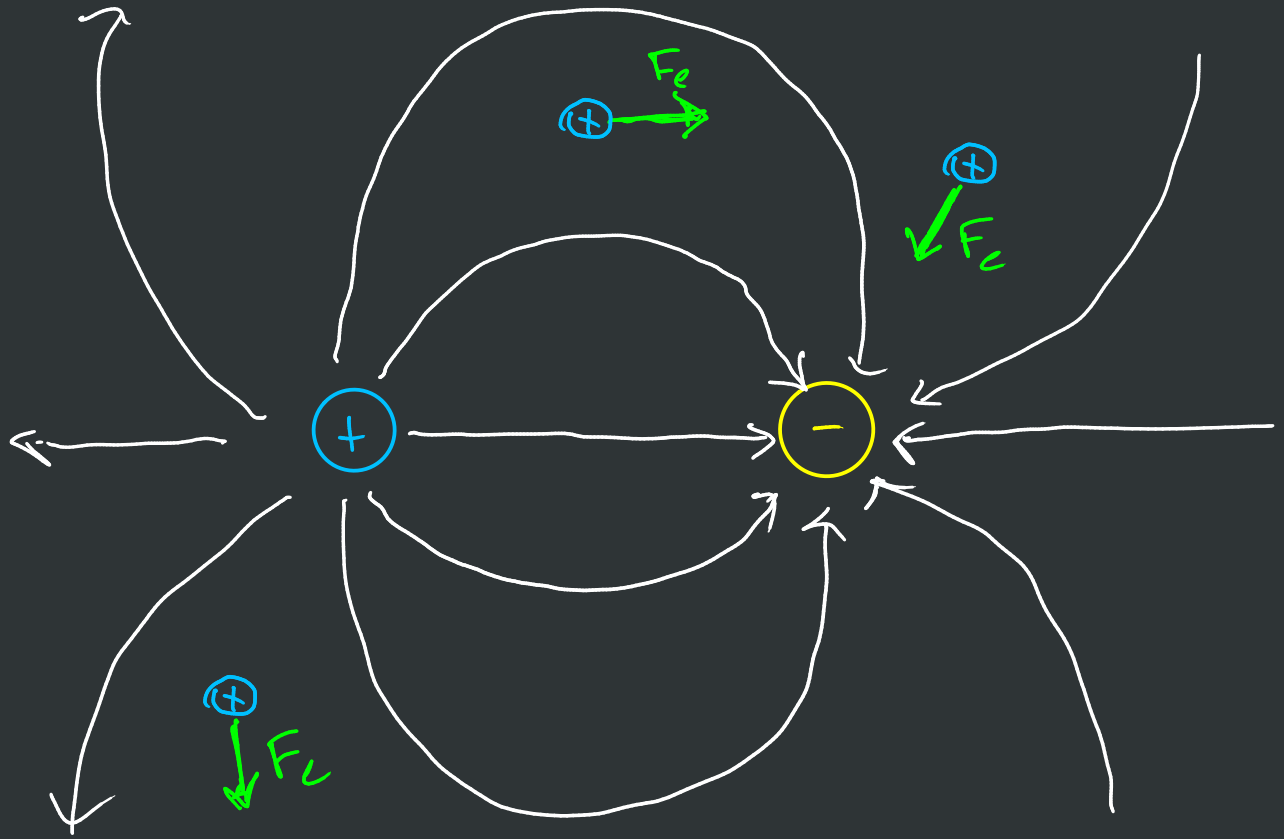
net 0 charge



- positive charge creates an electric field that points away.
  - positive charge in an electric field will experience an electric force in the same direction as the field
  - negative charge will do the opposite

- negative charge creates electric fields that point towards them


+
+


Fe
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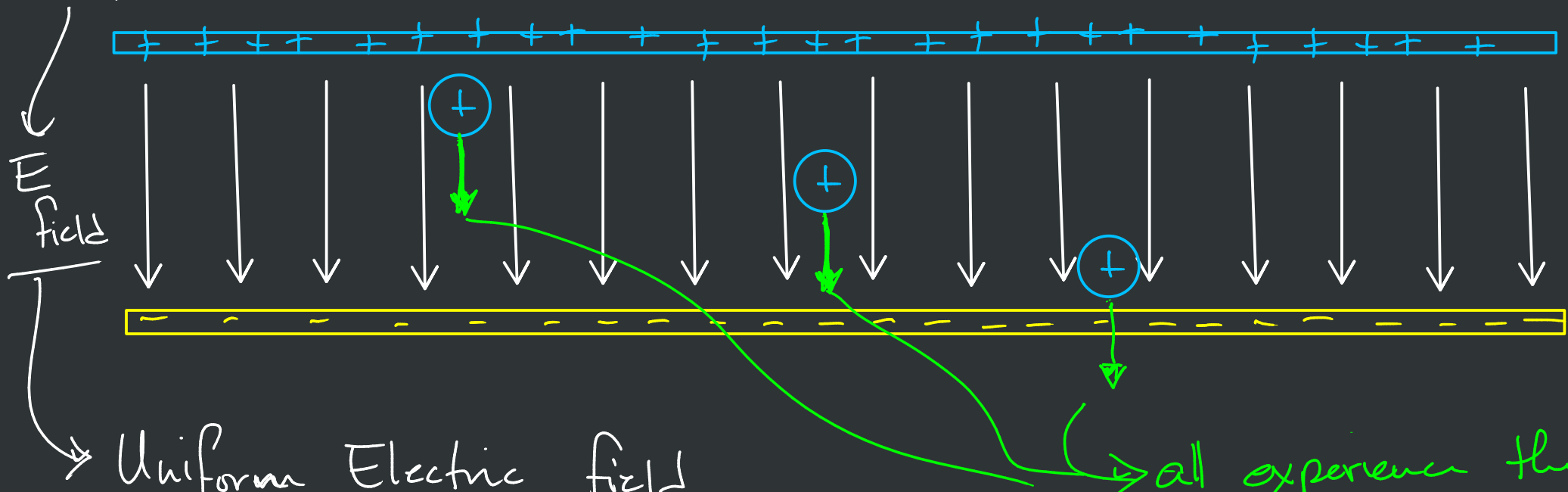
Capacitor → device w/ parallel sheets of opposite charge



→ Uniform Electric field

→ all experience the same force in the same direction

Unit of Charge (like the kilogram for mass)

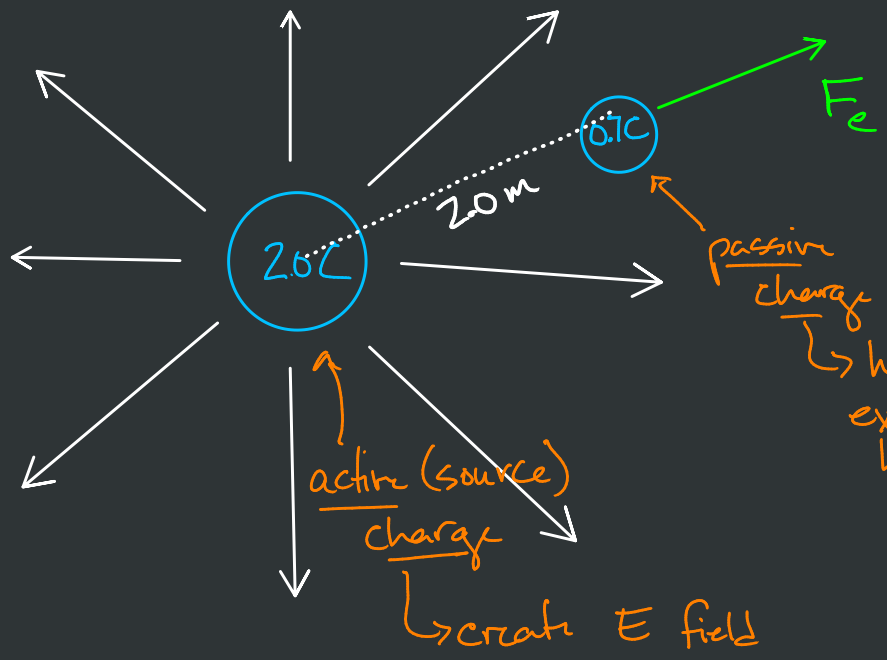
→ 1 Coulomb

1 elementary charge = 1.6×10^{-19} C

↳ charge of a proton or electron

How many protons make 1 Coulomb?

$$\frac{1\ C}{1.6 \cdot 10^{-19} C/e} = 6.24 \cdot 10^{18}\ e$$



$$F_e = \text{passive charge} \times \text{Electric Field}$$

$$[\text{Newtons}] \quad 0.7\,C \qquad \frac{\text{Newtons}}{C}$$

for a point charge

$$\text{Electric field} = \frac{\text{constant} \cdot \text{active charge}}{(\text{distance})^2}$$

$$E = \frac{k \cdot q_0}{r^2}$$

$k \rightarrow 9 \cdot 10^9 \frac{N m^2}{C^2}$