**Charge and Matter**

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## 26.1 Electromagnetism – A Preview

Light is electromagnetic. Its speed can be found making purely electric and magnetic measurements.

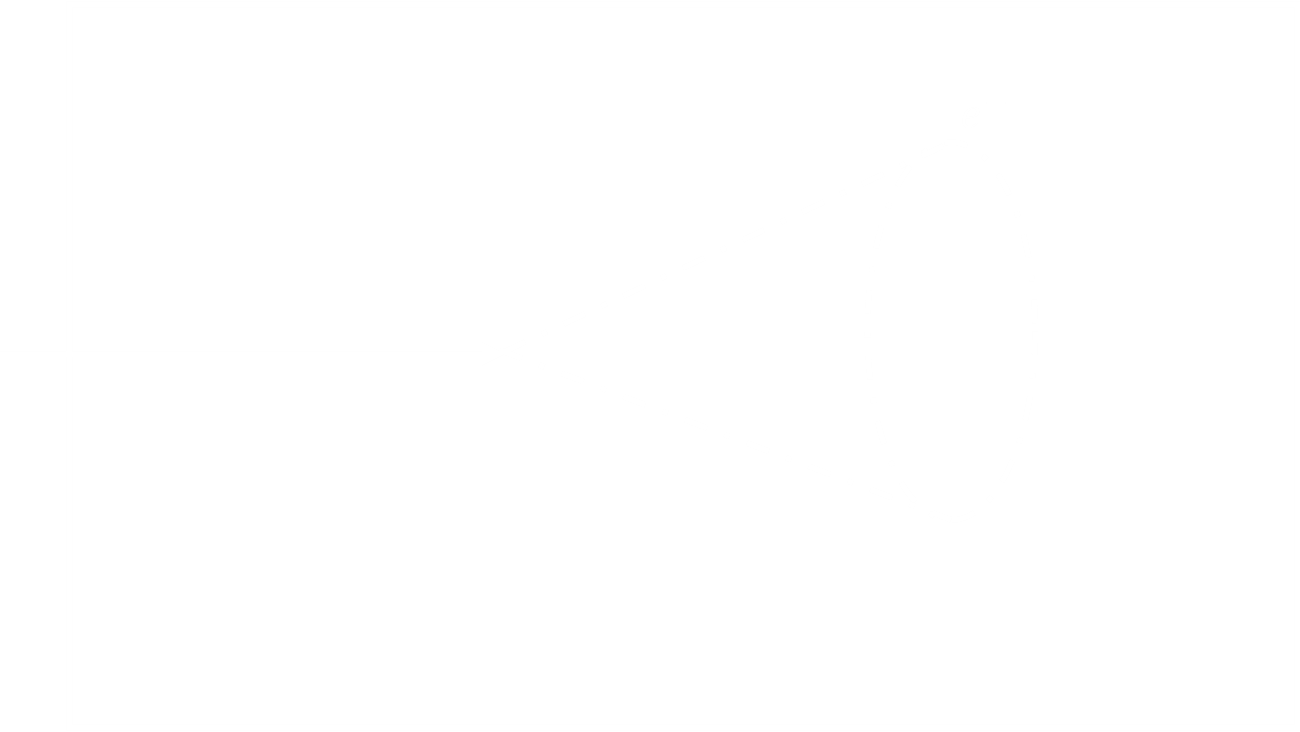
## 26.4 Coulomb’s Law

Coulomb’s Law –

## 26.6 Charge and Matter

### Bubble Chamber

* detects electrons



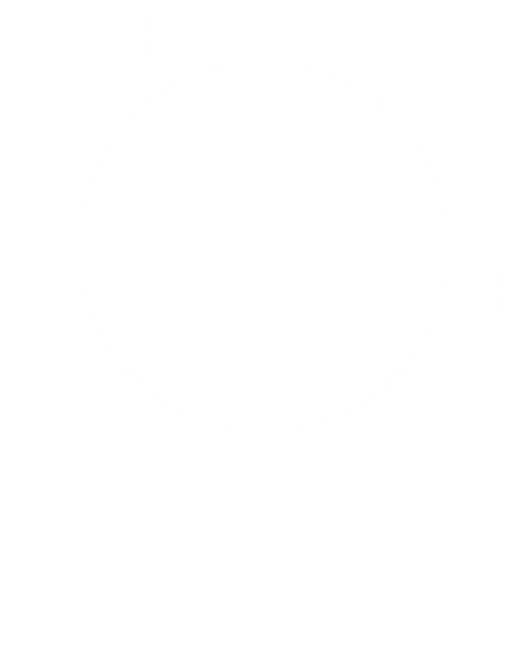
* Charge is spinning around on electron surface
* Speed
* Magnetic Field
* Electron is magnetic dipole

Electron - electric monopoly

- magnetic dipole

### Maxwell’s Laws

1st Law



* No charge inside as balanced by ions
* No electric field
* Excess added charge lies on surface

2nd Law

* magnetic poles can’t be isolated

3rd Law

* Ampere’s Law
* Speed of light can be measured using electric and magnetic
* (electric parameter)
* (magnetic parameter)

4th Law

* Magnetic field lines cut by a wire produce a current
* () sign is because of Lenz’s Law: Induced EMF opposes motion of the current produced

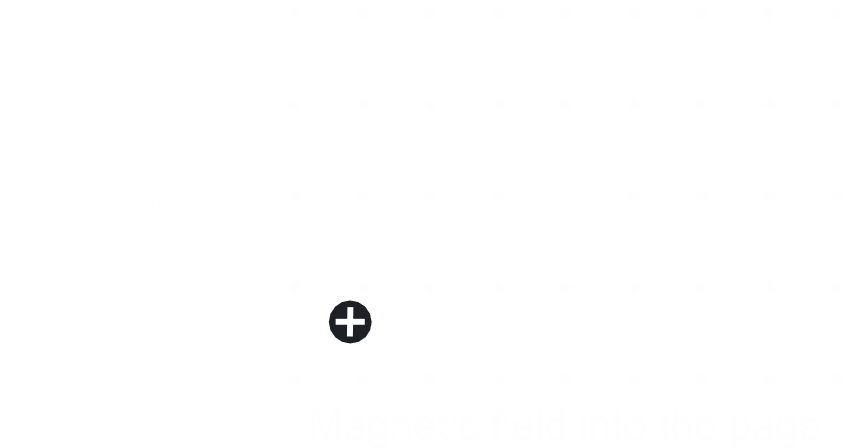
Current produced by electrons,

– frequency

– charge

Bohr Magneton

### Electromagnetic Radiation



Nothing happens for electromagnetic radiation

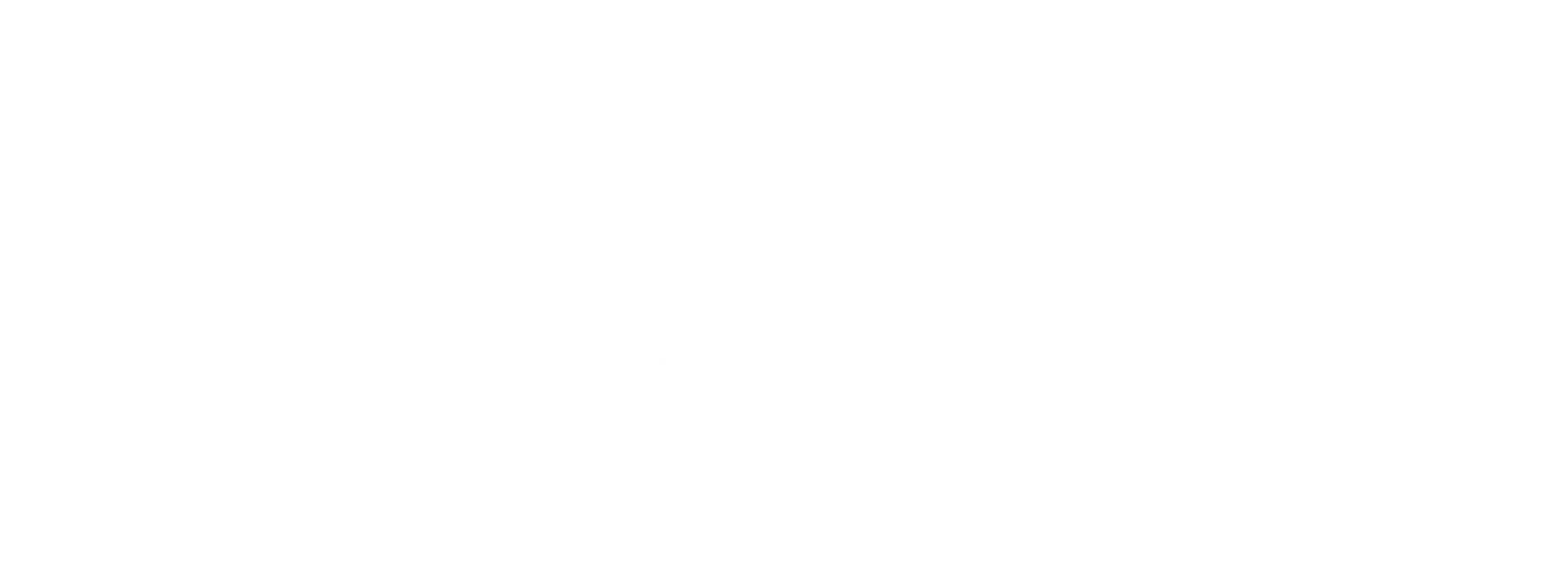
particle is deflected upwards

particle is deflected downwards

Light is undeviated

### Oscilloscope

* shows electromagnetic wave patterns



If both signals together, parabolic path, Lissajous figures

example

1. Fluorescence
2. Photoluminescence
3. Electroluminescence
4. Cathodoluminescence

Electric field ()

1. (vector)
2. (vector)

is a macro quantity (can be measured)

is a micro quantity (cannot be measured)

The acceleration of the electron can be found using this equation.

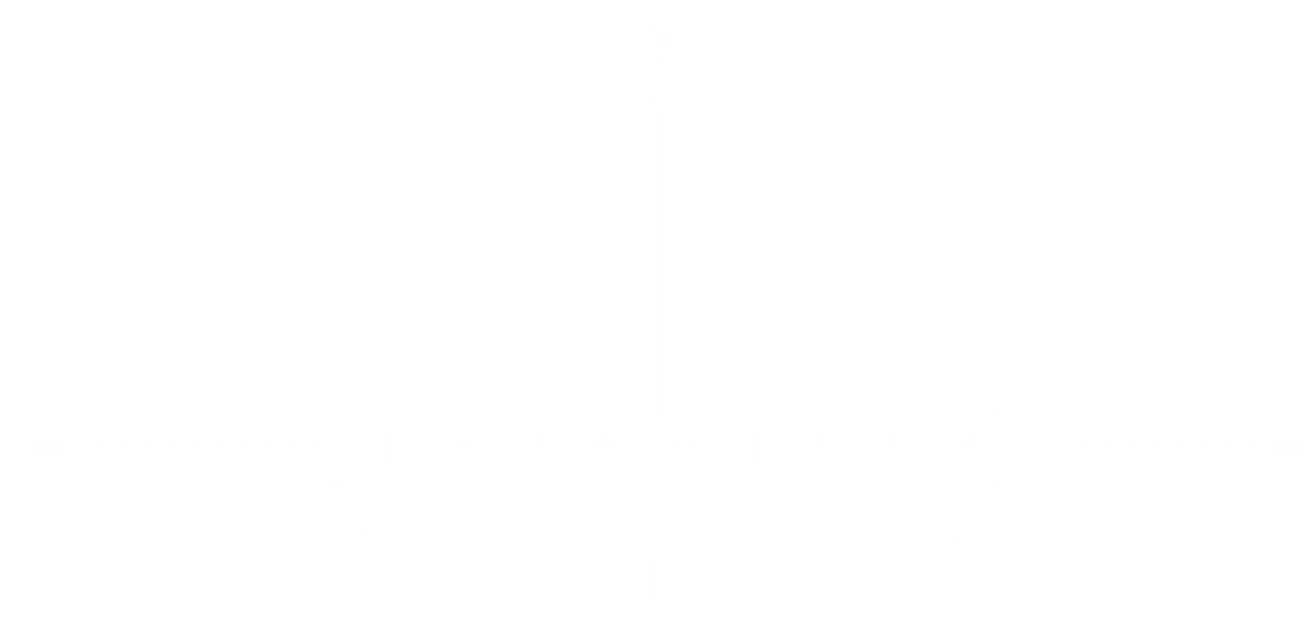
### Gauss’s Law

Electric Flux

Magnetic Flux

- integration in closed area

Example 1:



charge density

since is constant

Example 2:



– surface charge density