

# Modern Physics

The physics of the 20th century

End of 19th century: general optimism, but some of the physicists can already see the trouble coming.

1900 Lord Kelvin: two clouds on the clear sky of physics: the missing proof of the existence of the aether, and the lack of explanation of the heat radiation.

Michelson - Morley →

→ Special Relativity

Black body radiation →

→ Wave Mechanics or  
Quantum Mechanics

## The people who started it

Atomic spectrum: Rydberg, Ritz

Atomic structure: J.J. Thomson,  
Rutherford, Bohr

Black body radiation: Planck

Light quantum: Wien, Einstein,  
de Broglie

X-ray: Röntgen (1901: first Nobel)

Nuclear physics: Becquerel, Marie  
and Pierre Curie, Rutherford

Quantum mechanics: Bohr,  
Sommerfeld, Heisenberg,  
Schrodinger, Dirac

# Optical Spectrums

⊗  
solid, liquid  
dense gas



continuous  
spectrum

⊗  
thin gas



discrete  
emission  
spectrum

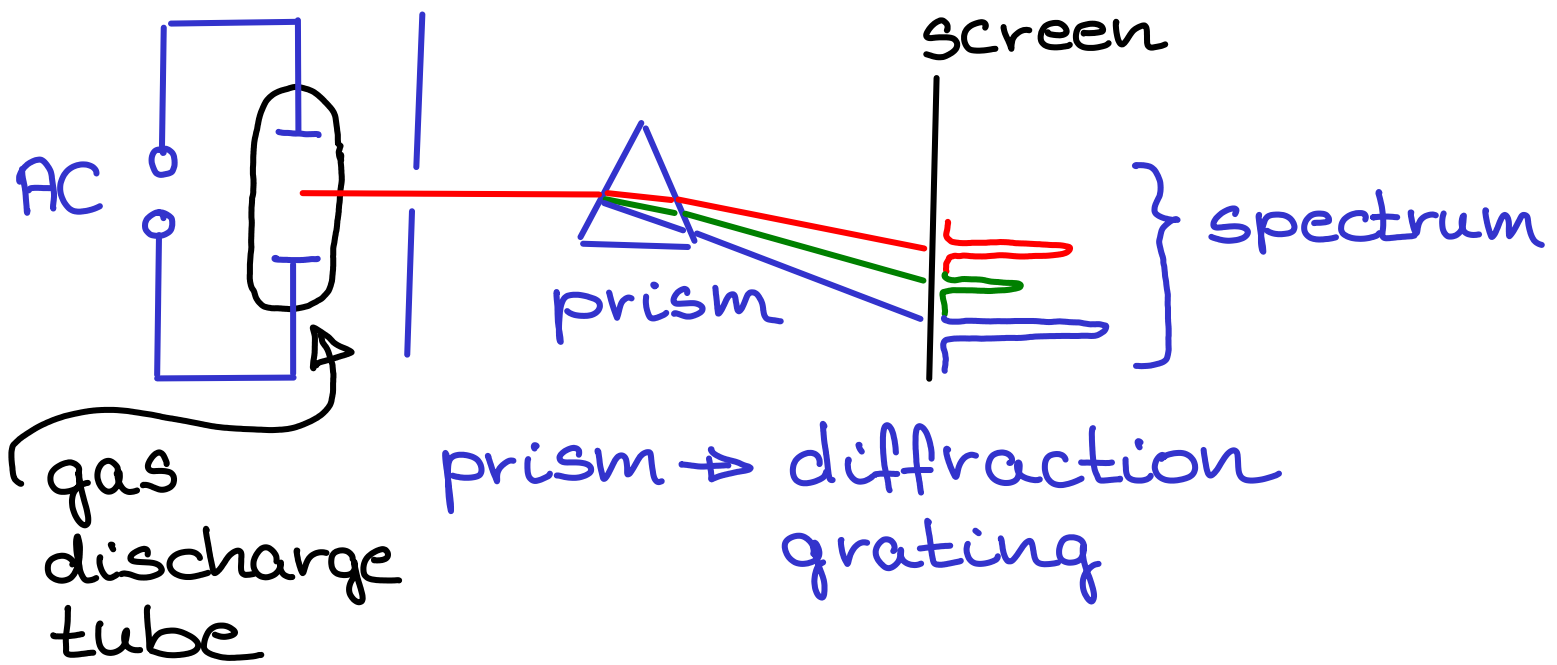
⊗  
solid

□  
thin  
gas



discrete  
absorption  
spectrum

# Optical spectroscopy



Hydrogen spectrum: J. Rydberg:

$$\frac{1}{\lambda} = R_H \left( \frac{1}{n^2} - \frac{1}{k^2} \right)$$

$R_H = 1.096776 \cdot 10^7 \frac{1}{m}$

$n = 1, 2, 3, \dots$  : final state

$k > n$  : initial state

$n = 1$  : Lyman (UV)

$n = 2$  : Balmer (UV, visible)

$n = 3$  : Paschen (IR)

$n = 4$  : Brackett (IR)

$n = 5$  : Pfund (IR)