Summary for Tutorial 1

QL
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Keep in mind: You still need to read the lecture notes. My summary can't have everything in it. If there's an error, please email me.

Three tips: 1. Don't memorize the equations. Understand them, and know how to use them. 2. Pay attention to the units. 3. Wikipedia

I. ENERGY LEVELS IN ATOMS

Z is the proton number in an atom while N is the neutron number.

A. photon

Energy of a photon with frequency ν:

$$E_\nu = h\nu \tag{1}$$

$$\nu = \frac{c}{\lambda} \tag{2}$$

B. Hydrogen Atom

$$Z = 1 \tag{3}$$

$$E_n = -13.6 \cdot \frac{1}{n^2}[eV] \tag{4}$$

C. Multi-electron Atom

$$E_n = -(Z-1)^2 \cdot \frac{13.6}{n^2}[eV] \tag{5}$$

TABLE I: Physical Constants

Quantity	Symbol	Value	Unit
Planck constant	h	6.626×10^{-34}	$J \cdot s$
Speed of light	c	2.987×10^8	m/s
Avogadro's number	N_A	6.022×10^23	$1/mol$

II. RADIOACTIVE DECAY LAWS

$$N(t) = N_0 \cdot e^{-\lambda t} \tag{6}$$

in which N_0 is the initial number of radioactive atoms. $N(t)$ is the number of radioactive atoms left after time t. λ is the decay constant.

A. half-life $T_{1/2}$

$$\lambda = \frac{ln2}{T_{1/2}} \tag{7}$$

B. Dose

Amount of energy deposited into body per unit mass

$$D = \frac{E}{m} \tag{8}$$

The units for dose are: 1) Rad, which is 100 erg/g. 2) Gray or Gy, which is J/kg.

C. Activity

$$A(t) = |\frac{dN(t)}{dt}| = \lambda N(t) \tag{9}$$

$$A(t) = A_0 \cdot e^{-\lambda t} \tag{10}$$