Atomic structure: The numbers

protons (Z) - Ze atomic numbehr

↳ identity

neutrons → nuclear stability

mass # = protons + neutrons

e^- → charge

charge = protons - electrons

Sep 21-7:03 AM

mass # → ◯ ◯ ← charge

Symbol

Z → ◯ ◯ ← how many

$^{13}_{6}C$ − 6 = 7 → 6 protons, 7 neutrons, 6 e^-

Z? ↓

[? ? ? Symbol ? ?] ← atomic mass ≠ mass #

↳ weighted average of isotopes

isotopes: same element, diff mass #

C: 98.9% = ^{12}C

1.1% = ^{13}C

$(.989)(12) + (.011)(13) \approx 12.0107$

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Spectroscopy

speed of light 3.00×10^{8} m/s

$$c = \lambda \nu$$

nu = frequency

NRG

$$E = h\nu$$

Planck's const 6.6262×10^{-34} J·s

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Balmer – swiss math teacher

4 NRG's (from last page)

$$E = -k\left(\frac{1}{4} - \frac{1}{n^2}\right)$$

n = 3, 4, 5, 6

Rydberg

$$\frac{1}{\lambda} = R\left(\frac{1}{4} - \frac{1}{n^2}\right)$$

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Paschen and Lyman

3 Infrared lines

$$\frac{1}{\lambda} = R\left(\frac{1}{9} - \frac{1}{n^2}\right)$$

n = 4, 5, 6

5 ultra-violet lines

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

n = 2, 3, 4, 5, 6

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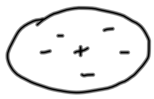
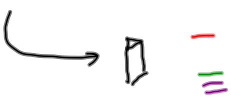
The four problems

① Atom  Why can't e^- in nucl. ?

②  Why light out ?

③  Why only 4 colors ?

④ $\frac{1}{\lambda} = R\left(\frac{1}{4} - \frac{1}{n^2}\right)$?

$$\frac{1}{\lambda} = R\left(\frac{1}{9} - \frac{1}{n^2}\right)$$

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

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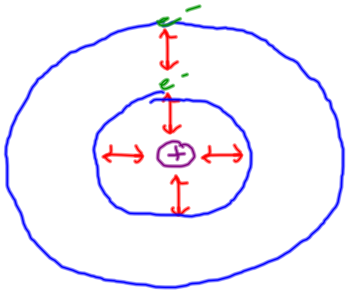
Neils
Bohr's Answer

→ NRG is quantized (NRG in tiny bits)

NRG of e- ⇒ Potential NRG



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