TEST ON ATOMIC THEORY AND NUCLEAR CHEMISTRY WED 11/6/13

TOPICS

DEMOCRITUS

JOHN DALTON – 1ST ATOMIC THEORY

THOMPSON – DISCOVERED e^- d^+

RUTHERFORD – PLANETARY ATOM

CHADWICK – NEUTRON

		Charge	mass
electron	e^-	-1	0
proton	p^+	$+1$	1
neutron	n^0	0	1

ISOTOPES

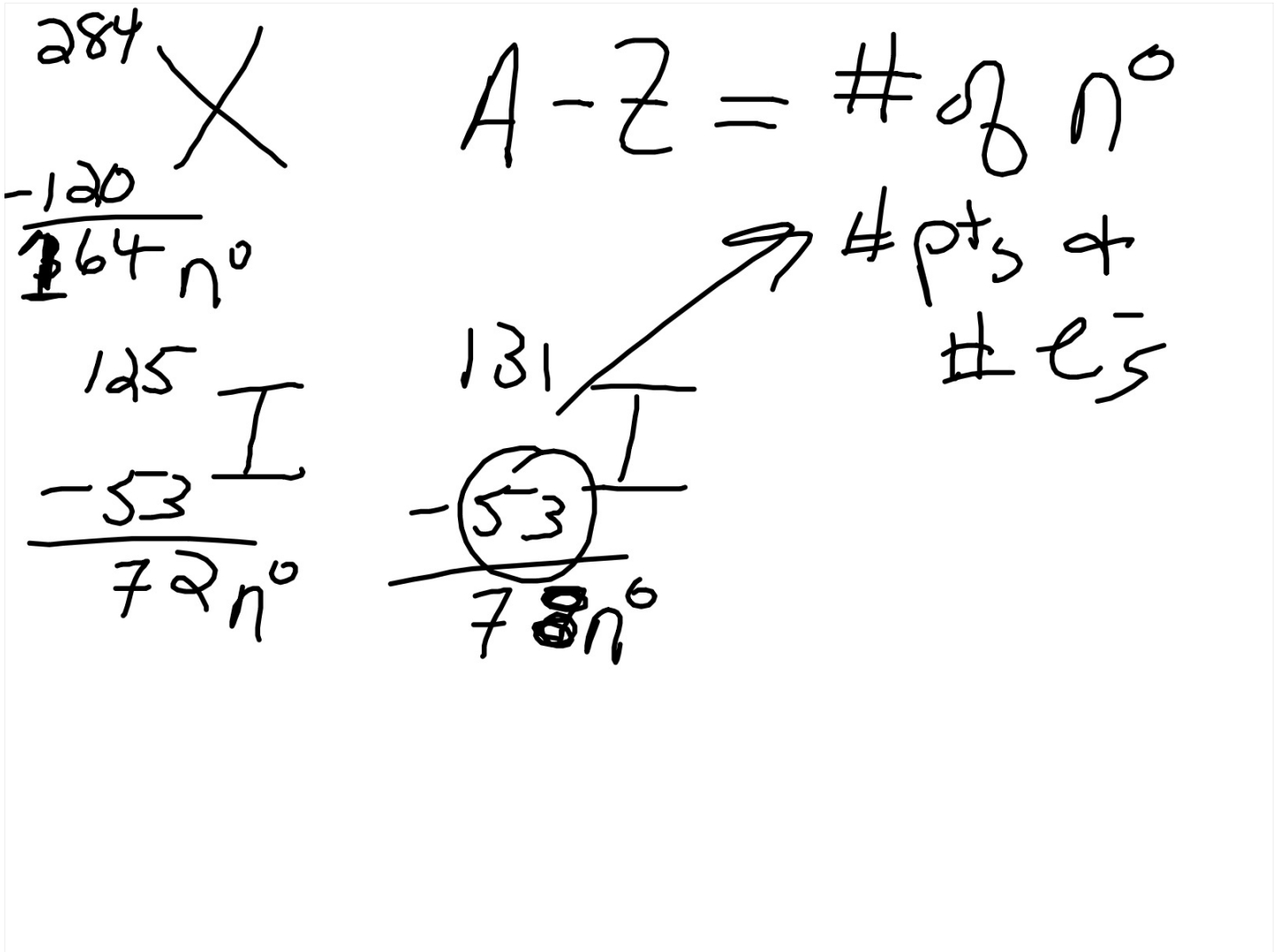
ATOMIC NUMBER (Z) - # of p^+s

MASS NUMBER (A) - $p^+ + n^0$

Xoniem - 284

284

120


284
-120
164 n°
125
-53
72 n°
131
-53
78 n°
A - Z = # of n°
→ # pt's +
e⁻s

at. mass =

$$\frac{(\%\ \text{isotope 1})(\text{mass isotope 1}) + (\%\ \text{isotope 2})(\text{mass isotope 2}) + \ldots}{100}$$

data given?

$^{1}_{1}H$ 99.99% 1 $^{2}_{1}H$ 0.009% 2

$^{3}_{1}H$ 0.0001% 3

$$\text{At. mass H} = \frac{(99.99\%)(1) + (0.009\%)(2) + (0.0001\%)(3)}{100}$$

$$= 1.008 \text{ amu}$$

* mole Concept

1 mol = 6.022×10^{23} atoms and has a mass = at. mass in g

equations:

$$\text{atoms} = (\text{mol})(N_A)$$

$$N_A = 6.022 \times 10^{23} \text{ atoms/mol}$$

$$\text{mol} = \text{g}/\text{at. mass}$$

nuclear chemistry

alpha α

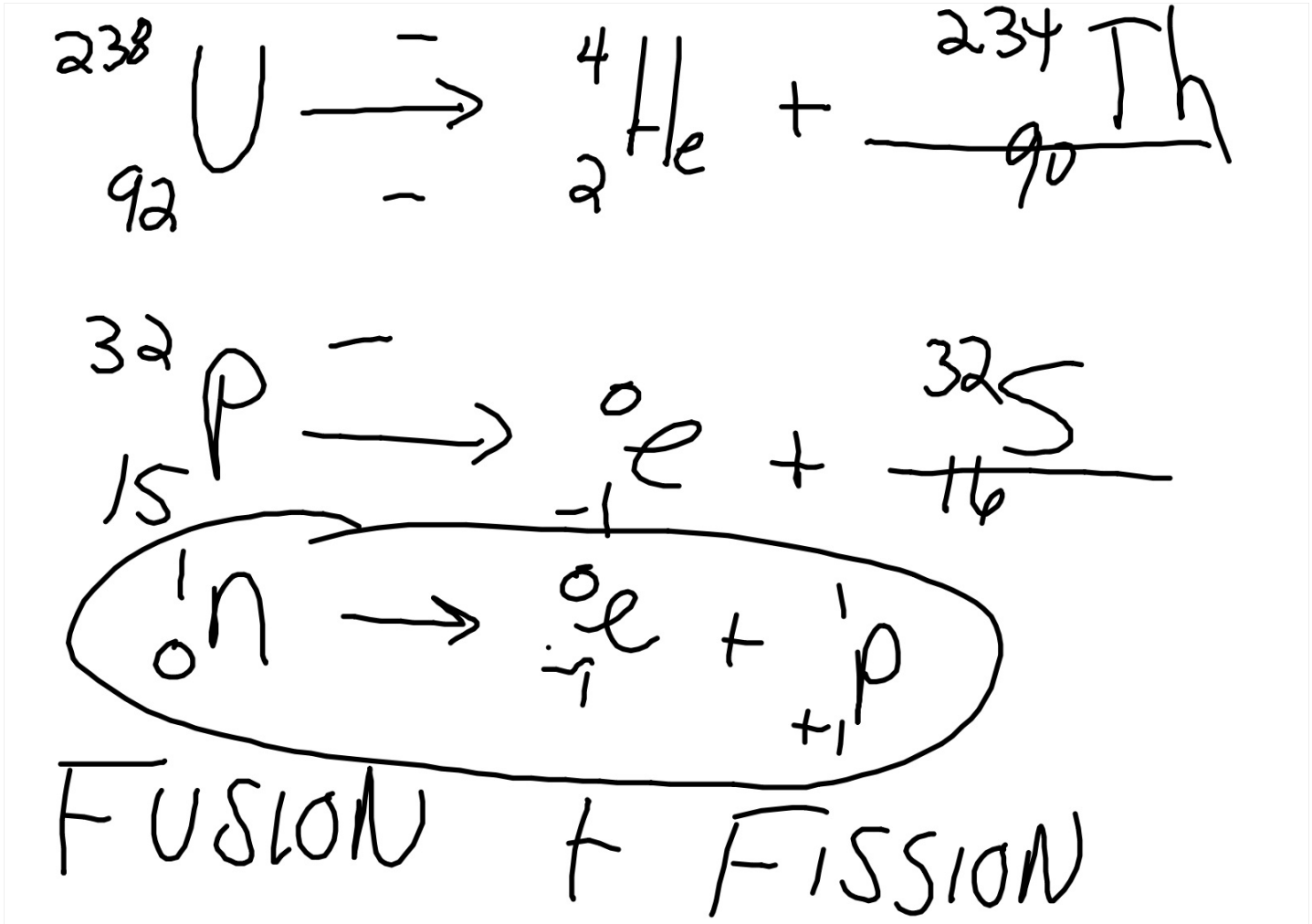
beta β

gamma γ

radioactivity

nuclide

radionuclide


238 92 U → 4 2 He + 234 90 Th
32 15 P → 0 -1 e + 32 16 S
1 0 n → 0 -1 e + 1 +1 p
FUSION + FISSION

Cu-63 62.9296 u 69.17%

Cu-65 64.9278 u 30.83%

$^{63}_{30}Cu$

$^{65}_{30}Cu$

at mass Cu = (% Cu-63)(mass) + (% Cu-65)(mass)
/ 100

at mass Cu = (69.17%)(62.9296 u) + (30.83%)(64.9278 u)
/ 100

$$\text{at mass Cu} = \frac{4352.84_{u} + 2001.72_{u}}{100}$$

$$= \frac{6354.56\,u}{100}$$

$$= 63.545\,u$$

how many atoms are contained in 13.5 g of Al ? $mol = \frac{g}{at.\ mass}$

$atoms = (mol)(N_A)$ $N_A = 6.022 \times 10^{23}$

$atoms\ Al = (0.5\ mol)\left(6.022 \times 10^{23}\ \frac{atoms}{mol}\right)$

$atoms\ Al = 3.011 \times 10^{23}\ atoms$

$mol\ Al = \frac{g\ Al}{at.\ mass\ Al} = \frac{13.5\ g}{27\ g/mol} = 0.5\ mol$

determine the mass (g) of 1.204×10^{25} atoms of Mo.

$g = (mol)(at.\ mass)$

$1940\ g = (20\ mol)\left(97\ g/mol\right)$

$mol\ Mo = \dfrac{atoms\ Mo}{N_A} = \dfrac{1.204 \times 10^{25}\ atoms}{6.022 \times 10^{23}\ \frac{atoms}{mol}}$

$= 20\ mol$

$$\text{At mass} = \frac{(\%\ \text{isotope 1})(\text{mass 1}) + (\%\ 2)(\text{mass}^2) + \ldots}{100}$$

5. determine the mass of 3.6×10^{24} atoms of Fe (iron)

atoms = (mol)(N_A) $\text{mol} = \frac{g}{\text{at mass}}$

$N_A = 6.022 \times 10^{23}$ atoms/mol

6. how many atoms are found in 56g of N, nitrogen?