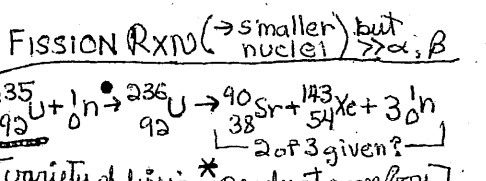
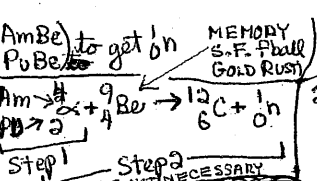
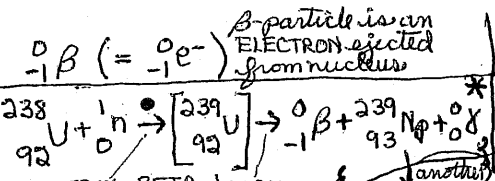
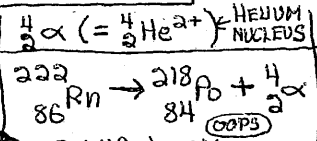


NUCLEAR RADIATION



* β -decay with δ or without δ , both possible, we will tell you

PENETRATION (what SHIELDING needed to stop?)

HEALTH EFFECTS depends on factors:

- AMOUNT of material
- $T_{1/2}$ (short \rightarrow MORE RADIACTION)
- outside or inside BODY
- PENETRATN/SHIELDING which depends on TYPE of radn (α, β, γ, n) (EX: $Q = 20$ for α)

Curie (Ci) (# from SAMPLE)

rem, damage to TISSUE (\equiv of background radn)

- BIO-accumulation EX: I (137 or 131) in THYROID GLAND Sr (mimics Ca) in BONES Cs (mimics Na)
- CHEMICAL toxicity (ignored in 108?)

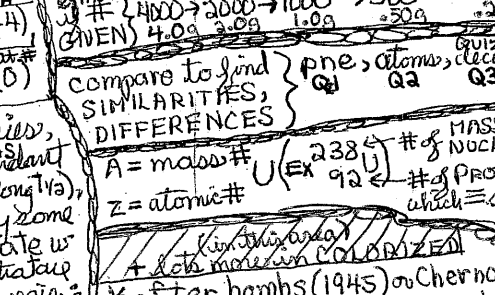
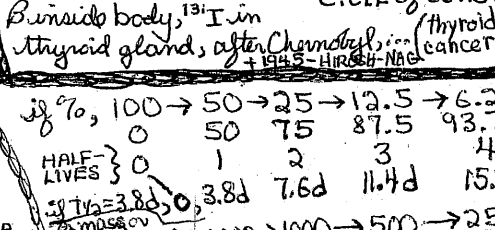
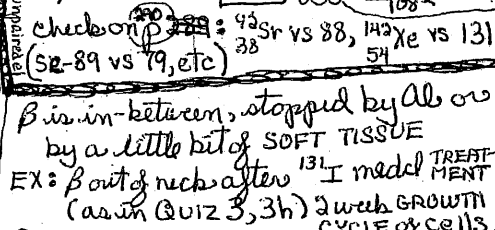
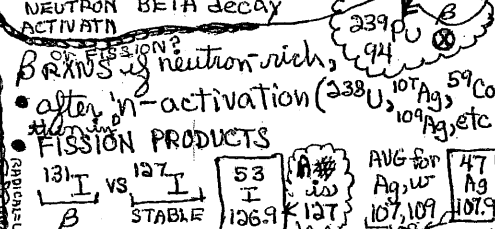
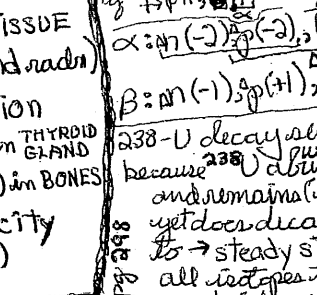
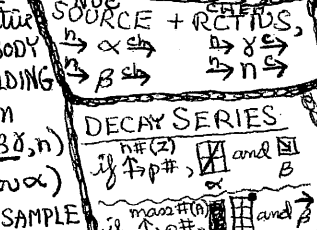
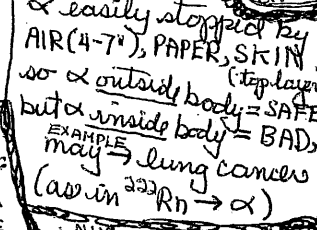
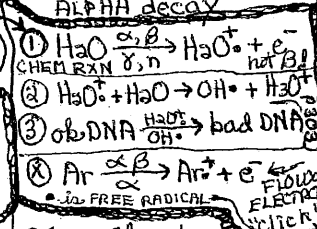
Ci-rate (HIGH)

medium-long $T_{1/2}$ (see 3d in post-Quiz 3 questions), 1-100y, can be physiological dangers, w combo of endurance & activity

2 week growth cycle of cells \rightarrow delay of radn sickness (new cells needed after 14d, but not available due to rad damg)

CANCER - if cells live, but in DNA-damaged form

RADIATION SICKNESS if cells die



lab manual (3-3, 3-4)

neutrons (slow, fast)

thermal, danger, RXNS

γ (\approx x-rays but higher energy) have most penetrn ($> \beta$)

ISOTOPES

same p# (same elmt) (P (1835) or N (1838))

diff n# (and mass#) - almost same

same chemical rxns (almost)

may have diff nuclear rxns

Fine Print (handouts), etc

Lear@UW - Content (L Notes and More)

SECTIONS-PAGE 16

google Chem 108 - Craig

\equiv of background radn, 6-1 pg 303

Fig 1.18, pg 304

Rn is 55% (by Rem, w $Q = 20$) (not by Ci)

quadn ≈ 360 Rem average

Ci rate (radioactivity) = (# of atoms) (RATE per atom)

$\approx 30y$ has endurance (# still high) and fairly high RATE-per-atom.

But IF RATE-per-atom same # of isotope-atom for each, ${}^{131}\text{I}$ ($T_{1/2} = 8d$) will have higher Ci-rate than the isotopes w $\approx 30yr$

δ is EM-radn, and (due to source) is nuclear-radn because it's produced by nuclear rxns

δ has mass $= 0$, e has mass ≈ 0

FIRST 3 BOMBS, 1945 (\rightarrow electricity, Pu)

July 16 (Pu, New Mex), Aug 6 (${}^{235}\text{U}$), Aug 9 (Pu)

* the smaller fission product ranges from 33-46% of original mass, pg 2090

pg 289: chain reaction & critical mass

ISOTOPES

same p# (same elmt) (P (1835) or N (1838))

diff n# (and mass#) - almost same

same chemical rxns (almost)

may have diff nuclear rxns

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pure substance

MIXTURE (He, H₂, O₂ together in a tank)

compare atoms in molecule

He or H₂... (ELEMENT) if only one TYPE of atom

CO₂ or H₂O... (COMPOUND) if 2 or more TYPES of atoms

you cannot say "one atom" because H₂, O₂, ... are diatomic

homog. HETEROG

STUFF

compare molecules

PURE SUBSTANCE

MIXTURE (He, H₂, O₂ together in a tank)

compare atoms in molecule

He or H₂... (ELEMENT) if only one TYPE of atom

CO₂ or H₂O... (COMPOUND) if 2 or more TYPES of atoms

you cannot say "one atom" because H₂, O₂, ... are diatomic

$T_{1/2}$: remaining, decayed; %; fraction, mass, #; radioactivity; time; # of half-lives

UNIT	FOCUS	What is measured? "how much"?
Curie, Ci	sample	disintegrations per second } depends on $T_{1/2}$ and sample size
rad	tissue	energy absorbed by tissue
rem	tissue	biological damage (\equiv rads $\times Q$) } $Q = 20$ for α , $Q = 1$ for β, γ