

α alpha ${}^4_2\text{He}^{+2}$

β^- beta(-) ${}^0_{-1}e$

β^+ beta(+) ${}^0_{+1}e$

γ gamma
ray γ

Final for CHM 103 is Tuesday 10:45 to 1:15

${}^4_2\text{He}^{+2}$ slowest

heavy
clothing

${}^0_{-1}e$

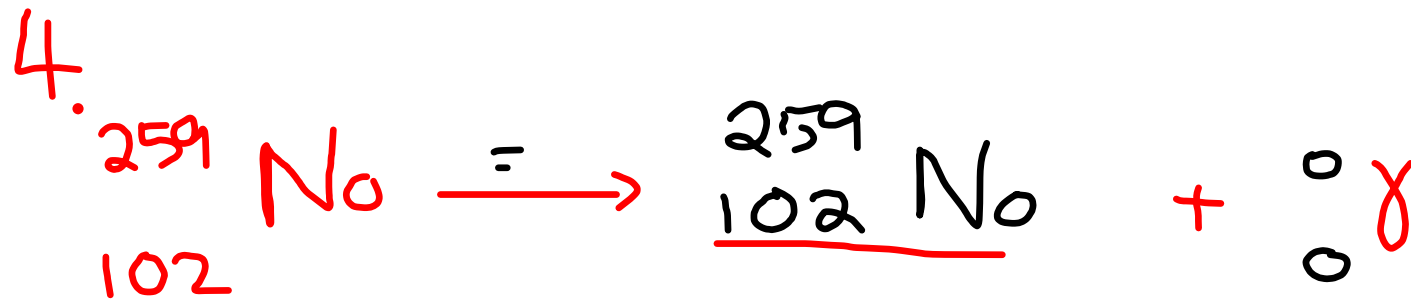
${}^0_{+1}e$

heavy
plastic

${}^0_0\gamma$

fastest

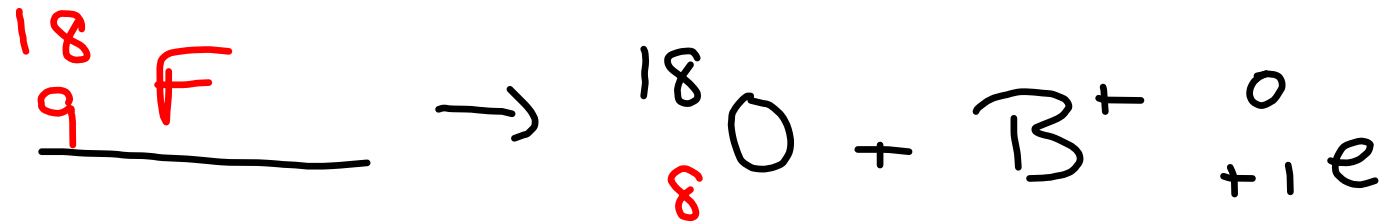
lead



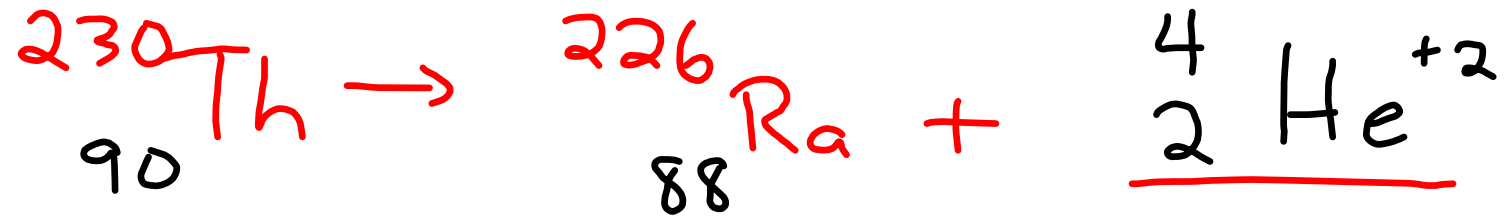
2.



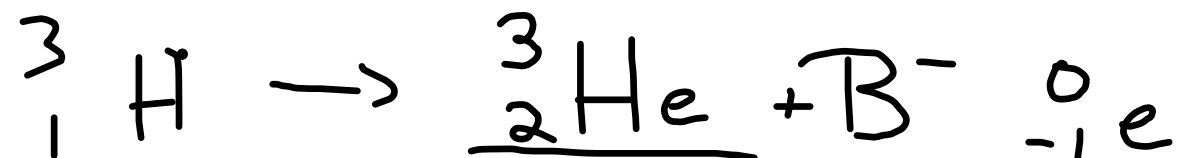
7.



10



1.



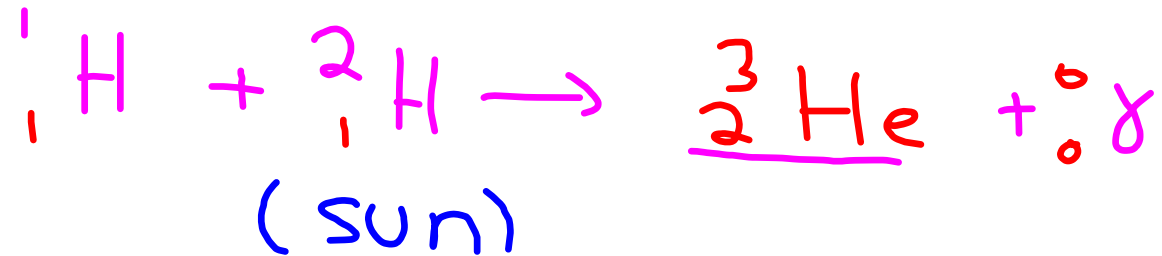
Natural Decay

Radioactivity

Transmutation

only one reactant

20



Artificial Decay

more than one reactant

$$\frac{\text{total time}}{\text{half-life time}} = \text{\# of half lives}$$

half-life - the time it
takes for half the
substance to decay

24. 1.36g ⁵⁹Fe 0.5 yrs
 ?g left 45.6 d

$$\frac{0.5 \text{ yrs} \times 365 \text{ d}}{1 \text{ yr}} = 182.5 \text{ d}$$

$$\frac{\text{total time}}{\text{half-life time}} = \# \text{ of half-lives}$$

$$\frac{182.5 \text{ d}}{45.6 \text{ d}} = 4$$

$$1.36 \text{ g} \xrightarrow{1} .68 \xrightarrow{2} .34 \xrightarrow{3}$$

$$.17 \xrightarrow{4} .085 \text{ g}$$

$$.0850 \text{ g}$$

$$8.50 \times 10^{-2} \text{ g}$$

25. ^{238}U 12435 mCi
 ? old 194 mCi

$$\frac{x}{4.5 \times 10^9 \text{ yrs}} = 6$$

original

$$12435 \xrightarrow{1} 6217.5 \xrightarrow{2} 3108.75 \xrightarrow{3} 1554.37 \xrightarrow{4} 777.1875 \xrightarrow{5} 388.59 \xrightarrow{6} 194$$

left

$$x = 2.7 \times 10^{10} \text{ yrs}$$

28. ^{238}U ? old

$$t_{1/2} = 4.5 \times 10^9 \text{ yr} \quad \text{left } 1/16$$

$$\frac{x}{4.5 \times 10^9 \text{ yr}} = 4$$

$$1 \xrightarrow{1} \frac{1}{2} \xrightarrow{2} \frac{1}{4} \xrightarrow{3} \frac{1}{8} \xrightarrow{4} \frac{1}{16}$$

$$x = 1.8 \times 10^{10} \text{ yrs}$$

30. 3000 mg ^{10}Be
12.5 million yrs ? mg left
 $t_{1/2} = 2.5 \times 10^6$ yrs

1,000,000

→ 12,500,000 yrs
 1.25×10^7 yrs

$$\frac{1.25 \times 10^7 \text{ yrs}}{2.5 \times 10^6 \text{ yrs}} = 5$$

3000 $\xrightarrow{1}$ 1500 $\xrightarrow{2}$ 750 $\xrightarrow{3}$
375 $\xrightarrow{4}$ 187.5 $\xrightarrow{5}$ 93.75 mg

22. $\overset{.42g}{4.2 \times 10^{-1}g}$ ^{14}C $\overset{.0066g}{6.6 \times 10^{-3}g}$

? old $t_{1/2} = 5730 \text{ yrs}$

$$\frac{x}{5730 \text{ yrs}} = 6$$

$.42 \rightarrow .21 \rightarrow$

$x = 34380 \text{ yrs}$

$$q = m C \Delta T$$

water or metal
change in
temp

$$q = m H_f$$

0°C

$$q = m H_v$$

100°C

} water

