

Today

- Review of Decay Activity Sheet
- Half-life (using rock-paper-scissors)
- Half-life examples
- Half-life practice questions

	Isotope	Symbol	# of Neutron	# of Proton	Type of Decays Available	Isotope After Decay	New Isotope Symbol	# of Neutron	# of Proton	New Particle?
1	Hydrogen - 3									
2	Carbon - 14									
3	Chlorine - 36									
4	Chromium - 49									

Half life

Half life is the **amount of time** that it takes for a **decreasing quantity** to reach **half of its initial amount**.

We use this symbol: $t_{1/2}$

Example: Caffeine - has a half life in the blood of about 5 h

$$t_{1/2} = 5 \text{ h}$$

Red Bull has 84mg of caffeine

After 1 half life (5h) there is

$$\frac{84 \text{ mg}}{2} = 42 \text{ mg left in the blood.}$$

After 2 half-lives (10h) there is

$$\frac{42 \text{ mg}}{2} = 21 \text{ mg is left}$$

After 15h ($3 \times t_{1/2}$)

$$\frac{21 \text{ mg}}{2} = 10.5 \text{ mg is left}$$

Why do we care?

All of the decays we talked about have half-lives!!

These radioactive isotopes can be used in medical applications, energy generation, household devices and many other practical applications!

Sample Activity - Rock Paper Scissors Tournament

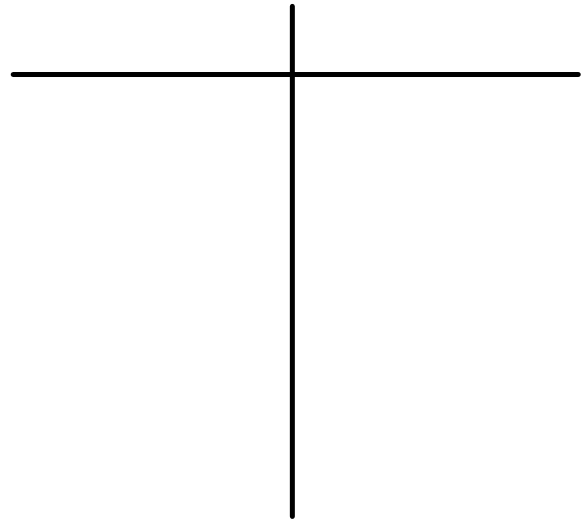
1. Count
2. Find a partner
3. Play RPS until someone wins
4. Loser sits, winner stands
5. Repeat

Round	# people
1	24
2	12
3	6
4	3
5	2
6	1

- What represents a half-life in this example? - Rounds
- What patterns or trends do you notice about the number of people remaining?

Rock Paper Scissors Tournament #2

1. Count
2. Find a partner
3. Play RPS until someone wins
4. Loser sits, winner stands
5. Repeat



How many half-lives did it take to have ___ people remaining?

How many people were remaining after 4 half-lives?

How many half-lives did it take for $\frac{3}{4}$ of the people to lose?

Sample Problem

1000 atoms of hydrogen - 3 are left in a jar. Tritium (hydrogen-3) has a half life of about 12.3 years.

1) How many half lives will it take for there to be 125 atoms of hydrogen-3 remaining?

3

2) How many atoms of hydrogen-3 will remain after 2 half lives?

250

3) How many years will pass until there will be fewer than 35 atoms of hydrogen-3 remaining?

62 years (or 61.5y or a little less than 61.5y)

	Half-lives	# of atoms	time
at the start	☺	1000 ÷ 2	☺
	1	500 ÷ 2	+12.3y 12.3y (or 1 × 12.3y)
	2	250 ÷ 2	+12.3y 24.6y (or 2 × 12.3y)
	3	125 ÷ 2	+12.3y 36.9y (3 × 12.3y)
	4	63 ÷ 2	+12.3y 49.2y (4 × 12.3y)
can't have half an atom.	5	32	<u>61.5y</u> (5 × 12.3y)

Nuclear Decay practice problems - Due Thursday.

