

Chemistry w/E&S Lab Handout 06

"Half Life Modeling"

Your Name: _____ Role: _____

| Lab Partners: | Role: | Role: |
|---------------|-------|-------|
| | | |

Purpose: To model the decay of radioactive nuclei.

| | | |
|------------|--------------|----------------------|
| Materials: | zip-lock bag | 100 plain m&m pieces |
| | cup | tray |

Caution: Don't eat any of these m&ms. They have been handled by many.

Procedure:

- 1) Place all of the m&m pieces in the plastic tray.
- 2) Organize them in 10 groups of 10 with the "m" side up to confirm you have 100 and that you can see the "m".
- 3) Place them all in the paper cup and shake it carefully.
- 4) Spread them out from the cup back into the tray.
- 5) Remove all of the m&m pieces that have the "m" side up. These have gone through decay. Put them back into the zip-lock bag.
- 6) Count those that remain and record in the table below.
- 7) Repeat steps 3-6 until all of the m&m pieces have gone through decay.

| Decay Event | m&m pieces remaining |
|-------------|----------------------|
| 0 | 100 |
| 1 | |
| 2 | |
| 3 | |
| 4 | |
| 5 | |
| 6 | |
| 7 | |
| 8 | |
| 9 | |
| 10 | |
| 11 | |
| 12 | |

- 8) Using Excel make an x-y scatter plot of the data in the table above.

Questions:

1. How good is our assumption that half of our radioactive "nuclei" decay in each half-life? Explain.

2. If you started with a sample of 600 radioactive nuclei, how many would remain undecayed after three half-lives?

3. If 175 undecayed nuclei remained from a sample of 2800 nuclei, how many half-lives have passed?

4. How many half-lives would it take for 6.02×10^{23} nuclei to decay to 6.25% (3.76×10^{22}) of the original number of nuclei?

5. Is there any way to predict when a specific piece of candy will land marked side up or "decayed?" If you could follow the fate of an individual atom in a sample of radioactive material, could you predict when it would decay? Explain.

6. Strontium-90 has a half-life of 28.8 years. If you start with a 10g sample of strontium-90, how much will remain as Strontium-90 after 115.2 years? Justify your answer.
