**Simulating radioactive decay**

**NAME: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_Class :\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

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| Background | Assume that a radioisotope of element X, has a half-life of one year. Complete Table 1.**Table 1: The radioactive decay of X**

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| --- | --- | --- | --- |
| **Number of half-lives** | **Number of radioactive atoms of X****present after half-life decay** | **Number of atoms decayed** | *This is what will happen in theory* |
| 0 | 64 | 0 |
| 1 | 32 | 32 |
| 2 |  |  |
| 3 |  |  |
| 4 |  |  |
| 5 |  |  |
| 6 |  |  |

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| Aim  | To simulate the practical radioactive decay of a radioisotope. |
| **Materials** | 64 squares of paper — plain on one side and an X on the otherBrown paper bag or empty container |
| **Method** | 1. Cut out the 64 squares from the page attached. Each square with an X represents an atom of an unstable radioisotope, X.
2. Place the squares in the brown paper bag or empty container.
3. Record the starting number in Table 2 below.
4. Each time you empty the bag represents one year of time. Shake the bag and empty the ‘atoms’ on the desk. If an atom lands X-up it has radioactively decayed and is now a stable atom. Remove these from the bag.
5. Record the number of atoms remaining in the table.
6. Return the un-decayed atoms to the bag.
7. Repeat steps 4–6 until all atoms of X have decayed.
8. Total up the class results (starting number is the number of groups multiplied by 64)
 |
| **Data collection** | **Table 2:** Decay Simulation results

|  |  |
| --- | --- |
| **Your results** | **Whole Class results** |
| Number of years | Number of radioactive atoms of X | Number of atoms of X decayed | Number of years | Number of radioactive atoms of X | Number of atoms of X decayed |
| 0 | 64 | 0 |  |  |  |
| 1 |  |  |  |  |  |
| 2 |  |  |  |  |  |
| 3 |  |  |  |  |  |
| 4 |  |  |  |  |  |
| 5 |  |  |  |  |  |
| 6 |  |  |  |  |  |

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| **Analysis of results and observations** | Construct two graphs (one for your group and one for the class results) of the change in the number of atoms of X left versus time.

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|  |  Describe the graph. What does it tell you? |
| **Discussion** | Use your graph to determine how many years it would take for half of the 64 atoms to decay.How long does it take for the number of un-decayed atoms to change from 32 to 16?How long does it take for the number of un-decayed atoms to change from 16 to eight?How long does it take for the number of un-decayed atoms to change from eight to four?How do your results compare to ‘Table 1: The radioactive decay of X’?Is your simulation a good model of the radioactive decay of a radioisotope?How could the model be altered to be a better representation of the radioactive decay of an isotope? |
| **Conclusion**1–2 sentences. Must relate to the aim. |  |

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