## Astronomy Ranking Task: Nuclear Physics

## Exercise #3

**Description:** The following table has some information for five pairs of parent-daughter isotopes (labeled A through E) and their radioactive decay data.

| ranking<br>letter | initial<br>mass of<br>parent<br>isotope | mass of<br>parent<br>isotope<br>remaining | current<br>fraction<br>of parent<br>isotope | current<br>fraction of<br>daughter<br>isotope | half-<br>life<br>(days) | elapsed<br>time<br>(days) | number<br>of<br>half-<br>lives |
|-------------------|---|---|---|---|-------------------------|---------------------------|--------------------------------|
| Α                 | 40 g                                    |   |   | 75%   |                         | 4                         |                                |
| В                 | 100 g                                   | 12.5 g                                    |   |   | 5                       |                           |                                |
| С                 |   | 125 g                                     | 12.5%                                       |   |                         | 24                        |                                |
| D                 | 20 g                                    |   | 50%   |   | 12                      |                           |                                |
| E                 |   | 50 g                                      |   | 0%  | 4                       |                           |                                |

**A. Ranking instructions:** Rank the initial masses of parent isotope.

Ranking Order: Least 1\_\_\_\_\_ 2 \_\_\_\_ 3 \_\_\_\_ 4 \_\_\_\_ 5 \_\_\_\_ Most

**Carefully explain** your reasoning for ranking this way:

**B. Ranking instructions:** Rank the masses of parent isotope remaining.

Ranking Order: Least 1\_\_\_\_\_ 2\_\_\_\_ 3\_\_\_\_ 4\_\_\_\_ 5\_\_\_\_ Most

Carefully explain your reasoning for ranking this way:

| C. Ranking instruction       | <b>าร:</b> Ran | k the cur    | rent fract           | ions of pa             | arent isot  | ope.                             |
|------------------------------|----------------|--------------|----------------------|------------------------|-------------|----------------------------------|
| Ranking Order: Least         | 1              | 2            | 3                    | 4                      | 5           | Most                             |
| <b>Carefully explain</b> you | r reaso        | ning for r   | anking th            | is way:                |             |                                  |
|                              |                |              |                      |                        |             |                                  |
|                              |                |              |                      |                        |             |                                  |
|                              |                |              |                      |                        |             |                                  |
|                              |                |              |                      |                        |             |                                  |
| D. Ranking instruction       | <b>ns:</b> Rar | nk the cur   | rent fract           | ions of d              | aughter is  | sotope.                          |
| Ranking Order: Least         | 1              | 2            | 3                    | 4                      | 5           | Most                             |
| <b>Carefully explain</b> you | r reaso        | ning for r   | anking th            | is way:                |             |                                  |
|                              |                |              |                      |                        |             |                                  |
|                              |                |              |                      |                        |             |                                  |
|                              |                |              |                      |                        |             |                                  |
|                              |                |              |                      |                        |             |                                  |
| E Bonking instruction        | ac. Dan        | k the cur    | ront mass            | oc of day              | abtor ico   | tono                             |
| E. Ranking instruction       | IS: Rafi       | k the cur    | rent mass            |                        | igniter iso | tope.                            |
| Ranking Order: Least         | 1              | 2            | 3                    | 4                      | 5           | Most                             |
| Or, there is not enoug       | sh infor       | rmation to   | o determi            | ine this.              | (in         | dicate with a check mark)        |
| Carefully explain you        | r reaso        | ning for r   | anking th            | is way:                |             |                                  |
|                              |                |              |                      |                        |             |                                  |
|                              |                |              |                      |                        |             |                                  |
|                              |                |              |                      |                        |             |                                  |
|                              |                |              |                      |                        |             |                                  |
|                              | _              |              |                      | 10.110                 | C . I       |                                  |
| F. Ranking instructior       | is: Ran        | k the leng   | gths of a r          | nalt-life o            | f the pare  | ent-daughter pairs.              |
| Ranking Order: Longe         | st 1_          | 2            | 3                    | 4                      | 5           | Shortest                         |
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Carefully explain your reasoning for ranking this way:

| <b>i. Ranking instructions:</b> Rank the ages of the parent-daughter pairs.                              |
|--|
| anking Order: Oldest 1 2 3 4 5 Youngest  |
| or, each parent-daughter pair is the same age (indicate with a check mark)                               |
| or, there is not enough information to determine this (indicate with a check mark)                       |
| Carefully explain your reasoning for ranking this way:   |
|  |
|  |
|  |
|  |
| I. Ranking instructions: Rank the number of half-lives the parent-daughter pairs have experienced.       |
| anking Order: Least 1 2 3 4 5 Most   |
| Or, each parent-daughter pair has experienced the same number of half-lives (indicate vith a check mark) |
| Or, there is not enough information to determine this (indicate with a check mark)                       |
| carefully explain your reasoning for ranking this way:   |
|  |
|  |
|  |
|  |