

## Nuclear Chemistry Worksheet

1. A bag of un-popped popcorn contains 335 kernels. After 2 minutes in the microwave, 48 kernels remain un-popped. What is the half-life of popcorn in seconds?

2. What does it mean if something is radioactive? What causes something to be radioactive?

3. How do nuclear power-plants produce energy? What is radiation and where does it come from?

4. Supply a complete symbol, with superscript and subscript, for each of the following.

a) alpha particle

b) beta particle

c) positron

d) gamma ray

5. Write a balanced nuclear equation for each of these changes.

(a) Alpha emission from Pu-242.

(b) Beta emission from Mg-28.

(c) Positron emission from Si-26.

(d) Electron capture by Ar-37.

6. Below are the products of decay reactions. Determine the species that decayed.

(a) Fm-257 by alpha emission.

(b) Bi-211 by beta emission.

(c) Nd-141 by positron emission.

(d) Ta-179 by electron capture.

7. Palladium -114 has a half-life of 2.4 minutes. What percentage of palladium-114 atoms will remain after the following periods of time?

a) 4.8 minutes

b) 4 half-lives

c) 6 minutes

8. A certain substance has a half-life of 38 years.

If 25 grams are present initially, how much remains after 7 years? How much decayed?

9. If you have 20 g of  $^{234}\text{Pa}$  ( $t_{1/2} = 7$  hours) how long do you have to wait until you have only 5 g left?

10. Once the C-14 activity in a fossil has dropped below 99.8% of its original value, it can no longer be accurately measured. What is the age of the oldest fossil we could accurately date using carbon dating? The half-life of carbon-14 is 5730 years.