

## Nuclear (Homework)

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Chemistry\_Questions\_0122

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1.

Bromine consists of two major isotopes with the following percent abundances and atomic masses:  $^{79}\text{Br}$  (50.54% and 78.918 amu) and  $^{81}\text{Br}$  (49.46% and 80.916 amu). Calculate the average atomic mass of bromine.

2.

What is the purpose of control rods in a nuclear reactor?

3.

Nuclear power plants produce energy through which process?

4.

A sheet of aluminum foil will stop which of the following types of radiation? (Select all that apply.)

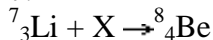
5.

25 g of a radioactive substance is left after 16 days of decay. What is the half life of the substance if the original sample had a mass of 100 g?

6.

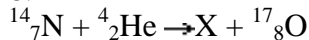
Which particles can be used to bombard the nuclei of certain atoms to start a nuclear fission reaction?

7.



Identify X when the equation above is correctly balanced.

8.



Identify X when the equation above is correctly balanced.

9.



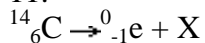
Identify X when the equation above is correctly balanced.

10.



Identify X when the equation above is correctly balanced.

11.



Identify X when the equation above is correctly balanced.

12.

Which particle is identical to a  $\beta^-$  (beta) particle?

13.

Gamma ( $\gamma$ ) radiation is a very short wavelength form of what?

14.

What is the role of the control rods in a nuclear reactor? (Select all that apply.)

15.

An amount of a radioactive isotope is allowed to decay. It has a half-life of 10 years. If the sample is allowed to decay for 60 years, what fraction of the isotope will remain? Enter your answer in fraction form, for example 1/3.

16.

A piece of paper will stop which of the following types of radiation? (Select all that apply.)

17.

10 g of a radioactive substance is left after 75 days of decay. What is the half life of the substance if the original sample had a mass of 80 g?

18.

${}^{28}\text{Mg}$  is a radioactive isotope with a half-life of 21.0 hours. If a 56.0 g sample is allowed to decay for 84.0 hours, how many grams will be left?

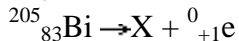
19.

${}^{222}\text{Fr}$  is a radioactive isotope with a half-life of 15.0 min. If 47.0 g sample is allowed to decay for 45.0 min, how many grams will be left?

20.

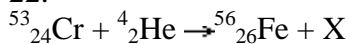
${}^{131}\text{I}$  is a radioactive element isotope used in medicine. It undergoes beta decay with a half-life of 8.00 days. If a 60.0 g sample is allowed to decay, how long will it take for the sample to decay to 15.0 g?

21.



Identify X when the equation above is correctly balanced.

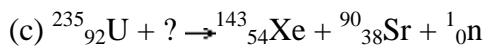
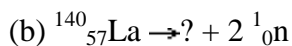
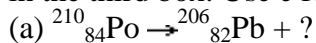
22.



Identify X when the equation above is correctly balanced.

23.

Complete each of the following nuclear equations by supplying the missing particle. (Enter the mass number in the first raised box, the atomic number in the second lower box, and the element's symbol in the third box. Use e for an electron and n for a neutron.)



24.

The following isotopes (listed with their half-lives) have been used in the medical and biological sciences. Arrange these isotopes in order of their relative decay activities.

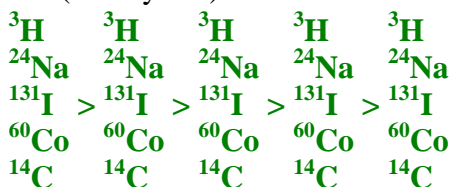
${}^3\text{H}$  (12.2 years)

${}^{24}\text{Na}$  (15 years)

${}^{131}\text{I}$  (8 days)

${}^{60}\text{Co}$  (5.3 years)

${}^{14}\text{C}$  (5730 years)



25.

Silicon-31 has a half-life of approximately 2.5 hours. If we begin with a sample containing 1000 mg of Si-31, what is the approximate amount remaining after 14 hours?

26.

The element krypton has several radioactive isotopes. Below are listed several of these isotopes along with their half-lives.

Isotope	Half-life
Kr-73	27 s
Kr-74	11.5 min
Kr-76	14.8 h
Kr-81	$2.1 \times 10^9$ yr

Which of the isotopes is most stable?

Which of the isotopes is "hottest"?

If we were to begin with a half-life experiment with separate 188  $\mu\text{g}$  samples of each isotope, approximately how much of each isotope would remain after 2 minutes?

Kr-73

Kr-74

Kr-76

Kr-81

27.

Technetium-99 has been used as a radiographic agent in bone scans ( $^{99}_{43}\text{Tc}$  is absorbed by bones). If  $^{99}_{43}\text{Tc}$  has a half-life of 6.0 hours, what fraction of an administered dose of 175  $\mu\text{g}$  of  $^{99}_{43}\text{Tc}$  remains in a patient's body after 2.5 days?