AP Physics Day 1

Slide 1

Nuclear Decay and Reactions

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**Half**

**-**

**Life**

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The time required for half of the

atoms in any given quantity of a

radioactive isotope to decay is

the

**half**

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**life**

of that

element

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If

you know the original amount

of a radioactive substance and

its half

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life, you can calculate the

amount remaining after a given

number of half

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lives

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**Half**

**-**

**Life**





Slide 2

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| **Half-Life*** Each particular isotope has its own half-life.
* Half-lives of radioactive isotopes are used to date objects.
* The decay rate, or number of decays per second, of a radioactive substance is called its **activity.**
* Activity is proportional to the number of radioactive atoms present. Therefore, the activity of a particular sample is also reduced by one-half in one half-life.
* The activity of a sample is also related to its half-life. The shorter the half-life, the higher the activity.
* The SI unit for decays per second is a Becquerel (Bq).

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**Activity: Solve the following half-life problems.**

1. Fluorine-21 has a half life of approximately 5 seconds. What fraction of the original nuclei would remain after 1 minute?

1. Iodine-131 has a half life of 8 days. What fraction of the original sample would remain at the end of 32 days?

1. The half-life of chromium-51 is 28 days. If the sample contained 510 grams, how much chromium would remain after 56 days? How much would remain after 1 year? How much was present 168 days ago?

1. If 20.0 g of a radioactive isotope are present at 1:00 PM and 5.0 g remain at 2:00 PM, what is the half life of the isotope?

1. The half life of Uranium-238 is 4.5 billion years and the age of earth is 4.5 X 109 years. What fraction of Uranium-238 that was present when Earth was formed still remains?

1. Chromium-48 decays. After 6 half-lives, what fraction of the original nuclei would remain?

1. The half life of iodine-125 is 60 days. What fraction of iodine-125 nuclides would be left after 360 days?

1. Titanium-51 decays with a half life of 6 minutes. What fraction of titanium would remain after one hour?

1. A medical institution requests 1 g of bismuth-214, which has a half life of 20 min. How many grams of bismuth-214 must be prepared if the shipping time is 2 h?

1. The half life of radium 226 is 1602 years. If you have 500 grams of radium today how many grams would have been present 9612 years ago?