

Worksheet 3.1

Big Bang & Nuclear

1. Explain what has happened to the **number of elements** in the universe over time (beginning with the big bang, up to the present day).

Now based on your explanation, draw a graph that illustrates the **number of elements** in the universe as a function of time (beginning with the big bang, up to the present day).

2. Explain what has happened to the **number of atoms** in the universe over time (beginning with the big bang, up to the present day).

Now based on your explanation, generate a graph that estimates the **number of atoms** in the universe as a function of time (beginning with the big bang, up to the present day).

3. Draw a graph showing how the potential energy changes when two protons approach each other and fuse to form deuterium.

In two parts!

- a. Explain how the PE changes in terms of forces where the **electromagnetic force is in operation** (about 10^{-14} to 10^{-13} m).

Draw just the part of the graph where the **electromagnetic force is in operation** (about 10^{-14} to 10^{-13} m). Put PE on the Y axis and distance on the X axis.

- b. Explain how the PE changes in terms of forces when the **strong nuclear force comes into operation** (smaller than 10^{-14} m).

Now just draw the part of the graph showing what happens when the **strong nuclear force comes into operation** (smaller than 10^{-14} m).

4a. Give the symbol for an isotope of carbon that has 7 neutrons.

b. What isotope/atom has 5 valence electrons and 7 neutrons?

c. How many protons and neutrons does U-235 have?