The Atomic Nature of Matter

Ordinary matter (as opposed to dark matter) is mostly composed of atoms. Atoms are discrete entities. A discrete system is composed of distinct individual parts. A discrete system is separable into pieces. The opposite of discrete is continuous. A continuous system forms an unbroken whole without interruption. One region blends seamlessly into another.

Atoms can only be found in a limited number of basic types called elements (short for chemical elements). There are 90 naturally occurring elements found on earth. An additional 28 elements have been produced artificially in laboratories on earth. A few elements that exist on earth only in the laboratory have been detected in stars other than the sun.

These discrete entities can be stable or unstable. Unstable atoms have a finite existence. There is a statistical probability that an unstable atom will decay into an atom of a different element. Stable atoms are eternal. The stable atoms of everyday existence are several billion years old. Nearly all of the hydrogen and helium in the universe was created in the first three minutes of the universe's existence (13.8 billion years ago). Nearly all of the elements heavier than helium found on the Earth were created many millions of years before the solar system formed (4.5 billion years ago).Stable atoms can be used over and over again (recycled) in different combinations and will never "wear out".

Atoms are effectively "invisible". They are on the order of 10^{-10} m in size. Light waves are on the order of 10^{-6} m in size. Since light is 10,000 times larger than atoms, atoms are too small to be "seen" with light (No optical device can ever be used to image atoms.) Atoms can be inferred to exist through the chemical laws of definite and multiple proportions, and the physical laws of statistical thermodynamics. Besides, they can be imaged through: x-ray diffraction, scanning tunneling electron microscopy, atomic force microscopy. The combination of these entities can form: ionic solids, network solids, metallic solids, and molecules.

Answer the following questions:

1-What is discussed in the text above?

2-What is the difference between the discrete system and the continuous one?

3- How many different kinds of elements (atoms) exist on earth?

4- How many man made atoms are there?

5- Give an example of an unstable isotope of an atom.

6- How many atoms are in each of the following molecules: H_2O, CH_4, $C_6H_{12}O_6$?

7- a-Find in the text words that are close in meaning to:

Finite =……. unseen =…….

b-Find in the text words that are opposite in meaning to:

Discrete=/=……. naturally =/=…….

8- Say true or false:

a- The sun is a planet.
b- Dark matter is composed of atoms.
c- Stable atoms can be recycled.
d- Atoms are effectively unseen.

9- What is dark matter?

10- What is the difference between dark matter and ordinary matter?