

## **NOTES: The Formation of the Universe**

1. Cosmology- The study of the origin, structure, and development of the universe.

### **UNIVERSAL EXPANSION**

1. Scientists study the movement of galaxies.
2. Measurements are showing that the galaxies are moving apart.

### **RAISIN-BREAD MODEL**

1. Imagine a loaf of raisin bread before it is baked.
2. Inside the dough each raisin is a certain distance from every other raisin.
3. As the dough gets warm it rises.
4. It expands and all of the raisins begin to move apart.
5. No matter which raisin you observe all of the other raisins are moving farther away from it.
6. The universe like the rising bread dough, is expanding.
7. Think of the raisins as the galaxies moving farther apart.

### **THE BIG BANG THEORY**

1. The theory that the universe began with a tremendous explosion..
2. The theory states that 13.7 billion years ago the contents of the universe was compressed and under extreme pressure, temperature, and density in a very tiny spot.
3. Then the universe rapidly expanded and matter began to come together and form galaxies.

### **COSMIC BACKGROUND RADIATION**

1. Scientists using a huge antenna accidentally found radiation coming from all directions in space..
2. An explanation for this is that it is COSMIC BACKGROUND RADIATION left over from the big bang.
3. To understand this concept think about a kitchen oven. when the oven door is left on after being used thermal energy is transfer-ed throughout the kitchen and he oven cools.
4. Eventually the room and the oven are the same temperature.
5. According to the big bang theory , the thermal energy from the original explosion was distributed in every direction as the universe expanded.
6. This cosmic background radiation now fills all of space.

## **STRUCTURE OF THE UNIVERSE**

1. The universe has a structure that is loosely repeated over and over again.
2. A cosmic repetition - Every object in the universe is part of a larger system.  
For example...

## **HOW OLD IS THE UNIVERSE**

1. One way that scientists can calculate the age of the Universe is to measure the distance from Earth to various galaxies.
2. By doing this scientists can estimate the age of the universe and predict its range of expansion.
3. Another way they can estimate the age of the universe is to calculate the ages of old nearby stars. Because the universe must be at least as old as the oldest stars that it contains.

## **A FOREVER EXPANDING UNIVERSE**

1. What will happen to the universe as it gets older?  
A: As the galaxies move farther apart, they get older and stop forming stars.. The farther galaxies move apart from each other, the less visible to us they will become.
2. The expansion of the universe depends on how much matter it contains.
3. Scientists predict that if there is enough matter then gravity will eventually stop the expansion of the universe.
4. If the universe stops expanding it could collapse back into its original state.
5. This would be a reversal of the big bang process.
6. As of now scientists believe that there may not be enough matter in the universe so the universe will continue to expand forever.
7. So because of this it is believed that stars will age and die, and the universe will probably become cold and dark after many billions of years.
8. Even after the universe becomes cold and dark it will continue to expand forever.