



Drexel-SDP GK-12 LESSON

Lesson: History of the Planets in Our Solar System

Subject Area(s) Earth and Space

Associated Unit Astronomy, module 2

Lesson Title Lesson: History of the Planets in Our Solar System

Grade Level 6 (3-7)

Lesson # 3 of 4

Lesson Dependency None.

Time Required 30 minutes

Heading

Summary

In this lesson we'll travel through 4.5 billion years of history and learn how our solar system was born. We'll then discuss planetary motion and some properties of the planets, ending with a math exercise for the students to use the factor label method to calculate their age and weight on several other planets.

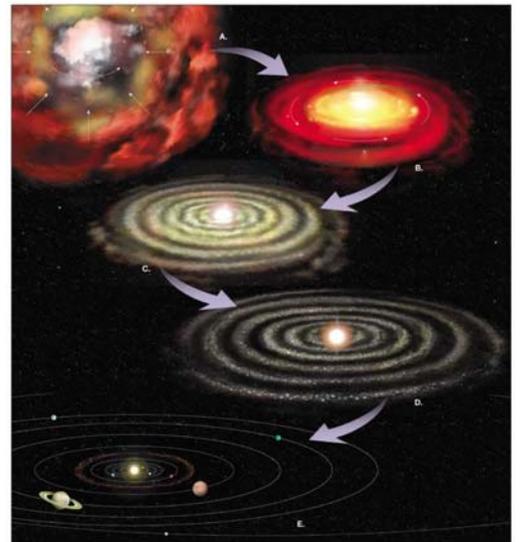


Image 1

ADA Description: Picture shows the formation of the solar system in 3 phases

Caption: Formation of the solar system in 3 phases

Image file name: solar_system_formation.jpg

Source/Rights: Copyright ©<http://www.zebu.uoregon.edu>

Engineering Connection

Engineers often rely upon the theories scientists develop in order to better understand the systems within which they work. For example, scientists propose that the oldest layers of the Earth are found deep underneath the surface, so engineers who design equipment to help these scientists must incorporate drills to bore down beneath the outer layers. In this lesson, we will learn about one of the prevailing theories about the development of our solar system.

Keywords

Astronomy, big bang, factor label, solar nebula

Educational Standards (PA)

- Science: Physical Science, Chemistry and Physics – Astronomy 3.4.D
- Math: Computation and Estimation 2.2

Pre-Requisite Knowledge

Be familiar with the concept of the big bang and the origins of our solar system

Learning Objectives

After this lesson, students should be able to:

- **Express the sequence of events that led to the formation of our solar system**
- **Describe gravity is related to mass**
- **Explain how a year is measured on a planet**

Introduction / Motivation

Have you ever wondered where the planets in our solar system came from? Have they always ‘been here’ or were there events that led to their formation? Scientists have formulated some theories about the beginnings of our universe, the most widely accepted of which is the ‘big bang’ theory, in which a massive explosion contributed to the beginnings of the universe as we know it. Scientists and engineers rely on theories to help explain observable phenomena in the natural world, such as how birds developed their ability to fly, how light can act as both a wave and a particle, in order to develop tools that either study the phenomena or take advantage of it for some practical purpose. In this lesson, we will learn about some of the observable phenomena that support the big bang theory.

(This activity is intended to help students practice their basic arithmetic skills, as well as to learn the factor label method of canceling units. The background for the exercise is material on the formation of the solar system, taken directly from their 6th grade astronomy textbook.)

Lesson Background & Concepts for Teachers

Step 1: Present the background material from the students' 6th grade astronomy book.

Below is a logical way to organize the presentation of the material such that the teacher starts with the “big bang” and the resulting solar nebula, then proceeds through the formation of the sun and the planets, and finishes by describing the gravitational forces exerted by each planet that directly correlates to their masses. This lesson segues nicely into the worksheet asking students to calculate their weight on another planet.

- a) How the solar system formed
 - a. What is a solar nebula? (point out the word “nebulous” that is similar)
 - b. Gravitational forces
 - c. Outward pressure from solar fusion – balanced by inward pressure from gravity
 - d. Equilibrium keeping the solar system in orbital balance
- b) How the sun formed
 - a. Process of nuclear fusion -- less dense Hydrogen becomes more dense Helium, $e = mc^2$ and because c is very large, small amounts of matter can produce huge amounts of energy
 - b. Temperatures in space – ‘feeling’ warm by absorption of radiation
- c) How the planets formed
 - a. Inner planets – warmer, gases released, rocky terrain
 - b. Outer planets – cooler, gases retained, ‘gas giants’
- d) Planetary properties
 - a. How gravitational force is related to mass
 - b. How a year is measured by the time to revolve around the sun

Step 2: Show an example of the factor label method to compute a student’s weight on another planet. (Remind them of the difference between mass and weight).

Step 3: Distribute lesson activity worksheets asking students to compute their age and weight on other planets.

Vocabulary / Definitions

Word	Definition
Solar nebula	The cloud of gas and dust left over after the formation of the Sun which eventually formed the moons and planets
Gravity (Gravitational force)	A phenomenon through which all objects attract each other. The more mass an object has, the greater its gravitational force.
Solar fusion	A nuclear reaction in which particles combine and produce

	a simultaneous release of energy
Radiation	Energy that is transmitted in the form of rays
Mass	A quantity of matter
Weight	The force exerted by matter as a result of gravity

Associated Activities

Mathematics Activity: Calculate your weight on another planet

Lesson Closure

Follow with the Mathematics Activity: Calculate your weight on another planet

Assessment

Lesson Summary Assessment

Review the lesson in a quick class-wide question and answer session to see if they understood the sequence of events that formed the solar system. Ask them for definitions, in their own words, of the vocabulary.

Contributors

Dara Kusic

Copyright

Copyright 2007 Drexel University GK12 Program. Reproduction permission is granted for non-profit educational use