

Exploding Universe

Disciplinary Core Ideas

ESS1.A The universe and its stars

- Earth and its solar system are part of the Milky Way galaxy, which is one of many galaxies in the universe.
- HS: The Big Bang theory is supported by observations of distant galaxies receding from our own, of the measured composition of stars and non-stellar gases, and of the maps of spectra of the primordial radiation (cosmic microwave background) that still fills the universe.
- HS: Other than the hydrogen and helium formed at the time of the Big Bang, nuclear fusion within stars produces all atomic nuclei lighter than and including iron, and the process releases electromagnetic energy. Heavier elements are produced when certain massive stars achieve a supernova stage and explode.

ESS2.A Earth materials and systems

- MS: All Earth processes are the result of energy flowing and matter cycling within and among the planet's systems. This energy is derived from the sun and Earth's hot interior. The energy that flows and matter that cycles produce chemical and physical changes in Earth's materials and living organisms.
- MS: The planet's systems interact over scales that range from microscopic to global in size, and they operate over fractions of a second to billions of years. These interactions have shaped Earth's history and will determine its future.
- HS: Earth's systems, being dynamic and interacting, cause feedback effects that can increase or decrease the original changes.
- HS: Evidence from deep probes and seismic waves, reconstructions of historical changes in Earth's surface and its magnetic field, and an understanding of physical and chemical processes lead to a model of Earth with a hot but solid inner core, a liquid outer core, a solid mantle and crust. Motions of the mantle and its plates occur primarily through thermal convection, which involves the cycling of matter due to the outward flow of energy from Earth's interior and gravitational movement of denser materials toward the interior.

ESS2.B Plate tectonics and large-scale system interactions

- HS: Plate tectonics is the unifying theory that explains the past and current movements of the rocks at Earth's surface and provides a framework for understanding its geologic history.

ESS3.B Natural Hazards

- MS: Mapping the history of natural hazards in a region, combined with an understanding of related geologic forces can help forecast the locations and likelihoods of future events.

PS1.A Structure of matter

- MS: The fact that matter is composed of atoms and molecules can be used to explain the properties of substances, diversity of materials, states of matter, phase changes, and conservation of matter.
- HS: Each atom has a charged substructure consisting of a nucleus, which is made of protons and neutrons, surrounded by electrons.

PS1.B Chemical reactions

- HS: Chemical processes are understood in terms of collisions of molecules, rearrangement of atoms, and changes in energy as determined by properties of elements involved

PS1.C Nuclear Processes

- HS: Nuclear processes, including fusion, fission, and radioactive decays of unstable nuclei, involve release or absorption of energy. The total number of neutrons plus protons does not change in any nuclear process.

PS3.C: Relationship Between Energy and Forces

- MS: When two objects interact, each one exerts a force on the other that can cause energy to be transferred to or from the object.

Crosscutting Concepts:

Influence of Science, Engineering, and Technology on Society and the Natural World

- Technologies extend the measurement, exploration, modeling, and computational capacity of scientific investigations. (MS-PS4-3)

Resources

NASA is constantly asked many questions everyday and one of the most asked based upon the measuring the size and age of the universe. This link contains two ways that the Universe's age has been estimated by: by looking at the oldest stars and extrapolating back to the Big Bang by varying methods with Hubble.

NASA. (2014, November 19). How do we Measure the Size and the Age of the Universe?
Retrieved September 08, 2017, from
