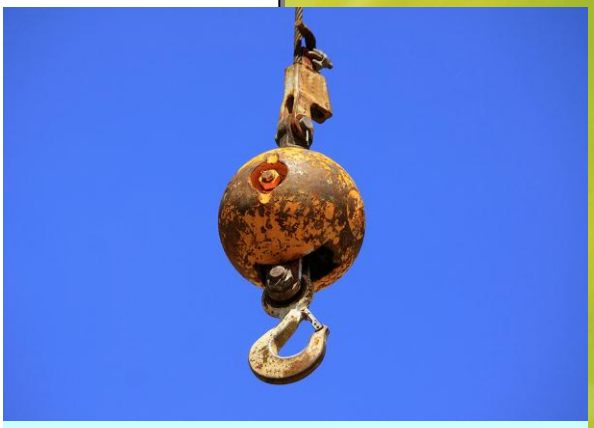
The Universe Has Potential

The universe is full of energy. Energy is the ability to do work, whether that work is a galaxy spinning in space, a blue whale migrating thousands of miles in the ocean, or bacteria digesting food. According to the Law of Energy Conservation, energy is never created nor destroyed. Energy just changes forms. The total amount of energy in the universe is constant. There are two main types of energy: kinetic and potential. Kinetic energy is energy an object has because of its motion. Potential energy is stored energy. Types of potential energy include gravitational, elastic, and chemical.



The higher a wrecking ball is off the ground, the greater its potential energy and the greater destruction it can cause.

Gravitational Potential Energy

One form of potential energy is gravitational potential energy. This is energy stored because of an object's vertical position or height. It takes energy to lift an object against Earth's gravitational pull. When an object is lifted, the energy from moving it vertically is transformed into potential energy. As the object falls back to Earth, the energy is transformed into kinetic energy. A wrecking ball used in construction applies gravitational potential energy to knock down buildings. The higher the wrecking ball is lifted, the more energy it will have to transfer into breaking the structure. The mass of the wrecking ball will also have an effect. A wrecking ball with more mass will be able to do more damage than one with less mass because it will have more potential energy.

Elastic Potential Energy

Elastic potential energy is stored energy from an object that is stretching or compressing. Springs and rubber bands have elastic potential energy. It takes energy to compress a spring or stretch out a rubber band. That energy is then transferred into elastic potential energy until the spring or rubber band is released. Archery bows also utilize elastic potential energy. It takes energy to draw back the bow and pull it tight. When the bow is let go, the energy is released and pushes the arrow forward. The

A compressed spring has elastic potential energy. The spring on the left is compressed more, so it has more potential energy.

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more the bow is stretched, the further and faster the arrow will move because it had more potential energy. The materials used are also a factor. Some materials, like rubber, can stretch better than others. These materials can handle more potential energy before breaking. Other materials are not elastic and will break before elastic potential energy can be stored.

Mechanics check vehicles' batteries to see if there is enough chemical potential energy left to safely run the vehicle.

Chemical Potential Energy

Chemical energy is also a form of potential energy. The bonds between atoms can be very strong. Energy is released as the atoms are broken apart and rearranged. The stronger the bonds within a chemical, the more potential energy it has. Fuels like gasoline have potential energy. The energy is released when the fuels are burned, breaking apart the molecules. Batteries also use chemical potential energy. The chemicals in batteries react and cause a buildup in electrons on one side. Because of the difference in charges, electricity is able to flow through the battery. Once the chemical reaction stops, the battery is no longer usable. Some batteries may be recharged and used again, but even these will eventually lose their chemical potential energy and their ability to work. The chemicals in batteries that cause the reactions can also be toxic, which is why they should not be thrown away with regular trash.

The energy from food powers all of the processes in the human body.

All life uses chemical potential energy. Life needs a source of energy to survive. For humans and many other species, that source is food. The chemicals in food store energy in their bonds. Sugar, for example, is a molecule made of several atoms bonded together. As the human body breaks this molecule down, the energy stored in the bonds is released. The chemical energy stored in food can be determined by looking at the nutrition labels. The more calories a food has, the more potential energy it has. But not all chemical energy from food is created equal. Different food molecules, like fats, proteins, and carbohydrates,

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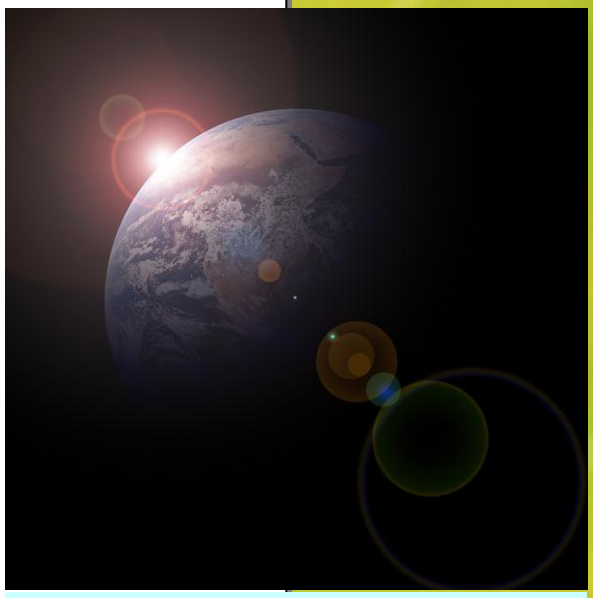
hold different amounts of energy. The more complicated the molecule, the longer it takes the body to break it down. Simple sugars, or simple carbohydrates, are easily broken down. Sugary foods like candy and soda might provide a burst of energy but it quickly wears off. Complex carbohydrates like brown rice and whole grains contain larger and more complicated molecules with more atomic bonds. It takes more energy to break down these bonds, so these foods release more energy. These molecules also release their energy over a longer period of time. Athletes carefully monitor the foods in their diet to make sure they have the best energy sources for their bodies to physically compete. Choosing the wrong foods could leave them tired and far from peak physical performance.



Energy takes many forms, but all of the forms are important to the universe.

Regardless of the form, potential energy is important to how the universe works. Stored energy turning into other forms runs the human body, powers vehicles, moves the planet through space, and powers the Sun. Different forms of potential energy can exist together to power an object. The power, speed, and length of time over which potential energy is released can depend on the size, height, and complexity of atomic bonds. Regardless of the type of energy or how it is being used, the amount of energy in the universe is unchanged. As scientists continue to study energy in all its forms, discoveries can be made as to how to use this energy more efficiently in the human body and the world.