

It is sunlight in modified form which turns all the windmills and water wheels and the machinery which they drive. It is the energy derived from coal and petroleum (fossil sunlight) which propels our steam and gas engines, our locomotives and automobiles. ... Food is simply sunlight in cold storage.

John Harvey Kellogg



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Energy in Everyday Life

Chemical Energy

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Chemical energy plays a crucial role in each and every one of our daily lives.



Through chemical reactions, the breaking and forming of chemical bonds, energy can be extracted and harnessed in a usable fashion.

Many of the chemical compounds used to produce energy involve burning - oxidation reactions.

Gasoline powers most automobiles and trucks, kerosene serves as jet fuel. Natural gas, coal and oil are burned to heat our homes and produce electricity.



**CHEMICAL
ENERGY
STORAGE**

The root source of the energy used for heating, transportation, and industry in most of the world is chemical energy.

Chemical energy is also the basis for the processes of life.

For example, the chemical energy in “food” is converted by organisms into mechanical energy and heat.

Atomic number → 20 * ← Element relatively abundant in the Earth's crust

Environmentally important trace elements → Ca ← Element symbol

↑ Name

1 H Hydrogen 2 He Helium

3 Li Lithium 4 Be Beryllium

11 * 12 * Na Sodium 13 Al Aluminum

19 * 20 * 21 Ca Calcium 22 Ti Titanium 23 V Vanadium 24 Cr Chromium 25 Mn Manganese 26 * 27 Fe Iron 28 Co Cobalt 29 Ni Nickel 30 Cu Copper 31 Zn Zinc 32 Ga Gallium 33 Ge Germanium 34 As Arsenic 35 Se Selenium 36 Br Bromine 37 Rb Rubidium 38 Sr Strontium 39 Y Yttrium 40 Zr Zirconium 41 Nb Niobium 42 Mo Molybdenum 43 Tc Technetium 44 Ru Ruthenium 45 Rh Rhodium 46 Pd Palladium 47 Ag Silver 48 Cd Cadmium 49 In Indium 50 Sn Tin 51 Sb Antimony 52 Te Tellurium 53 I Iodine 55 Cs Cesium 56 Ba Barium 57 La Lanthanum 72 Hf Hafnium 73 Ta Tantalum 74 W Tungsten 75 Re Rhenium 76 Os Osmium 77 Ir Iridium 78 Pt Platinum 79 Au Platinum 80 Hg Mercury 81 Au Gold 82 Tl Thallium 83 Pb Lead 84 Bi Bismuth 85 Po Polonium 86 At Astatine 87 Fr Francium 88 Ra Radium 89 Ac Actinium 58 Ce Cerium 59 Pr Praseodymium 60 Nd Neodymium 61 Pm Promethium 62 Sm Samarium 63 Eu Europium 64 Gd Gadolinium 65 Tb Terbium 66 Dy Dysprosium 67 Ho Holmium 68 Er Erbium 69 Tm Thulium 70 Yb Ytterbium 71 Lu Lutetium

90 Th Thorium 91 Pa Protactinium 92 U Uranium 93 Np Neptunium 94 Pu Plutonium 95 Am Americium 96 Cm Curium 97 Bk Berkelium 98 Cf Curium 99 Es Einsteinium 100 Fm Fermium 101 Md Mendelevium 102 No Nobelium 103 Lw Lawrencium

Legend:

- Green square = Required for all life-forms
- Green diagonal-striped square = Required for some life-forms
- Red 'X' in a square = Moderately toxic: either slightly toxic to all life-forms or highly toxic to a few forms
- Red 'X' in a red square = Highly toxic to all life-forms, even in low concentrations

Chemical reactions involve the making and breaking of chemical bonds.

The chemical energy of a system is the energy released or absorbed due to the making and breaking of these bonds.

**Breaking bonds absorbs energy.
Forming bonds releases energy.**

