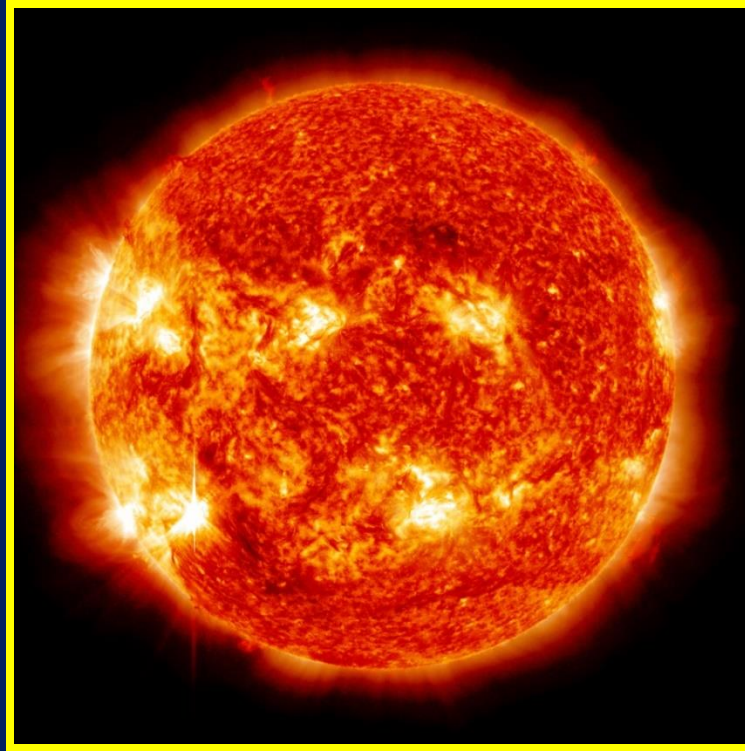


Energy from the Sun



Essential Standard 1.1: Explain Earth's role as a body in space.

Objective 1.1.3: Explain how the Sun produces energy which is transferred to the Earth by radiation.

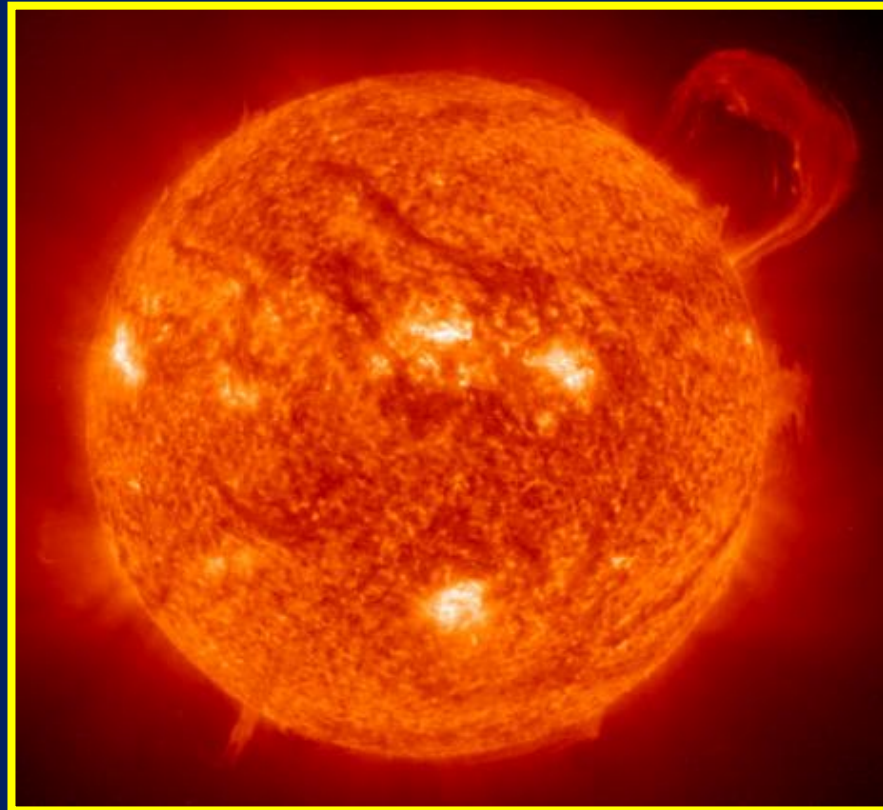
I Can Statements

At the end of this lesson, you should be able to say, with confidence:

- I can explain what happens during fusion reactions in the Sun.
- I can explain the difference between fusion and fission reactions.
- I can explain how Energy from the Sun travels to Earth as radiant energy in the form of electromagnetic waves.
- I can explain how infrared waves are responsible for heating Earth's atmosphere.
- I can explain how plants use light energy to produce chemical energy in the form of food during photosynthesis.

Our Sun - Star

The Sun contains 99.8 % of the total mass of our Solar System is 864,000 miles in diameter and yet is just an ordinary star.



Responsible for Life

Every fraction of a second, our Sun releases more energy than all humans consume within an entire year.



Without the Sun, we would have no light, warmth, or life on Earth.

Plasma

The temperatures at the core of the Sun reach 27 million degrees Fahrenheit.

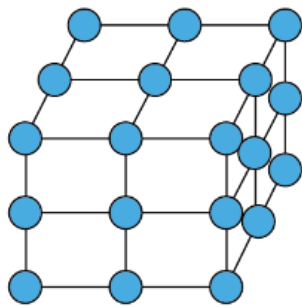


Plasma

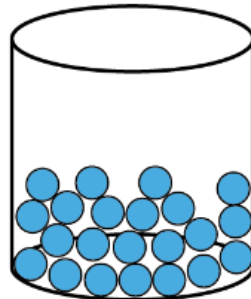
At extremely high temperatures, much of the matter exists as plasma, not as fully formed atoms.

States of Matter

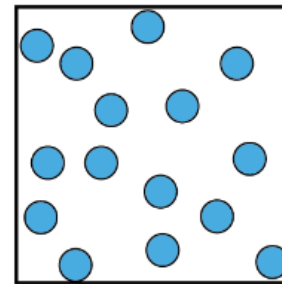
- = atom
- ⊕ = nucleus
- ⊖ = electron



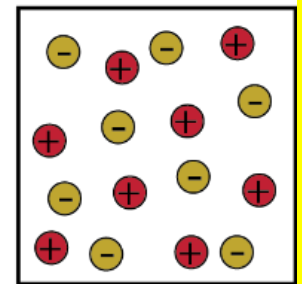
Solid



Liquid



Gas



Plasma



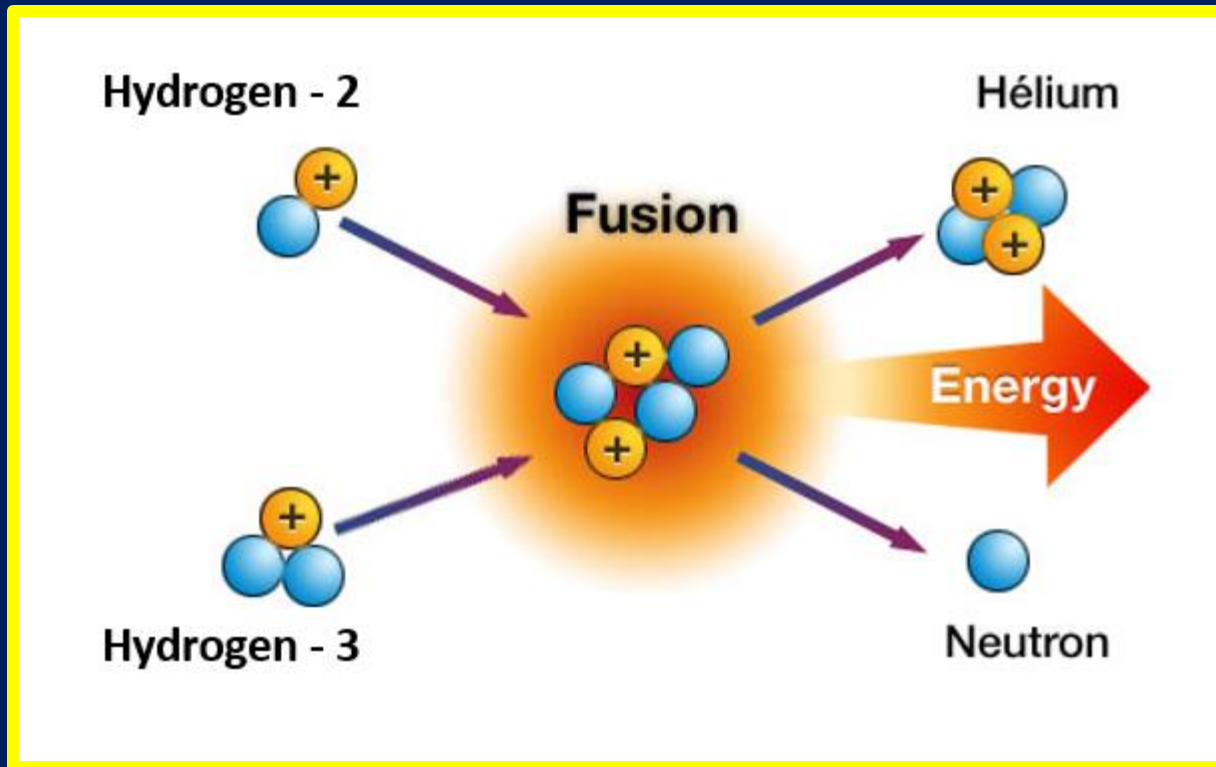
Fusion Reactions

The high temperatures, inside the core, transfer thermal energy to the particles, setting them in motion at extreme speeds.



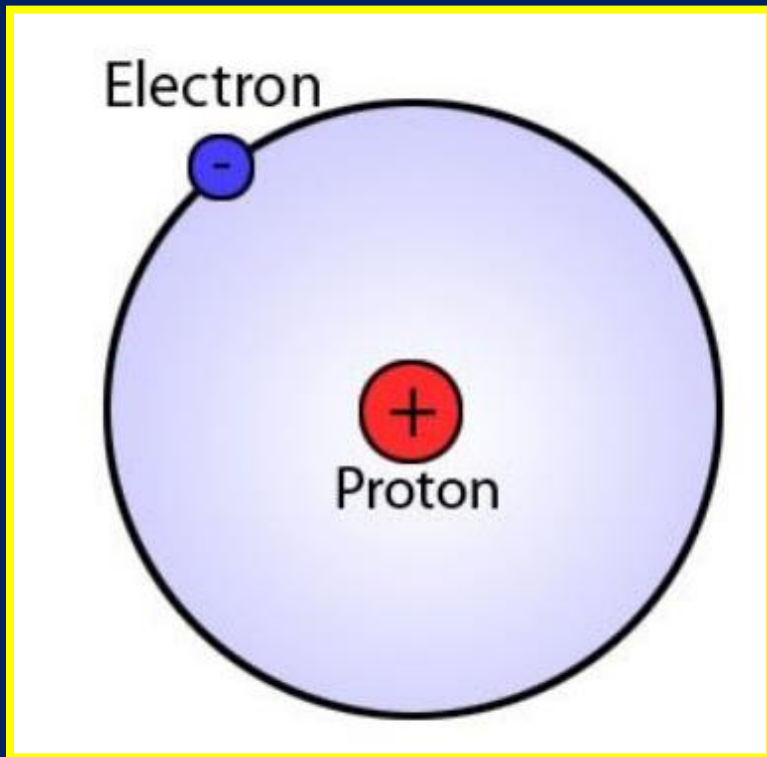
Fusion Reactions

As the extremely fast-moving particles move, they collide and fuse together, forming atoms, in a process called fusion.



Fusion Reactions

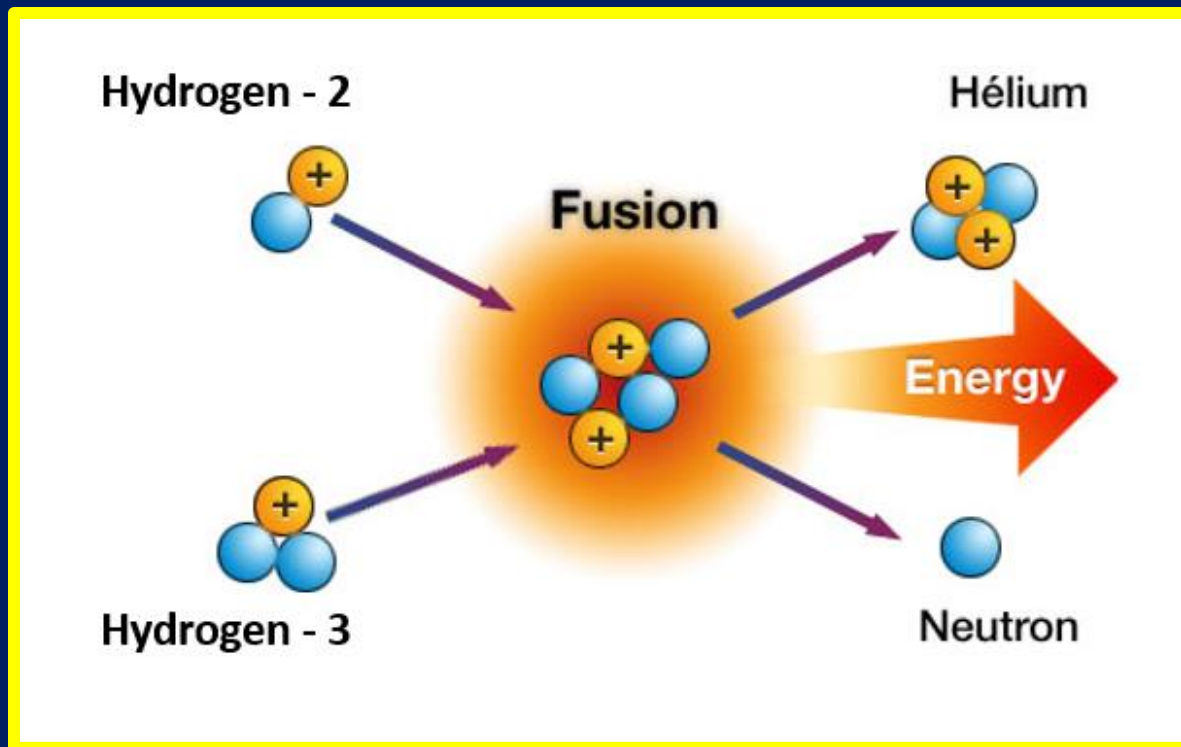
Hydrogen atoms are the smallest atoms and the first atoms formed during fusion reactions.



Hydrogen atoms consist of one proton, one electron, and no neutrons.

Fusion Reactions

Further fusion reactions result in hydrogen atoms colliding to form Helium atoms.



Fusion Reactions

Most of the atoms or elements, found on the periodic table, are formed through fusion reactions inside of stars like our Sun.

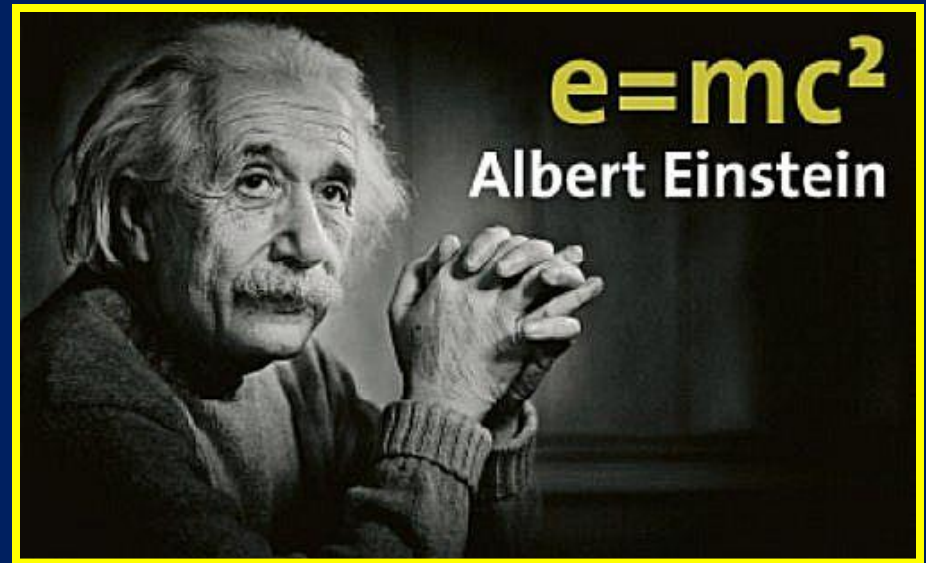
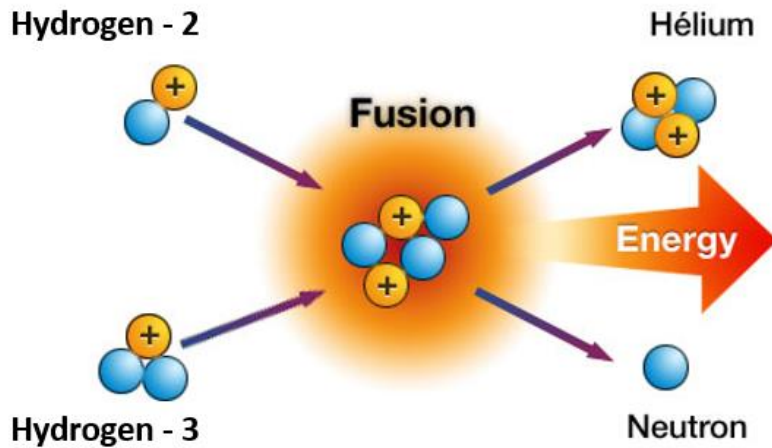
Periodic Table Of The Elements

The periodic table is color-coded by groups: Group 1 (blue), Group 2 (orange), Groups 3-10 (yellow), Groups 11-12 (green), Groups 13-18 (purple), and Lanthanoids/Actinoids (pink). A legend box in the center defines the format: Number (top), Symbol (middle), Name (bottom), and Atomic Mass (bottom right).

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1 H Hydrogen 1.008																	2 He Helium 4.003
3 Li Lithium 6.941	4 Be Beryllium 9.012											5 B Boron 10.811	6 C Carbon 12.011	7 N Nitrogen 14.007	8 O Oxygen 15.999	9 F Fluorine 18.998	10 Ne Neon 20.180
11 Na Sodium 22.990	12 Mg Magnesium 24.305											13 Al Aluminum 26.982	14 Si Silicon 28.086	15 P Phosphorus 30.974	16 S Sulfur 32.064	17 Cl Chlorine 35.453	18 Ar Argon 39.948
19 K Potassium 39.098	20 Ca Calcium 40.078	21 Sc Scandium 44.956	22 Ti Titanium 47.867	23 V Vanadium 50.942	24 Cr Chromium 51.996	25 Mn Manganese 54.938	26 Fe Iron 55.845	27 Co Cobalt 58.933	28 Ni Nickel 58.693	29 Cu Copper 63.546	30 Zn Zinc 65.38	31 Ga Gallium 69.723	32 Ge Germanium 72.631	33 As Arsenic 74.922	34 Se Selenium 78.971	35 Br Bromine 79.904	36 Kr Krypton 83.798
37 Rb Rubidium 85.468	38 Sr Strontium 87.62	39 Y Yttrium 88.906	40 Zr Zirconium 91.224	41 Nb Niobium 92.906	42 Mo Molybdenum 95.95	43 Tc Technetium 98.907	44 Ru Ruthenium 101.07	45 Rh Rhodium 102.906	46 Pd Palladium 106.42	47 Ag Silver 107.868	48 Cd Cadmium 112.414	49 In Indium 114.818	50 Sn Tin 118.711	51 Sb Antimony 121.760	52 Te Tellurium 127.6	53 I Iodine 126.904	54 Xe Xenon 131.293
55 Cs Cesium 132.905	56 Ba Barium 137.328	57-71 Lanthanoids	72 Hf Hafnium 178.49	73 Ta Tantalum 180.948	74 W Tungsten 183.84	75 Re Rhenium 186.207	76 Os Osmium 190.23	77 Ir Iridium 192.227	78 Pt Platinum 195.085	79 Au Gold 196.967	80 Hg Mercury 200.592	81 Tl Thallium 204.382	82 Pb Lead 207.2	83 Bi Bismuth 208.980	84 Po Polonium [209]	85 At Astatine 209	86 Rn Radon 222.018
87 Fr Francium 223.021	88 Ra Radium 226.025	89-103 Actinoids	104 Rf Rutherfordium [261]	105 Db Dubnium [262]	106 Sg Seaborgium [266]	107 Bh Bohrium [264]	108 Hs Hassium [269]	109 Mt Meitnerium [278]	110 Ds Darmstadtium [281]	111 Rg Roentgenium [284]	112 Cn Copernicium [285]	113 Nh Nihonium [286]	114 Fl Flerovium [289]	115 Mc Moscovium [288]	116 Lv Livermorium [293]	117 Ts Tennessine [294]	118 Og Oganesson [294]
57 La Lanthanum 138.905	58 Ce Cerium 140.116	59 Pr Praseodymium 140.908	60 Nd Neodymium 144.242	61 Pm Promethium 144.912	62 Sm Samarium 150.36	63 Eu Europium 151.964	64 Gd Gadolinium 157.25	65 Tb Terbium 158.925	66 Dy Dysprosium 162.500	67 Ho Holmium 164.930	68 Er Erbium 167.259	69 Tm Thulium 168.934	70 Yb Ytterbium 173.055	71 Lu Lutetium 174.967			
89 Ac Actinium 227.028	90 Th Thorium 232.038	91 Pa Protactinium 231.036	92 U Uranium 238.029	93 Np Neptunium 237.048	94 Pu Plutonium 244.064	95 Am Americium 243.061	96 Cm Curium 247.070	97 Bk Berkelium 247.070	98 Cf Californium 251.080	99 Es Einsteinium [254]	100 Fm Fermium 257.085	101 Md Mendelevium 258.1	102 No Nobelium 259.101	103 Lr Lawrencium [262]			

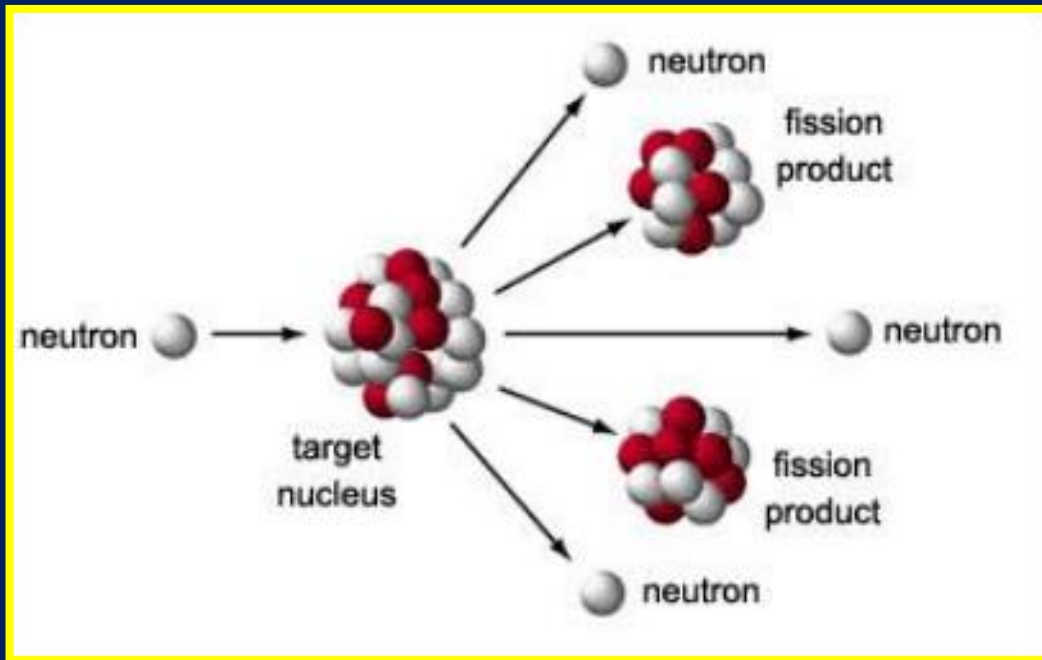
Fusion Reactions

Besides the formation of atoms, fusion reactions also release massive amounts of energy.



Fission Reactions

Related to fusion reactions are fission reactions but instead of forming atoms, larger atoms are split into smaller atoms.



Fission reactions also release massive amounts of energy.

Fission Reactions

Fission reactions are responsible for radioactive decay and can take place naturally or be caused by humans.



Fission reactions are used in nuclear bombs.

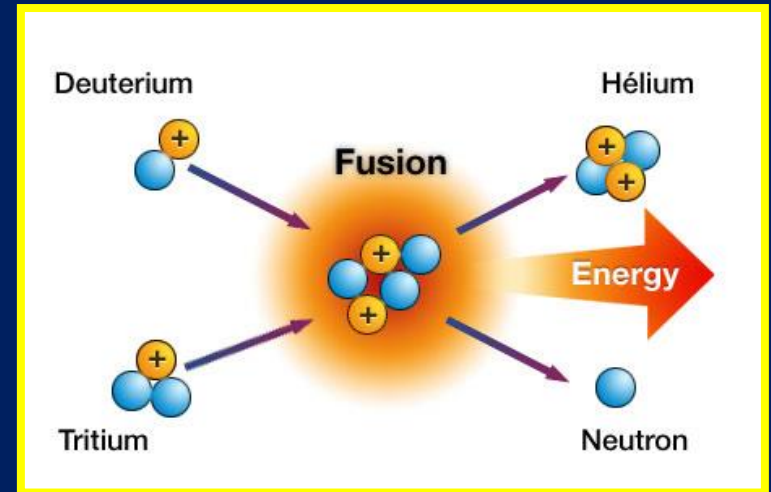
Fission Reactions

Fission reactions are also used in nuclear power plants.

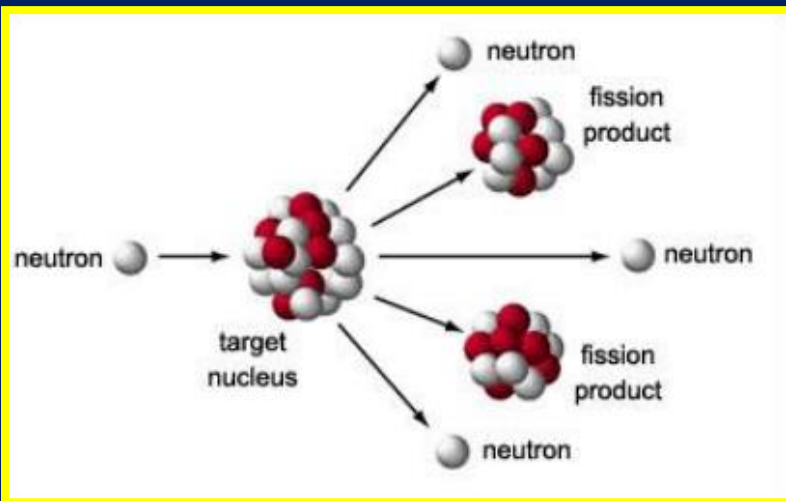


Fusion or Fission Reactions

Fusion reactions occur in the Sun and involve smaller atoms colliding to produce larger atoms, while releasing energy.



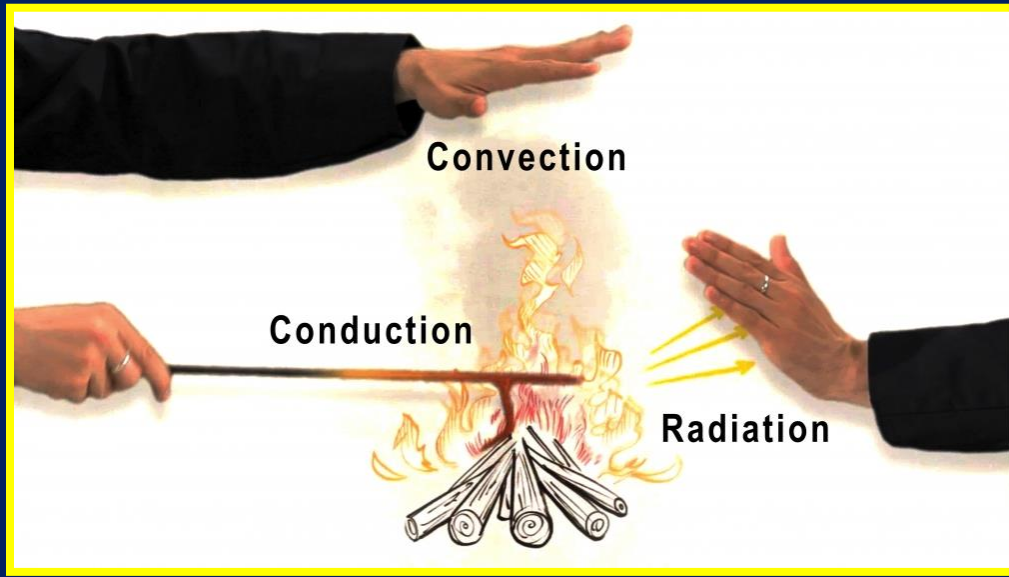
Fusion contains the letters for Sun.



Fission reactions involve splitting apart large atoms to form smaller atoms, while releasing energy.

Radiant Energy

The energy produced in the Sun, during fusion reactions travel to the Earth in the form of radiant energy or radiation.



Radiant energy, or radiation, is transferred without the use of atoms.

Radiant Energy

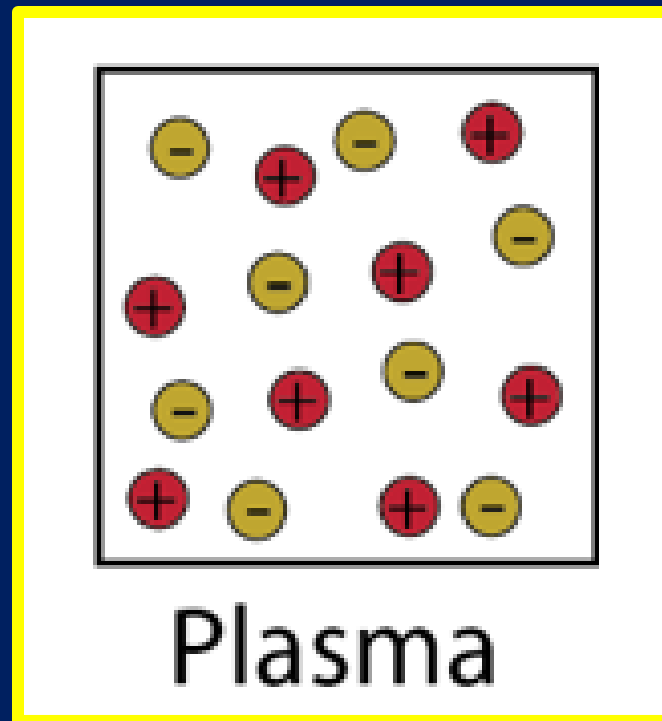
Most of space is a vacuum, which means that there are not any atoms present.



Since radiant energy doesn't require atoms, it can travel through space to Earth, making life possible on Earth.

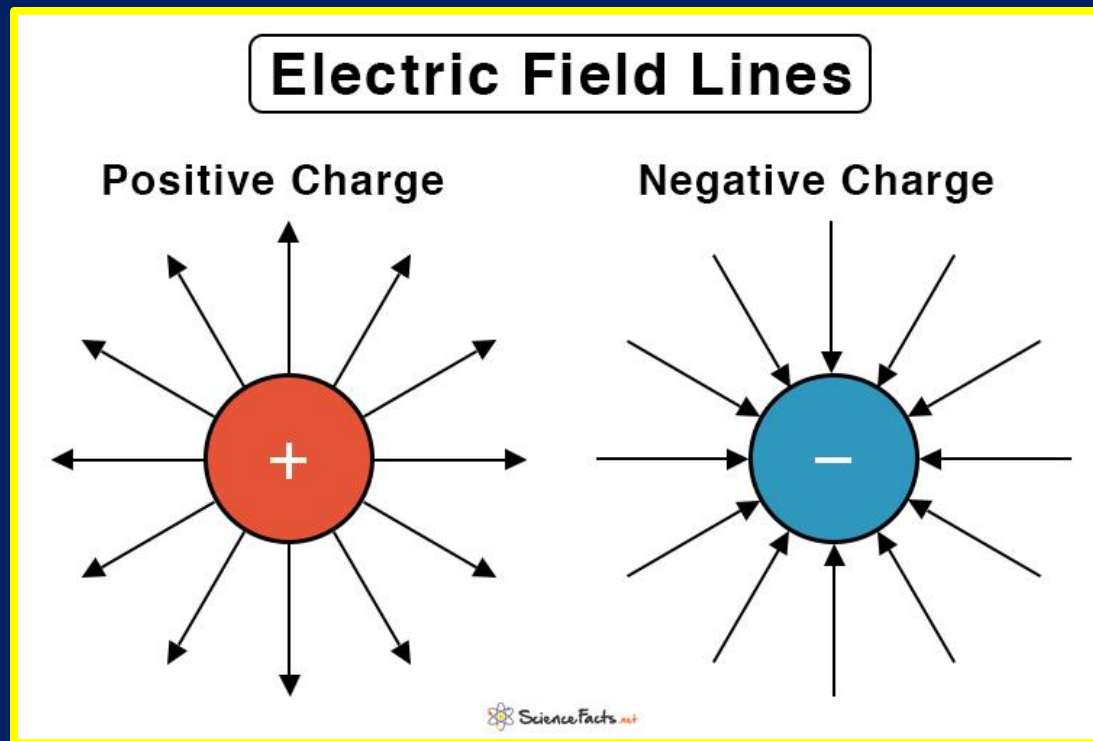
How Radiant Energy Works

Inside the Sun are a lot of charged particles, consisting of lone electrons and lone protons in the plasma state.



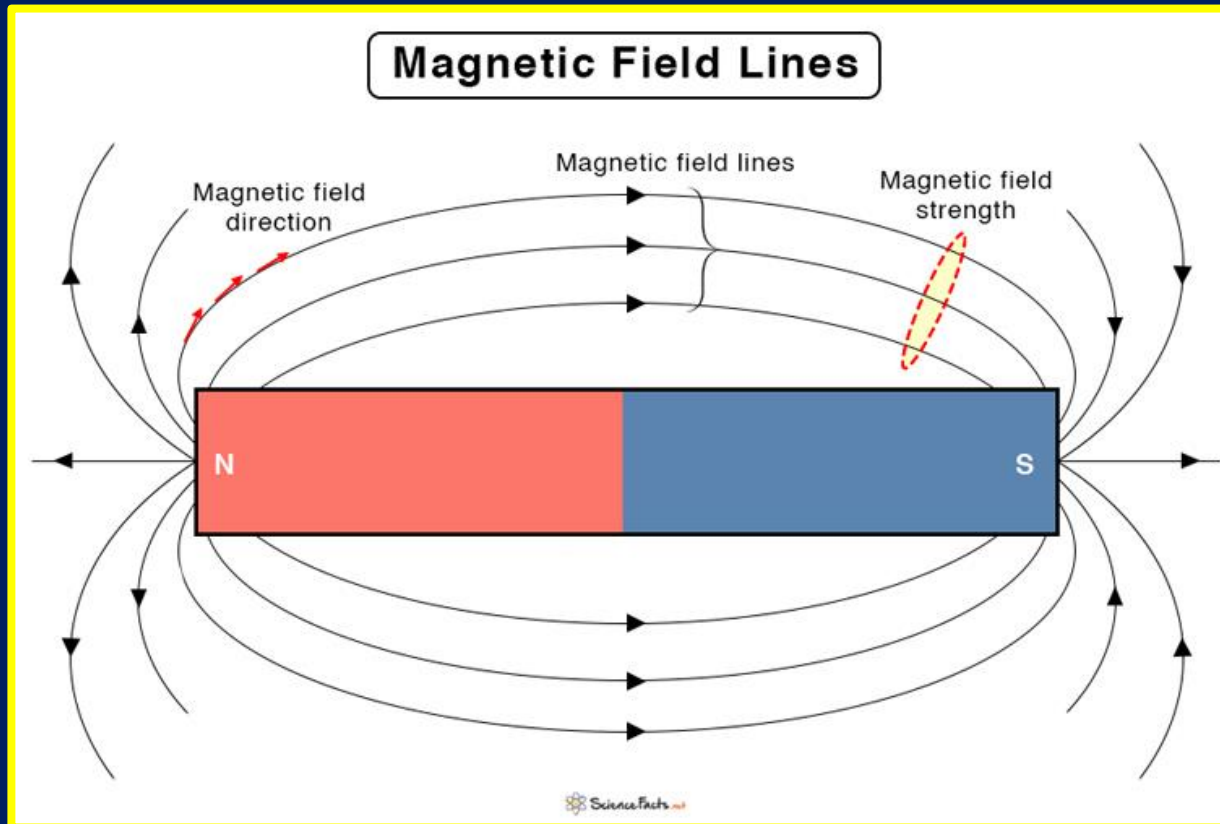
How Radiant Energy Works

Surrounding any charged particle is an electrical field that extends out into the space, surrounding the charged particle.



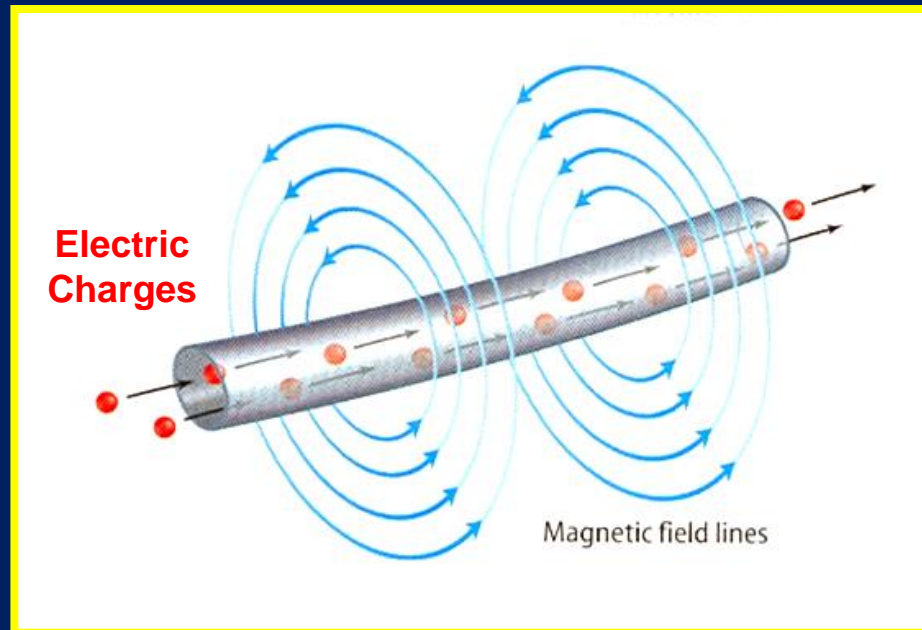
How Radiant Energy Works

Also surrounding any charged particle is a magnetic field.



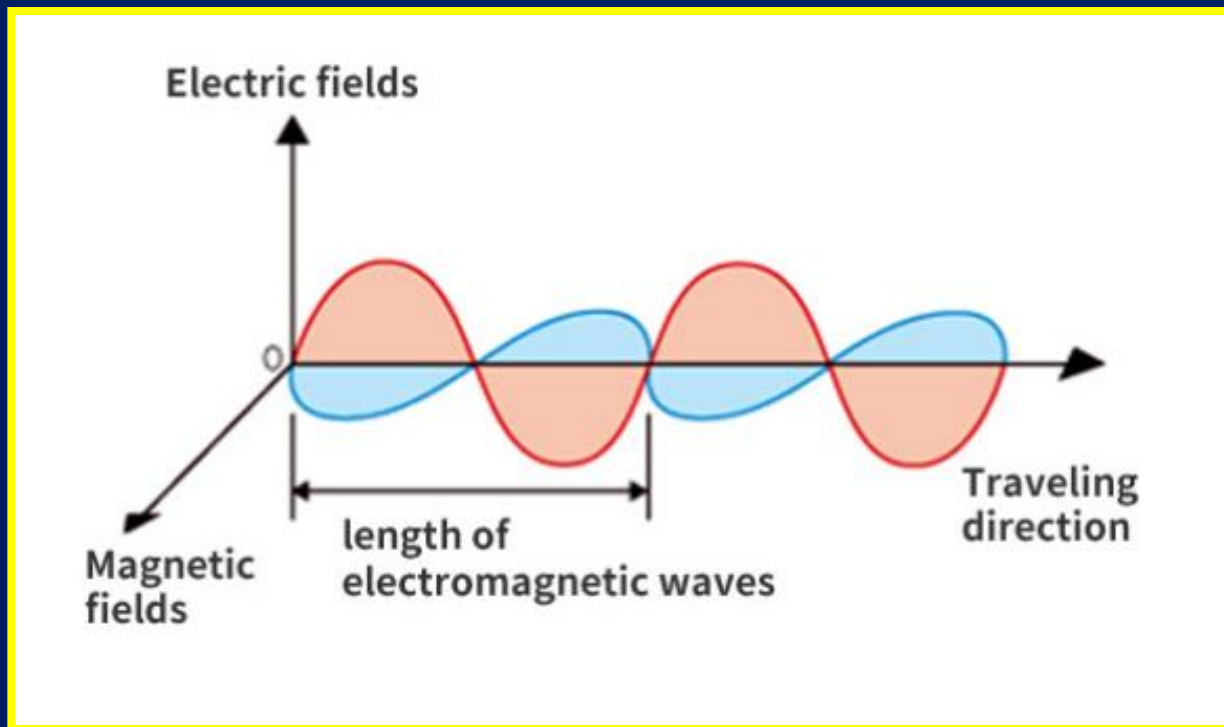
How Radiant Energy Works

Electrical fields and magnetic fields interact so that a vibrating electrical field will produce a vibrating magnetic field and visa versa.



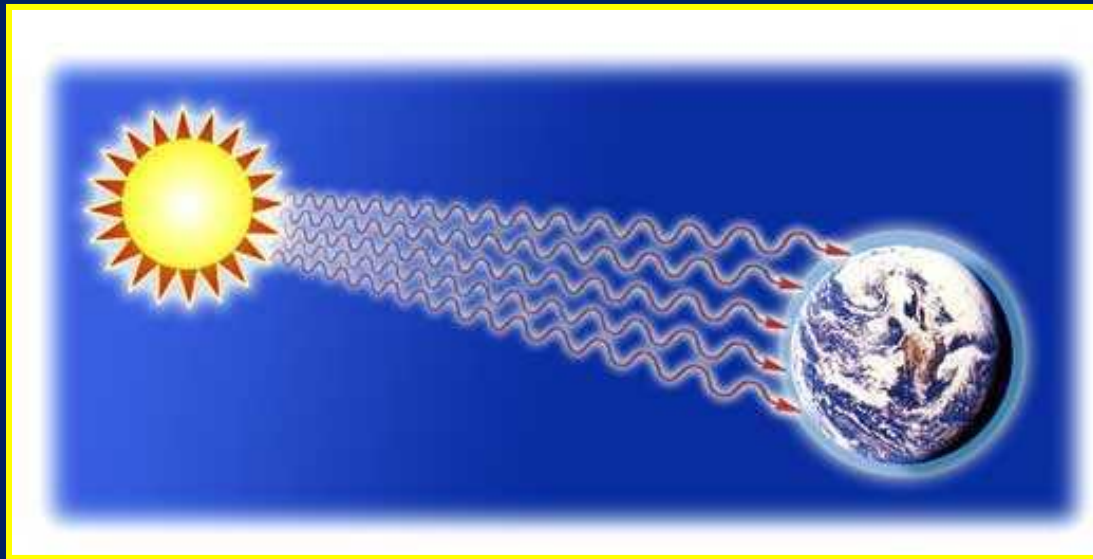
How Radiant Energy Works

The process of electrical fields producing magnetic fields and visa versa results in the formation of an electromagnetic wave.



How Radiant Energy Works

Since electromagnetic waves rely only upon alternating electrical and magnetic fields, they can travel from the Sun to Earth thru the vacuum of space.



The End

