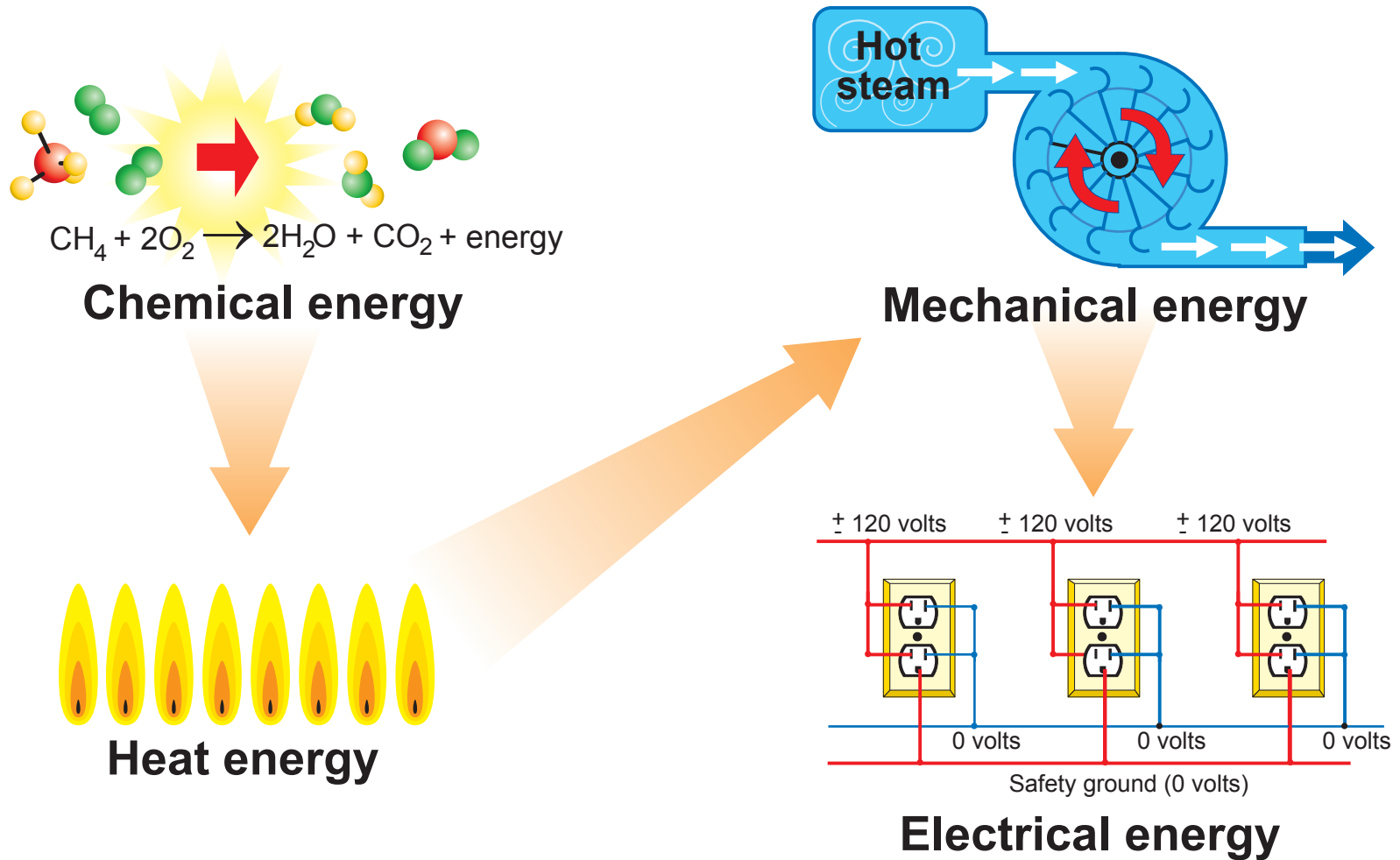
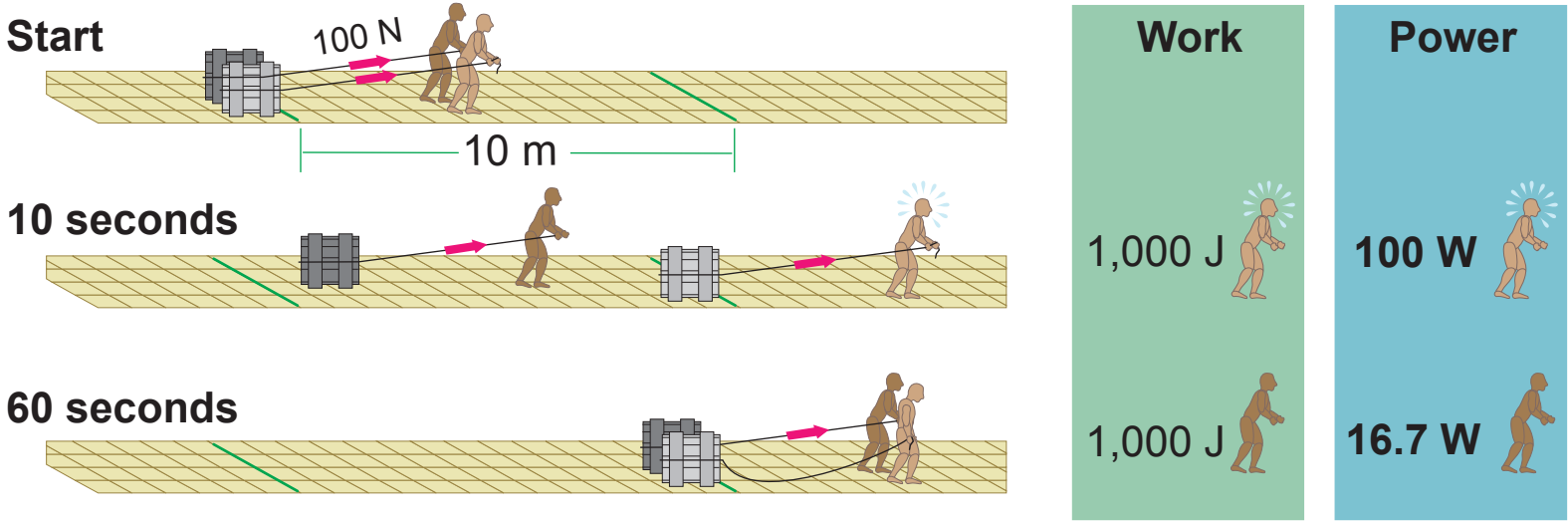


Forms of Energy



Power Example



$$\text{Power} = \frac{\text{Amount of work done}}{\text{time}}$$

Energy Flow

Rechargeable electric drill



Battery
45% efficient

100 J
Chemical energy

Motor
65% efficient

45 J
Electrical energy

Energy flow diagram

72 J
Friction and heat

29 J
Mechanical energy
(high speed)

Gears
95% efficient

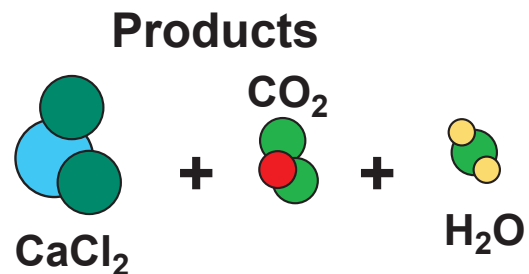
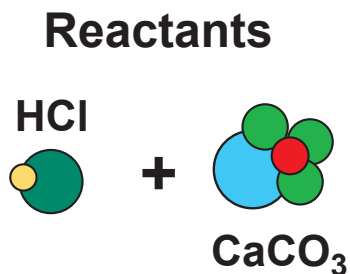
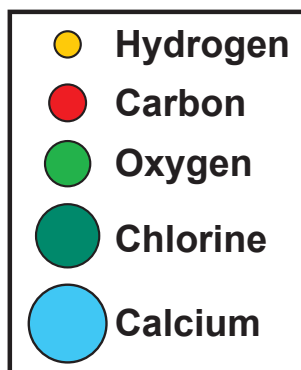
28 J
Mechanical energy
(low speed)

Drill bit

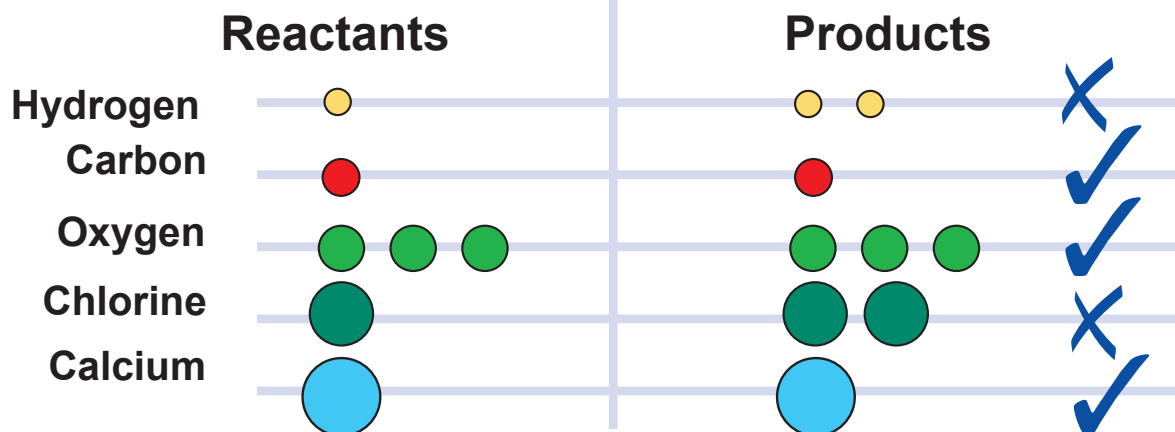
28 J
Output work

Balancing Chemical Equations

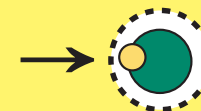
1. Write the chemical equation.



2. Count the number of each type of atom on both sides.








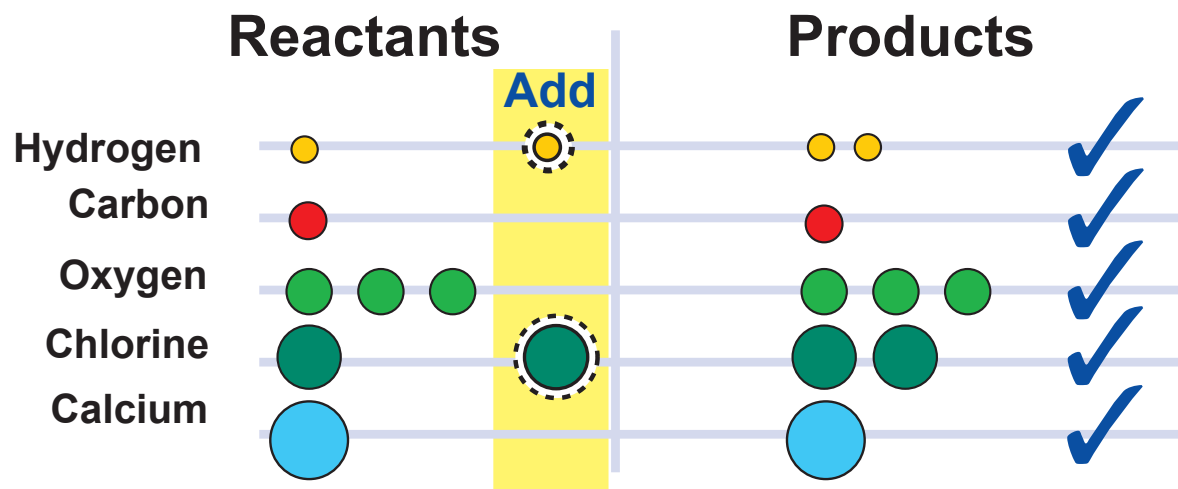
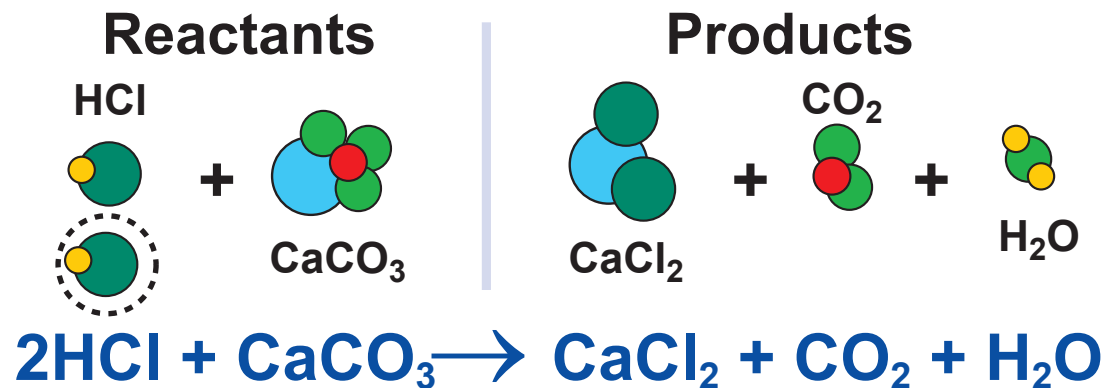
Missing a hydrogen atom and a chlorine atom on the reactant side.
These can only be added as a HCl molecule.



Balancing Chemical Equations

3. Add coefficients to balance the equation.

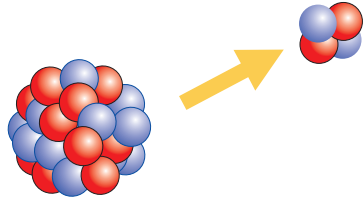
	Hydrogen
	Carbon
	Oxygen
	Chlorine
	Calcium



Radioactive Decay

Alpha decay

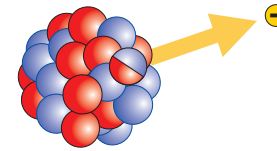
Nucleus ejects a helium-4 nucleus



Protons	Decrease by 2
Neutrons	Decrease by 2
Atomic number	Decrease by 2
Mass number	Decrease by 4

Beta decay

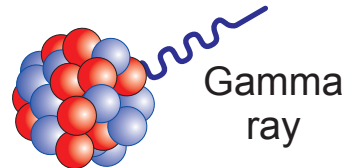
Nucleus converts a neutron to a proton and electron, ejecting the electron.



Protons	Increase by 1
Neutrons	Decrease by 1
Atomic number	Increase by 1
Mass number	Stays the same

Gamma decay

Nucleus emits gamma radiation and lowers its energy.



Protons	Stays the same
Neutrons	Stays the same
Atomic number	Stays the same
Mass number	Stays the same

Einstein's Formula

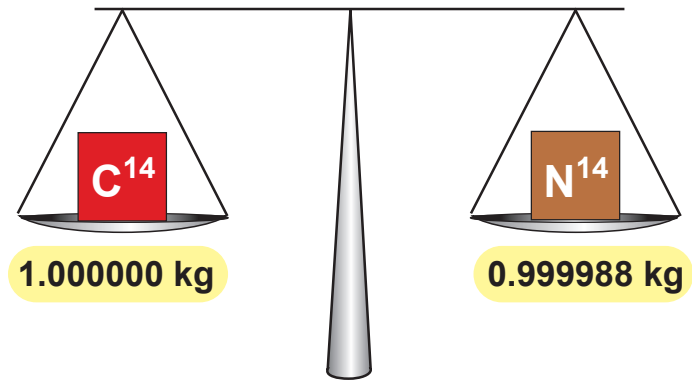
Energy (joules) Mass (kg)

$$E = mc^2$$

Speed of light (3×10^8 m/sec)

Mass difference

1.000000 kg
- 0.999988 kg
<hr/>
0.000012 kg



Energy released

$$E = mc^2$$
$$= (0.000012 \text{ kg})(3 \times 10^8 \text{ m/sec})^2$$
$$= 1.1 \times 10^{11} \text{ joules}$$

A tiny amount of mass is converted to energy by the radioactive decay of carbon-14.