

## Category 1 – Matter and Energy

### PHYSICAL PROPERTIES

**matter:** anything that has mass and takes up space; makes up all things in the world; the physical properties (characteristics) of matter determine how it is classified, changed, and used

Physical Property	Description
mass	amount of matter in an object
magnetism	ability to be attracted, or pulled, to magnets; iron is magnetic, but wood is not
solubility in water	ability of matter to dissolve in water; sugar is soluble in water, but sand is not
conduction	ability to carry thermal or electrical energy; many metals are good conductors; air and rubber are poor conductors (good insulators)
physical state	form of matter (solid, liquid, or gas); depends on the object's energy
relative density	comparison of density (mass divided by volume); an object placed in liquid will: <ul style="list-style-type: none"> <li>• sink if object density &gt; liquid density</li> <li>• float if object density &lt; liquid density</li> </ul>

**Example:** relative density

toy floats (the toy is less dense than water) / toy sinks (the toy is more dense than water)

**Example:** Andrea measures, observes, and records several physical properties of a sugar cube.

Property	Value
State	solid (k...
Mass	2.3 g (m...
Magnetism	not magnetic (not attracted to magnet)

### CHANGES IN STATE

Physical State	Energy
solid	low
liquid	medium
gas	high

Term	Change in State	Temperature
boiling point	occurs when heated	100°C
melting point	occurs when heated	0°C
freezing point	occurs when cooled	0°C

**Example:** Cody's mixture is heated. He observes that it changes from solid to liquid.

### SOLUTIONS AND MIXTURES

Two or more substances that are blended together but do not chemically combine. In a mixture, the substances physically separate, but they keep the physical properties of the individual substances, but others do not. **Solutions** are mixtures in which one substance dissolves into another. The same physical process happens throughout the mixture. The mixture is different from the original, individual substances.

**Example:** Determine if the mixtures below are also solutions or mixtures.

**Mixture 1:** Stones and milk. Stones and milk are a mixture in which the stones remain visible. They do not dissolve. **This mixture is not a solution.**

**Mixture 2:** Chocolate and milk. Chocolate milk is a mixture in which chocolate dissolves. New physical properties exist. **This mixture is a solution.**

## Category 2 – Force, Motion and Energy

### ENERGY

**energy:** ability to change matter or to do work

Form	Description	Example
thermal	transfer of heat	hot natural gas heats water, turning it into steam
mechanical	moves matter	air pressure in a tire spins a blade, turning a lawnmower's engine
electrical	moves through the wires of a circuit	electricity generates electricity that flows down power lines
light	travels in a wave; an eye can see it	light uses electricity to produce light in a closet
sound	vibrates and causes motion	electricity is used to create the sound of music

### CIRCUITS

**Complete circuit:** energy flows through the wires of a circuit; the other end of the wire connects back to a source of electricity, like a battery

**Example 1:** This complete path produces sound.

**Example 2:** This incomplete path does not produce sound.



### LIGHT

**Light:** form of energy that moves in a straight line until it hits an object or moves through one medium into another

**Medium:** material (like a solid, liquid, or gas) through which a wave moves

**Example:** Light (wave) moves through air (medium).

Term	Description
reflection	light bounces off a shiny surface and returns to the medium at the same speed and angle
refraction	light changes speeds and bends at an angle as it moves through one medium into another; can change how a person sees the appearance of an object

**Example:** reflection of light

Reflection allows the boy to see his image. Light reflects off the shiny mirror's surface.

**Example:** refraction of light

Refraction makes this straw appear to be broken. Light refracts as it moves from air (as shown) into water.

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