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Course: FVS Chemistry

Teacher: Kerr

**Question:** How can you distinguish a physical change from a chemical change?

**Claim:** If a substance undergoes a chemical change, it will not retain its original properties because a new substance is formed.

**Evidence:**

Material	Change(s) Observed	Type of Change (Physical or Chemical)
Calcium Carbonate	The substance was crushed into a fine powder (particle size decreased)	Physical
Calcium Carbonate and Hydrochloric Acid	The two substances mixed and began to release gas	Chemical
Water	The substance was heated and began to release gas (water vapor) as it boiled	Physical
Copper Sulfate Pentahydrate (CSP)	The substance was heated, causing it to release gas, lose volume, and change color from blue to white	Chemical
Iron Filings and Sulfur	The two substances were stirred together, changing color to an olive. Then, a magnet was placed above the pile, and iron filings were pulled onto it.	Physical
Potassium Iodide and Lead Nitrate	The lead nitrate (liquid) was poured into potassium iodide (liquid), and they changed color from both light blue to yellow.	Chemical
Magnesium and Hydrochloric Acid	Magnesium was placed into hydrochloric acid, significantly increasing the temperature; bubbles were released on the magnesium strip, and the magnesium disappeared	Chemical
Candle	The top of the candle's wick was lit, starting a flame which burned away the wick and melted much of the candle wax, refrozen at the bottom of the candle	Physical and Chemical

**Certain Chemical and Physical Changes**

I know this because all observed chemical changes formed substances with new properties. For example, the calcium carbonate and hydrochloric acid combined to create a substance (the released gas) which was gaseous at room temperature. The CSP chemical change also demonstrates this because, when heated, it created a substance which was white and powdery (in contrast to its original form).

The physical changes prove the inverse: "if a substance undergoes a physical change, it will retain most of its original properties." Heating water, for example, left water with the same properties as before (other than temperature). Stirring iron filing and sulfur, another physical change, clearly left two substances with precisely the same properties as before – clearly evidenced by the magnet pulling out the still magnetically attracted iron filings.

**Justification (Reasoning) of the Evidence:**

A chemical change is defined as "a change in the identity and properties of matter." A physical change is defined as "a change in one or more physical properties of a substance but not in the identity of the substance." Thus, it seems reasonable that a chemical change would result in the change of a substance's identity and consequently its properties (the essential elements of any form of identity). The numerous examples of chemical structure's significant effect on the properties of a substance also show that any minor or major change in structure (all chemical changes) or makeup can drastically modify a substance.

The properties which change only during chemical changes are chemical properties, and these can also be used to differentiate from physical changes which still change physical properties (such as temperature — a physical property — when water was heated, as compared to color — a chemical property — changing when CSP was heated). Also, because chemical changes can modify both chemical and physical changes, any given chemical change likely changes the majority of properties of a substance.