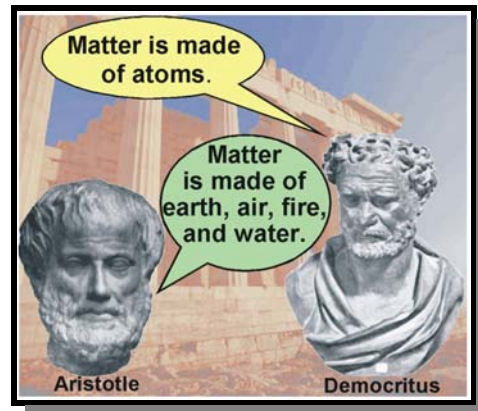


Early Theories of Matter

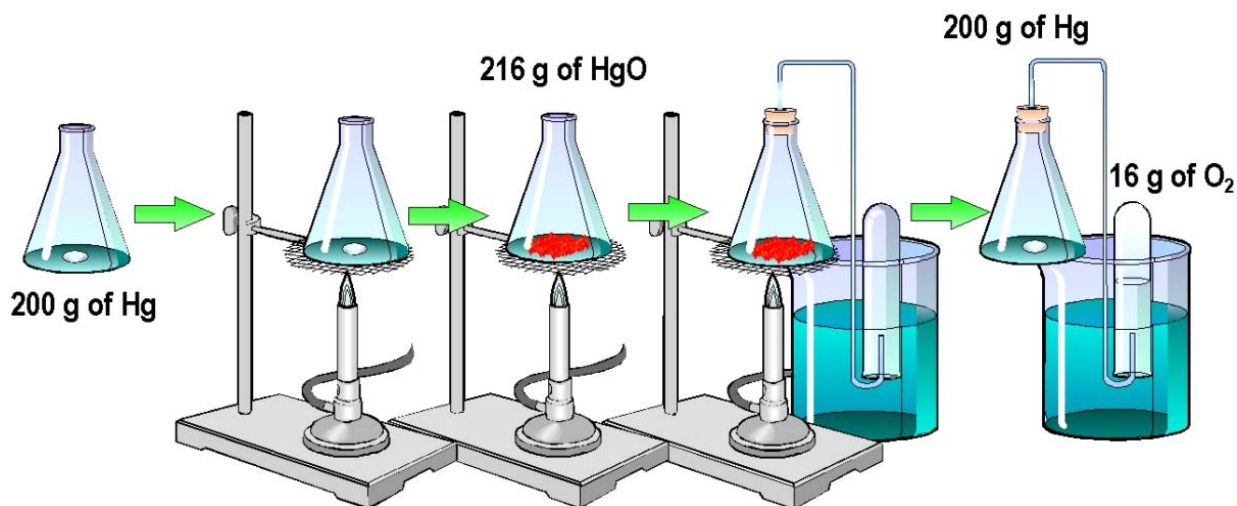
Democritus, a Greek Philosopher (~460 BC) proposed that all matter is composed of particles he called atoms (Greek for “uncuttable”). He said the particles are invisible, cannot be broken down into smaller parts, and cannot be destroyed. He envisioned atoms of different substances as having different geometric shapes. His idea did not gain acceptance because he couldn’t explain what held the particles together or how they caused a substance’s properties.

Aristotle proposed, instead, that there are four elements: [1] earth; [2] air; [3] fire; and [4] water. His idea gained acceptance because substances appeared to have different degrees of each of these building blocks. For example: a burning green stick releases: smoke (air); sap (water); ash (earth), and, of course, fire.



By the 1800s these early theories of matter were no longer accepted because of :

- the behavior of gases—You’ve probably seen Brownian motion of dust in a sunbeam. The dust behaves as if it is being buffeted by tiny invisible particles;
- Priestley’s discovery of oxygen—If air is a mixture that contains oxygen, air cannot be an element; and
- Lavoisier’s experiment—Lavoisier heated mercury in a flask. It turned into a red powder with a greater mass than the mercury. As Lavoisier continued heating, the red powder turned back into mercury, and gave off the gas oxygen. The mass of the mercury plus the mass of the oxygen was equal to the mass of the red powder. This showed that the red powder was a compound composed of the elements mercury and oxygen.



This was just some of the evidence that showed that the early Greek conception of matter was incorrect. Quantitative evidence for the existence of atoms was still lacking.

Answer the questions below based on your reading and on your understanding of the early theories of matter.

1. Democritus's idea that matter was made of atoms was correct. Why didn't people believe his idea? _____

2. Aristotle's idea that matter was made of four elements was incorrect, yet people believed it for about 2,000 years. Why? _____

3. How did Priestley's discovery show that Aristotle was incorrect? _____

4. How did Lavoisier's experiment show that Aristotle was incorrect? _____

5. Why weren't people convinced of the existence of atoms after Priestly and Lavoisier showed that Aristotle was wrong? _____
