

Topic 1 Classification of Materials

1. Fe = iron, At = Astatine, Li = Lithium
2. Arsenic = As, Helium = He, Phosphorus = P
3. For example, the allotropes of carbon are diamond, graphite, soot ("buckyballs"); the allotropes of oxygen are oxygen, O₂ and ozone O₃; the allotropes of phosphorous are "red" phosphorous (does not react with air) and "white" phosphorous (spontaneously combusts); there are allotropes of sulphur that contain 2, 6, 7, 8, 10, 12, 18, and 20 atoms per molecule (formulas S₂ to S₂₀) although several are unstable...
4. C₆H₁₂O₆ means that in one molecule of this substance (in this case, glucose) there are 6 carbon atoms, 12 hydrogen atoms and 6 oxygen atoms
5. CO₂ – carbon dioxide.
6. For example brine (for olives, salmon etc) solute = sodium chloride (table salt) and the solvent = water
7. For example, crystallisation, filtration, distillation...
8. gold dust from silt: physical change; boiling an egg: chemical change (ie coagulating the proteins in the egg); boiling water: physical change; making toast: chemical change, gin and tonic: physical change
9. In the dissolved state, the sodium cations are 'solvated' (surrounded by water molecules) and the chloride anions are solvated, the solvated ions are free to move in the solution (which lets the solution conduct electricity). In the molten state, although they are still close to each other, the sodium cations and chloride anions have sufficient energy to move freely (again letting the molten state conduct electricity).
10. Solids: not compressible, they have a fixed volume. They have a fixed shape ("edges") and do not conform to the shape of their container.
Liquids: not compressible. They have a fixed volume but no fixed shape. They "flow" to fill a container. Liquids do have an "edge".
Gases: can be compressed. They have no edges, no fixed shape and no fixed volume.
11. The particles in a liquid are very close together and there is little scope to push them closer, so liquids are not compressible. The particles in a gas are a long way apart and can be pushed, relatively easily, closer together, so gases are compressible.
12. Solids maintain a fixed shape because the atoms (or molecules) are not free to move.
13. Temperature is a measure of the average energy (or average speed) of particles in a substance.
14. A metal is shiny, malleable, ductile, and conducts heat and electricity.