### **11. Atomic Theories and Models**
- **Dalton's Atomic Theory**:
  - Atoms are indivisible particles (now known to contain subatomic particles).
  - Atoms of the same element are identical.
- **Thomson's Plum Pudding Model**: Atoms consist of electrons scattered in a positive charge "pudding."
- **Rutherford’s Nuclear Model**: Discovered the nucleus through the gold foil experiment.
- **Bohr Model**: Electrons orbit the nucleus in discrete energy levels.
- **Quantum Mechanical Model**: Electrons exist in orbitals, regions of space where the probability of finding an electron is high.

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### **12. Chemical Equilibrium**
- **Dynamic Equilibrium**: Rate of forward reaction equals the rate of reverse reaction.
- **Equilibrium Constant (K)**:
  - $K_c = \frac{[products]^{\text{coefficients}}}{[reactants]^{\text{coefficients}}}$
- **Le Chatelier's Principle**:
  - A system at equilibrium will adjust to counteract changes (e.g., concentration, pressure, temperature).

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### **13. Solutions and Solubility**
- **Solutions**: Homogeneous mixtures of solute and solvent.
  - **Solubility**: The maximum amount of solute that can dissolve in a solvent at a given temperature.
- **Concentration Units**:
  - **Molarity (M)**: $M = \frac{\text{moles of solute}}{\text{liters of solution}}$.
  - **Molality (m)**: $m = \frac{\text{moles of solute}}{\text{kilograms of solvent}}$.
- **Colligative Properties**: Depend on solute particle number, not type (e.g., boiling point elevation, freezing point depression).

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### **14. Redox Reactions**
- **Oxidation**: Loss of electrons.
- **Reduction**: Gain of electrons.
- **Oxidizing Agent**: Causes oxidation (gets reduced).
- **Reducing Agent**: Causes reduction (gets oxidized).
- Use **oxidation states** to track electron transfer.

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