SCIENCE NORTH SCIENCE NORD
SUDBURY, ONTARIO, CANADA

Electron configuration in Scratch	Grade 12 Chemistry

Lesson Plan

Coding Tool	Scratch
Cross-curricular	N/A

Big Ideas

C2. Investigate the molecular shapes and physical properties of varies types of matter

- Demonstrating electron configuration in atoms

Specific Expectations

C2.2 use the Pauli exclusion principle, Hund's rule, and the Aufbau principle to write electron configurations for a variety of elements in the periodic table

Description

Write a program in Scratch to demonstrate electron configuration and the Aufbau principle.

Materials

- Scratch
- Internet-capable device

Computational Thinking Skills

- Variables
- Loops
- Conditional Statements

Introduction

Scratch code is a form of "block coding" created by MIT for use in schools that you may already be familiar with. (If not, see "What is Scratch" at https://www.youtube.com/watch?v=jXUZaf5D12A)

We recommend you create a teacher account at https://scratch.mit.edu/educators#teacher-accounts so you can better manage the use of Scratch in your classroom, though that is beyond the scope of this lesson plan.

Though primarily used for creating games and game-like programs, Scratch can also be used for mathematical or scientific purposes. In this case, we are going to create a simple program that creates Bohr diagrams for the first 92 elements. A walkthrough in how to do this in Scratch is provided with the associated handout.

The program can be accessed on Scratch here: https://scratch.mit.edu/projects/450593118

Action

The Bohr model can be used as a simple way to understand the energy levels of electrons, doing so in terms of atomic orbitals that are filled by electrons in a specified way.

Using the Aufbau principle (electrons fill atomic orbitals of the lowest available energy level before occupying higher level), it is possible to model the atomic orbitals for unique elements.

Rather than hand drawing the different atomic models for each element, this lesson tasks students with creating a program for the first 92 elements. While this sounds initially daunting, the various principles in place make this much easier, as the configuration of the electrons follows a predicted pattern. With this in mind, this lesson could be done one of two ways. The first, more challenging way, would be to have students create this model for themselves. Alternatively, you can get them started with the first few elements, then once they've established the trends and how the code in the exercise works, they can start to create the rest of the program themselves.

Consolidation/Extension

Extension:

- Challenge students to expand this demonstration to include Spin and the Pauli Exclusion Principle.
- The demonstration can also be expanded to include ionized states, with extra buttons to add/remove electrons outside the ground state.

Assessment

Assess students on how well their code can demonstrate the principle: do the electron subshells fill up in the correct order? How many elements (to what principle number, N) did they get?