**🎯 Activity 1: ✍️ Drawing Canvas – “Sketch That Atom”**

**🧪 Type:** Interactive Drawing Lab  
**🎯 Target Skill:** Use dots or crosses to represent electrons in the correct shells based on atomic number

**🎙️ Activity Introduction 🎤**

**Narration:**  
"Every atom has a unique structure. In this activity, you will use dots or crosses to sketch electrons in the correct energy levels. Think like a chemist and draw like a scientist!"

**👨‍💻 Developer Guide Instructions**

* Display a static atom template with:
  + Centre nucleus (not interactive)
  + Three concentric shell zones (clickable drop zones)
* Learner interaction:
  + Click to place • or ×
  + Count each dot per shell
* Tool buttons:
  + **Undo:** Removes last-placed electron
  + **Clear:** Clears all dots
  + **Check:** Triggers validation and feedback based on atomic number
* Feedback system:
  + Show **specific facilitative feedback** for correct and incorrect arrangements.
  + Keep shell capacity rules enforced during placement to guide learners.

**📋 Learner Instructions (On-Screen)**

1. Click on each shell to place electrons as • or ×.
2. Use the atom’s atomic number to determine the total number of electrons.
3. Follow the filling rules:
   * 1st shell: maximum 2 electrons
   * 2nd shell: maximum 8 electrons
   * 3rd shell: maximum 8 electrons
4. Use the tools provided:
   * **Undo:** Remove last dot
   * **Clear:** Start over
   * **Check:** Submit your diagram for feedback

**💡 Hint Panel (On-Screen)**

**Electron Shell Rules:**

* Shell 1 → Up to 2 electrons
* Shell 2 → Up to 8 electrons
* Shell 3 → Up to 8 electrons

**Examples:**

* Hydrogen (1) → 1 dot in 1st shell
* Carbon (6) → 2 in 1st, 4 in 2nd → 2.4
* Neon (10) → 2 in 1st, 8 in 2nd → 2.8
* Sodium (11) → 2 in 1st, 8 in 2nd, 1 in 3rd → 2.8.1

**🧪 Activity Content and Facilitative Feedback**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Element** | **Atomic Number** | **Expected Sketch (by shell)** | **Correct Feedback** | **Incorrect Feedback Examples** |
| Hydrogen | 1 | 1 in 1st | Correct. Hydrogen has 1 electron in the first shell only. | If more than 1 in 1st: Hydrogen only has 1 electron, check the atomic number. |
| Helium | 2 | 2 in 1st | Correct. Helium’s first shell is full at 2 electrons. | If 1 in 1st: Helium has 2 electrons; one is missing. |
| Lithium | 3 | 2 in 1st, 1 in 2nd | Correct. Lithium’s configuration is 2.1. | If 3 in 1st: First shell can only hold 2 electrons; move one to second shell. |
| Carbon | 6 | 2 in 1st, 4 in 2nd | Correct. Carbon has 6 electrons arranged as 2.4. | If 3 in 1st: First shell max is 2. If 2 in 1st, 5 in 2nd: Too many electrons for carbon; check total count. |
| Neon | 10 | 2 in 1st, 8 in 2nd | Correct. Neon has a full outer shell at 2.8, making it stable. | If 2 in 1st, 7 in 2nd: Missing one electron. If 3rd shell used: Neon only needs two shells. |
| Sodium | 11 | 2 in 1st, 8 in 2nd, 1 in 3rd | Correct. Sodium’s configuration is 2.8.1. | If 2 in 1st, 9 in 2nd: Second shell can only hold 8; move extra to third shell. |
| Magnesium | 12 | 2 in 1st, 8 in 2nd, 2 in 3rd | Correct. Magnesium has 12 electrons arranged as 2.8.2. | If 2 in 1st, 10 in 2nd: Second shell max is 8; move 2 to third shell. |
| Phosphorus | 15 | 2 in 1st, 8 in 2nd, 5 in 3rd | Correct. Phosphorus has 15 electrons arranged as 2.8.5. | If 2 in 1st, 9 in 2nd, 4 in 3rd: Second shell cannot hold more than 8; adjust distribution. |

**🎙️ Activity Conclusion 🎤**

**Narration:**  
"You have successfully drawn atoms with the correct electron arrangements. Understanding how to represent electrons in shells helps you identify atomic properties and predict chemical behaviour. Keep practising to master the skill of atomic sketching."