Name\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_Date\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_Hour\_\_\_\_\_\_\_\_\_\_\_\_

**Periodic Trends: Station Lab Answer Sheet**

**Station 1: Alien Periodic Table**

1. a. Drawing of Alien One b. Drawing of Alien Two
2. Explain how you knew what the missing aliens should look like.
3. What was the KEY SIMILARITY that put the aliens in a GROUP together?
4. List at least two of the VARYING TRAITS you noticed as you look down a group.
5. What was the KEY SIMILARITY that puts the aliens in a PERIOD together?
6. List at least two of the VARYING TRAITS you noticed as you go from left to right across a period.
7. How does this theoretical periodic table relate to the actual Periodic Table of Elements? List at least 2 ways. Please be specific.

a.

b.

**Station 2: Coulombic Attraction**

|  |  |
| --- | --- |
| **Drawing of Description 1** | **Answer to Question 1** |
|  |  |
| **Answer to Question 2** |
|  |
| **Drawing of Description 2** | **Answer to Question 3** |
|  |  |

**Station 3: Light My Fire, Flame Tests!**

**Read this before you the teacher does the demo!**

Many elements produce colors in the flame when heated. The origin of this phenomenon lies in the arrangement, or “configuration” of the electrons in the atoms of the different elements. In the “solar system” model of the atom first proposed by Ernest Rutherford and Niels Bohr in the early 1900s, the electrons were pictured as moving around the nucleus in circular orbits in a similar manner that the planets in our solar system orbit the sun. As envisioned by Bohr, during heating, one or more electrons may absorb energy in sufficient amounts to “jump” to an orbit farther away from the nucleus. Since the electron has a higher potential energy in its new orbit, the electron is said to be in a higher energy level.

When the electron has been promoted to a higher energy level, the atom is said to be in an ***excited state.*** When the electrons drop from a higher energy level to a lower energy level (in an orbit closer to the nucleus), **energy is released in the form of light**. In the flame test, if this energy has the form of visible light, the flame will produce a color characteristic of the element. Different elements have a unique color in the flame which can be used to identify an element.

When the electrons are in their lowest energy levels (closest to the nucleus), the atom is said to be in its ***ground state.*  You will need to look online to determine what elements might be in the flame.**

Data Table Flame Tests:

|  |  |  |
| --- | --- | --- |
| **Sample Number** | **Flame Color Observed** | **Possible Ion Tested** |
| 1 |  |  |
| 2 |  |  |
| 3 |  |  |
| 4 |  |  |
| 5 |  |  |
| 6 |  |  |
| 7 |  |  |

1. Why did you need to put the ion from the solution into a flame in order to see the color?
2. When do you see a color from the flame-when the electrons are being promoted to higher energy levels or when they are coming back down?
3. Why do you think the flame test was unique for every element that you looked at?

**Station 4:** Below you will see a star's spectrum. Your job is to identify all the elements you can detect in the star's atmosphere by comparing it to the individual spectra given to you at the station.

|  |  |
| --- | --- |
| Mystery Star Spectrum | Elements Present |
| hm | 1. |
| hcm | 2. |
| hi | 3. |
| hc | 4. |
| ci | 5. |

You have identified all the elements we can see in the star's spectrum. Real spectra are more complex, but now you have the basic idea.

1. Explain how astronomers use spectrographs to identify the composition of a star.

**Station 5: The Color In Our Stars!! Emission Spectra Reading Passage**

Define ground state

Define excited state

Why do different elements have unique spectra?

**Station 6: Draw in the spectral lines below the colors you see using the colored pencils provided at this station (Indigo has been omitted due to the difficulty of distinguishing it from violet.)**

|  |  |
| --- | --- |
| **Element in Tube** | **Observed Spectrum** |
|  | V B G Y O R |

**Station 6: The Hog Hilton**

Monday: 12 hogs

6th floor \_\_\_\_ \_\_\_\_ \_\_\_\_ \_\_\_\_ \_\_\_\_

5th floor \_\_\_\_ \_\_\_\_ \_\_\_\_

4th floor \_\_\_\_

3rd floor \_\_\_\_ \_\_\_\_ \_\_\_\_

2nd floor \_\_\_\_

1st floor \_\_\_\_

Tuesday: 8 hogs

6th floor \_\_\_\_ \_\_\_\_ \_\_\_\_ \_\_\_\_ \_\_\_\_

5th floor \_\_\_\_ \_\_\_\_ \_\_\_\_

4th floor \_\_\_\_

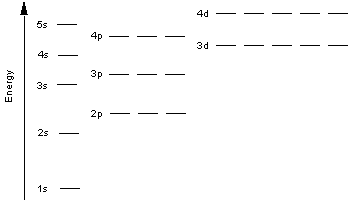
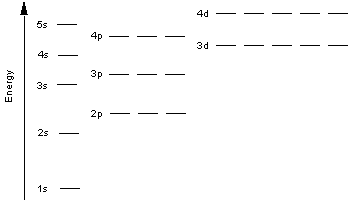
3rd floor \_\_\_\_ \_\_\_\_ \_\_\_\_

2nd floor \_\_\_\_

1st floor \_\_\_

You just learned how to fill up an imaginary hotel. Now you will relate this example to electron orbitals. These are where electrons reside in the atom. Electron orbitals are modeled by the picture below and are grouped into principal energy levels (representing how far they are away from the nucleus.)

2a. 22 electrons 2b. 5 electrons



1. Compare the orbital diagram above with the Hog Hilton setup. What are the similarities and the

differences?

1. **a.** Fill 22 electrons in the orbital diagram above on the left following your Hog Hilton rules. Use up

and down arrows to represent electrons.

**b.** Repeat part a with 5 electrons.

**Station 7: The Science Behind Fireworks**

1. Which elements are used to create the most unstable and dangerous colors?
2. What elements could be used to create red, white and blue fireworks?
3. What element(s) are used as a color and an effect? What effect and color does it display?
4. If you wanted to create a glow in the dark green firework, what would the primary elements you would use?
5. If you wanted deep red fireworks, what would you use?

**Station 8: Wint-O-Green Mints**

1. What did you observe?
2. What was necessary for you to make the wint o green spark?
3. Why did this happen? Use your phone/internet to determine the chemistry behind why the mint sparked.

**Station 9: Electron Energy and Light**

1. Do all colors of light travel at the same speed?

1. Do all colors of light have the same energy? If no, which colors have the highest energy and the

least energy, respectively?

3. Consider the light illustrated in Model 1.

*a.* Which color corresponds to the longest wavelengths?

*b.* Which color corresponds to the shortest wavelengths?

*c.* Write a sentence that describes the relationship between wavelength and energy of light.

**Station 10: Emission Spectra**

1. Which colors are present in a hydrogen discharge tube?
2. Which colors are present in a boron discharge tube?
3. What do the three lines at 412, 420, and 424 nm represent?
4. Which color has the shortest wavelength? Longest wavelength?

1. Is this information consistent with what you learned from station 10?