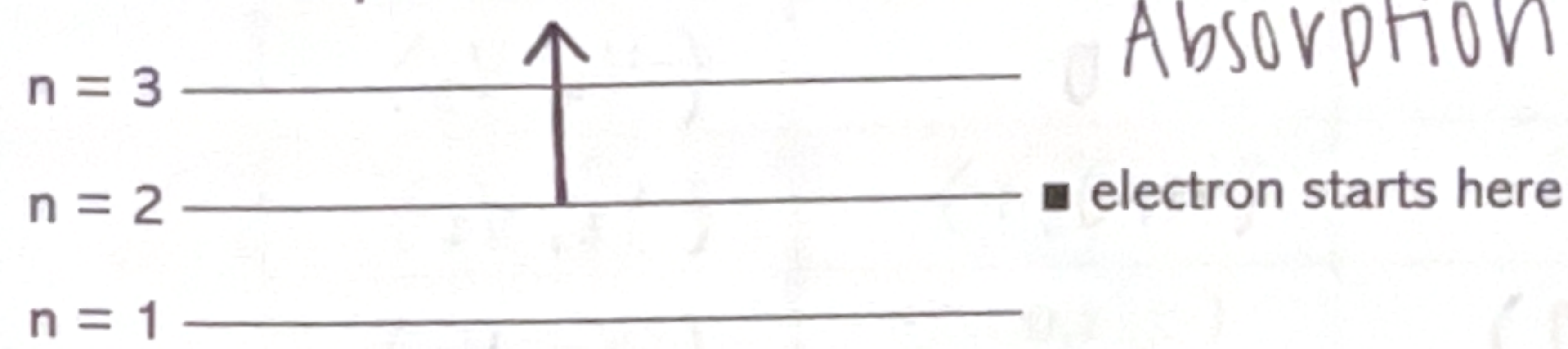
Electron Configuration

A photon of energy 4.9 eV strikes the atom. Draw an arrow showing the electron's motion and label it 'Absorption' or 'Emission.'

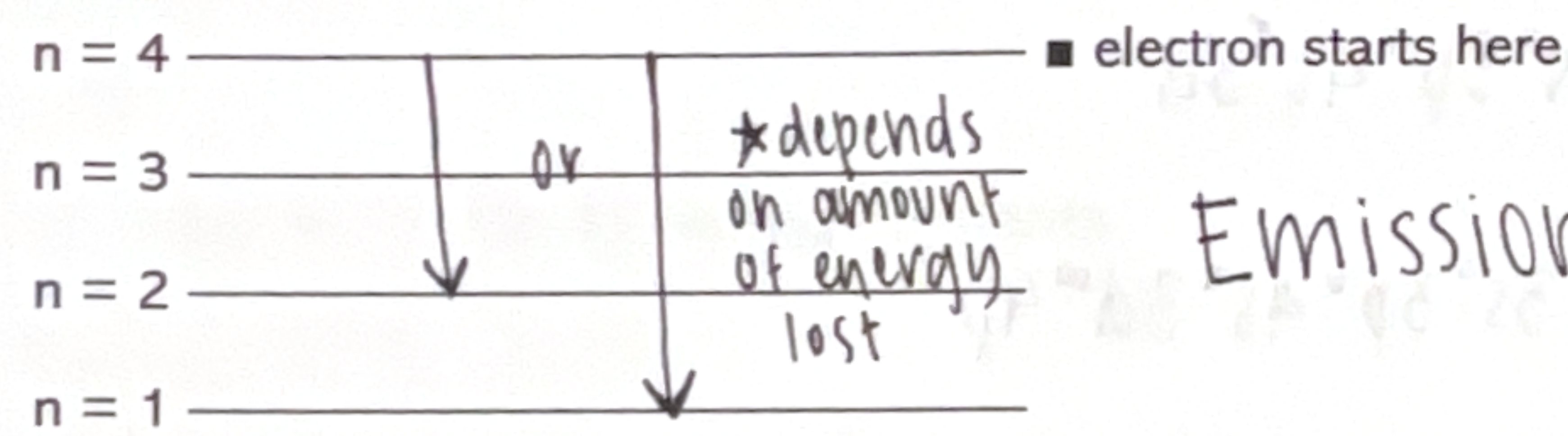


Absorption - gaining energy

- What happens to the photon and what does this tell you about the atom's energy?

  The photon is absorbed and the atom's total energy increases. The atom becomes excited and less stable.

The excited electron releases a photon. Draw an arrow showing the transition.



Emission - releasing energy

- What happens to the atom's stability?

  The atom loses energy so it becomes more stable and moves towards ground state.

Explain the following.

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- Aufbau Principle- electrons fill atomic orbitals of lower energy first, then higher energy
  $1s^2, 2s^2, 2p^6, 3s^2, 3p^6, \ldots$
  - *Exception:* half-filled subshells are more stable than unevenly-filled
    ex. Cu : $4s^1 3d^{10}$ instead of $4s^2 3d^9$ *certain transition metals
- Pauli Exclusion Principle- no two electrons can have the same set of 4 quantum #s
- Hund's Rule- electrons occupy each orbital singly w/ parallel spins first, then form pairs

  X [1↓|1↓|] [1↓|1|1] ✓

Define each quantum number.

n= principle quantum #
-shell category (1, 2, 3, 4...)

l= angular momentum #
-subshell (s, p, d, f)

m_l= magnetic quantum #
-orientation (ex. p_x, p_y, p_z)

m_s= magnetic spin #
-direction ($-\frac{1}{2}$ or $\frac{1}{2}$)

l: 0 → s
1 → p
2 → d
3 → f

ml: s → 1 orientation = 1 orbital
p → 3 orientations = 3 orbitals
d → 5 orientations = 5 orbitals
f → 7 orientations = 7 orbitals

Each orbital houses 2 e^- max

Complete the table below by including a range of all possible values.

n	l	m_l	m_s
1	0	0	(-1/2, 1/2)
2	(0,1)	(-1, 0, 1)	(-1/2, 1/2)
3	(0, 1, 2)	(-2,-1,0,1,2)	(-1/2, 1/2)
4	(0, 1, 2, 3)	(-3,-2,-1,0,1,2,3)	(-1/2, 1/2)

Write the full electron configuration for the following elements.

1) Copper $1s^2 2s^2 2p^6 3s^2 3p^6 4s^1 3d^{10}$
2) Bromine $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^5$
3) Potassium ion (K^+) $1s^2 2s^2 2p^6 3s^2 3p^6$
4) Bismuth $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^6 5s^2 4d^{10} 5p^6 6s^2 4f^{14} 5d^{10} 6p^3$
5) Magnesium ion (Mg^{2+}) $1s^2 2s^2 2p^6$

Write the noble electron configuration for the following elements.

1) Aluminum [Ne] $3s^2 3p^1$
2) Calcium [Ar] $4s^2$
3) Oxygen ion (O^{2-}) [Ne]
4) Arsenic [Ar] $4s^2 3d^{10} 4p^3$
5) Scandium ion (Sc^{3+}) [Ar]

Identify the following elements based on their configuration.

$1s^2\ 2s^2\ 2p^6\ 3s^1$ sodium

$1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 4s^2\ 3d^{10}\ 4p^6\ 5s^2\ 4d^6$ Ruthenium

$[Kr]\ 5s^2\ 4d^{10}$ cadmium

$[Xe]\ 6s^2\ 4f^{14}\ 5d^{10}\ 6p^2$ Lead

$[Rn]\ 7s^2\ 5f^{14}\ 6d^4$ seaborgium

Fill in the diagram for the following elements.

1) Sodium $1s^2 2s^2 2p^6 3s^1$

↑↓		↑↓		↑↓	↑↓	↑↓		↑						
1s		2s			2p			3s			3p			4s

2) Nitrogen $1s^2 2s^2 2p^3$

↑↓		↑↓		↑	↑	↑								
1s		2s			2p			3s			3p			4s

3) Manganese $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^5$

1s		2s			2p			3s			3p			4s
↑↓		↑↓		↑↓	↑↓	↑↓		↑↓		↑↓	↑↓	↑↓		↑↓
	↑	↑	↑	↑	↑									
			3d					4p			5s			

4) Copper $1s^2 2s^2 2p^6 3s^2 3p^6 4s^1 3d^{10}$

1s		2s			2p			3s			3p			4s
↑↓		↑↓		↑↓	↑↓	↑↓		↑↓		↑↓	↑↓	↑↓		↑
	↑↓	↑↓	↑↓	↑↓	↑↓									
			3d					4p			5s			