Chem Workshop 2
Odds

1. Fe [↑↓] [↑↓] [↑↓|↑↓|↑↓] [↑↓] [↑↓|↑↓|↑↓] [↑↓] [↑↓|↑|↑|↑|↑]
$1s^2$ $2s^2$ $2p^6$ $3s^2$ $3p^6$ $4s^2$ $3d^6$

Fill orbital boxs using Hund's rule and the Pauli exclusion Principle.

Hund's rule says that electrons must be of opposite spins when filled in a sublevel (box).

Correction: Hund's rule states that each orbital is filled with a single electron before pairing them.

Pauli exclusion principle says that no 2 electrons can have the same set of 4 quantum numbers. Each set for each electron is specific and unique to that electron, like a fingerprint.

Acceptable quantum numbers
n = the subshell. For the highest energy electrons, $n = 3$ from 3d.
l : Angular quantum number (shape of orbital) $l = 0, 1, 2$ for 3d e^-.
m_l : Magnetic quantum number (orientation) $m_l = -l; 0; +l$. $-2, -1, 0, 1, 2$
m_s: spin of the electron. $+1/2$ or $-1/2$.

3A. Sn : [Kr] $5s^2 4d^{10} 5p^2$

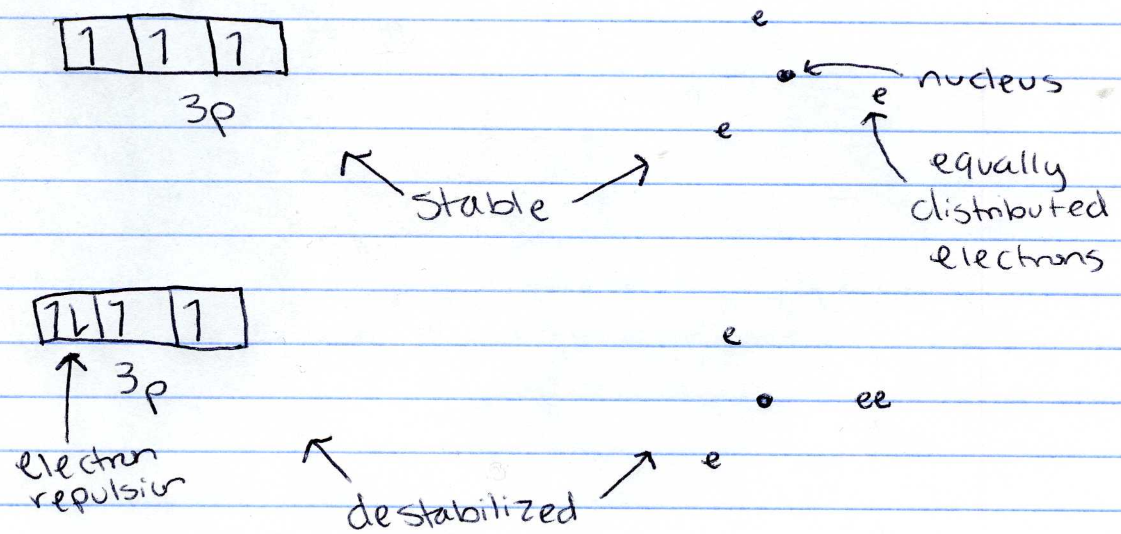
- use the last noble gas past the element you're looking at.
- Always fill sublevels as s < p < d < f unless the element is an exception (Cr, Cu)

B. V : [Ar] $4s^2 3d^3$

- know the order of the sub levels.
1s, 2s, 2p, 3s, 3p, 4s, 3d, 4p, 5s...
4d, 5p, 6s, 4f, 5d, 6p, 7s,
5f, 6d, 7p.

5. When a subshell is half filled, the electrons are equally distributed around the electron cloud in the probability range of the electrons. If another electron comes in to pair up with a unpaired electron, electron repulsion (negative - negative charges) occurs. This destabilizes the atom.

For example...



7. Speed of light = $c = 2.9979 \times 10^8$ m/s

~~We will use the equation: $v = \frac{c}{\lambda}$~~

* We know any wave at any frequency, in this case radio waves, travel at the speed of light.

60 million km = 60 billion m

* It would be useful to convert km → m

We will use the equation $\text{speed} = \frac{\text{distance (m)}}{\text{time (m/s)}} = \text{time} = \frac{\text{distance}}{\text{speed}}$ to solve for time.

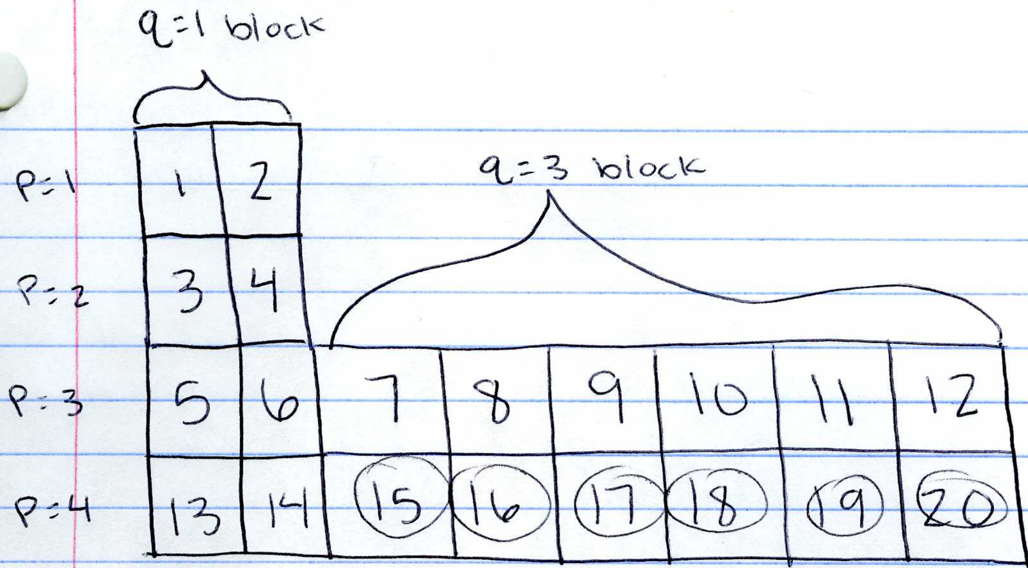
$$\frac{60 \text{ billion m}}{2.9979 \times 10^8 \text{ m/s}} = \text{time} = \boxed{200s}$$

9A. $P = 1, 2, 3, 4, 5 \ldots$
q = positive odd integers $q \leq P$
r = even integers including zero ($-q$ to $+q$)
$s = +1/2$ or $-1/2$

* set up a table using these 4 quantum numbers and their rules.

	P	q	r	s
period	1	1	0	±1/2
	2	1	0	±1/2
	3	1, 3	-2, 0, 2	±1/2
	4	1, 3	-2, 0, 2	±1/2

* From this we see that in period 1, there can be 2 element boxes. For period 2, there is also room for 2 different element boxes. For periods 3 and 4, there are each 2 elements for the q=1 boxs and 6 elements in the q=3 level for a total of 8 elements in Periods 3 and 4. We can now arrange the periodic table using this.



B. First 4 elements that are least reactive?
2, 4, 12, 20. These 4 elements have all their sublevels filled, so they are stable and do not want to transfer electrons.

C. How many electrons can have p=4, q=3
6 elements (circled above)

D. How many electrons can have p=3, q=0, r=0?
According to these rules, q can never be zero. So there is no element that can have this set of quantum numbers because $q \neq 0$.