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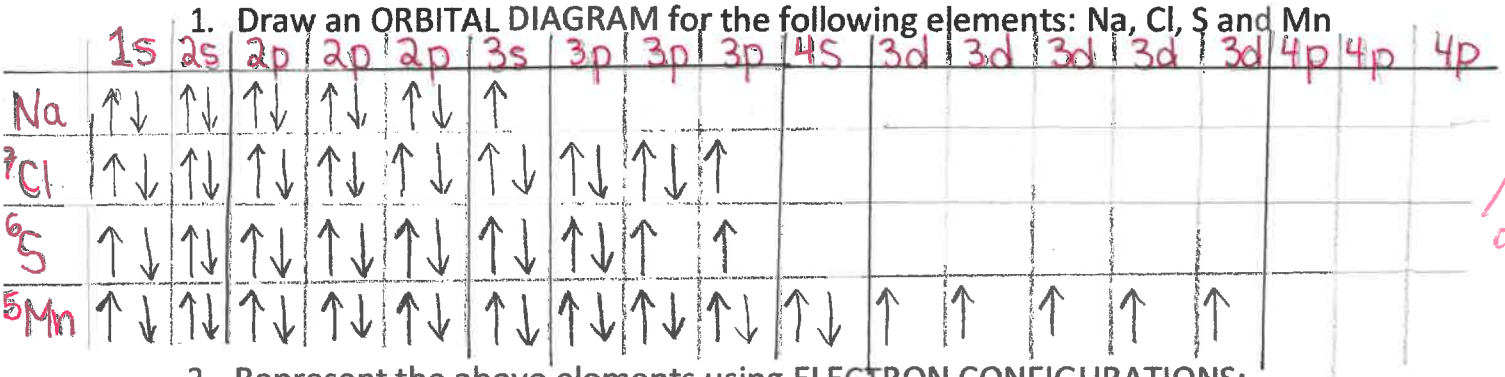
Name: Key
Blk:_____ Date:_____

Chemistry 11
QUANTUM NUMBERS AND ORBITAL DIAGRAMS EXERCISES

1. Draw an ORBITAL DIAGRAM for the following elements: Na, Cl, S and Mn



1/2

2. Represent the above elements using ELECTRON CONFIGURATIONS:

Na $(1s^2 2s^2 2p^6 3s^1)$
Cl $(1s^2 2s^2 2p^6 3s^2 3p^5)$
S $(1s^2 2s^2 2p^6 3s^2 3p^4)$
Mn $(1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^5)$

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3. How do two electrons that occupy the same orbital differ?

They differ because they have opposite spins

↑ up spin / clockwise & ↓ spin / counter

1/1

4. What does the Pauli Exclusion Principle state about electrons?

No two electrons can have the same exact four quantum number

Know Hund's rule! → public transit/urinal analogy

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5. Why does the orbital diagram you draw for Manganese in #1 show the five 3d electrons each in a separate orbital rather than grouped together in pairs?

To decrease the force of repulsion between electrons, each electron is placed individually into the available orbitals before doubling up (Hund's rule!)

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6. **Briefly explain why when completing an electron configuration the 4s orbital "fills" before the 3d.**

Following the energy level diagram, you must fill the lowest energy level 1st, because 4s is lower on the chart, it is "filled" before 3d! 1

7. **Write the ION CONFIGURATIONS for the following:**

a. Ca^{2+} $(1s^2 2s^2 2p^6 3s^2 3p^6)$ or $([Ne] 3s^2 3p^6)$

b. Al^{3+} $(1s^2 2s^2 2p^6)$ or $([He] 2s^2 2p^6)$

c. P^{3-} $(1s^2 2s^2 2p^6 3s^2 3p^6)$ or $([Ne] 3s^2 3p^6)$

d. F^{1-} $(1s^2 2s^2 2p^6)$ or $([He] 2s^2 2p^6)$

e. Co^{2+} $(1s^2 2s^2 2p^6 3s^2 3p^6 3d^7)$ or $([Ar] 3d^7)$

↑ electron Config. ↑ Core Notation

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Three ways to show the Quantum Mechanical Model

1. electron configuration
2. Core Notation
3. Orbital diagram (to show the 4th Quantum No.)

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