#12 Ca^{+2} [Ar] | Cl^- [Ar] | O^{-2} [Ne] | K^+ [Ar] | Li^+ [He] | Rb^+ [Kr] | S^{2-} [Ar]

+13 Name _____ all noble gas config.

Transition Metal Electron Configuration Worksheet

1. Give abbreviated electron configurations of the following:
   a) Sc atom, Sc^{3+} ion b) Zn atom, Zn^{2+} ion

Sc [Ar] $4s^2 3d^1$

Sc^{3+} [Ar]

Zn [Ar] $4s^2 3d^{10}$

Zn^{2+} [Ar] $3d^{10}$

2. Using orbital diagrams, determine the number of unpaired electrons in the following:
   a) Cd^{2+} b) Cr^{2+} c) Cu^+ d) Zr^{2+}

[Kr] $3d^{10}$

Cr
[Ar] $4s^1 3d^5$

Cr^{2+}
[Ar] $3d^3$

Cu
[Ar] $4s^1 3d^{10}$

Cu^+
[Ar] $3d^{10}$

Zr
[Kr] $5s^2 3d^2$

Zn^{2+}
[Kr] $3d^2$

3. Consider the element cobalt (Z=27).
   a) Write the electron configuration of the Co atom and the Co^{3+} ion.

Co [Ar] $4s^2 3d^7$

Co^{3+} [Ar] $4s^1 3d^5$

b) Give the orbital diagram (beyond Ar) for the Co atom and the Co^{3+} ion.

Co [Ar] ⇅ | ⇅ ↑ ↑ ↑ ↑ (−2 −1 0 +1 +2)

Co^{3+} [Ar] ↑ | ↑ ↑ ↑ ↑ ↑

c) Give the quantum numbers for all the d electrons in the Co atom and the Co^{3+} ion.

Co atom
3 2 −2 +1/2
3 2 −2 −1/2
3 2 −1 +1/2
3 2 −1 −1/2
3 2 0 +1/2
3 2 +1 +1/2
3 2 +2 +1/2

just can't be the same!

−1/2 OR −1/2 −1/2

Co ion
3 2 −2 +1/2
3 2 −1 +1/2
3 2 0 +1/2
3 2 +1 +1/2
3 2 +2 +1/2

NO 2 e⁻ can have the same PQ#

or −1/2 for all or any!!