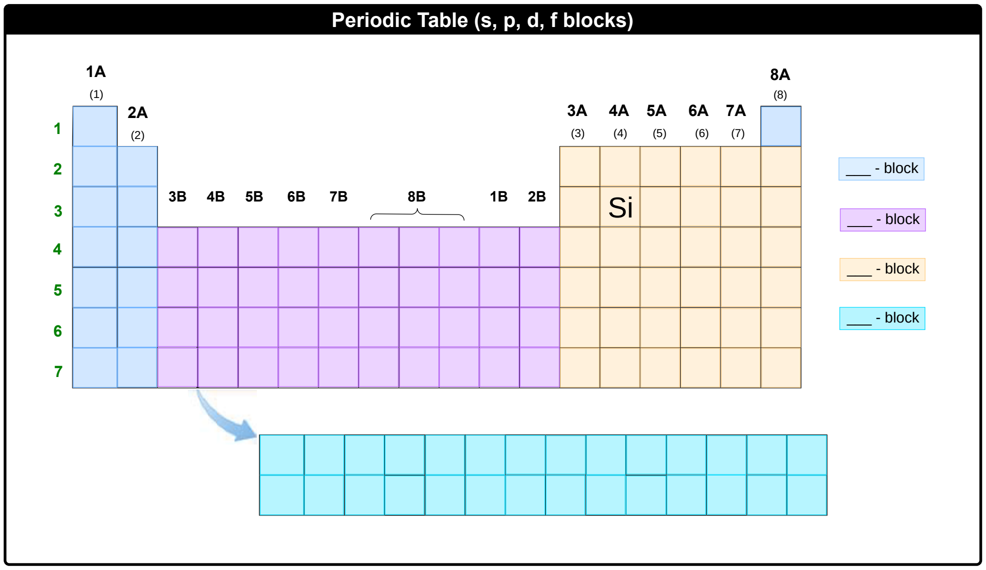
CONCEPT: THE ELECTRON CONFIGURATION

● Electron configurations represent the arrangement of electrons within ___________ & ___________.



EXAMPLE: Write the full ground-state electron configuration for the following element:

Si (Z = 14)

Condensed Electron Configurations

● With condensed electron configurations, we start at the last ________________ before the desired element.

EXAMPLE: Write the condensed electron configuration for the following element:

Ca (Z = 20)

Charged Electron Configurations

● With a cation, we first remove electrons from the highest shell number (*n* value).

□ *n* value represents the _______________ quantum number and deals with the atomic orbital's size and energy.

□ The quantum number provides the shell number or energy level of the electron.

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

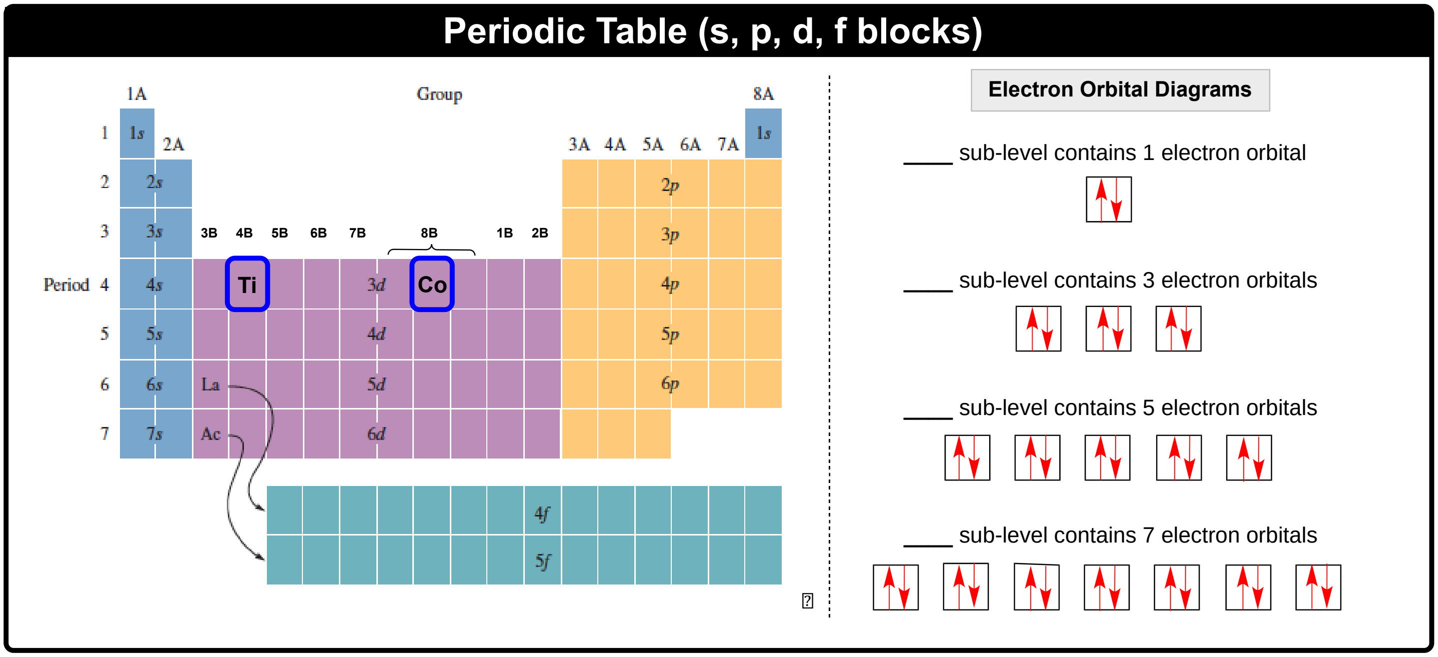
n = n = n =

EXAMPLE: Write the condensed electron configurations for the element and its ion:

V (Z = 23) V^{3+} (Z = 23)

CONCEPT: ELECTRON CONFIGURATIONS OF TRANSITION METALS

- The transition metals are the elements in the _____ – block or Group _____ of the periodic table.
  - □ Within a given period, a transition metal fills its ____ – orbital in the *n* quantum level followed by its ____ – orbital.



EXAMPLE: Write the full ground-state electron configuration and electron orbital diagram for the following element:

Ti (Z = 22)

[ ]

[ ]

PRACTICE: Write the condensed configuration for the following element:

Co^{+} (Z = 27)

CONCEPT: ELECTRON CONFIGURATION EXCEPTIONS

● Starting from chromium, as the atomic number (Z) ____________ exceptions to electron configurations can be observed.

□ s orbitals can be promoted to create half-filled orbitals with ___- elements.

Cr (Z = 24) [Ar] $4s^{2}3d^{4}$

[Ar] □ □ □ □ □ □ [Ar] □ □ □ □ □ □

□ s orbitals can be promoted to create totally-filled orbitals with ___- elements.

Cu (Z = 29) [Ar] $4s^{2}3d^{9}$

[Ar] □ □ □ □ □ □ [Ar] □ □ □ □ □ □

□ There are more advanced explanations for the exceptions, but for the scope of this course we won't go into them.

Periodic Table (Transition Metals)

	3B	4B	5B	6B	7B	8B			1B	2B
Period 4	21 Sc	22 Ti	23 V	24 **Cr**	25 Mn	26 Fe	27 Co	28 Ni	29 **Cu**	30 Zn
Period 5	39 Y	40 Zr	41 Nb	42 **Mo**	43 Tc	44 Ru	45 Rh	46 Pd	47 **Ag**	48 Cd
Period 6	57 La	72 Hf	73 Ta	74 W	75 Re	76 Os	77 Ir	78 Pt	79 **Au**	80 Hg
Period 7	89 Ac	104 Rf	105 Db	106 Sg	107 Bh	108 Hs	109 Mt	110 Ds	111 **Rg**	112 Cn

EXAMPLE: With an atomic number (Z) of 42, illustrate the exception to the electron configuration of molybdenum.

Mo (Z = 42)

[ ] □ □ □ □ □ □

EXAMPLE: Write the condensed electron configuration of the following ion:

Ag^{+} (Z = 47)

[ ] □ □ □ □ □ □

CONCEPT: ELECTRON CONFIGURATION EXCEPTIONS

PRACTICE: Write the condensed electron configuration of the following ion:

Cu^+ (Z = 29)

PRACTICE: The palladium atom possesses a unique electron configuration, in which its d-orbital would prefer to be completely filled. Based on this information, provide the electron configuration of both Pd^0 and Pd^{2+}.

CONCEPT: VALENCE ELECTRONS OF TRANSITION METALS

- The valence electrons represent the _________ shell electrons that are involved in the formation of chemical bonds.
  - □ For Main Group elements, the number of valence electrons is equal to the group number.

Group 1	Group 2	Group 3	Group 4	Group 5	Group 6	Group 7	Group 8
•Na	•Mg•	•Al•	•Si•	•P•	•S•	:Cl•	:Ar:

  - □ The valence of a transition metal (Metal M) is equal to ______ + ______ electrons.

Periodic Table (Transition Metals)

	3B	4B	5B	6B	7B	8B	8B	8B	1B	2B
Valence e⁻	____	____	____	____	____	____	____	____	____	____
Period 4	21 Sc $4s^2 3d^1$	22 Ti $4s^2 3d^2$	23 V $4s^2 3d^3$	24 Cr $4s^1 3d^5$	25 Mn $4s^2 3d^5$	26 Fe $4s^2 3d^6$	27 Co $4s^2 3d^7$	28 Ni $4s^2 3d^8$	29 Cu $4s^1 3d^{10}$	30 Zn $4s^2 3d^{10}$
Period 5	39 Y $5s^2 4d^1$	40 Zr $5s^2 4d^2$	41 Nb $5s^1 4d^4$	42 Mo $5s^1 4d^5$	43 Tc $5s^2 4d^5$	44 Ru $5s^1 4d^7$	45 Rh $5s^1 4d^8$	46 Pd $4d^{10}$	47 Ag $5s^1 4d^{10}$	48 Cd $5s^2 4d^{10}$
Period 6	57 La $6s^2 5d^1$	72 Hf $6s^2 5d^2$	73 Ta $6s^2 5d^3$	74 W $6s^2 5d^4$	75 Re $6s^2 5d^5$	76 Os $6s^2 5d^6$	77 Ir $6s^2 5d^7$	78 Pt $6s^1 5d^9$	79 Au $6s^1 5d^{10}$	80 Hg $6s^2 5d^{10}$
Period 7	89 Ac $7s^2 6d^1$	104 Rf $7s^2 6d^2$	105 Db $7s^2 6d^3$	106 Sg $7s^2 6d^4$	107 Bh $7s^2 6d^5$	108 Hs $7s^2 6d^6$	109 Mt $7s^2 6d^7$	110 Ds $7s^2 6d^8$	111 Rg $7s^1 6d^{10}$	112 Cn $7s^2 6d^{10}$

EXAMPLE: How many valence electrons are present in the following ion?

Ni^{+} (Z = 28)

PRACTICE: Provide the condensed electron configuration and the number of valence electrons for the following ion:

Fe^{3+} (Z = 26)