2.6 How Are the Electrons in an Atom Arranged?

Electron Configurations Worksheet.

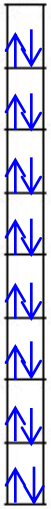
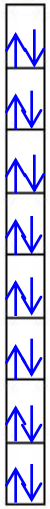
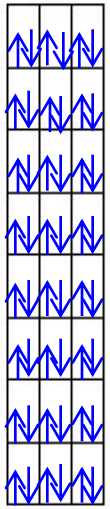
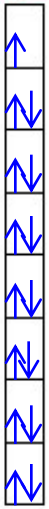
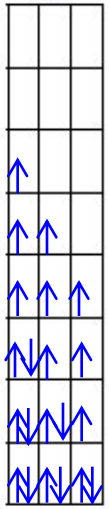
Gp		#e	1s	2s	2p	3s	3p	Electronic Configuration	Noble Gas	Valence	Lewis Dot
1A	H	1	↑					$1s^1$	$1s^1$	1	H•
8A	He	2 ①	↑↓					$1s^2$	$1s^2$	2	He:
1A	Li	3	↑↓	↑				$1s^2\ 2s^1$	$[He]\ 2s^1$	1	Li•
2A	Be	4	↑↓	↑↓				$1s^2\ 2s^2$	$[He]\ 2s^2$	2	Be:
3A	B	5	↑↓	↑↓	↑			$1s^2\ 2s^2 2p^1$	$[He]\ 2s^2 2p^1$	3	•B:
4A	C	6 ②	↑↓	↑↓	↑ ↑			$1s^2\ 2s^2 2p^2$	$[He]\ 2s^2 2p^2$	4	•C:
5A	N	7	↑↓	↑↓	↑ ↑ ↑			$1s^2\ 2s^2 2p^3$	$[He]\ 2s^2 2p^3$	5	•N:
6A	O	8	↑↓	↑↓	↑↓ ↑			$1s^2\ 2s^2 2p^4$	$[He]\ 2s^2 2p^4$	6	•O:
7A	F	9	↑↓	↑↓	↑↓ ↑↓ ↑			$1s^2\ 2s^2 2p^5$	$[He]\ 2s^2 2p^5$	7	:F:
8A	Ne	10	↑↓	↑↓	↑↓ ↑↓ ↑↓			$1s^2\ 2s^2 2p^6$	$[He]\ 2s^2 2p^6$	8	:Ne:

③

④

2.6 How Are the Electrons in an Atom Arranged?

Electron Configurations Worksheet.

Gp		#e	1s	2s	2p	3s	3p	Electronic Configuration		Noble Gas	Valence	Lewis Dot
1A	Na	11						$1s^2 2s^2 2p^6$	$3s^1$	$[Ne]3s^1$	1	Na•
2A	Mg	12						$1s^2 2s^2 2p^6$	$3s^2$	$[Ne]3s^2$	2	•Mg•
3A	Al	13						$1s^2 2s^2 2p^6$	$3s^2 3p^1$	$[Ne]3s^2 3p^1$	3	•Al•
4A	Si	14						$1s^2 2s^2 2p^6$	$3s^2 3p^2$	$[Ne]3s^2 3p^2$	4	•Si•
5A	P	15						$1s^2 2s^2 2p^6$	$3s^2 3p^3$	$[Ne]3s^2 3p^3$	5	•P•
6A	S	16						$1s^2 2s^2 2p^6$	$3s^2 3p^4$	$[Ne]3s^2 3p^4$	6	•S•
7A	Cl	17						$1s^2 2s^2 2p^6$	$3s^2 3p^5$	$[Ne]3s^2 3p^5$	7	:Cl•
8A	Ar	18						$1s^2 2s^2 2p^6$	$3s^2 3p^6$	$[Ne]3s^2 3p^6$	8	:Ar:

2.6 How Are the Electrons in an Atom Arranged?

① **Pauli :** Maximum of two electrons per orbital.

② **Hund :** Orbitals on the same level are filled by a single electron first before pairing up.

③ **Noble Gas : (electrons)** Their stability precludes them from any desire to get involved in any chemistry ... under NORMAL circu

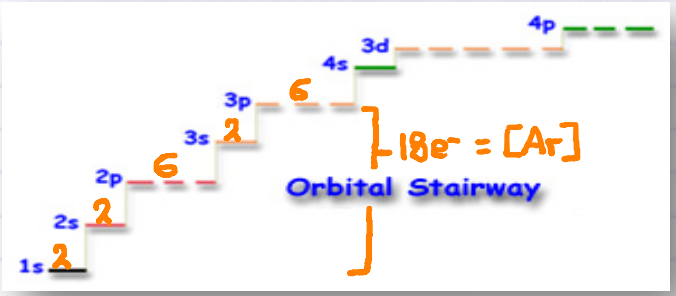
④ **Valence Electrons:** For Main Group elements ... the total number of electrons occupying the highest n valued orbitals.

↳ I : $[Kr]\,5s^2\ 4d^{10}\ 5p^5$ ... 7 valence electrons.

✓ ✗ ✓

2.6 How Are the Electrons in an Atom Arranged?

Transition Metals



21 Sc Scandium 44.9559	22 Ti Titanium 47.88	23 V Vanadium 50.9415	24 Cr Chromium 51.9961	25 Mn Manganese 54.9380	26 Fe Iron 55.847	27 Co Cobalt 58.9332	28 Ni Nickel 58.693	29 Cu Copper 63.546	30 Zn Zinc 65.39

		PREDICTED CONFIGURATION	GRADED ≠	ACTUAL CONFIGURATION
21	Sc	$[Ar]\ 4s^2\ 3d^1$	✓	✓
22	Ti	$[Ar]\ 4s^2\ 3d^2$	✓	✓
23	V	$[Ar]\ 4s^2\ 3d^3$	✓	✓
24	Cr	$[Ar]\ 4s^2\ 3d^4$	X	$[Ar]\ 4s^1\ 3d^5$
25	Mn	$[Ar]\ 4s^2\ 3d^5$	✓	✓
26	Fe	$[Ar]\ 4s^2\ 3d^6$	✓	✓
27	Co	$[Ar]\ 4s^2\ 3d^7$	✓	✓
28	Ni	$[Ar]\ 4s^2\ 3d^8$	✓	✓
29	Cu	$[Ar]\ 4s^2\ 3d^9$	X	$[Ar]\ 4s^1\ 3d^{10}$
30	Zn	$[Ar]\ 4s^2\ 3d^{10}$	✓	✓
			80%!	

≠ See class web site to check on the experimentally determined actual configurations.

2.6 How Are the Electrons in an Atom Arranged?

1A	Li	3	↑↓	↑									$1s^2 2s^1$	$[He]2s^1$	1	Li·
2A	Be	4	↑↓	↑↓									$1s^2 2s^2$	$[He]2s^2$	2	·Be·
3A	B	5	↑↓	↑↓	↑								$1s^2 2s^2 2p^1$	$[He]2s^2 2p^1$	3	·B·
4A	C	6	↑↓	↑↓	↑	↑							$1s^2 2s^2 2p^2$	$[He]2s^2 2p^2$	4	·C·
5A	N	7	↑↓	↑↓	↑	↑	↑						$1s^2 2s^2 2p^3$	$[He]2s^2 2p^3$	5	·N·
6A	O	8	↑↓	↑↓	↑↓	↑	↑						$1s^2 2s^2 2p^4$	$[He]2s^2 2p^4$	6	·O·
7A	F	9	↑↓	↑↓	↑↓	↑↓	↑						$1s^2 2s^2 2p^5$	$[He]2s^2 2p^5$	7	·F·
8A	Ne	10	↑↓	↑↓	↑↓	↑↓	↑↓						$1s^2 2s^2 2p^6$	$[He]2s^2 2p^6$	8	·Ne·

1A	Na	11	↑↓	↑↓	↑↓	↑↓	↑↓	↑					$1s^2 2s^2 2p^6 3s^1$	$[Ne]\ 3s^1$	1	Na·
2A	Mg	12	↑↓	↑↓	↑↓	↑↓	↑↓	↑↓					$1s^2 2s^2 2p^6 3s^2$	$[Ne]\ 3s^2$	2	·Mg·
3A	Al	13	↑↓	↑↓	↑↓	↑↓	↑↓	↑↓	↑				$1s^2 2s^2 2p^6 3s^2 3p^1$	$[Ne]\ 3s^2 3p^1$	3	·Al·
4A	Si	14	↑↓	↑↓	↑↓	↑↓	↑↓	↑↓	↑	↑			$1s^2 2s^2 2p^6 3s^2 3p^2$	$[Ne]\ 3s^2 3p^2$	4	·Si·
5A	P	15	↑↓	↑↓	↑↓	↑↓	↑↓	↑↓	↑	↑	↑		$1s^2 2s^2 2p^6 3s^2 3p^3$	$[Ne]\ 3s^2 3p^3$	5	·P·
6A	S	16	↑↓	↑↓	↑↓	↑↓	↑↓	↑↓	↑↓	↑	↑		$1s^2 2s^2 2p^6 3s^2 3p^4$	$[Ne]\ 3s^2 3p^4$	6	·S·
7A	Cl	17	↑↓	↑↓	↑↓	↑↓	↑↓	↑↓	↑↓	↑↓	↑		$1s^2 2s^2 2p^6 3s^2 3p^5$	$[Ne]\ 3s^2 3p^5$	7	·Cl·
8A	Ar	18	↑↓	↑↓	↑↓	↑↓	↑↓	↑↓	↑↓	↑↓	↑↓		$1s^2 2s^2 2p^6 3s^2 3p^6$	$[Ne]\ 3s^2 3p^6$	8	·Ar·

2.7 Electronic Configuration and Position in the Periodic Table

			Electron Configuration	Noble Gas	Valence
1A	Li	3	$1s^2 2s^1$	$[He]2s^1$	1
2A	Be	4	$1s^2 2s^2$	$[He]2s^2$	2
3A	B	5	$1s^2 2s^2 2p^1$	$[He]2s^2 2p^1$	3
4A	C	6	$1s^2 2s^2 2p^2$	$[He]2s^2 2p^2$	4
5A	N	7	$1s^2 2s^2 2p^3$	$[He]2s^2 2p^3$	5
6A	O	8	$1s^2 2s^2 2p^4$	$[He]2s^2 2p^4$	6
7A	F	9	$1s^2 2s^2 2p^5$	$[He]2s^2 2p^5$	7
8A	Ne	10	$1s^2 2s^2 2p^6$	$[He]2s^2 2p^6$	8
1A	Na	11	$1s^2 2s^2 2p^6 3s^1$	$[Ne]\ 3s^1$	1
2A	Mg	12	$1s^2 2s^2 2p^6 3s^2$	$[Ne]\ 3s^2$	2
3A	Al	13	$1s^2 2s^2 2p^6 3s^2 3p^1$	$[Ne]\ 3s^2 3p^1$	3
4A	Si	14	$1s^2 2s^2 2p^6 3s^2 3p^2$	$[Ne]\ 3s^2 3p^2$	4
5A	P	15	$1s^2 2s^2 2p^6 3s^2 3p^3$	$[Ne]\ 3s^2 3p^3$	5
6A	S	16	$1s^2 2s^2 2p^6 3s^2 3p^4$	$[Ne]\ 3s^2 3p^4$	6
7A	Cl	17	$1s^2 2s^2 2p^6 3s^2 3p^5$	$[Ne]\ 3s^2 3p^5$	7
8A	Ar	18	$1s^2 2s^2 2p^6 3s^2 3p^6$	$[Ne]\ 3s^2 3p^6$	8

Gp 1A, +1

Gp 2A, +2

Gp 7A, -1

2.7 Electronic Configuration and Periodic Blocks