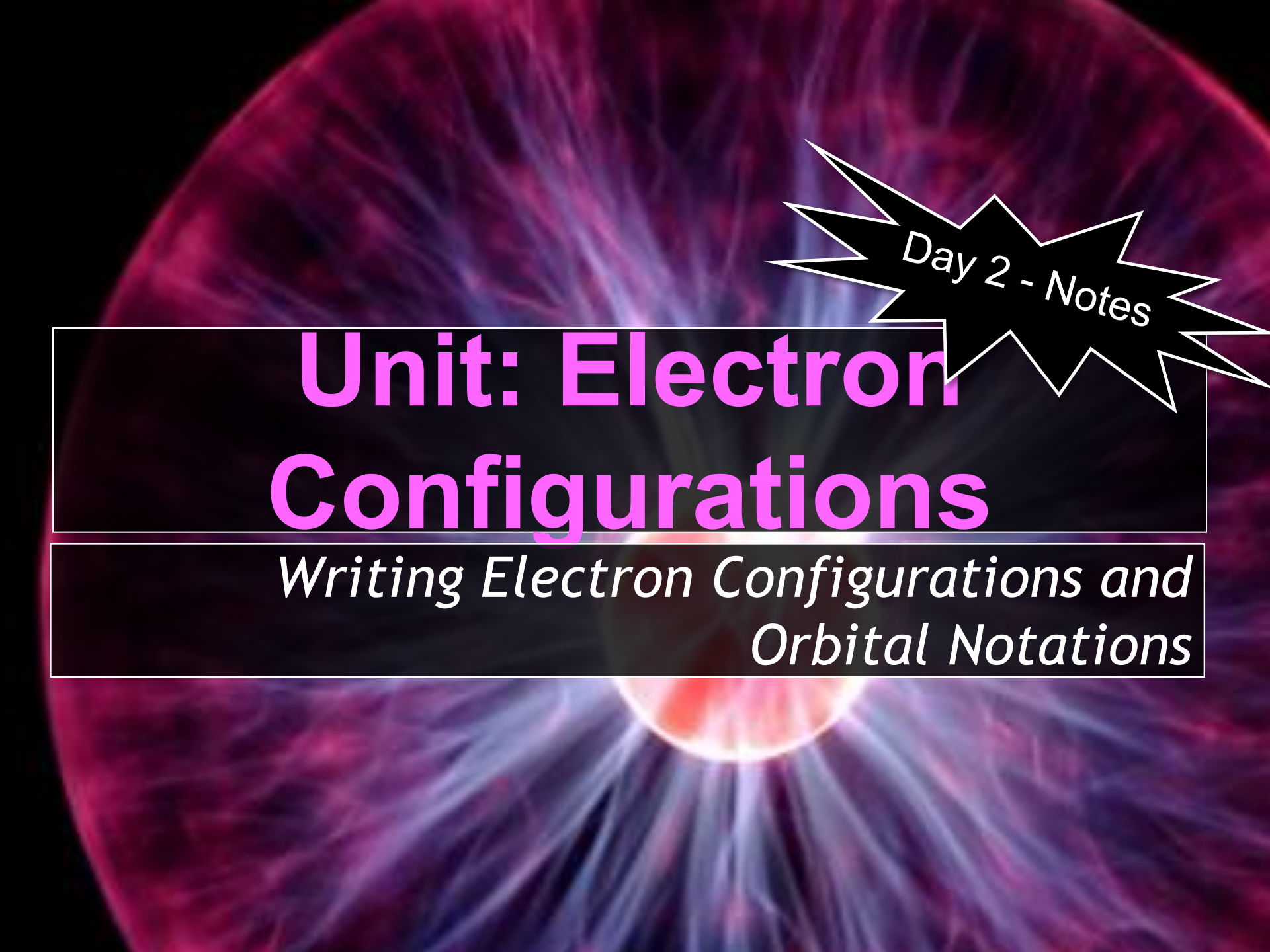


Grade 11 NTI Day #5 Chemistry

Please read through the slidedeck below. Then answer the questions that follow. Use the standard periodic table and the blank periodic table (the one showing the Energy levels and sublevels) to complete the worksheet.



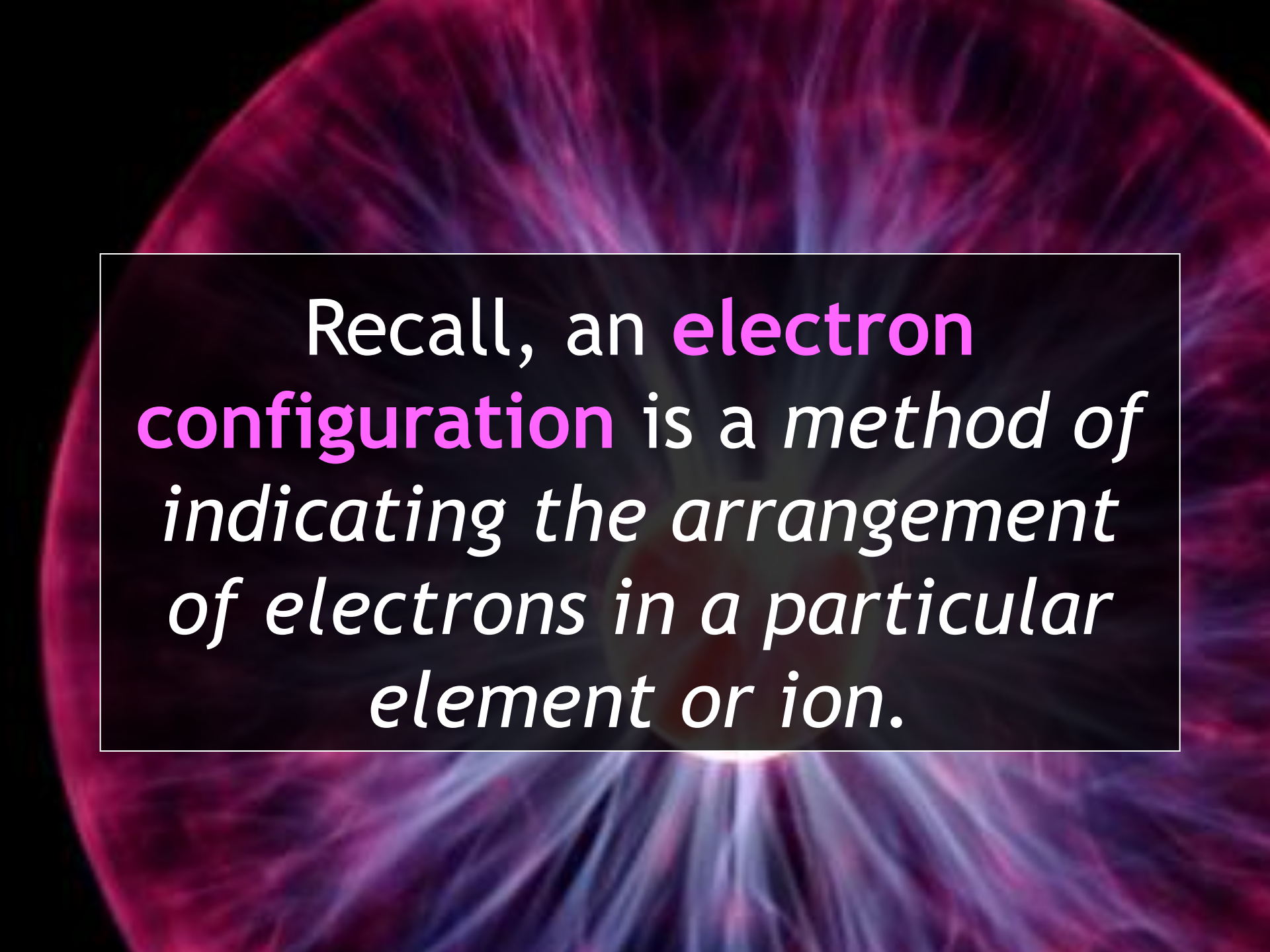
Day 2 - Notes

Unit: Electron Configurations

*Writing Electron Configurations and
Orbital Notations*

After today you should be able to...

- Write electron configurations in the proper long-form notation
- Write orbital notations for elements in the proper notation
- Identify elements from their electron configuration or orbital notation

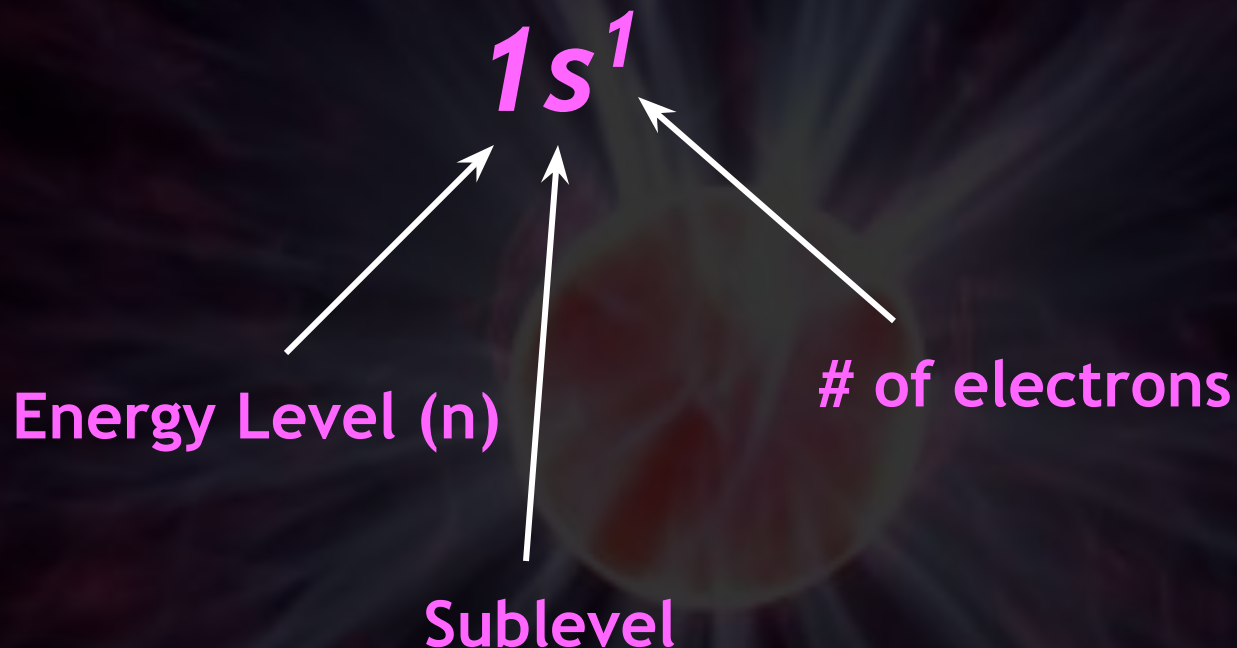


Recall, an **electron configuration** is a *method of indicating the arrangement of electrons in a particular element or ion.*

- Electrons fill the *1st energy level before the 2nd, before the 3rd, etc.*
- Within an energy level fill *s, p, d, then f*
- Remember for a neutral atom:
 $p^+ = e^- = \text{atomic number}$

Example: Write the electron configuration for Hydrogen

Hydrogen has $1e^-$:



Example: Write the electron configuration for Helium

Helium has $2e^-$:



Example: Write the electron configuration for Lithium

Lithium has $3e^-$:



Aufbau Principle: *Electrons enter sublevels with the lowest energy first*

Example: Write the electron configuration for *Nitrogen*

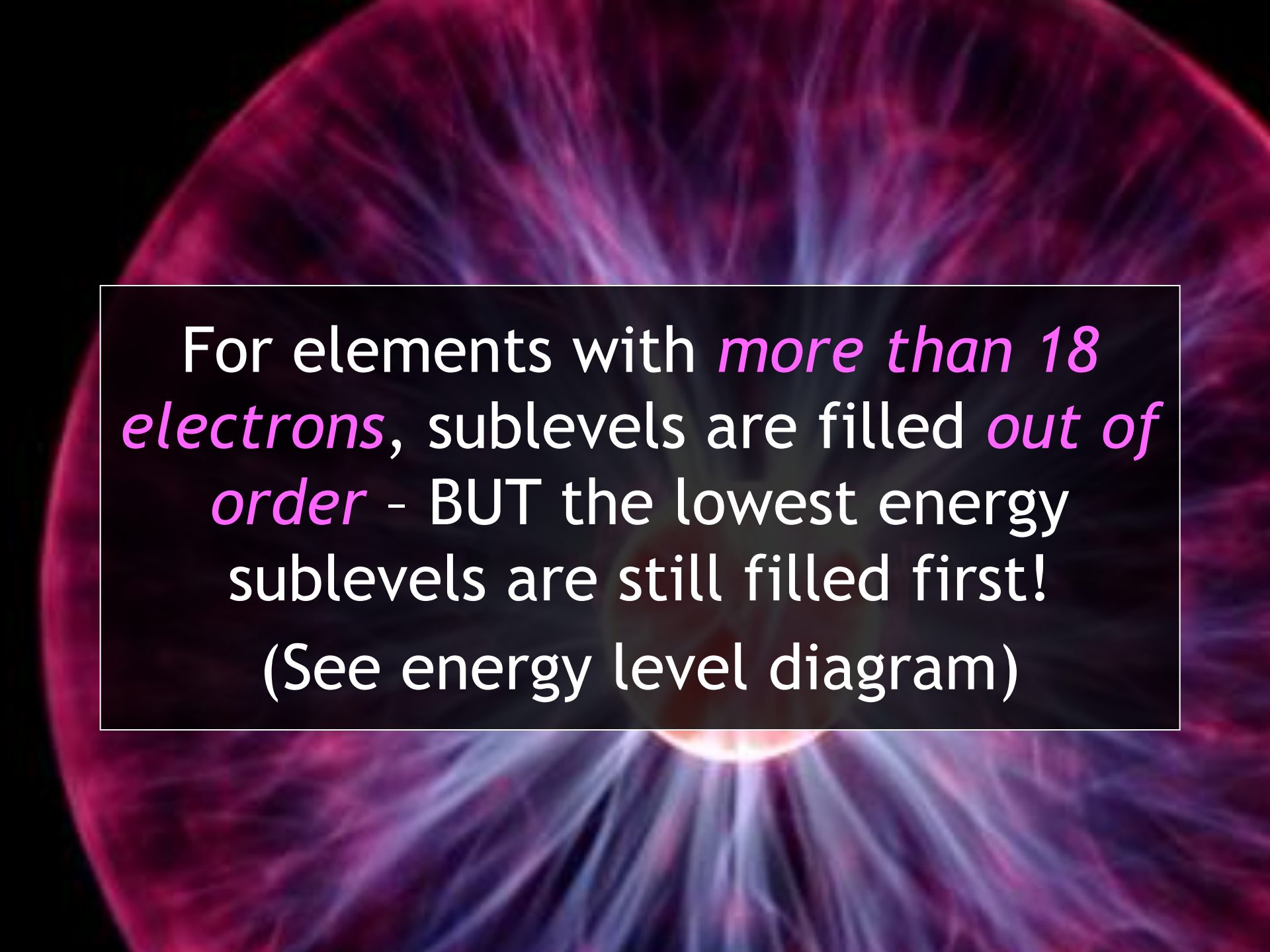
Nitrogen has $7e^-$:



Example: Write the electron configuration for Magnesium

Magnesium has $12e^-$:





For elements with *more than 18 electrons*, sublevels are filled *out of order* - BUT the lowest energy sublevels are still filled first!
(See energy level diagram)

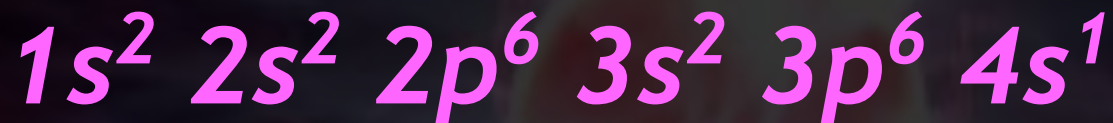
Increasing Energy



Energy Levels

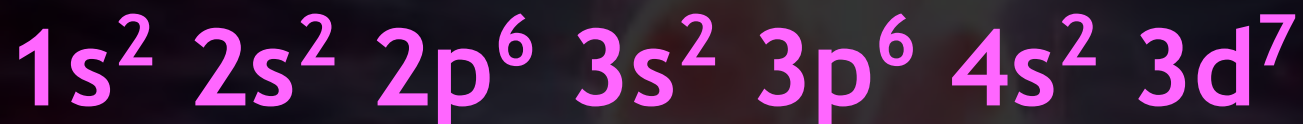
Example: Write the electron configuration for Potassium

Potassium has $19e^-$:



Example: Write the electron configuration for Cobalt

Cobalt has $27e^-$:



How to Write Orbital Notations

Uses circles to represent atomic orbitals with a label underneath to indicate sublevel and energy level

- One electron = $\underline{\uparrow}$ or $\circ\uparrow$

- Two electrons = $\underline{\uparrow\downarrow}$ or $\circ\uparrow\downarrow$

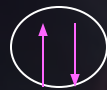
Examples...

Hydrogen



1s

Lithium



1s



2s

Pauli Principle: *Atomic orbitals can hold only 2 electrons at most and they must have opposite spins.*

Examples...

Nitrogen



Hund's Rule: *In a sublevel with more than one orbital, put one electron into each orbital before putting 2e-into any one orbital.*

Identifying elements from the e- configurations or orbital notation...

Recall, if an element is neutral:

$$\# \text{ of } e^- = \# \text{ of } p^+ = \text{atomic \#}$$

Examples:



= 10 e- = Neon



= 11 e- = Sodium

1s

2s

2p

3s



Questions?

Begin Worksheet #2



WebElements: the periodic table on the world-wide web

www.webelements.com

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18		
	hydrogen 1 H 1.0079	beryllium 4 Be 9.0122	lithium 3 Li 6.941	boron 5 B 10.811	carbon 6 C 12.011	nitrogen 7 N 14.007	oxygen 8 O 15.999	fluorine 9 F 18.998	neon 10 Ne 20.180										helium 2 He 4.0026	
			sodium 11 Na 22.990	magnesium 12 Mg 24.305	aluminum 13 Al 26.982	silicon 14 Si 28.086	phosphorus 15 P 30.974	sulfur 16 S 32.065	chlorine 17 Cl 35.453	argon 18 Ar 39.948										
			potassium 19 K 39.098	calcium 20 Ca 40.078	gallium 31 Ga 69.723	germanium 32 Ge 72.61	arsenic 33 As 74.922	selenium 34 Se 78.96	bromine 35 Br 79.904	krypton 36 Kr 83.80										
			rubidium 37 Rb 85.468	strontium 38 Sr 87.62	zinc 30 Zn 65.38	cadmium 48 Cd 112.41	indium 49 In 114.82	tin 50 Sn 118.71	antimony 51 Sb 121.76	tellurium 52 Te 127.60									xenon 54 Xe 131.29	
			caesium 55 Cs 132.91	barium 56 Ba 137.33	mercury 80 Hg 200.59	gold 79 Au 196.97	platinum 78 Pt 195.08	silver 107 Ag 107.87	mercury 80 Hg 200.59	lead 82 Pb 207.2									radon 86 Rn [222]	
			francium 87 Fr [223]	radium 88 Ra [226]	unnilium 112 Uub [285]	roentgenium 111 Rg [280]	copernicium 110 Ds [281]	tennessine 113 Uut [284]	unbinilium 114 Uuq [289]	unhexium 116 Uuh [293]									astatine 85 At [210]	
																				unseptilium 117 Uus [294]
																				unocrium 118 Uuo [294]

Key:

element name
atomic number
symbol
atomic weight (mean relative mass)

lanthanum 57 La	cerium 58 Ce	praseodymium 59 Pr	neodymium 60 Nd	promethium 61 Pm	samarium 62 Sm	europium 63 Eu	gadolinium 64 Gd	terbium 65 Tb	dysprosium 66 Dy	holmium 67 Ho	erbium 68 Er	thulium 69 Tm	ytterbium 70 Yb
actinium 89	thorium 90	protactinium 91	uranium 92	neptunium 93	plutonium 94	americium 95	curium 96	berkelium 97	californium 98	einsteinium 99	fermium 100	mendelevium 101	nobelium 102
AC	Th	Pa	U	Np	Pu	Am	Cm	Bk	Cf	Es	Fm	Md	NO
[227]	232.04	231.04	238.03	[237]	[244]	[243]	[247]	[247]	[251]	[252]	[257]	[258]	[259]

*lanthanoids

**actinoids

Symbols and names: the symbols and names of the elements, and their spellings are those recommended by the International Union of Pure and Applied Chemistry (IUPAC - <http://www.iupac.org>). Names have yet to be proposed for the most recently discovered elements beyond 112 and so those used here are IUPAC's temporary systematic names. In the USA and some other countries, the spellings **aluminum** and **cesium** are normal while in the UK and elsewhere the common spelling is **sulphur**.
 Group labels: the numeric system (1-18) used here is the current IUPAC convention.
 Atomic weights (mean relative masses): Apart from the heaviest elements, these are the IUPAC 2007 values and given to 5 significant figures. Elements for which the atomic weight is given within square brackets have no stable nuclides and are represented by the element's longest lived isotope reported at the time of writing.
 ©2007 Dr. Mark J. Winter/Webelements Ltd and University of Sheffield. webelements@sheffield.ac.uk. All rights reserved. For updates to this table see http://www.webelements.com/nexus/Printable_Periodic_Table/ (Version date: 21 September 2007).

Worksheet:

For the following atoms, please write (a) the standard electron configuration and (b) the Noble gas configuration.

1. Al (Hint: It is atomic number 13)

Standard electron configuration:

Noble gas configuration:

2. Be: (Hint: It is atomic number 4)

Standard electron configuration:

Noble gas configuration:

3. Ge (Hint: It is atomic number 32)

Standard electron configuration:

Noble gas configuration:

4. Ag: (Hint: It is atomic number 47)

Standard electron configuration:

Noble gas configuration:

Please write the Noble gas configuration for each of the following atoms. Then state the number of valence electrons.

5. Cl (Hint: It is atomic number 17)

6. Se (Hint: (Hint: It is atomic number 34)