

Part 3 Work Bundle

Name: _____

Due Date: _____

Periodic Table of the Elements

1 H Hydrogen 1.01																	2 He Helium 4.00												
3 Li Lithium 6.94	4 Be Beryllium 9.01											5 B Boron 10.81	6 C Carbon 12.01	7 N Nitrogen 14.01	8 O Oxygen 16.00	9 F Fluorine 19.00	10 Ne Neon 20.18												
11 Na Sodium 22.99	12 Mg Magnesium 24.31											13 Al Aluminum 26.98	14 Si Silicon 28.09	15 P Phosphorus 30.97	16 S Sulfur 32.06	17 Cl Chlorine 35.45	18 Ar Argon 39.95												
19 K Potassium 39.10	20 Ca Calcium 40.08	21 Sc Scandium 44.96	22 Ti Titanium 47.88	23 V Vanadium 50.94	24 Cr Chromium 51.99	25 Mn Manganese 54.94	26 Fe Iron 55.85	27 Co Cobalt 58.93	28 Ni Nickel 58.69	29 Cu Copper 63.55	30 Zn Zinc 65.38	31 Ga Gallium 69.72	32 Ge Germanium 72.63	33 As Arsenic 74.92	34 Se Selenium 78.97	35 Br Bromine 79.90	36 Kr Krypton 83.80												
37 Rb Rubidium 85.47	38 Sr Strontium 87.62	39 Y Yttrium 88.91	40 Zr Zirconium 91.22	41 Nb Niobium 92.91	42 Mo Molybdenum 95.95	43 Tc Technetium 98.91	44 Ru Ruthenium 101.07	45 Rh Rhodium 102.91	46 Pd Palladium 106.42	47 Ag Silver 107.87	48 Cd Cadmium 112.41	49 In Indium 114.82	50 Sn Tin 118.71	51 Sb Antimony 121.76	52 Te Tellurium 127.6	53 I Iodine 126.90	54 Xe Xenon 131.29												
55 Cs Cesium 132.91	56 Ba Barium 137.33	57-71 Lanthanides	72 Hf Hafnium 178.49	73 Ta Tantalum 180.95	74 W Tungsten 183.85	75 Re Rhenium 186.21	76 Os Osmium 190.23	77 Ir Iridium 192.22	78 Pt Platinum 195.08	79 Au Gold 196.97	80 Hg Mercury 200.59	81 Tl Thallium 204.38	82 Pb Lead 207.20	83 Bi Bismuth 208.98	84 Po Polonium (208, 98)	85 At Astatine 209, 98	86 Rn Radon 222, 02												
87 Fr Francium 223, 02	88 Ra Radium 226, 03	89-103 Actinides	104 Rf Rutherfordium (261)	105 Db Dubnium (262)	106 Sg Seaborgium (266)	107 Bh Bohrium (264)	108 Hs Hassium (269)	109 Mt Meitnerium (278)	110 Ds Darmstadtium (281)	111 Rg Roentgenium (280)	112 Cn Copernicium (285)	113 Nh Nihonium (286)	114 Fl Flerovium (289)	115 Mc Moscovium (289)	116 Lv Livermorium (293)	117 Ts Tennessine (294)	118 Og Oganesson (294)												
57 La Lanthanum 138.91	58 Ce Cerium 140.12	59 Pr Praseodymium 140.91	60 Nd Neodymium 144.24	61 Pm Promethium 144.91	62 Sm Samarium 150.36	63 Eu Europium 151.96	64 Gd Gadolinium 157.25	65 Tb Terbium 158.93	66 Dy Dysprosium 162.50	67 Ho Holmium 164.93	68 Er Erbium 167.26	69 Tm Thulium 168.93	70 Yb Ytterbium 173.06	71 Lu Lutetium 174.97	89 Ac Actinium 227, 03	90 Th Thorium 232, 04	91 Pa Protactinium 231, 04	92 U Uranium 238, 03	93 Np Neptunium 237, 05	94 Pu Plutonium 244, 06	95 Am Americium 243, 06	96 Cm Curium 247, 07	97 Bk Berkelium 247, 07	98 Cf Californium 251, 08	99 Es Einsteinium (254)	100 Fm Fermium 257, 10	101 Md Mendelevium 258, 10	102 No Nobelium 259, 10	103 Lr Lawrencium (262)

- Alkali Metal
- Alkaline Earth
- Transition Metal
- Basic Metal
- Metalloid
- Nonmetal
- Halogen
- Noble Gas
- Lanthanide
- Actinide

Part 3 Lesson 1

John Dalton's Atomic Theories

- All matter is composed of _____
 Atoms cannot be made or _____
 All atoms of the same element are _____
 Different elements have different types of _____
 Chemical reactions occur when atoms are _____
 Compounds are formed from atoms of the _____

Please make some reference to John Daltons Atomic Assumptions in the space below.



Which is not one of John Daltons Atomic Theories?

- A.) All matter is composed of atoms.
- B.) Atoms cannot be made or destroyed.
- C.) All atoms of the same element are different.
- D.) Different elements have different types of atoms.
- E.) Chemical reactions occur when atoms are rearranged.
- F.) Compounds are formed from atoms of the constituent elements.

Which is not one of John Daltons Atomic Theories?


- A.) All matter is composed of atoms.
- B.) Atoms cannot be made or destroyed.
- C.) All atoms of the same element are identical.
- D.) Different elements have the same type of atoms.
- E.) Chemical reactions occur when atoms are rearranged.
- F.) Compounds are formed from atoms of the constituent elements.

Atomic Mass = AMU Atomic Mass Units, The number of _____, _____, and _____.


Valence electrons: Electrons in the _____ shell.

Please record in large bold numbers the number of **valence electrons** beneath the elements below.

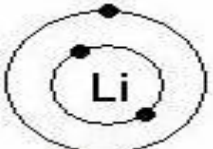
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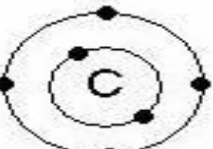
H
1+



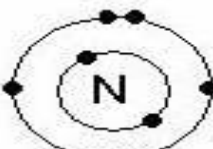
He
2+



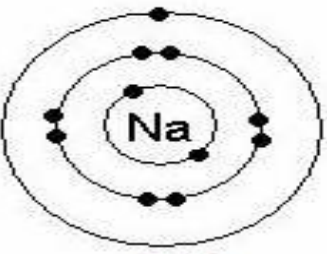
Li
3+



C
6+



N
7+

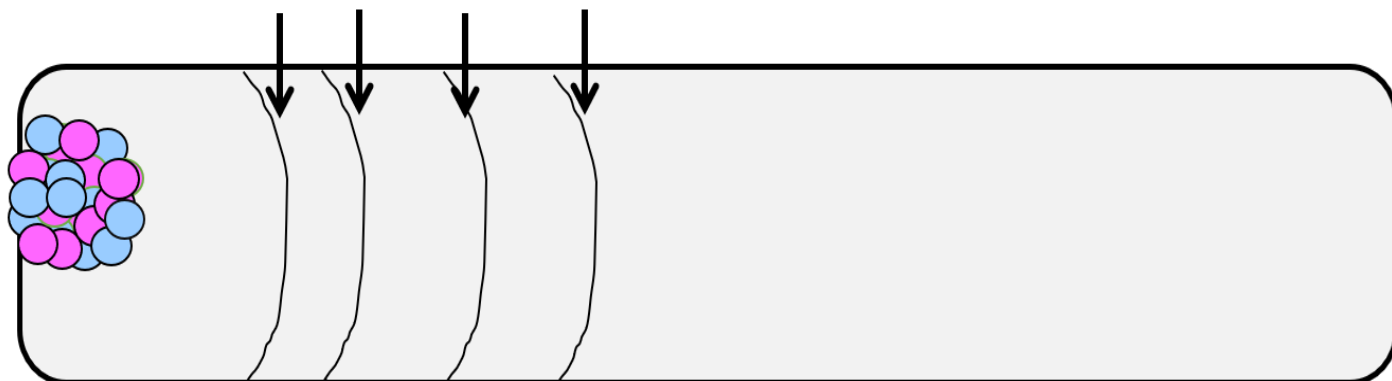


Na
11+

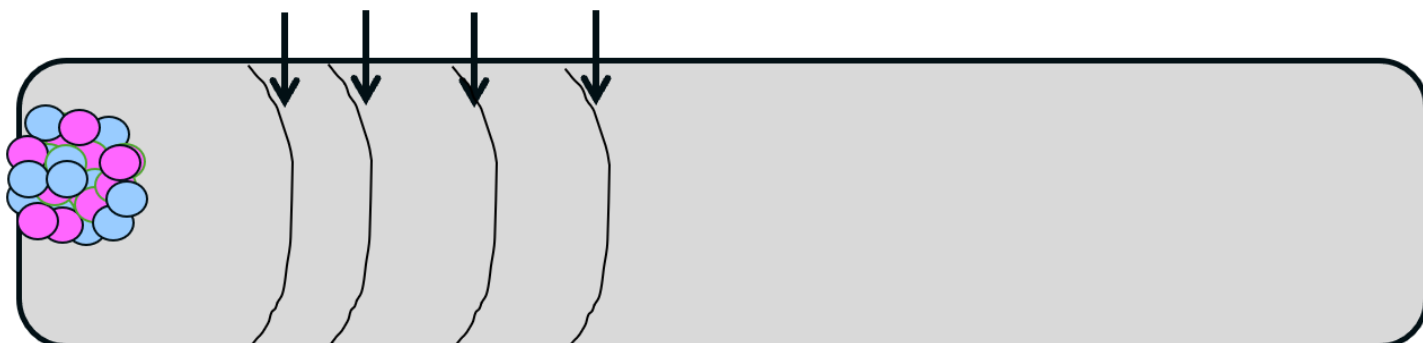
Part 3 Lesson 2 Electron Orbitals

The number of _____ electrons determines the group placement of an element on the periodic table.

- The 1st, 2nd, 3rd, 4th electron shell can hold... (1st 18 elements)



- The 1, 2, 3, 4 electron shell can hold... (after first 20 elements)



Please add the correct number of electrons to each orbital as described in the slideshow.

Li



C



Ne



Na



S



Ar



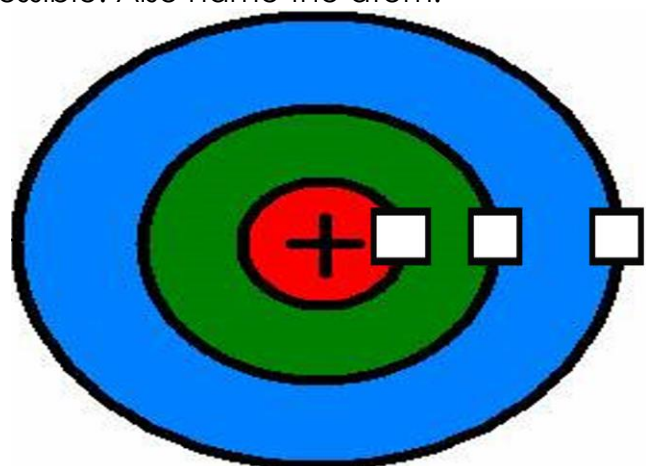
K



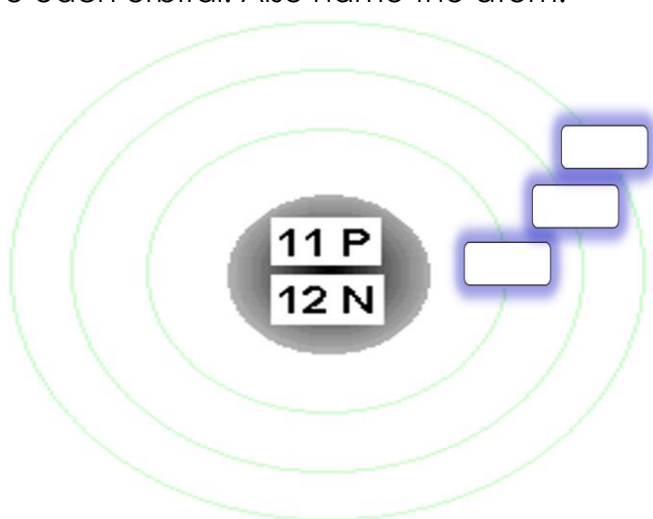
Ca



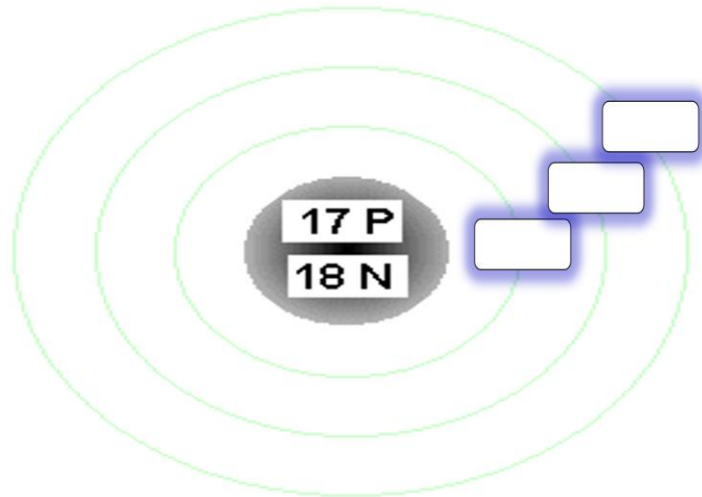
Please fill this atom with the most electrons possible. Also name the atom.



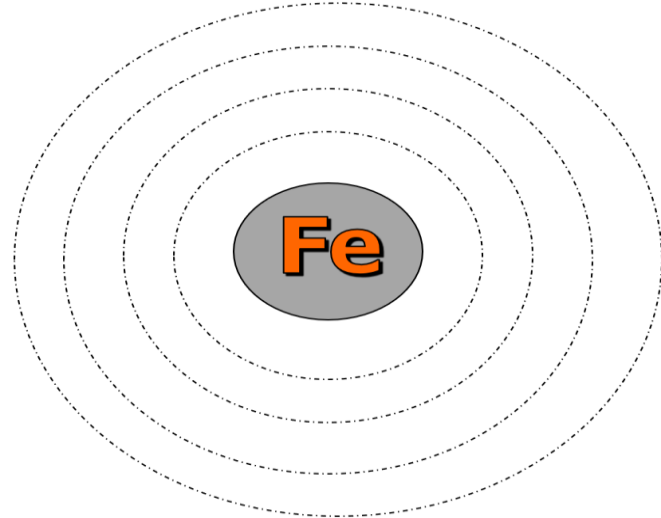
Please add the correct number of electrons to each orbital. Also name the atom.



Please add the correct number of electrons to each orbital. Also name the atom.



Please add the correct number of electrons to each orbital. Also name the atom.

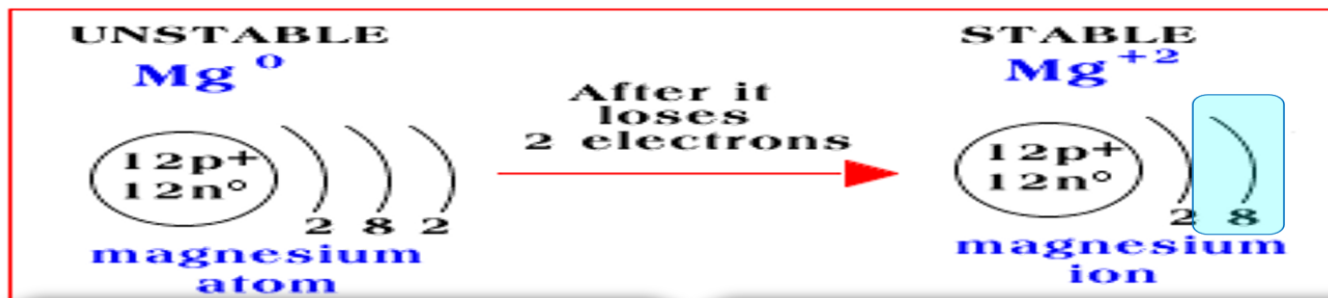


Most of the transition metals...Record the number of electron in each orbit from the slideshow



Part 3 Lesson 3 Lewis Dot Structures

- Valence electrons are the _____ energy electrons in an atom and are therefore the most r_____.



iSPONCH!

Which element is below?

Octet Rule – Elements want ____ electrons in their outer shell (valence).
Add the correct electrons (Lewis Dots for the elements below)

HYDROGEN 1 H							HELIUM 2 He
LITHIUM 3 Li	BERYLLIUM 4 Be	BORON 5 B	CARBON 6 C	NITROGEN 7 N	OXYGEN 8 O	FLOURINE 9 F	NEON 10 Ne
SODIUM 11 Na	MAGNESIUM 12 Mg	ALUMINUM 13 Al	SILICON 14 Si	PHOSPHORUS 15 P	SULFUR 16 S	CHLORINE 17 Cl	ARGON 18 Ar
POTASSIUM 19 K	CALCIUM 20 Ca						

Molecule: _____ or more atoms that join together chemically.

Make a Lewis Dot for the elements below as described in the slideshow.

S**O****C****P****N****H**

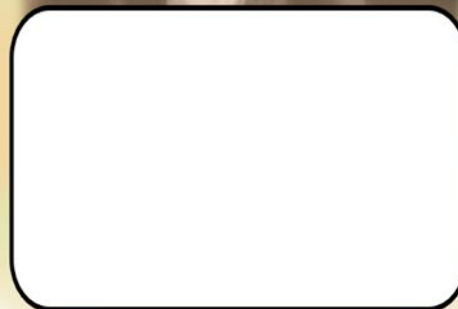
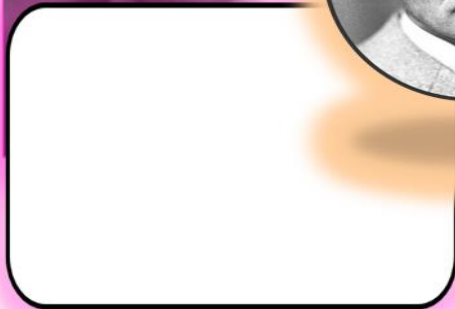
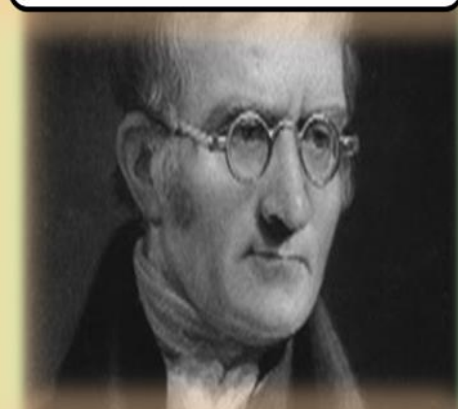
Part 3 Lesson 4 Organic Molecules

Please do a Lewis Dot Structure for the following Elements. Follow the video.

– <http://www.youtube.com/watch?v=ulyopnxjAZ8>

Ne	H	He	Si	Li
C	O N	H ₂	H ₂ O	CO ₂

Please name and describe an important contribution of the chemists below?



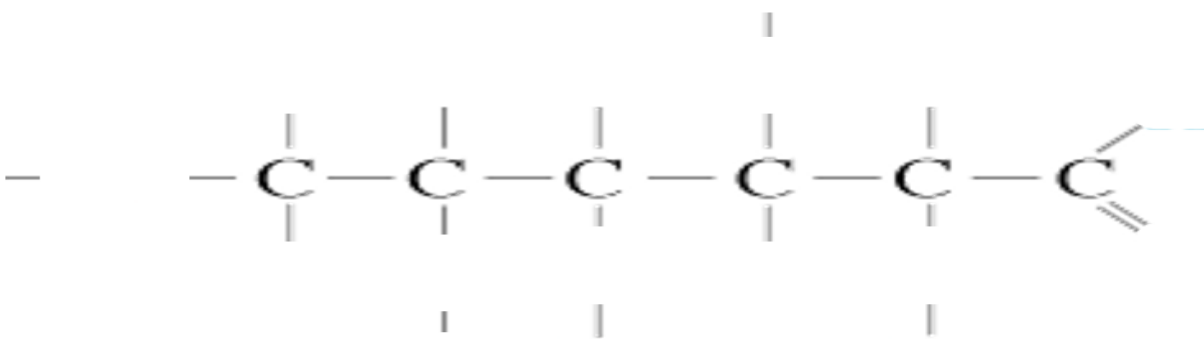
Please create a Lewis Electron Dot diagram for the following molecules in the boxes below

H_2	CH_4 Methane	NF_3
H_2O Water	$NaCl$ Table Salt	O_2 Oxygen gas Note – Double Bond

N ₂ Nitrogen gas Note – triple bond	CCl ₄	HCN Hydrogen Cyanide
C ₂ H ₆ Ethane	C ₃ H ₈ Propane	C ₄ H ₁₀ Butane
C ₂ H ₆ O Ethanol	CO ₂ Carbon Dioxide	C ₅ Diamond
Make your own.	Al Aluminum	AlH ₃

Carbohydrate: A group of organic compounds, including sugars, starches and fiber, that is a major source of energy for animals. Made of _____ (1:2:1)

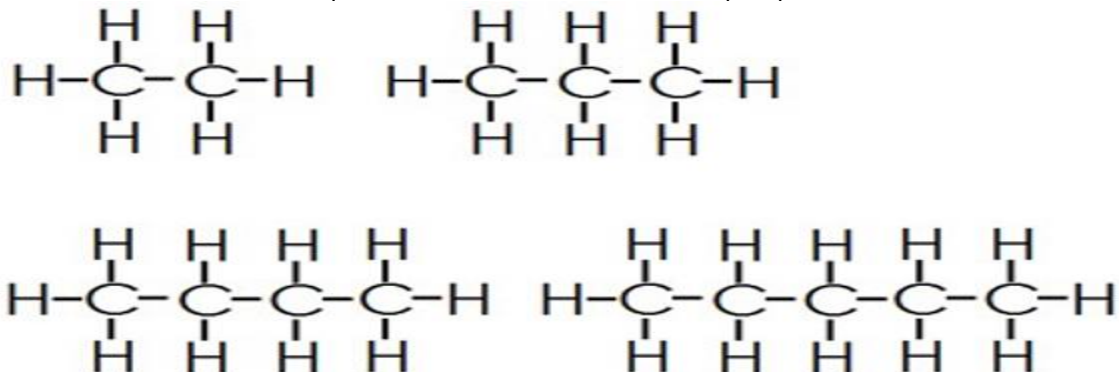
Please complete a molecule of glucose C₆H₁₂O₆



Part 3 Lesson 5 Organic Chemistry / Molecules Cont.

Hydrocarbon: An organic compound consisting entirely of _____ and _____.

Which is butane C_4H_{10} ? Which is pentane C_5H_{12} ? Which is propane C_3H_8 ? What's left?

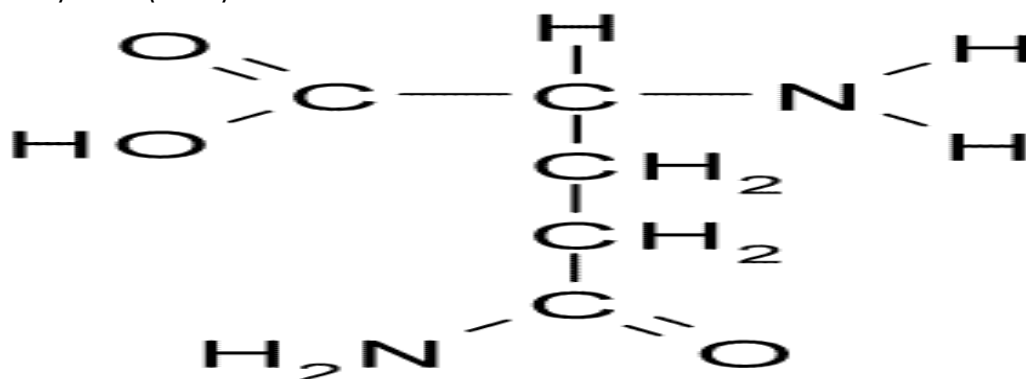


Alcohol: Mostly carbon and hydrogen with an _____ group

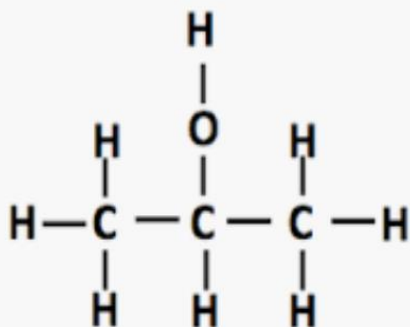
Create Lewis Dot Structure and then build Ethanol C_2H_6O



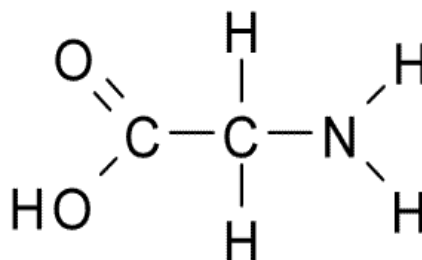
Circle and label the NH_2 groups, and $COOH$ group in the Amino Acid, Glutamine $H_2N-CO-(CH_2)_2-CH(NH_2)-COOH$



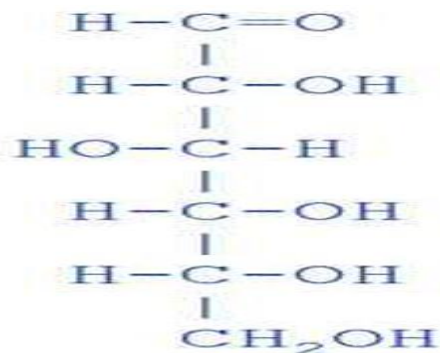
What is the empirical formula for this molecule? Name?



What is a group of nitrogenous organic compounds that are an essential part of living cells



What is this molecule?



Part 3 Lesson 6 Electron Configurations

Heisenberg Uncertainty Principle

- You can't know with certainty both where an electron is and where it's going next.
- That makes it impossible to plot an orbit for an electron around a nucleus.

"Electron _____"

- Austrian physicist Erwin Schrödinger (1887-1961) It consisted of a dense nucleus surrounded by a cloud of electrons at various levels in orbitals.

Energy levels increase each period (Quantum) Na Sodium has more energy than Lithium

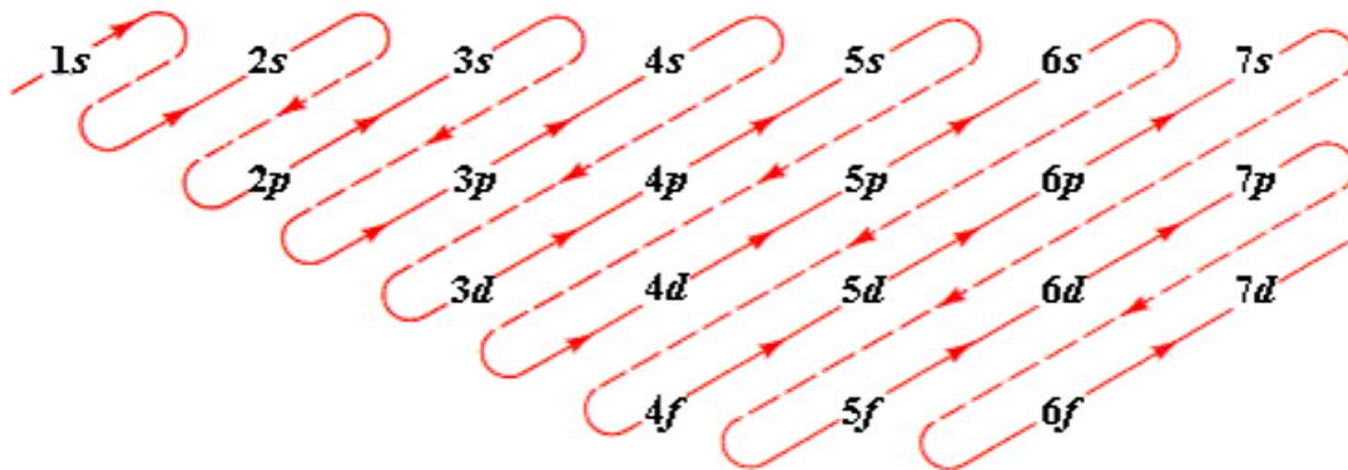
Electrons can get excited and enter a _____ energy state. (energy added).

- As they get further from the nucleus, their force gets _____ and they can be removed more easily. (Next Part in the Unit, Atomic Bonding)
- Electrons can drop to a _____ energy state (energy removed).

Fill up orbitals in the order 1s, 2s, 2p, 3s, 3p, 4s, 3d, 4p - until you run out of electrons

-Energy increases as you move up the energy levels.

-Pauli Exclusion Principle: No two electrons in an atom can have _____ quantum numbers. Different spins



1s 2s 2p 3s 3p 4s 3d 4p 5s 4d 5p 6s 4f 5d 6p 7s 5f 6d 7p

Electrons fill low energy orbitals (closer to the nucleus) before they fill higher energy ones. The 4f orbitals don't fill until after the 6s.

Try Silicon Atomic Number #14

Try Iodine Atomic Number #53

Group →	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
↓ Period	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1	1 H																	2 He
2	3 Li	4 Be											5 B	6 C	7 N	8 O	9 F	10 Ne
3	11 Na	12 Mg											13 Al	14 Si	15 P	16 S	17 Cl	18 Ar
4	19 K	20 Ca	21 Sc	22 Ti	23 V	24 Cr	25 Mn	26 Fe	27 Co	28 Ni	29 Cu	30 Zn	31 Ga	32 Ge	33 As	34 Se	35 Br	36 Kr
5	37 Rb	38 Sr	39 Y	40 Zr	41 Nb	42 Mo	43 Tc	44 Ru	45 Rh	46 Pd	47 Ag	48 Cd	49 In	50 Sn	51 Sb	52 Te	53 I	54 Xe
6	55 Cs	56 Ba		72 Hf	73 Ta	74 W	75 Re	76 Os	77 Ir	78 Pt	79 Au	80 Hg	81 Tl	82 Pb	83 Bi	84 Po	85 At	86 Rn
7	87 Fr	88 Ra		104 Rf	105 Db	106 Sg	107 Bh	108 Hs	109 Mt	110 Ds	111 Rg	112 UUb	113 Uut	114 Uuq	115 Uup	116 Uuh	117 Uus	118 Uuo

Lanthanides F Actinides	57 La	58 Ce	59 Pr	60 Nd	61 Pm	62 Sm	63 Eu	64 Gd	65 Tb	66 Dy	67 Ho	68 Er	69 Tm	70 Yb	71 Lu
	89 Ac	90 Th	91 Pa	92 U	93 Np	94 Pu	95 Am	96 Cm	97 Bk	98 Cf	99 Es	100 Fm	101 Md	102 No	103 Lr

Aufbau principle: Electrons enter the lowest energy first

Try Silicon Atomic Number #14

Try Magnesium

Try Argon

Try Krypton

Try Potassium

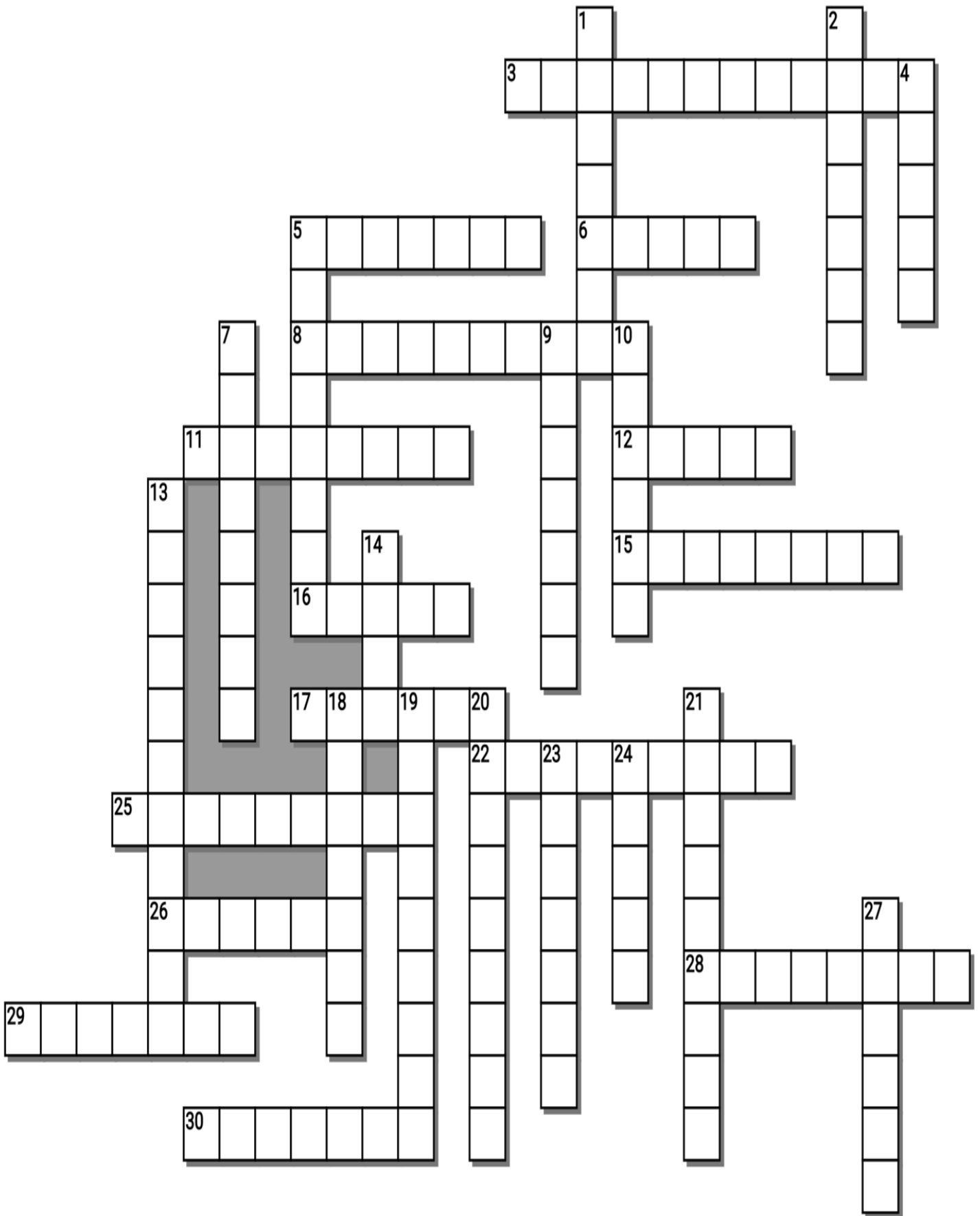
Try Aluminum

Quantum theory is the theoretical basis of modern physics that explains the nature and behavior of matter and energy on the atomic and subatomic level.

The energy is quantized. _____ electrons are the highest energy electrons in an atom and are therefore the most reactive.

What are the electron configurations for the following elements?

What are the electron configurations for the following elements?	
Nitrogen	
Calcium	
Arsenic	
	Make your own
	$1s^2 2s^2$
Chlorine	
	$1s^2 2s^2 2p^1$
Calcium	
	$1s^2 2s^2 2p^6 3s^2 3p^4 4s^2 3d^9$



Across

3. _____: A group of organic compounds, including sugars, starches and fiber, that is a major source of energy for animals.
5. Group of nitrogenous organic compounds that are essential parts of living cells.
6. All matter is composed of _____
8. Chemical reactions occur when atoms are _____.
11. [He] 2s² 2p⁵
12. Gilbert Newton _____ (1875-1946) was an American physical chemist whose concept of electron pairs led to modern theories of chemical bonding.
15. Named for their energy sublevels, there are four types of _____: s, p, d, and f.
16. Electron _____ Model" – Austrian physicist Erwin Schrödinger (1887-1961) It consisted of a dense nucleus surrounded by a cloud of electrons at various levels in orbitals.
17. Energy levels increase each p _____ (Quantum)
22. Pauli _____ Principle: No two electrons in an atom can have identical quantum numbers
25. [Ar] 3d⁵ 4s²
26. C₄H₁₀
28. Valence electrons are the highest energy electrons in an atom and are therefore the most r _____.
29. C₂H₆O
30. Mostly carbon and hydrogen with a OH group

-----teacher can remove word bank to make more difficult-----

ALCOHOL, ATOMS, BOHR, BUTANE, CALCIUM, CARBOHYDRATE, CLOUD, DALTON, DESTROYED, DIFFERENT, EIGHT, ELEMENT, ETHANOL, EXCLUSION, FLUORINE, GLUCOSE, HIGHER, HYDROCARBON, IDENTICAL, LEWIS, MANGANESE, MOLECULE, PERIOD, PERIODIC, PROPANE, PROTEIN, REACTIVE, REARRANGED, UNITS, VALENCE, ORBITALS

Down

1. C₃H₈
2. _____ electrons: Electrons in the outermost shell.
4. Octet Rule – Elements want _____ electrons in their outer shell (valence).
5. The number of valence electrons determines the group placement of an element on the _____ table.
7. Two or more atoms that join together chemically.
9. C₆H₁₂O₆
10. John _____'s Atomic Theories
13. _____ is an organic compound consisting entirely of hydrogen and carbon.
14. Niels Henrik David _____ was a Danish physicist who made foundational contributions to understanding atomic structure and quantum theory
18. Compounds are formed from atoms of the _____
19. All atoms of the same element are _____
20. Atoms cannot be made or _____ "easily"
21. Different elements have _____ types of atoms.
23. 1s²2s²2p¹
24. AMU Atomic Mass _____
27. Electrons can get excited and enter a _____ energy state.

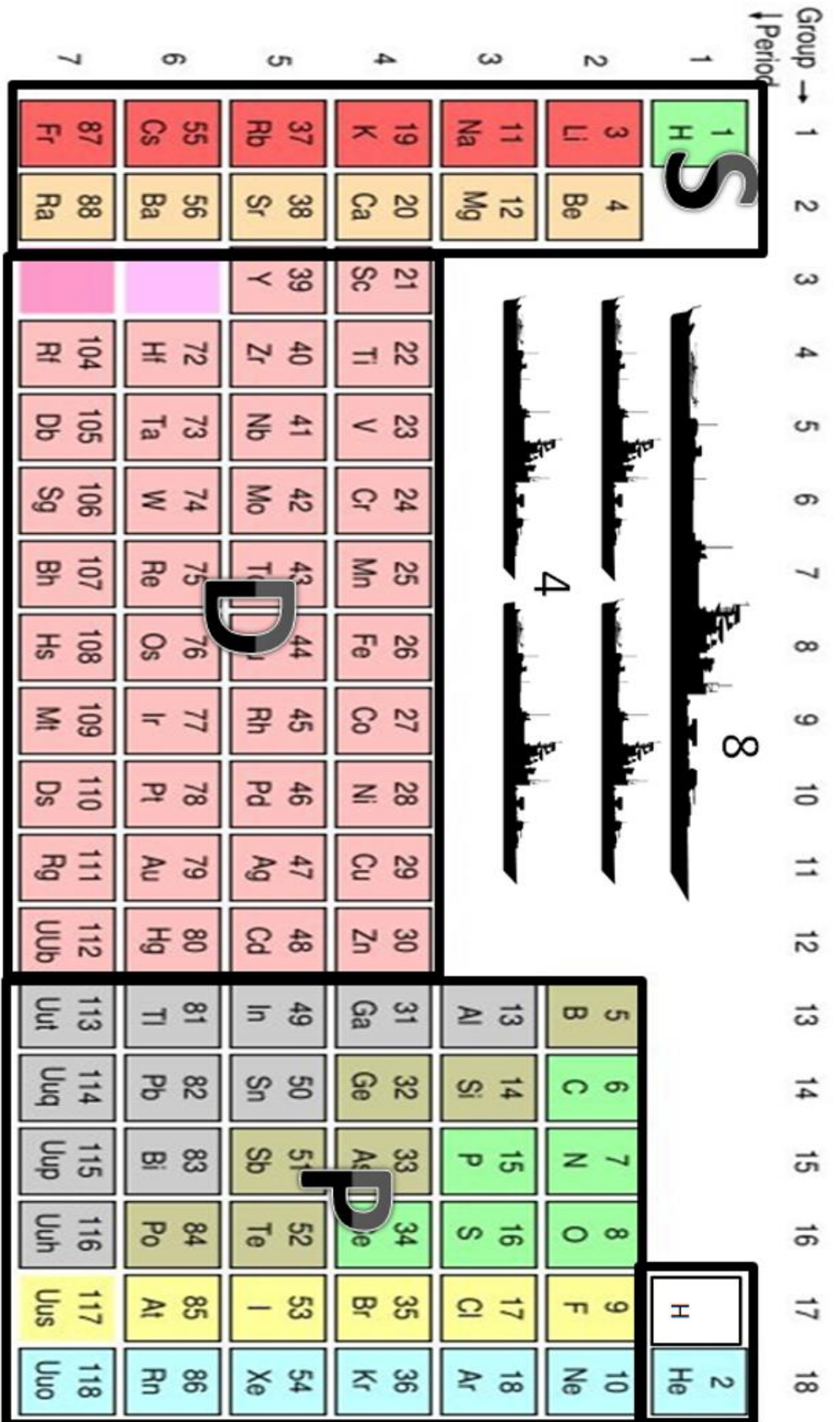
Part 3 Review Game

1-10 = 10 pts * = Bonus + 1 pt, **Lesson 8**
 (Secretly write owl in correct space +1 pt)
 Final Question = 5 pt wager

Name: _____
 Due: Today
 Score ____ / 100

REVIEW POWER	GET IN LINE	MALL LIKE YOU	SERIOUSLY!	CIRCUS CIRCUS <small>Bonus round 1 pt each</small>
1)	6)	11)	16)	*21)
2)	7)	12)	17)	*22)
3)	8)	13)	18)	*23)
4)	9)	14)	19)	*24)
5)	10)	15)	20)	*25)

Final Question Wager ____ /5 Answer: _____



Lanthanides		57	58	59	60	61	62	63	64	65	66	67	68	69	70	71
Actinides		89	90	91	92	93	94	95	96	97	98	99	100	101	102	103
	La	Ce	Pr	Nd	Pm	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu	
	Ac	Th	Pa	U	Np	Pu	Am	Cm	Bk	Cf	Es	Fm	Md	No	Lr	

Part 3 Work Bundle

Name:

Due Date:

hydrogen 1 H	helium 2 He
lithium 3 Li	beryllium 4 Be
sodium 11 Na	magnesium 12 Mg
potassium 19 K	calcium 20 Ca
rubidium 37 Rb	strontium 38 Sr
cesium 55 Cs	barium 56 Ba
francium 87 Fr	radium 88 Ra
	actinide series 89-102 ** **
scandium 21 Sc	titanium 22 Ti
yttrium 39 Y	zirconium 40 Zr
niobium 41 Nb	niobium 41 Nb
niobium 42 Mo	niobium 42 Mo
niobium 43 Tc	niobium 43 Tc
niobium 44 Ru	niobium 44 Ru
niobium 45 Rh	niobium 45 Rh
niobium 46 Pd	niobium 46 Pd
niobium 47 Ag	niobium 47 Ag
niobium 48 Cd	niobium 48 Cd
niobium 49 In	niobium 49 In
niobium 50 Sn	niobium 50 Sn
niobium 51 Sb	niobium 51 Sb
niobium 52 Te	niobium 52 Te
niobium 53 I	niobium 53 I
niobium 54 Xe	niobium 54 Xe
vanadium 23 V	vanadium 23 V
chromium 24 Cr	chromium 24 Cr
manganese 25 Mn	manganese 25 Mn
iron 26 Fe	iron 26 Fe
cobalt 27 Co	cobalt 27 Co
nickel 28 Ni	nickel 28 Ni
copper 29 Cu	copper 29 Cu
zinc 30 Zn	zinc 30 Zn
gallium 31 Ga	gallium 31 Ga
germanium 32 Ge	germanium 32 Ge
arsenic 33 As	arsenic 33 As
selenium 34 Se	selenium 34 Se
bromine 35 Br	bromine 35 Br
krypton 36 Kr	krypton 36 Kr
boron 5 B	boron 5 B
carbon 6 C	carbon 6 C
nitrogen 7 N	nitrogen 7 N
oxygen 8 O	oxygen 8 O
fluorine 9 F	fluorine 9 F
neon 10 Ne	neon 10 Ne
aluminum 13 Al	aluminum 13 Al
silicon 14 Si	silicon 14 Si
phosphorus 15 P	phosphorus 15 P
sulfur 16 S	sulfur 16 S
chlorine 17 Cl	chlorine 17 Cl
argon 18 Ar	argon 18 Ar
lanthanum 57 La	lanthanum 57 La
cerium 58 Ce	cerium 58 Ce
praseodymium 59 Pr	praseodymium 59 Pr
neodymium 60 Nd	neodymium 60 Nd
promethium 61 Pm	promethium 61 Pm
samarium 62 Sm	samarium 62 Sm
europium 63 Eu	europium 63 Eu
gadolinium 64 Gd	gadolinium 64 Gd
terbium 65 Tb	terbium 65 Tb
dysprosium 66 Dy	dysprosium 66 Dy
holmium 67 Ho	holmium 67 Ho
erbium 68 Er	erbium 68 Er
thulium 69 Tm	thulium 69 Tm
ytterbium 70 Yb	ytterbium 70 Yb
lutetium 71 Lu	lutetium 71 Lu
hafnium 72 Hf	hafnium 72 Hf
tantalum 73 Ta	tantalum 73 Ta
tungsten 74 W	tungsten 74 W
rhenium 75 Re	rhenium 75 Re
osmium 76 Os	osmium 76 Os
iridium 77 Ir	iridium 77 Ir
platinum 78 Pt	platinum 78 Pt
gold 79 Au	gold 79 Au
mercury 80 Hg	mercury 80 Hg
thallium 81 Tl	thallium 81 Tl
lead 82 Pb	lead 82 Pb
bismuth 83 Bi	bismuth 83 Bi
polonium 84 Po	polonium 84 Po
astatine 85 At	astatine 85 At
radon 86 Rn	radon 86 Rn
actinide series 89-102 ** **	actinide series 89-102 ** **
actinium 89 Ac	actinium 89 Ac
thorium 90 Th	thorium 90 Th
protactinium 91 Pa	protactinium 91 Pa
uranium 92 U	uranium 92 U
neptunium 93 Np	neptunium 93 Np
plutonium 94 Pu	plutonium 94 Pu
americium 95 Am	americium 95 Am
curium 96 Cm	curium 96 Cm
berkelium 97 Bk	berkelium 97 Bk
californium 98 Cf	californium 98 Cf
einsteinium 99 Es	einsteinium 99 Es
fermium 100 Fm	fermium 100 Fm
mendelevium 101 Md	mendelevium 101 Md
nobelium 102 No	nobelium 102 No
unquadium 114 Uuq	unquadium 114 Uuq

* Lanthanide series

** Actinide series

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 Ac	thorium 90 Th	protactinium 91 Pa	uranium 92 U	neptunium 93 Np	plutonium 94 Pu	americium 95 Am	curium 96 Cm	berkelium 97 Bk	californium 98 Cf	einsteinium 99 Es	fermium 100 Fm	mendelevium 101 Md	nobelium 102 No

Part 3 Lesson 1

John Dalton's Atomic Theories

- All matter is composed of atoms
- Atoms cannot be created or destroyed
- All atoms of the same element are identical
- Different elements have different types of atoms
- Chemical reactions occur when atoms are rearranged
- Compounds are formed from atoms of the elements

Please make some reference to John Daltons Atomic Assumptions in the space below.

From his experiments and observations, as well as the work from peers of his time, Dalton proposed a new theory of the atom. This later became known as Dalton's atomic theory. The general tenets of this theory were as follows:

- All matter is composed of extremely small particles called atoms.
 - Atoms of a given element are identical in size, mass, and other properties. Atoms of different elements differ in size, mass, and other properties.
 - Atoms cannot be subdivided, created, or destroyed.
 - Atoms of different elements can combine in simple whole number ratios to form chemical compounds.
 - In chemical reactions, atoms are combined, separated, or rearranged.
- Dalton's atomic theory has been largely accepted by the scientific community, with the exception of three changes. We know now that (1) an atom can be further sub-divided, (2) all atoms of an element are not identical in mass, and (3) using nuclear fission and fusion techniques, we can create or destroy atoms by changing them into other atoms.

Which is not one of John Daltons Atomic Theories?

- A.) All matter is composed of atoms.
- B.) Atoms cannot be made or destroyed.
- C.) All atoms of the same element are different.
- D.) Different elements have different types of atoms.
- E.) Chemical reactions occur when atoms are rearranged.
- F.) Compounds are formed from atoms of the constituent elements.

Which is not one of John Daltons Atomic Theories?


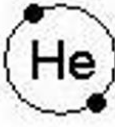
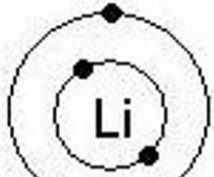
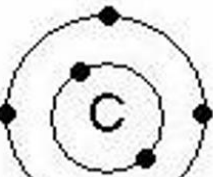
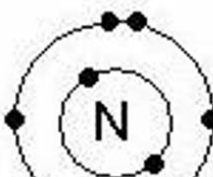
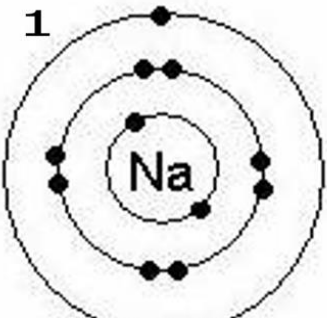
- A.) All matter is composed of atoms.
- B.) Atoms cannot be made or destroyed.
- C.) All atoms of the same element are identical.
- D.) Different elements have the same type of atoms.
- E.) Chemical reactions occur when atoms are rearranged.
- F.) Compounds are formed from atoms of the constituent elements.

Atomic Mass = AMU Atomic Mass Units, The number of Protons, Neutrons, and Electrons.

Valence electrons: Electrons in the outermost shell.

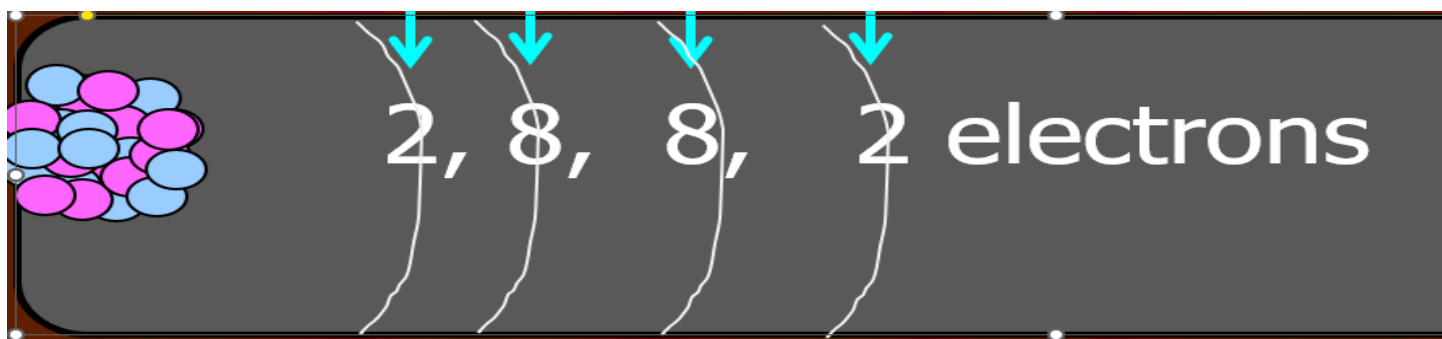
Please record in large bold numbers the number of **valence electrons** beneath the elements below.

1	2	1	4	5	1
----------	----------	----------	----------	----------	----------

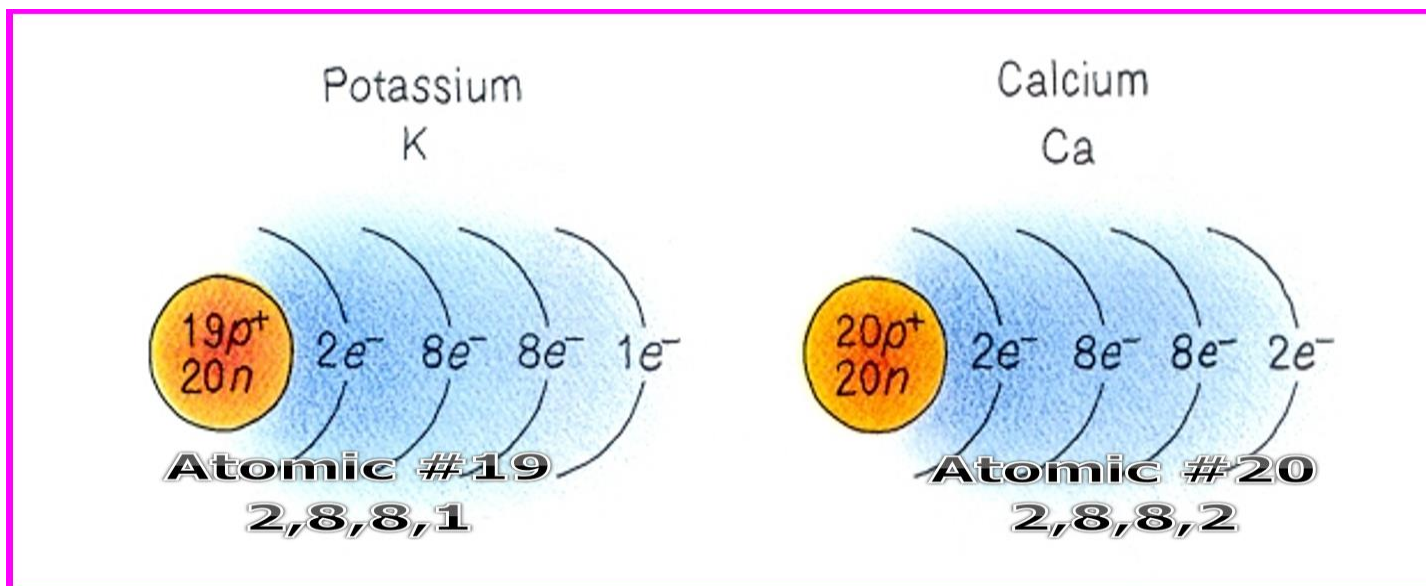
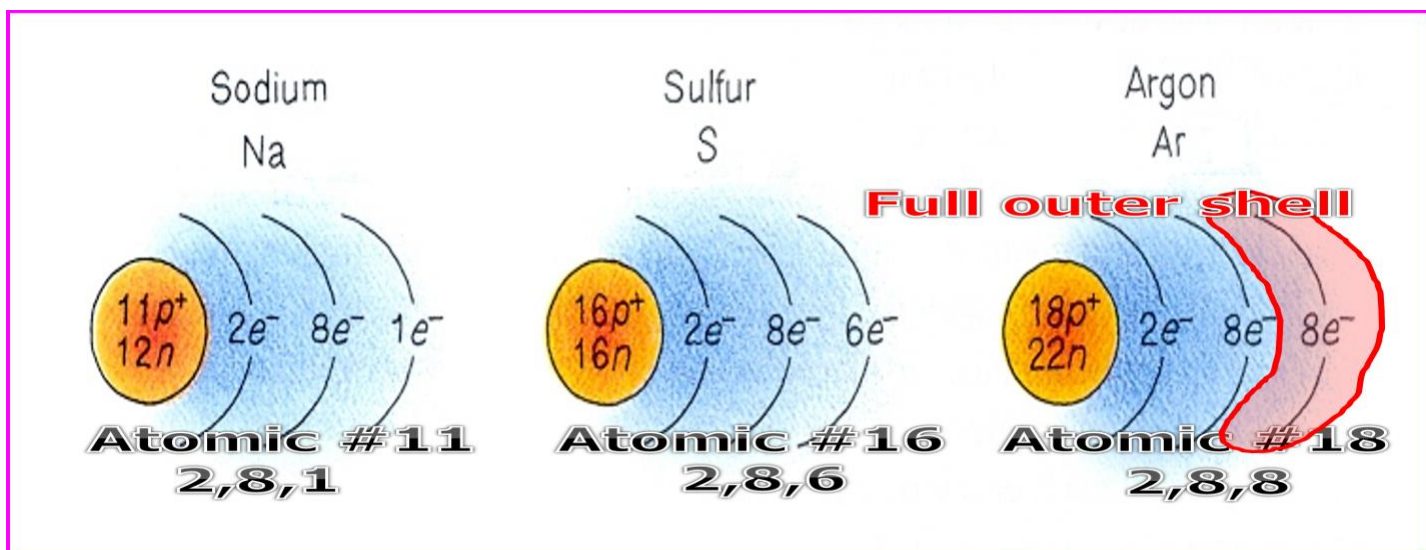
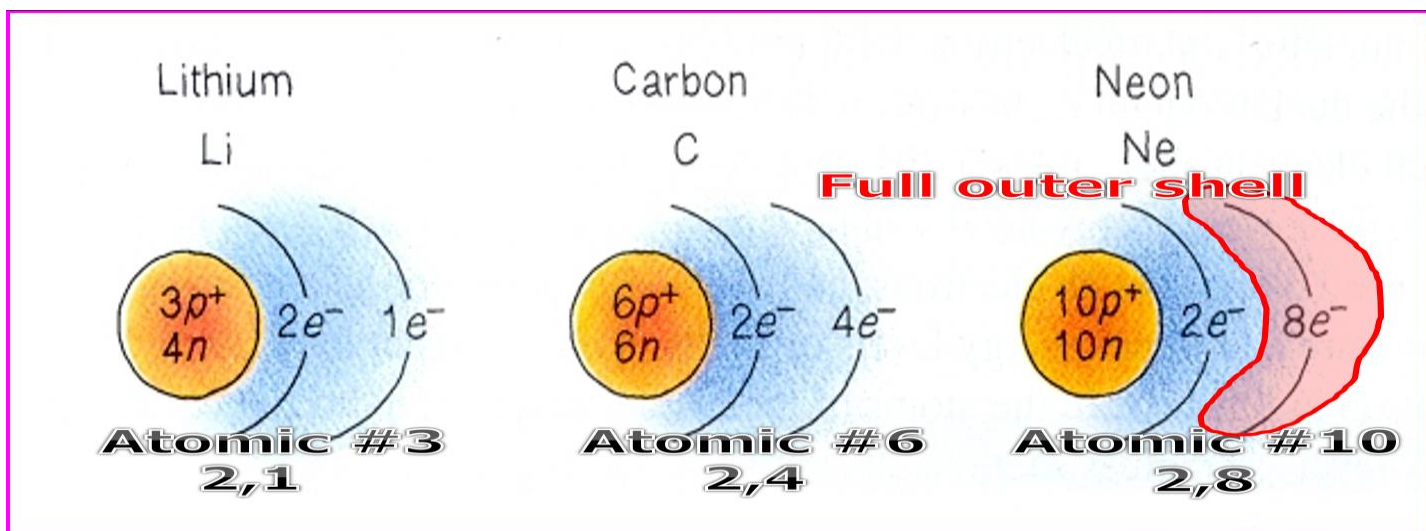
1	2	1	4	5	1
					
1+	2+	3+	6+	7+	11+
Total Electrons					

Part 3 Lesson 2 Electron Orbitals

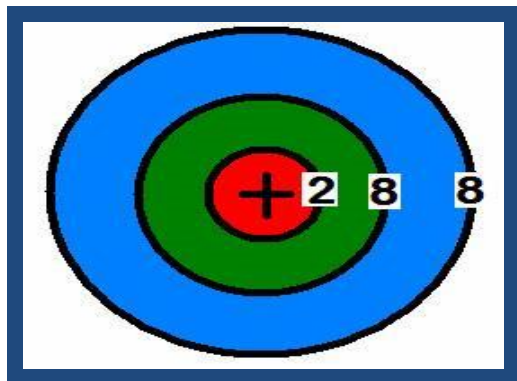
The number of valence electrons determines the group placement of an element on the periodic table.



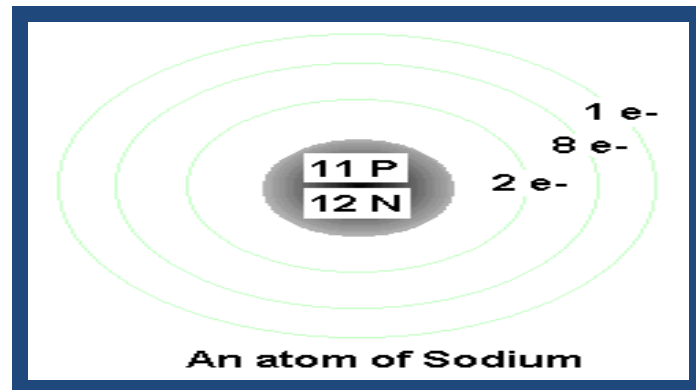
Please add the correct number of electrons to each orbital as described in the slideshow.



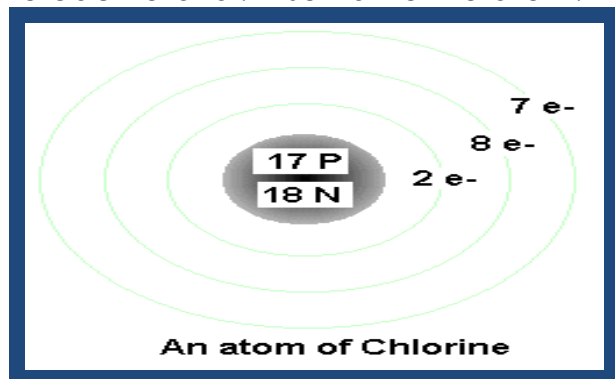
Please fill this atom with the most electrons possible. Also name the atom.



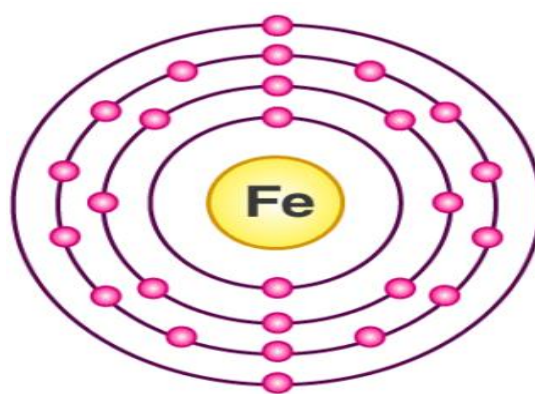
Please add the correct number of electrons to each orbital. Also name the atom.



Please add the correct number of electrons to each orbital. Also name the atom.



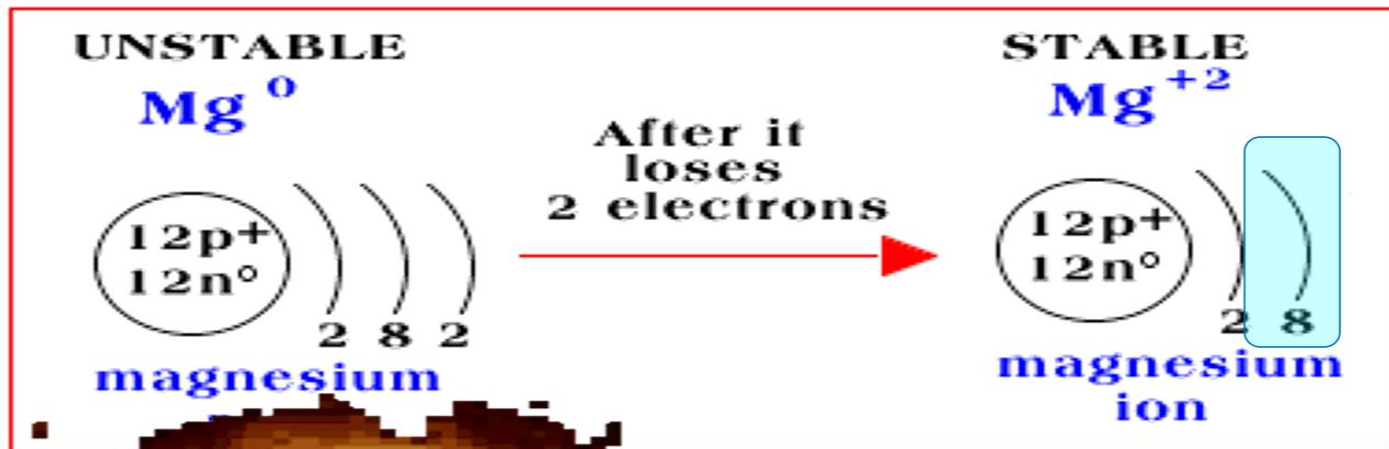
Please add the correct number of electrons to each orbital. Also name the atom.



Most of the transition metals...Record the number of electron in each orbit from the slideshow

Part 3 Lesson 3 Lewis Dot Structures

- Valence electrons are the **highest** energy electrons in an atom and are therefore the most **reactive**.



More reactive when it needs to lose or gain electrons

An atom becomes stable when it has a full outer shell

S 16 32.07 Sulfur	P 15 30.97 Phosphorus	O 8 16.00 Oxygen	N 7 14.01 Nitrogen	C 6 12.01 Carbon	H 1 1.008 Hydrogen
-----------------------------------	---------------------------------------	----------------------------------	------------------------------------	----------------------------------	------------------------------------



Which element is below?

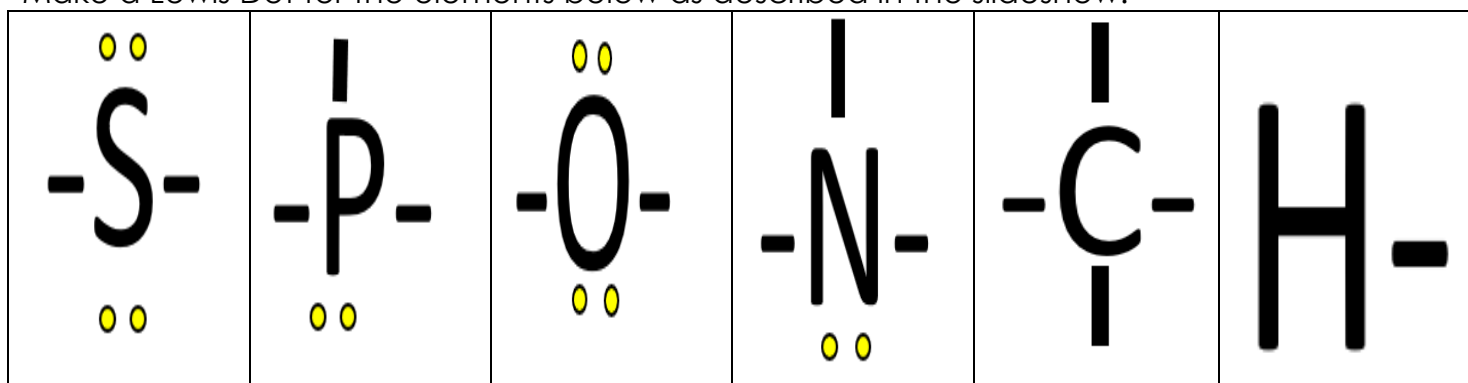
PHOSPHORUS	HYDROGEN	CARBON	OXYGEN	SULFUR

Octet Rule – Elements want **8** electrons in their outer shell (valence).
Add the correct electrons (Lewis Dots for the elements below)

1A		2A						7A	8A		
Li ·	· Be ·					· B ·	· C ·	· N ·	· O ·	· F ·	· Ne ·
Lithium	Beryllium					Boron	Carbon	Nitrogen	Oxygen	Fluorine	Neon
Na ·	· Mg ·					· Al ·	· Si ·	· P ·	· S ·	· Cl ·	· Ar ·
Sodium	Magnesium					Aluminum	Silicon	Phosphorus	Sulfur	Chlorine	Argon

Molecule: **Two** or more atoms that join together chemically.

Make a Lewis Dot for the elements below as described in the slideshow.



Part 3 Lesson 4 Organic Molecules

Please name and describe an important contribution of the chemists below?

Niels Bohr

Niels Bohr proposed a model of the atom in which the electron was able to occupy only certain orbits around the nucleus. This atomic model was the first to use quantum theory, in that the electrons were limited to specific orbits around the nucleus. Bohr used his model to explain the spectral lines of hydrogen.



Gilbert Lewis

Erwin Schrödinger

Gilbert Lewis was best known for his discovery of the covalent bond and his concept of electron pairs; his Lewis dot structures and other contributions to valence bond

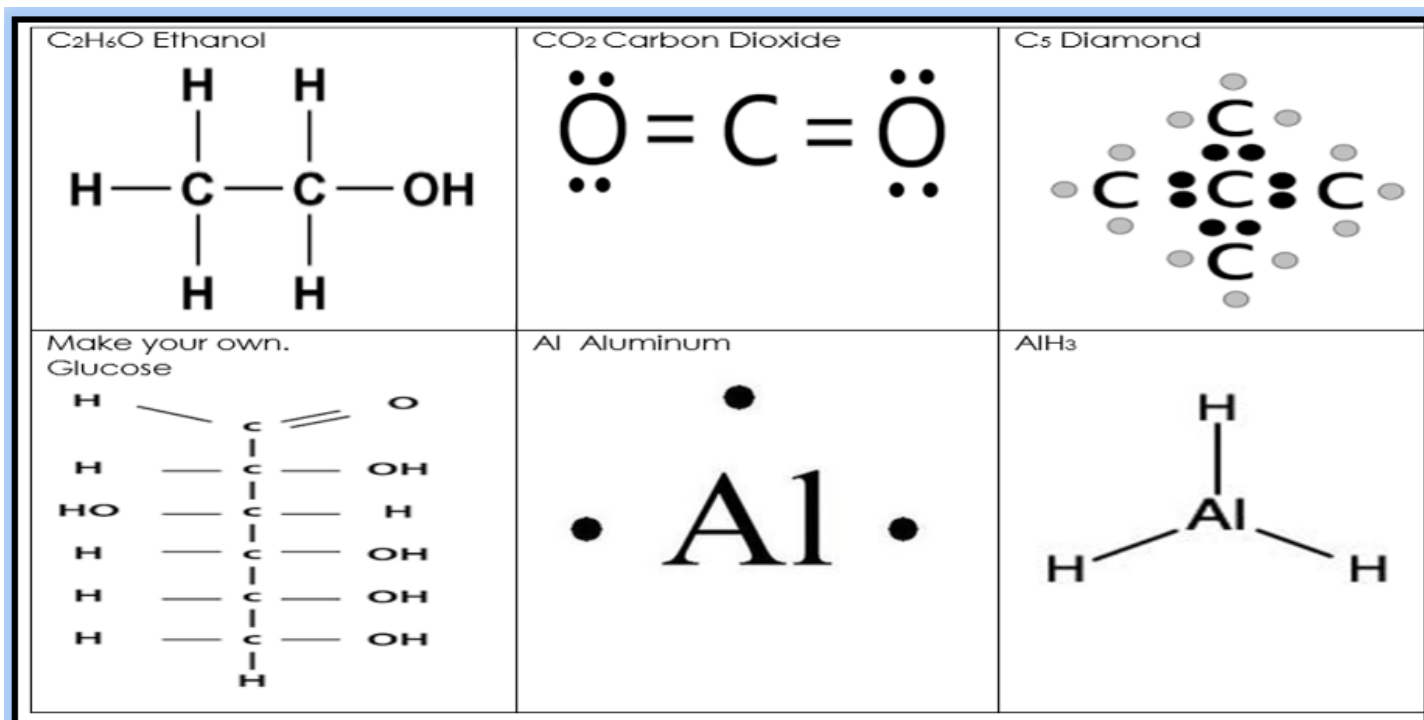
John Dalton



John Dalton (1766-1844) was an English chemist, physicist, and meteorologist, best known for introducing the atomic theory into chemistry

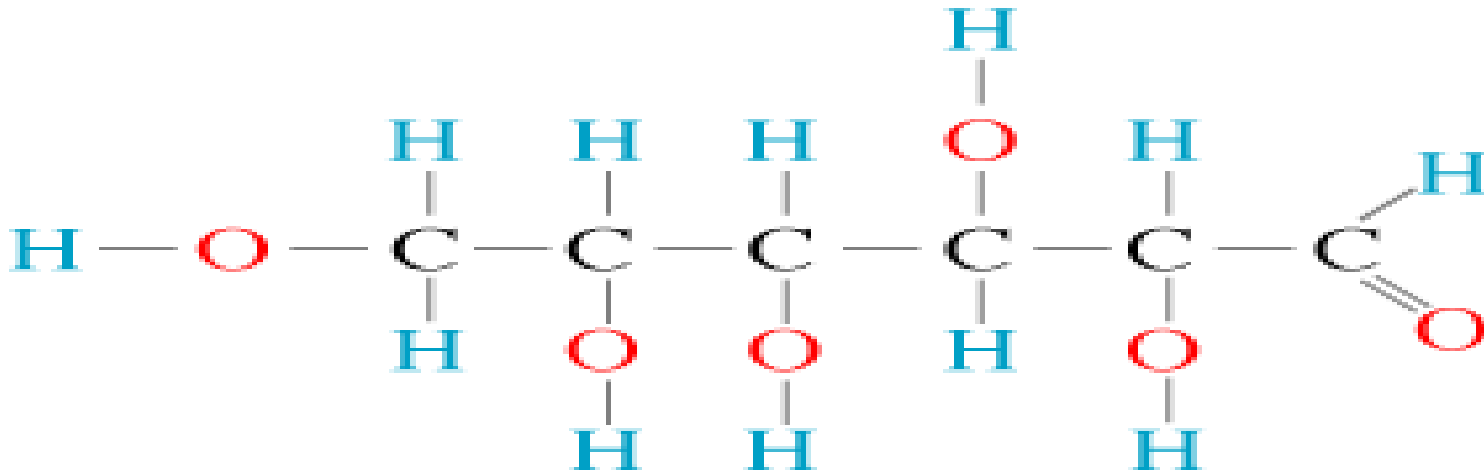
Please create a Lewis Electron Dot diagram for the following molecules in the boxes below

Please create a Lewis Electron Dot diagram for the following molecules in the boxes below		
<p>H₂</p> $\text{H}:\text{H}$	<p>CH₄ Methane</p> $\begin{array}{c} \text{H} \\ \\ \text{H}-\text{C}-\text{H} \\ \\ \text{H} \end{array}$	<p>NF₃</p> $\begin{array}{c} \text{:}\ddot{\text{F}}\text{:} \\ \diagdown \quad \diagup \\ \text{:}\ddot{\text{N}}\text{:} \\ \diagup \quad \diagdown \\ \text{:}\ddot{\text{F}}\text{:} \\ \text{:}\ddot{\text{F}}\text{:} \end{array}$
<p>H₂O Water</p> $\begin{array}{c} \text{:}\ddot{\text{O}}\text{:} \\ \diagdown \quad \diagup \\ \text{H} \quad \text{H} \end{array}$	<p>NaCl Table Salt</p> $\text{Na}^+ \text{:Cl}^-$	<p>O₂ Oxygen gas Note - Double Bond</p> $\text{:}\ddot{\text{O}}=\ddot{\text{O}}\text{:}$
<p>N₂ Nitrogen gas Note - triple bond</p> $\text{:N}\equiv\text{N:}$	<p>CCl₄</p> $\begin{array}{c} \text{:}\ddot{\text{Cl}}\text{:} \\ \\ \text{:}\ddot{\text{Cl}}-\text{C}-\ddot{\text{Cl}}\text{:} \\ \\ \text{:}\ddot{\text{Cl}}\text{:} \end{array}$	<p>HCN Hydrogen Cyanide</p> $\text{H}-\text{C}\equiv\text{N:}$
<p>C₂H₆ Ethane</p> $\begin{array}{c} \text{H} \quad \text{H} \\ \quad \\ \text{H}-\text{C}-\text{C}-\text{H} \\ \quad \\ \text{H} \quad \text{H} \end{array}$	<p>C₃H₈ Propane</p> $\begin{array}{c} \text{H} \quad \text{H} \quad \text{H} \\ \quad \quad \\ \text{H}-\text{C}-\text{C}-\text{C}-\text{H} \\ \quad \quad \\ \text{H} \quad \text{H} \quad \text{H} \end{array}$	<p>C₄H₁₀ Butane</p> $\begin{array}{c} \text{H} \quad \text{H} \quad \text{H} \quad \text{H} \\ \quad \quad \quad \\ \text{H}-\text{C}-\text{C}-\text{C}-\text{C}-\text{H} \\ \quad \quad \quad \\ \text{H} \quad \text{H} \quad \text{H} \quad \text{H} \end{array}$



Carbohydrate: A group of organic compounds, including sugars, starches and fiber, that is a major source of energy for animals. Made of **Carbon, Hydrogen, Oxygen** (1:2:1)

Please complete a molecule of glucose $C_6H_{12}O_6$

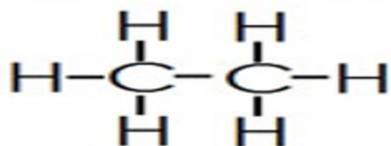


Part 3 Lesson 5 Organic Chemistry / Molecules Cont.

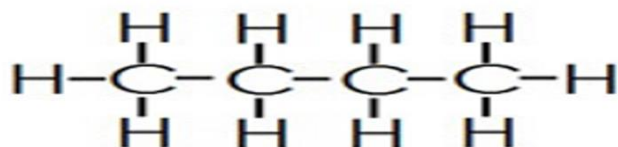
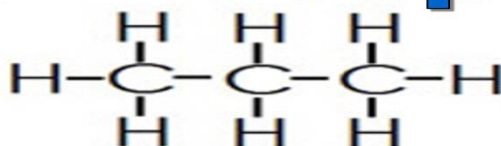
Hydrocarbon: An organic compound consisting entirely of **Hydrogen** and **Carbon**.

Which is butane C_4H_{10} ? Which is pentane C_5H_{12} ? Which is propane C_3H_8 ? What's left?

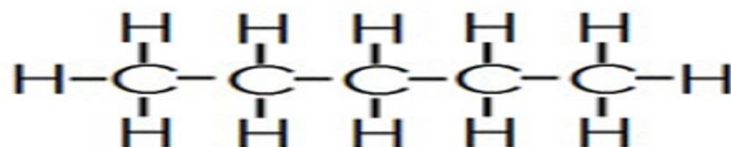
Ethane



Propane



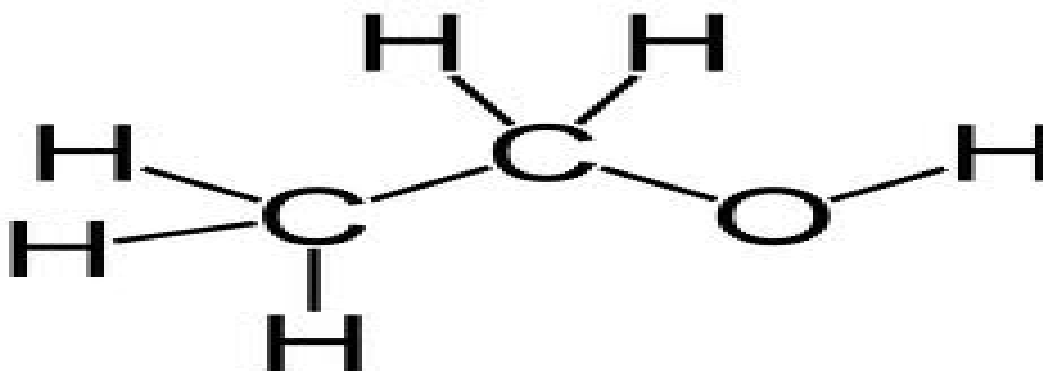
Butane



Pentane

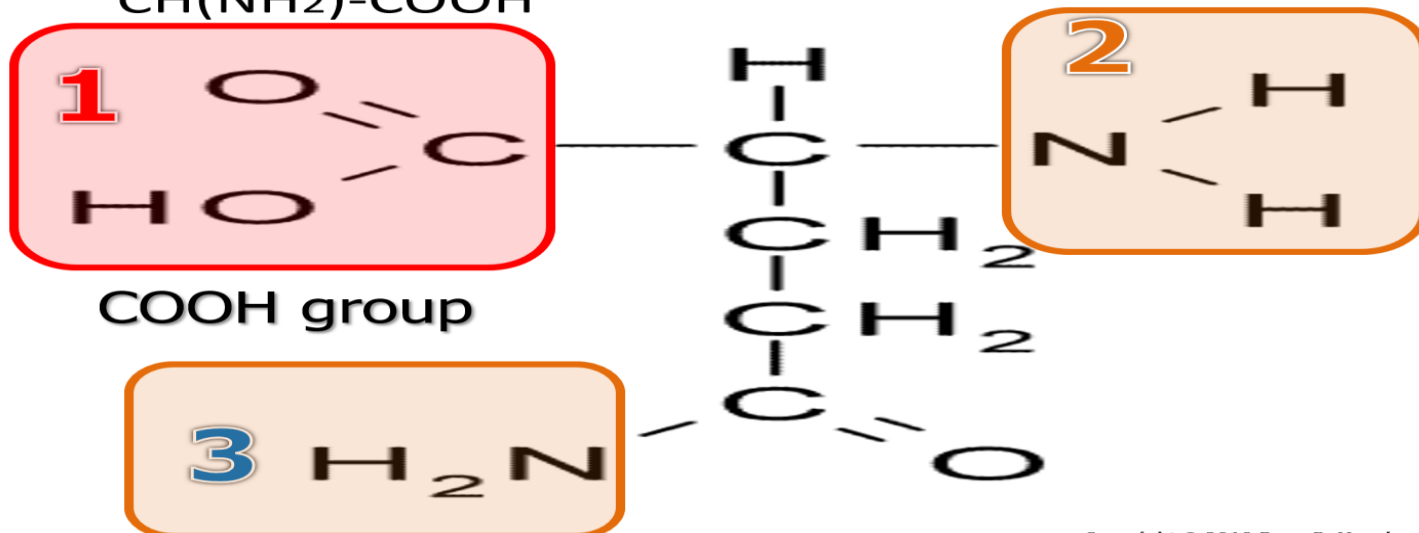
Alcohol: Mostly carbon and hydrogen with an **OH** group

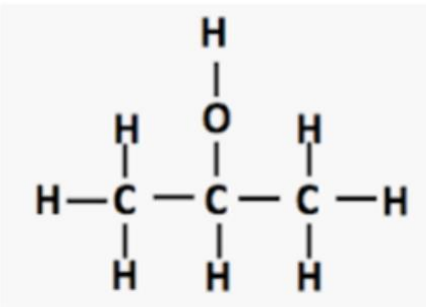
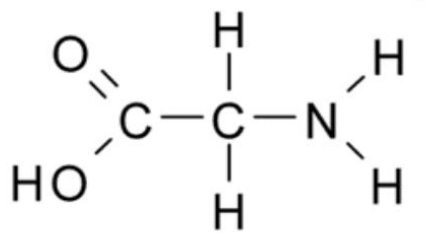
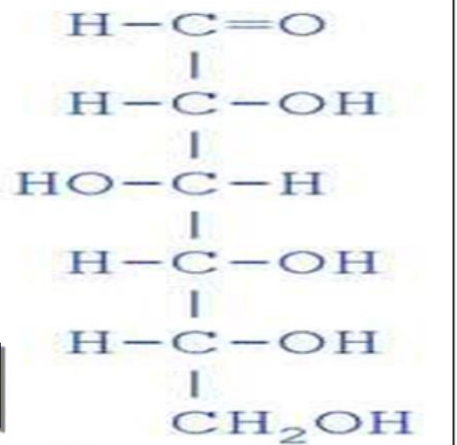
Create Lewis Dot Structure and then build Ethanol $\text{C}_2\text{H}_6\text{O}$



Try and find the NH_2 groups, and COOH group in the Amino Acid, Glutamine $\text{H}_2\text{N}-\text{CO}-(\text{CH}_2)_2-\text{CH}(\text{NH}_2)-\text{COOH}$

- Try and find the **NH_2** groups, and **COOH** group in the Amino Acid, Glutamine $\text{H}_2\text{N}-\text{CO}-(\text{CH}_2)_2-\text{CH}(\text{NH}_2)-\text{COOH}$



<p>What is the empirical formula for this molecule? Name?</p>  <p>C₃H₈O</p> <p>Isopropyl Alcohol</p>	<p>What is a group of nitrogenous organic compounds that are an essential part of living cells</p>  <p>Amino Acid</p>	<p>What is this molecule?</p> <p>C₆H₁₂O₆</p>  <p>Glucose</p>
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Part 3 Lesson 6 Electron Configurations

Heisenberg Uncertainty Principle

- You can't know with certainty both where an electron is and where it's going next.
- That makes it impossible to plot an orbit for an electron around a nucleus.

"Electron **Cloud Model**" Austrian physicist Erwin Schrödinger (1887-1961) It consisted of a dense nucleus surrounded by a cloud of electrons at various levels in orbitals.

Energy levels increase each period (Quantum) Na Sodium has more energy than Lithium

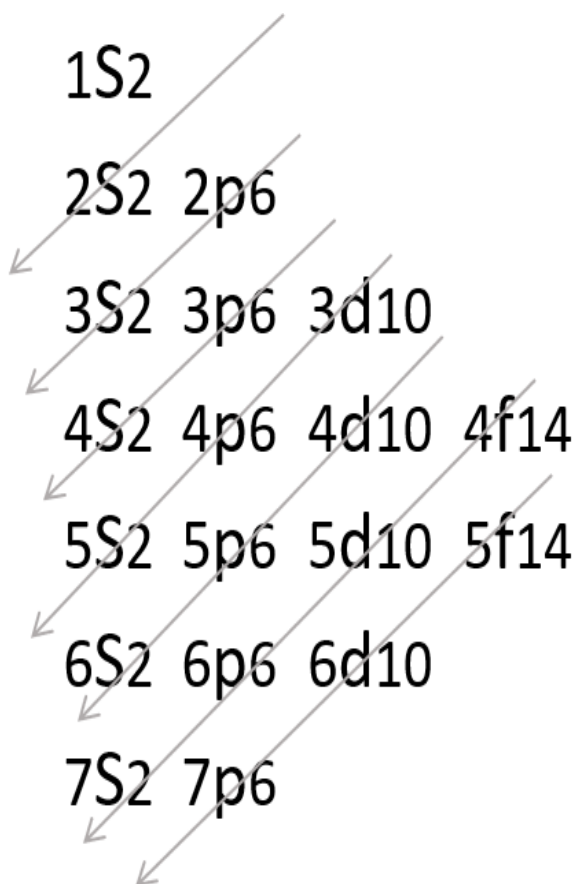
Electrons can get excited and enter a **higher** energy state. (energy added).

- As they get further from the nucleus, their force gets **weaker** and they can be removed more easily. (Next Part in the Unit, Atomic Bonding)
- Electrons can drop to a **lower** energy state (energy removed).

Fill up orbitals in the order 1s, 2s, 2p, 3s, 3p, 4s, 3d, 4p - until you run out of electrons

-Energy increases as you move up the energy levels.

-Pauli Exclusion Principle: No two electrons in an atom can have _____ quantum numbers. Different spins



Electrons fill low energy orbitals (closer to the nucleus) before they fill higher energy ones. The 4f orbitals don't fill until after the 6s.

Try Silicon Atomic Number #14

Electron Configuration Chart

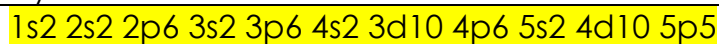
s holds up to 2
 p holds up to 6
 d holds up to 10

14
Si
Silicon
28.09

Diagram showing orbital filling for Silicon (Si) with 14 electrons. The orbitals are filled in the order: 1s, 2s, 2p, 3s, 3p. The 2p orbital is highlighted in yellow.

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

Try Iodine Atomic Number #53



Group →	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
↓ Period																		
1	1 H																	2 He
2	3 Li	4 Be											5 B	6 C	7 N	8 O	9 F	10 Ne
3	11 Na	12 Mg											13 Al	14 Si	15 P	16 S	17 Cl	18 Ar
4	19 K	20 Ca	21 Sc	22 Ti	23 V	24 Cr	25 Mn	26 Fe	27 Co	28 Ni	29 Cu	30 Zn	31 Ga	32 Ge	33 As	34 Se	35 Br	36 Kr
5	37 Rb	38 Sr	39 Y	40 Zr	41 Nb	42 Mo	43 Tc	44 Ru	45 Rh	46 Pd	47 Ag	48 Cd	49 In	50 Sn	51 Sb	52 Te	53 I	54 Xe
6	55 Cs	56 Ba		72 Hf	73 Ta	74 W	75 Re	76 Os	77 Ir	78 Pt	79 Au	80 Hg	81 Tl	82 Pb	83 Bi	84 Po	85 At	86 Rn
7	87 Fr	88 Ra		104 Rf	105 Db	106 Sg	107 Bh	108 Hs	109 Mt	110 Ds	111 Rg	112 Uub	113 Uut	114 Uuq	115 Uup	116 Uuh	117 Uus	118 Uuo

Lanthanides F Actinides	57 La	58 Ce	59 Pr	60 Nd	61 Pm	62 Sm	63 Eu	64 Gd	65 Tb	66 Dy	67 Ho	68 Er	69 Tm	70 Yb	71 Lu
	89 Ac	90 Th	91 Pa	92 U	93 Np	94 Pu	95 Am	96 Cm	97 Bk	98 Cf	99 Es	100 Fm	101 Md	102 No	103 Lr

Aufbau principle: Electrons enter the lowest energy first

Try Silicon Atomic Number #14

Electron Configuration Chart

s holds up to 2 p holds up to 6 d holds up to 10

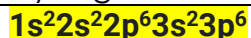
14
Si
Silicon
28.09

1s² 2s² 2p⁶ 3s² 3p²

Try Magnesium



Try Argon



Try Krypton



Try Potassium



Try Aluminum



Try Gold



Quantum theory is the theoretical basis of modern physics that explains the nature and behavior of matter and energy on the atomic and subatomic level.

The energy is quantized. **Valence** electrons are the highest energy electrons in an atom and are therefore the most reactive.

What are the electron configurations for the following elements?

What are the electron configurations for the following elements?

Nitrogen	$1s^2 2s^2 2p^3$
Calcium	$1s^2 2s^2 2p^1$.
Arsenic	$1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 4s^2 4p$
Lead (Short)	$[Xe] 6s^2 4f^{14} 5d^{10} 6p^2$
Beryllium	$1s^2 2s^2$
Chlorine	$1s^2 2s^2 2p^6 3s^2 3p^5$
Aluminum	$1s^2 2s^2 2p^1$.
Calcium	$1s^2 2s^2 2p^6 3s^2 3p^6 4s^2$
Chromium	$1s^2 2s^2 2p^6 3s^2 3p^4 4s^2 3d^9$.

1 P
2 V
3 C A R B O H Y D R A T E
4 E
5 P R O T E I N
6 A T O M S
7 M
8 R E A R R A N G E D
9 E D
10 L A
11 F L U O R I N E
12 L E W I S
13 H
14 B
15 O R B I T A L S
16 C L O U D
17 P E R I O D
18 I O N
19 D
20 E X C L U S I O N
21 D
22 M A N G A N E S E
23 S A L T
24 I O N S
25 B U T A N E
26 T R O I C
27 H E R
28 R E A C T I V E
29 E T H A N O L
30 A L C O H O L

Across

3. _____: A group of organic compounds, including sugars, starches and fiber, that is a major source of energy for animals.
5. Group of nitrogenous organic compounds that are essential parts of living cells.
6. All matter is composed of _____
8. Chemical reactions occur when atoms are _____.
11. [He] 2s² 2p⁵
12. Gilbert Newton _____ (1875-1946) was an American physical chemist whose concept of electron pairs led to modern theories of chemical bonding.
15. Named for their energy sublevels, there are four types of _____: s, p, d, and f.
16. Electron _____ Model" – Austrian physicist Erwin Schrödinger (1887-1961) It consisted of a dense nucleus surrounded by a cloud of electrons at various levels in orbitals.
17. Energy levels increase each p _____ (Quantum)
22. Pauli _____ Principle: No two electrons in an atom can have identical quantum numbers
25. [Ar] 3d⁵ 4s²
26. C₄H₁₀
28. Valence electrons are the highest energy electrons in an atom and are therefore the most r _____.
29. C₂H₆O
30. Mostly carbon and hydrogen with a OH group

Down

1. C₃H₈
2. _____ electrons: Electrons in the outermost shell.
4. Octet Rule – Elements want _____ electrons in their outer shell (valence).
5. The number of valence electrons determines the group placement of an element on the _____ table.
7. Two or more atoms that join together chemically.
9. C₆H₁₂O₆
10. John _____'s Atomic Theories
13. _____ is an organic compound consisting entirely of hydrogen and carbon.
14. Niels Henrik David _____ was a Danish physicist who made foundational contributions to understanding atomic structure and quantum theory
18. Compounds are formed from atoms of the _____
19. All atoms of the same element are _____
20. Atoms cannot be made or _____ "easily"
21. Different elements have _____ types of atoms.
23. 1s²2s²2p¹
24. AMU Atomic Mass _____
27. Electrons can get excited and enter a _____ energy state.

-----teacher can remove word bank to make more difficult-----
 ALCOHOL, ATOMS, BOHR, BUTANE, CALCIUM, CARBOHYDRATE, CLOUD, DALTON, DESTROYED, DIFFERENT, EIGHT, ELEMENT, ETHANOL, EXCLUSION, FLUORINE, GLUCOSE, HIGHER, HYDROCARBON, IDENTICAL, LEWIS, MANGANESE, MOLECULE, PERIOD, PERIODIC, PROPANE, PROTEIN, REACTIVE, REARRANGED, UNITS, VALENCE, ORBITALS

Part 3 Review Game

1-10 = 10 pts * = Bonus + 1 pt, **Lesson 8**
 (Secretly write owl in correct space +1 pt)
 Final Question = 5 pt wager

Name: _____
 Due: Today
 Score ____ / 100

REVIEW POWER	GET IN LINE	MALL LIKE YOU	SERIOUSLY!	CIRCUS CIRCUS Bonus round 1 pt each
1.) D.) Different elements have different types of atoms.	6) SPONCH Elements	11) Carbo-hydrate	16) C.) Pauli Exclusion Principle	*21) A Bugs Life
2) Protons and Electrons	7) Letter B 8	12) Hydrocarbon	17) Double Bond	*22) Pennywise Or Bozoo
3) Atomic Mass Units	8) Molecule	13) Letter C is Ethanol	18) 1S ₂ , 2S ₂ , 2P ₅ , or [He] 2S ₂ 2P ₅	*23) Uncle Buck
4) The Element Silicon	9) C ₃ H ₈	14) Amino Acid	19) 1s ² 2s ² 2p ⁶ 3s ² 3p ³ or [Ne] 3s ² 3p ³	*24) BIG
5) 2, 8, 7 Electrons	10) $\begin{array}{c} \text{H} \\ \\ \text{H}-\text{C}-\text{H} \\ \\ \text{H} \end{array}$	15) Glucose	20) A=Gilbert Lewis B=Niels Bohr C=John Dalton +1 Austrian physicist Erwin Schrödinger	*25) DUMBO

Final Question Wager ____/5 Answer: **The Element Gold**

