

Answer key

10/29/25

Periodic Properties of Elements

Define effective nuclear charge.

The nucleus' pull + strength to hold in e^-
The more protons, then the higher the effective nuclear charge

Define atomic radius and label the trend.

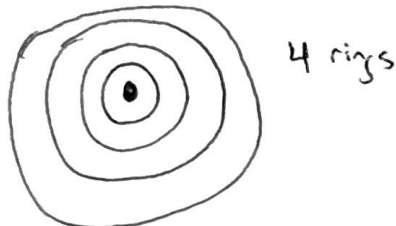
Half the distance b/w the nucleus + outer e^-

EX: Li



More rings =
larger radius

IL



Increases

Periodic Table of the Elements

Atomic Number Symbol Name Group																18	19								
1 H Hydrogen																	2 He Helium	3 Li Lithium	4 Be Beryllium	5 B Boron	6 C Carbon	7 N Nitrogen	8 O Oxygen	9 F Fluorine	10 Ne Neon
11 Na Sodium	12 Mg Magnesium																	13 Al Aluminum	14 Si Silicon	15 P Phosphorus	16 S Sulfur	17 Cl Chlorine	18 Ar Argon		
19 K Potassium	20 Ca Calcium	21 Sc Scandium	22 Ti Titanium	23 V Vanadium	24 Cr Chromium	25 Mn Manganese	26 Fe Iron	27 Co Cobalt	28 Ni Nickel	29 Cu Copper	30 Zn Zinc	31 Ga Gallium	32 Ge Germanium	33 As Arsenic	34 Se Selenium	35 Br Bromine	36 Kr Krypton								
37 Rb Rubidium	38 Sr Strontium	39 Y Yttrium	40 Zr Zirconium	41 Nb Niobium	42 Mo Molybdenum	43 Tc Technetium	44 Ru Ruthenium	45 Rh Rhodium	46 Pd Palladium	47 Ag Silver	48 Cd Cadmium	49 In Indium	50 Sn Tin	51 Sb Antimony	52 Te Tellurium	53 I Iodine	54 Xe Xenon								
55 Cs Cesium	56 Ba Barium	57-71 Lanthanide Series		72 Hf Hafnium	73 Ta Tantalum	74 W Tungsten	75 Re Rhenium	76 Os Osmium	77 Ir Iridium	78 Pt Platinum	79 Au Gold	80 Hg Mercury	81 Tl Thallium	82 Pb Lead	83 Bi Bismuth	84 Po Polonium	85 At Astatine	86 Rn Radon							
87 Fr Francium	88 Ra Radium	89-103 Actinide Series		104 Rf Rutherfordium	105 Db Dubnium	106 Sg Seaborgium	107 Bh Bohrium	108 Hs Hassium	109 Mt Meitnerium	110 Ds Darmstadtium	111 Rg Roentgenium	112 Cn Copernicium	113 Uut Ununtrium	114 Fl Flerovium	115 Uup Ununpentium	116 Lv Livermorium	117 Uus Ununseptium	118 Uuo Ununoctium							

Lanthanide Series

57

La

Ce

Pr

Nd

Pm

Sm

Eu

Gd

Tb

Dy

Ho

Er

Tm

Yb

Lu

Actinide Series

89

Ac

Th

Pa

U

Np

Pu

Am

Cm

Bk

Cf

Es

Fm

Md

No

Lr



O



Increases in size b/c fewer protons
↳ creates lesser pull on e^-

Define ionic radius and label the trend.

Radius of an element in
an ionic state

EX: Li^+ $3 - 1 = 2e^-$



Li



Increases

EX: O



O^{2-} $8 + 2 = 10e^-$
↳ Larger b/c
more e^-
cause more
repulsion

$X + X^+$ positive ion =
smaller

$X + X^-$ negative ion =
bigger

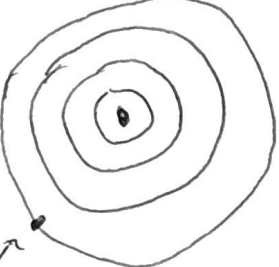
Periodic Table of the Elements

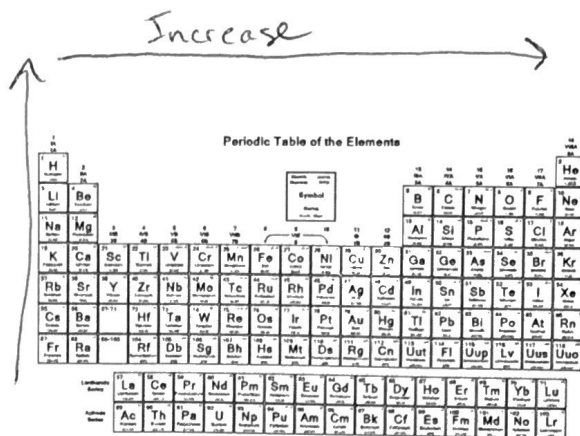
1	2											10	11	12	13	14	15	16	17	18															
H	He											Ne	Ar	Kr	Xe	Rn																			
Li	Be									B	C	N	O	F	Ne	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe			
Na	Mg									Al	Si	P	S	Cl	Ar	Rb	K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr	
K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr	Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe
Ce	Ba			Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At	Rn	La	Pr	Nd	Pm	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu			
Fr	Ra			Rf	Db	Sg	Bh	Hs	Mt	Ds	Rg	Cn	Uut	Fl	Uup	Lv	Uus	Uuo	Ac	Th	Pa	U	Np	Pu	Am	Cm	Bk	Cf	Es	Fm	Md	No	Lr		

Define ionization energy and label the trend.

Minimum energy required to remove an e^- from ground state

EX: Li 

Li 
further from nucleus = less strongly attracted
- less E to remove



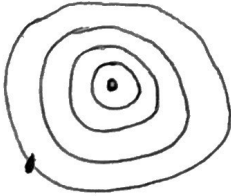
EX: Li  

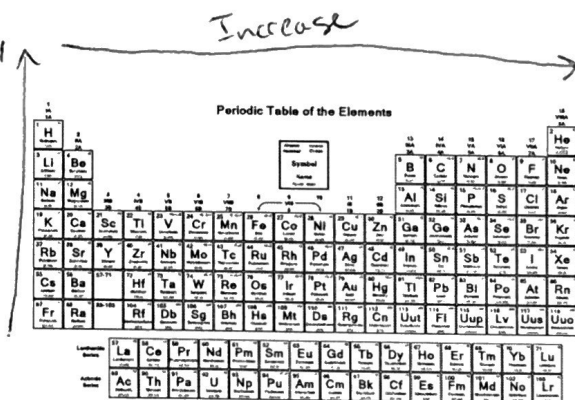
Define electron affinity and label the trend.

Amount of energy associated w/ the addition of an e^-

- Atom's willingness to gain e^-

EX: Li 

Li 
less E needed to add e^-



EX: Li  

Define electronegativity and label the trend.

Ability of an atom to attract shared pairs of e^-

EX: Li



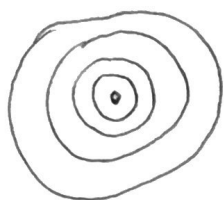
more willing to share e^-

Increases →

↑

Periodic Table of the Elements

Li



EX:



more willing to share
b/c smaller radius

Label P, S, As, and Se in increasing size.

Smallest → largest

Rings 1st
then look
crow

$S < P < Se < As$

3 rings P S
4 rings As Se

Arrange ~~Mg²⁺, Ca²⁺, and Sr~~ in order of decreasing radius.

Ca^{2+}, Sr^{2+}, Sr

$Sr > Sr^{2+} > Ca^{2+}$

large → small

$Ca^{2+} = 3$ rings

$Sr^{2+} = 4$ rings

$Sr = 5$ rings

Which of the following is the largest atom: ~~S²⁻, Se, S²⁻~~

Se^{2-}, Se, S^{2-}

$Se^{2-} = 4$ rings

$Se = 4$ rings

$S^{2-} = 3$ rings

Se^{2-}

more e^- than Se →

more repulsion → larger radius

Which element has the largest atomic radius: K or Ca? Why?

K has the larger radius b/c it has a lesser effective nuclear charge

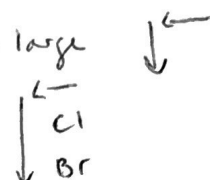
K rings are more spread than Ca b/c has fewer protons

more protons = greater pull on e^-

Arrange Cl, Cl^- , and Br in order of increasing atomic radius. Small $\rightarrow$ large



$\uparrow$ more e^- than Cl

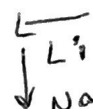


Arrange Na, Li^+ , and Li in order of decreasing atomic radius.



$\uparrow$ loses e^- ; 1 ring now

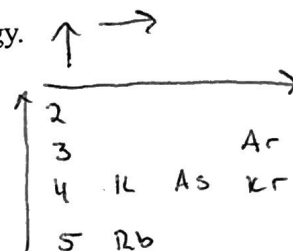
large $\rightarrow$ small



Arrange ~~Ar, K, As, Kr, Rb~~ in order of increasing first ionization energy.

Ar, K, As, Kr, Rb

Small $\rightarrow$ lg



Arrange N, Na, and F in order of decreasing electronegativity.

high $\rightarrow$ low

