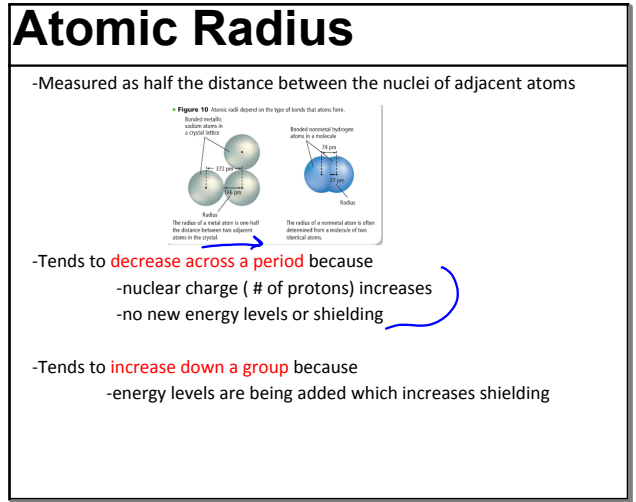
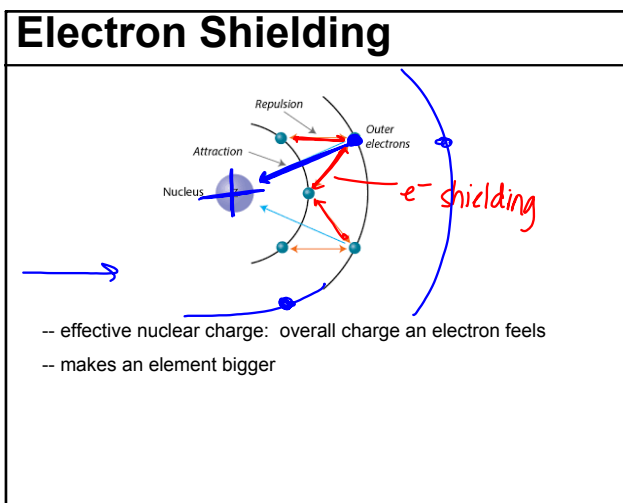


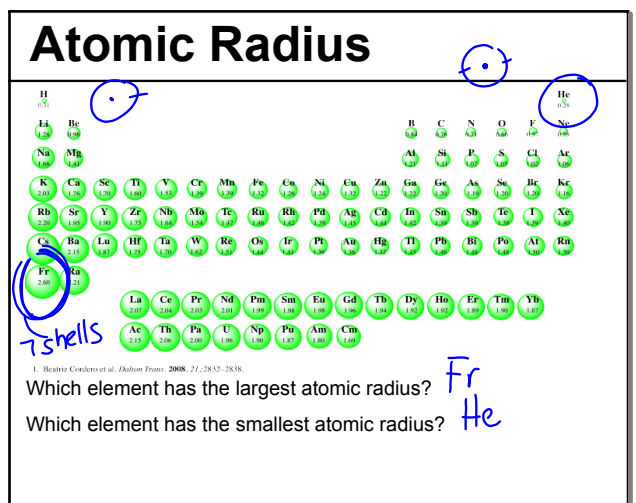
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Sep 27-7:36 AM



Sep 28-9:06 AM



Sep 27-7:43 AM

INCREASING ATOMIC RADIUS

INCREASING ATOMIC RADIUS

1	2											10	11	12	13	14	15	16	17	18	
H	He											Ne	Ar	Kr	Xe	Rn					
3	4											5	6	7	8	9					
Li	Be											B	C	N	O	F					
11	12											13	14	15	16	17	18				
Na	Mg											Al	Si	P	S	Cl	Ar				
19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36				
K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr				
37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54				
Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe				
55	56	57	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86				
Cs	Ba	La	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At	Rn				
87	88	89	104	105	106	107	108	109	110	111	112	113	114								
Fr	Ra	Ac	Rf	Db	Sg	Bh	Ht	Mt													

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**Practice:** Which element in each pair has the largest atomic radius?

- Na or Li
- Na or F
- Fr or He
- Cl or Ar
- F or Br

\* Lanthanide series  
# Actinide series

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# Ions

-atoms w/ charge

lose 2  
lose 1  
gain 2  
gain 1  
gain 1  
gain 1  
gain 1

varied

7p<sup>+</sup> 7p<sup>+</sup>  
2e<sup>-</sup> 10e<sup>-</sup>  
0 -3

11p<sup>+</sup> 11p<sup>+</sup>  
11e<sup>-</sup> 10e<sup>-</sup>  
0 +1

20p<sup>+</sup> 20p<sup>+</sup>  
20e<sup>-</sup> 10e<sup>-</sup>  
0 +2

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# Ionic Radius

-An ion is a charged particle

-What happens to the size of an atom that gains an electron to become a negative ion?  
-more electrons makes the ion larger than the atom

-What happens to the size of an atom that loses electrons to become a positive ion?  
-fewer electrons makes the ion smaller than the atom

+ cation  
- anion

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# Ionic Radius Practice

ap+ bp+  
10e- 10e-  
7p+ 10e-

Using the picture shown, which ion is larger:  $N^{3-}$ ,  $O^{2-}$  or  $F^-$ ?

smallest  $\rightarrow$  largest  $F^-, O^{2-}, N^{3-}$

Why do you think this is so?

**Figure 14** The ionic radii of most of the representative elements are shown in picometers ( $10^{-12}$  m). Explain why the ionic radii increase for both positive and negative ions as you move down a group.

	1	2	13	14	15	16	17
2	Li 76 1+	Be 31 2+	B 20 3+	C 15 4+	N 146 3-	O 140 2-	F 133 1-
3	Na 102 1+	Mg 72 2+	Al 54 3+	Si 41 4+	P 212 3-	S 184 2-	Cl 181 1-
4	K 138 1+	Ca 100 2+	Ga 62 3+	Ge 53 4+	As 222 3-	Se 198 2-	Br 196 1-
5	Rb 152 1+	Sr 118 2+	In 81 3+	Sn 71 4+	Sb 62 5+	Te 221 2-	I 220 1-
6	Cs 167 1+	Ba 135 2+	Tl 95 3+	Pb 84 4+	Bi 74 5+		

# Ionic Radius Practice

Which atom or ion in each pair is larger?

1. a.  $Na$  or  $Na^+$
- b.  $Na$  or  $Mg^{2+}$
- c.  $Cl$  or  $Cl^-$
- d.  $F$  or  $Cl^-$
- e.  $Ga^{3+}$  or  $Ca^{2+}$
- f.  $S^{2-}$  or  $Cl^-$

	1	2	13	14	15	16	17	18
2	H 100 1+	He 100 0	B 110 3+	C 110 4+	N 110 3-	O 110 2-	F 110 1-	Ne 110 0
3	Li 102 1+	Be 102 2+	Al 102 3+	Si 102 4+	P 102 3-	S 102 2-	Cl 102 1-	Ar 102 0
4	K 138 1+	Ca 100 2+	Ga 62 3+	Ge 53 4+	As 222 3-	Se 198 2-	Br 196 1-	Kr 196 0
5	Rb 152 1+	Sr 118 2+	In 81 3+	Sn 71 4+	Sb 62 5+	Te 221 2-	I 220 1-	Xe 220 0
6	Cs 167 1+	Ba 135 2+	Tl 95 3+	Pb 84 4+	Bi 74 5+			Rn 220 0

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