

## CONCEPT: ATOMIC RADIUS & DENSITY OF TRANSITION METALS

### Atomic Radius

- **Recall:** Atomic Radius of main group elements \_\_\_\_ from left to right across a period and going up the group.
  - Transition metals follow the same general trend but change in size is more \_\_\_\_\_.
- **Across a period:** number of outermost electrons ( \_\_\_\_ ) is constant.

<div>→ Atomic Radius _____</div>										↑
3B	4B	5B	6B	7B	8B			1B	2B	
(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	
4	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	
5	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd
			146 pm	139 pm	136 pm	134 pm				
6	La	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg
			146 pm	139 pm	137 pm	135 pm				

**EXAMPLE:** Which element from each pair would you predict to have the biggest atomic size?

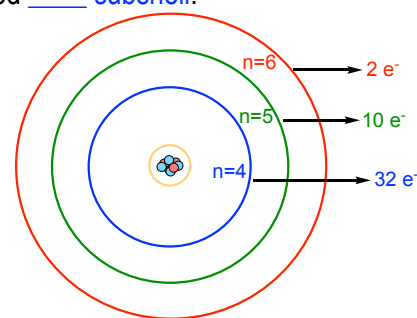
a) Ni & Ti

b) Tc & Ru

c) Rh & Nb

d) Y & Ag

- **Down a group:** period 5 to 6 transition metals have relatively \_\_\_\_\_ size; this is due to *lanthanide contraction*.
  - **Lanthanide Contraction:** \_\_\_\_ in Effective Nuclear charge ( $Z_{\text{Eff}}$ ) due to filled \_\_\_\_ subshell.
    - Recall: \_\_\_\_ in electrons in same shell = \_\_\_\_ attractive force.
    - Causes a \_\_\_\_ in expected atomic size of period 6 transition metals.
  - **Note:** see Periodic Trend: Effective Nuclear Charge topic for more info.



**EXAMPLE:** Which of the following transition metals would you expect to be larger but are actually same or nearly same size as Tc (technetium)?

a) Zn

b) Mo

c) Ta

d) Re

## CONCEPT: ATOMIC RADIUS & DENSITY OF TRANSITION METALS

### Density

- Increases as \_\_\_\_\_ of metal increases.
- Increase in density down the group is \_\_\_\_\_ significant than across the period.

Density ____										
	3B	4B	5B	6B	7B	8B		1B	2B	
	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
4	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn
5	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd
6	La	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg

Density \_\_\_\_

**EXAMPLE:** Identify a transition metal with the highest density.

a) Zn

b) Sc

c) Os

d) Hf