

## CONCEPT: HYDROGEN COMPOUNDS

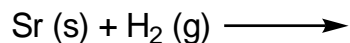
- Elemental H reacts with different elements to produce *hydrides*.
  - **Hydrides**: binary compounds containing H and a \_\_\_\_\_ or \_\_\_\_\_.
  - There are 3 types: (1) ionic, (2) covalent, and (3) metallic hydrides.

### (1) Ionic Hydrides

- White, crystalline \_\_\_\_\_ formed when H<sub>2</sub> reacts with group 1A or 2A metals (**Exception**: Beryllium).
  - H possesses oxidation # of \_\_\_\_\_.

Ionic Hydrides	
1A metals	___ M (s) + H <sub>2</sub> (g) → _____ (s)
2A metals	M (s) + H <sub>2</sub> (g) → _____ (s)

**EXAMPLE:** Complete and balance the following reaction.



**PRACTICE:** Write and balance a reaction for formation of an ionic hydride with sodium.

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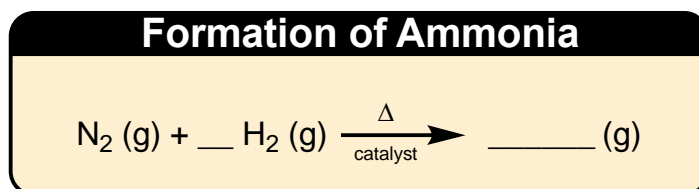
### (2) Covalent (Molecular) Hydrides

- Form when H<sub>2</sub> reacts with \_\_\_\_\_ and metalloids.
  - H possesses oxidation # of \_\_\_\_\_.

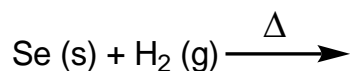
Common Covalent Hydrides			
4A ( )	5A ( )	6A ( )	7A ( )
CH <sub>4</sub>	NH <sub>3</sub>	H <sub>2</sub> O	HF

3A	4A	5A	6A	7A	8A (8)
(3)	(4)	(5)	(6)	(7)	
5 B	6 C	7 N	8 O	9 F	10 Ne
13 Al	14 Si	15 P	16 S	17 Cl	18 Ar
31 Ga	32 Ge	33 As	34 Se	35 Br	36 Kr
49 In	50 Sn	51 Sb	52 Te	53 I	54 Xe
81 Tl	82 Pb	83 Bi	84 Po	85 At	86 Rn
113 Nh	114 Fl	115 Mc	116 Lv	117 Ts	118 Og

- An example is formation of \_\_\_\_\_ through the following reaction.



**EXAMPLE:** Complete and balance the following reaction.

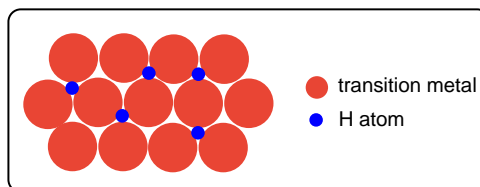


**PRACTICE:** Provide a balanced equation for the reaction of hydrogen gas with bromine gas.

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### (3) Metallic Hydrides

- Formed when  $H_2$  reacts with \_\_\_\_\_ metals.
- Many do \_\_\_\_\_ follow a stoichiometric ratio of metal to hydrogen atoms.
  - H fills in between the \_\_\_\_\_ of the metal lattice structure.



**EXAMPLE:** Identify a metallic hydride out of the following.

- |            |            |
|------------|------------|
| a) $H_2Te$ | c) $RbH$   |
| b) $TiH_2$ | d) $AlH_3$ |

**PRACTICE:** Classify each hydride according to its type.

- |                  |       |
|------------------|-------|
| i) $SbH_3$       | _____ |
| ii) $NaH$        | _____ |
| iii) $PdH_{0.5}$ | _____ |
| iv) $CaH_2$      | _____ |