Chemistry H

# Exercise 8.3a(H)

## Using the Activity Series

Name: _____

Date: _____ Per: _____

In a single replacement reaction, one element replaces another element in a compound. For one element to replace another, it must be more reactive than the element it replaces. During the replacement, the more reactive element increases its stability more than the element it is replacing did during the formation of the compound.

For example, in a compound of zinc chloride, two chlorine atoms remove two electrons from a single atom of zinc. As the zinc loses it electrons it becomes more stable. Calcium is more reactive than zinc. When it loses two electrons, it releases much more energy than zinc does when it loses two electrons. So, if calcium is added to a solution of zinc chloride, calcium will lose its electrons to zinc to maximize the stability of the system. The zinc will become less stable again, but the calcium will become much more stable. Chemicals react to achieve the greatest stability.

The reactivities of many elements have been ranked and are shown below in the *Activity Series Table*. More reactive elements are at the top of the chart and will the elements below them on the chart.

***DIRECTIONS: For each set of reactants below, if a reaction will occur based on the elements' positions in the Activity Series, complete the equation and balance it. If there is no reaction, write "No Reaction".***

*[NOTE: For metals, the format for single replacement reactions is AB + C → CB + A; for nonmetals the format is AB + D → AD + B]*

1. ___ Mg(s) + _2_ HCl(aq) → $MgCl_2(aq) + H_2(g)$
2. ___ Ag(s) + ___ $Cu(NO_3)_2(aq)$ → No Reaction
3. ___ Zn(s) + ___ $Mn(C_2H_3O_2)_7(aq)$ → No Reaction
4. _2_ Al(s) + _6_ HCl(aq) → $2AlCl_3(aq) + 3H_2(g)$
5. ___ Cu(s) + ___ HBr(aq) → No Reaction
6. ___ Cu(s) + _2_ $AgC_2H_3O_2$ (aq) → $Cu(C_2H_3O_2)_2(aq) + 2Ag(s)$
7. ___ Sn(s) + ___ $H_2SO_4(aq)$ → $SnSO_4(aq) + H_2(g)$
8. ___ Mg(s) + ___ $Pb(NO_3)_2(aq)$ → $Mg(NO_3)_2(aq) + Pb(s)$
9. ___ Pb(s) + _2_ AuCl(aq) → $PbCl_2(aq) + 2Au(s)$
10. ___ Zn(s) + _2_ $AgNO_3(aq)$ → $Zn(NO_3)_2(aq) + 2Ag(s)$
11. _2_ Al(s) + _3_ $H_2SO_4(aq)$ → $Al_2(SO_4)_3(aq) + 3H_2(g)$
12. _2_ Li(s) + _2_ $H_2O(l)$ → $2LiOH(aq) + H_2(g)$
13. _2_ Al(s) + _3_ $Pb(NO_3)_2(aq)$ → $2Al(NO_3)_3(aq) + 3Pb(s)$
14. ___ $Cl_2(g)$ + _2_ NaI(aq) → $2NaCl(aq) + I_2(s)$
15. _2_ Al(s) + _3_ $CuCl_2(aq)$ → $2AlCl_3(aq) + 3Cu(s)$
16. ___ Zn(s) + ___ $H_2SO_4(aq)$ → $ZnSO_4(aq) + H_2(g)$
17. ___ $Cl_2(g)$ + ___ $MgI_2(aq)$ → $MgCl_2(aq) + I_2(s)$

***Directions: Write and the balance the full formula equation for the following.***

18. lead + zinc acetate: No reaction
19. aluminum bromide + chlorine: $2AlBr_3(aq) + 3Cl_2(g) \rightarrow 2AlCl_3(aq) + 3Br_2(l)$
20. calcium + hydrochloric acid: $Ca(s) + 2HCl(aq) \rightarrow CaCl_2(aq) + H_2(g)$
21. magnesium + nitric acid: $Mg(s) + 2HNO_3(aq) \rightarrow Mg(NO_3)_2(aq) + H_2(g)$
22. sodium + water: $2Na(s) + 2H_2O(l) \rightarrow 2NaOH(aq) + H_2(g)$

**Activity Series**

| Metals | | Nonmetals |
|---|---|---|
| Li | More | $F_2$ |
| Rb | | $Cl_2$ |
| K | | $Br_2$ |
| Cs | | $I_2$ |
| Ba | | |
| Sr | | |
| Ca | | |
| Na | | |
| Mg | | |
| Al | | |
| Ti | | |
| Mn | | |
| Zn | | |
| Cr | | |
| Fe | | |
| Co | | |
| Ni | | |
| Sn | Less | |
| Pb | | |
| $H_2$ | | |
| Cu | | |
| Ag | | |
| Pt | | |
| Au | | |