SCH 3UI - Common Reactions That You Must Know

Activity Series

These elements are ranked most reactive to least reactive. A more reative element will often react to displace a less reactive element in a reaction.

K, Na, Ca, Mg, Al, Zn, Fe, Sn, Pb, H, Cu, Hg, Ag, Pt, Au

Common Reactions

1. A metal and oxygen gas will combine to make a metal oxide.

eg. $4\,Fe + 3\,O_2 \text{ -----> } 2\,Fe_2O_3$ **eg.** $4\,Na + O_2 \text{ -----> } 2\,Na_2O$

i) use the periodic table to predict the most likely valence of a transisiton metal.
ii) metals are always elemental , O_2 is always diatomic.

2. Non-metallic elements combine with oxygen to make non-metallic oxides.

eg. $S + O_2 \text{ ----> } SO_2$

eg. $C + O_2 \text{ ------> } CO_2$

3. Metal oxides in water form metal hydroxides.

eg. $K_2O + H_2O \text{ -----> } 2\,KOH$

eg. $Fe_2O_3 + H_2O \text{ -------> } 2\,Fe(OH)_3$

4. Non-metallic oxides and water combine to form acids.

eg. $SO_2 + H_2O \text{ -----> } H_2SO_3$

eg. $NO_2 + H_2O \text{ -----> } HNO_3 + HNO$

5. Peroxides decompose to metallic oxides and oxygen gas

eg. $2\,Na_2O_2 \text{ --------> } 2\,Na_2O + O_2$

eg. $2\,H_2O_2 \text{ --------> } 2\,H_2O + O_2$

6. Chlorates and perchlorates decompose on heating to give oxygen and a salt.

eg. $2\,KClO_3 \text{ ------heat-------> } 2\,KCl + 3\,O_2$

eg. $KClO_4 \text{ ---------heat------> } KCl + 2\,O_2$

7. A metal and a compound may react in a single displacement reaction if the metal is more reactive than the metal in the compound. See the activity series above for more information.

eg. $2\ Al_{(s)} + 6\ HCl \text{ -------> } 2\ AlCl_3 + 3\ H_{2(g)}$

eg. $Cu_{(s)} + 2\ AgNO_3 \text{ ----> } 2\ Ag_{(s)} + Cu(NO_3)_2$

eg. $Ag(s) + Cu(NO_3)_2 \text{ -----> No reaction}$

8. A metal in acid will produce a metallic salt and hydrogen gas. A salt is a positive metal ion and a negative ion ending in "ide", "ate" or "ite".

eg. $2\ Na + 2\ HCl \text{ ----> } 2\ NaCl + H_{2(g)}$

Na displaces H from the moelcules because Na is more reactive.

eg. $Pb + H_2SO_4 \text{ --------> } PbSO_4 + H_{2(g)}$

- Copper and nitric acid do not perform this reaction.

$Cu + HNO_3 \text{ ---> } Cu(NO_3)_2 + H_2O + NO_{2(g)}$

9. Metals in water form metal hydroxides and hydrogen gas.

eg. $2\ Na + 2\ H_2O \text{ -----> } 2\ NaOH + H_{2(g)}$

10. An acid and a base will neutralize each other to create water and a salt.

eg. $HCl + NaOH \text{ -----> } H_2O + NaCl$

eg. $2\ H_3PO_4 + 3\ Mg(OH)_2 \text{ -------> } 6\ H_2O + Mg_3(PO_4)_2$

11. Some aqueous ions will react to form a gaseous product

eg. $CO_3^{2-}{}_{(aq)} + acid \text{ -----> } H_2CO_{3(aq)} \text{ -----> } CO_{2(g)} + HOH$ ($CaCO_{3(aq)} + 2HCl_{(aq)}$ -----> $CaCl_2 + CO_{2(g)} + HOH$)

eg. $SO_3^{2-}{}_{(aq)} + acid \text{ -----> } H_2SO_{3(aq)} \text{ -----> } SO_{2(g)} + HOH$ ($Na_2SO_{3(aq)} + 2HCl_{(aq)}$ -----> $2NaCl + SO_{2(g)} + HOH$)

eg. $NH_4^{+1}{}_{(aq)} + base \text{ -----> } NH_4OH_{(aq)} \text{ -----> } NH_{3(g)} + HOH$ ($NH_4Cl_{(aq)} + KOH_{(aq)}$ -----> $KCl_{(aq)} + NH_{3(g)} + HOH$)

eg. $S^{2-}{}_{(aq)} + acid \text{ -----> } H_2S_{(g)}$ ($FeS_{(s)} + 2HCl_{(aq)}$ -----> $FeCl_{2(aq)} + H_2S_{(g)}$)

eg. $CN^{1-}{}_{(aq)} + acid \text{ -----> } HCN_{(g)}$ ($KCN_{(aq)} + HCl_{(aq)}$ -----> $KCl_{(aq)} + HCN_{(g)}$)