

# CHART - 3 > Revision Equations - CHAPTER 6 - WATER

REACTIONS OF WATER -	
<b>WITH METALS</b>	
1. Potassium	$2K + 2H_2O \rightarrow 2KOH + H_2$ [g]
2. Sodium	$2Na + 2H_2O \rightarrow 2NaOH + H_2$ [g]
3. Calcium	$Ca + 2H_2O \rightarrow Ca(OH)_2 + H_2$ [g]
4. Magnesium	$Mg + H_2O \rightarrow MgO + H_2$ [g]
5. Aluminium	$2Al + 3H_2O \rightarrow Al_2O_3 + 3H_2$ [g]
6. Zinc	$Zn + H_2O \rightarrow ZnO + H_2$ [g]
7. Iron	$3Fe + 4H_2O \rightleftharpoons Fe_3O_4 + 4H_2$ [g]
<b>WITH NON-METALS</b>	
8. Coke	$C + H_2O \xrightarrow{\text{[steam]}} CO + H_2$ [water gas]
9. Chlorine	$Cl_2 + H_2O \rightarrow HCl + HClO$
<b>NON-METALLIC OXIDES</b>	
10. Sulphur dioxide	$SO_2 + H_2O \rightarrow H_2SO_3$
11. Sulphur trioxide	$SO_3 + H_2O \rightarrow H_2SO_4$
12. Carbon dioxide	$CO_2 + H_2O \rightarrow H_2CO_3$
13. Nitrogen dioxide	$2NO_2 + H_2O \rightarrow HNO_2 + HNO_3$
<b>METALLIC OXIDES</b>	
14. Potassium oxide	$K_2O + H_2O \rightarrow 2KOH$
15. Calcium oxide	$CaO + H_2O \rightarrow Ca(OH)_2$
<b>TESTS - FOR WATER</b>	
16. Anhydrous copper sulphate	$CuSO_4 + 5H_2O \rightarrow CuSO_4 \cdot 5H_2O$ [white] [blue]
17. Cobalt chloride	$CoCl_2 + 6H_2O \rightarrow CoCl_2 \cdot 6H_2O$ [blue] [pink]
<b>BIOLOGICAL IMPORTANCE - of dissolved gases in water</b>	
18. Dissolved oxygen - respiration	$C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O + \text{energy}$
19. Dissolved $CO_2$ - photosynthesis	$6CO_2 + 12H_2O \rightarrow C_6H_{12}O_6 + 6H_2O + 6O_2$
20. Dissolved $CO_2$ - formation of shells	$CaCO_3 + H_2O + CO_2 \rightarrow Ca(HCO_3)_2$
<b>WATER AS A - CATALYST</b>	
21. Synthesis of hydrogen chloride	$H_2 + Cl_2 \rightarrow 2HCl$
22. Combustion of phosphorus	$4P + 5O_2 \rightarrow 2P_2O_5$



# Practise Equations - CHAPTER 6 - WATER [Contd.]

REACTIONS OF WATER -	
<b>WITH METALS</b>	
1. Potassium	$K + H_2O \rightarrow \text{_____} + \text{_____} [g]$
2. Sodium	$Na + H_2O \rightarrow \text{_____} + \text{_____} [g]$
3. Calcium	$Ca + H_2O \rightarrow \text{_____} + \text{_____} [g]$
4. Magnesium	$Mg + H_2O \rightarrow \text{_____} + \text{_____} [g]$
5. Aluminium	$Al + H_2O \rightarrow \text{_____} + \text{_____} [g]$
6. Zinc	$Zn + H_2O \rightarrow \text{_____} + \text{_____} [g]$
7. Iron	$Fe + H_2O \rightleftharpoons \text{_____} + \text{_____} [g]$
<b>WITH NON-METALS</b>	
8. Coke	$C + H_2O \xrightarrow{\text{[steam]}} \text{_____} + \text{_____} \text{[water gas]}$
9. Chlorine	$Cl_2 + H_2O \rightarrow \text{_____} + \text{_____}$
<b>NON-METALLIC OXIDES</b>	
10. Sulphur dioxide	$SO_2 + H_2O \rightarrow \text{_____}$
11. Sulphur trioxide	$SO_3 + H_2O \rightarrow \text{_____}$
12. Carbon dioxide	$CO_2 + H_2O \rightarrow \text{_____}$
13. Nitrogen dioxide	$NO_2 + H_2O \rightarrow \text{_____} + \text{_____}$
<b>METALLIC OXIDES</b>	
14. Potassium oxide	$K_2O + H_2O \rightarrow \text{_____}$
15. Calcium oxide	$CaO + H_2O \rightarrow \text{_____}$
<b>TESTS - FOR WATER</b>	
16. Anhydrous copper sulphate	$CuSO_4 + 5H_2O \rightarrow \text{_____}$ [white] [blue]
17. Cobalt chloride	$CoCl_2 + 6H_2O \rightarrow \text{_____}$ [blue] [pink]
<b>BIOLOGICAL IMPORTANCE - of dissolved gases in water</b>	
18. Dissolved oxygen - respiration	$C_6H_{12}O_6 + O_2 \rightarrow \text{_____} + \text{_____} + \text{energy}$
19. Dissolved $CO_2$ - photosynthesis	$CO_2 + H_2O \rightarrow \text{_____} + \text{_____} + \text{_____}$
20. Dissolved $CO_2$ - formation of shells	$CaCO_3 + H_2O + CO_2 \rightarrow \text{_____}$
<b>WATER AS A - CATALYST</b>	
21. Synthesis of hydrogen chloride	$H_2 + Cl_2 \rightarrow \text{_____}$
22. Combustion of phosphorus	$P + O_2 \rightarrow \text{_____}$



# Revision Equations - CHAPTER 9 - Study of First Element - HYDROGEN

PREPARATIONS OF HYDROGEN - General Methods	
<b>REACTIONS OF METALS -</b>	
<b>WITH COLD WATER</b>	
1. Potassium	$2K + 2H_2O \rightarrow 2KOH + H_2 [g]$
2. Sodium	$2Na + 2H_2O \rightarrow 2NaOH + H_2 [g]$
3. Calcium	$Ca + 2H_2O \rightarrow Ca(OH)_2 + H_2 [g]$
<b>WITH BOILING WATER OR STEAM</b>	
4. Magnesium	$Mg + H_2O \rightarrow MgO + H_2 [g]$
5. Aluminium	$2Al + 3H_2O \rightarrow Al_2O_3 + 3H_2 [g]$
6. Zinc	$Zn + H_2O \rightarrow ZnO + H_2 [g]$
7. Iron	$3Fe + 4H_2O \rightleftharpoons Fe_3O_4 + 4H_2 [g]$
<b>WITH DILUTE ACIDS</b>	
8. Magnesium	$Mg + 2HCl \rightarrow MgCl_2 + H_2 [g]$
9. Aluminium	$2Al + 3H_2SO_4 \rightarrow Al_2(SO_4)_3 + 3H_2 [g]$
10. Zinc	$Zn + 2HCl \rightarrow ZnCl_2 + H_2 [g]$
11. Iron	$Fe + 2HCl \rightarrow FeCl_2 + H_2 [g]$
<b>WITH ALKALI [conc. soln.]</b>	
12. Zinc	$Zn + 2NaOH \rightarrow Na_2ZnO_2 + H_2 [g]$
	$Zn + 2KOH \rightarrow K_2ZnO_2 + H_2 [g]$
13. Lead	$Pb + 2NaOH \rightarrow Na_2PbO_2 + H_2 [g]$
14. Aluminium	$2Al + 2NaOH + 2H_2O \rightarrow 2NaAlO_2 + 3H_2 [g]$
	$2Al + 2KOH + 2H_2O \rightarrow 2KAlO_2 + 3H_2 [g]$
<b>Laboratory Method</b>	
15. Zinc - With dil. HCl	$Zn + 2HCl \rightarrow ZnCl_2 + H_2 [g]$
<b>Industrial Method - Bosch process</b>	
16. Production of water gas - $[CO + H_2]$	$C + H_2O \xrightarrow{1000^\circ C} [CO + H_2] - \Delta$
17. Reduction of steam to $H_2$ by CO	$CO + H_2 + H_2O \xrightarrow[Fe_2O_3]{450^\circ C} CO_2 + 2H_2 + \Delta$ [water gas]
18. Removal of unreacted $CO_2$ & CO from the above mixture	$2KOH + CO_2 \rightarrow K_2CO_3 + H_2O$ $CuCl + CO + 2H_2O \rightarrow CuCl \cdot CO \cdot 2H_2O$
<b>TESTS AND USES</b>	
<b>CONVERSION OF HYDROGEN TO</b>	
19. Water	$2H_2 + O_2 \rightarrow 2H_2O$
20. Hydrogen chloride	$H_2 + Cl_2 \rightarrow 2HCl$
21. Ammonia	$N_2 + 3H_2 \rightleftharpoons 2NH_3$
22. Hydrogen sulphide	$H_2 + S \rightarrow H_2S$
<b>HYDROGEN IN METALLURGY</b>	
23. Zinc oxide	$ZnO + H_2 \rightarrow Zn + H_2O$
24. Iron [III] oxide	$Fe_2O_3 + 3H_2 \rightarrow 2Fe + 3H_2O$
25. Lead oxide	$PbO + H_2 \rightarrow Pb + H_2O$



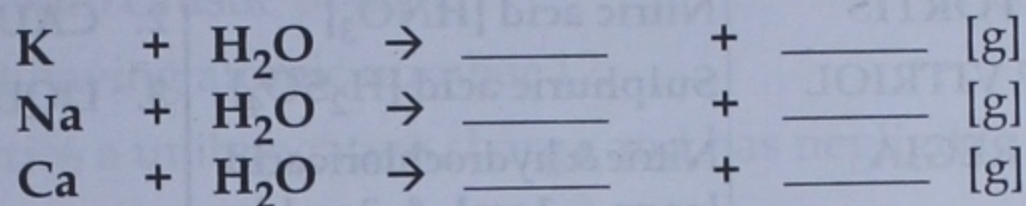
# Practise Equations - CHAPTER 9 - Study of First Element - HYDROGEN

## PREPARATIONS OF HYDROGEN - General Methods

### REACTIONS OF METALS -

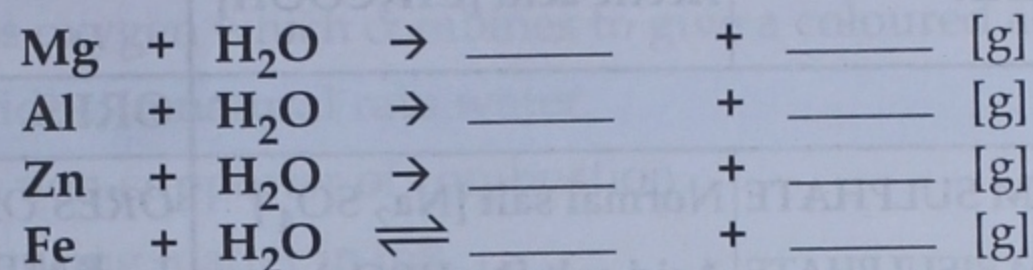
#### WITH COLD WATER

- Potassium
- Sodium
- Calcium



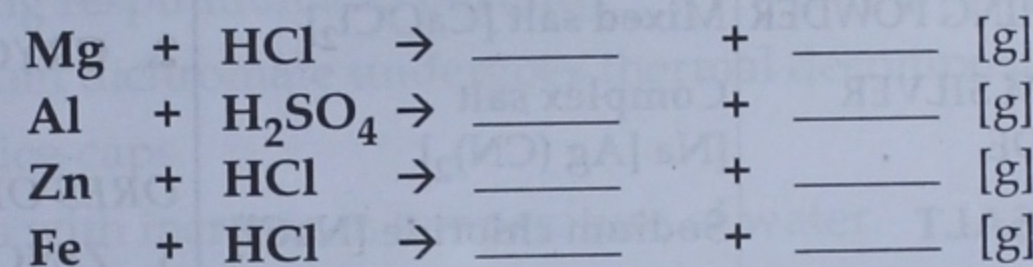
#### WITH BOILING WATER OR STEAM

- Magnesium
- Aluminium
- Zinc
- Iron



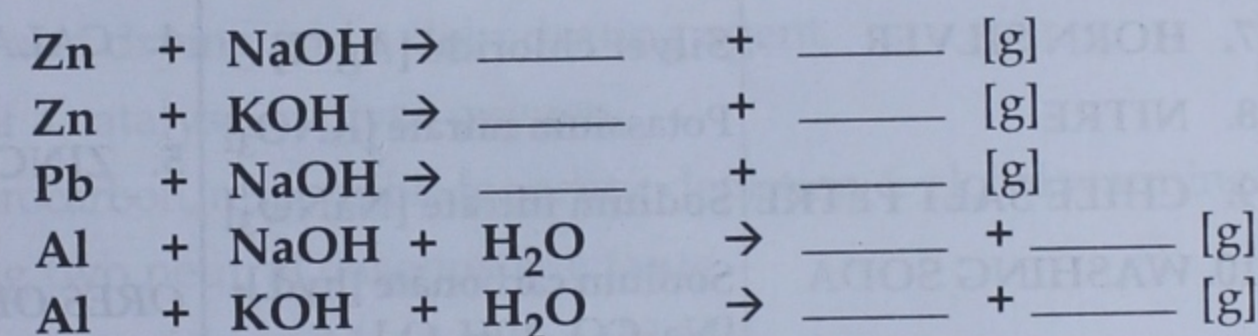
#### WITH DILUTE ACIDS

- Magnesium
- Aluminium
- Zinc
- Iron



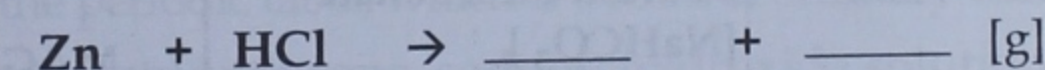
#### WITH ALKALI [conc. soln.]

- Zinc
- Lead
- Aluminium



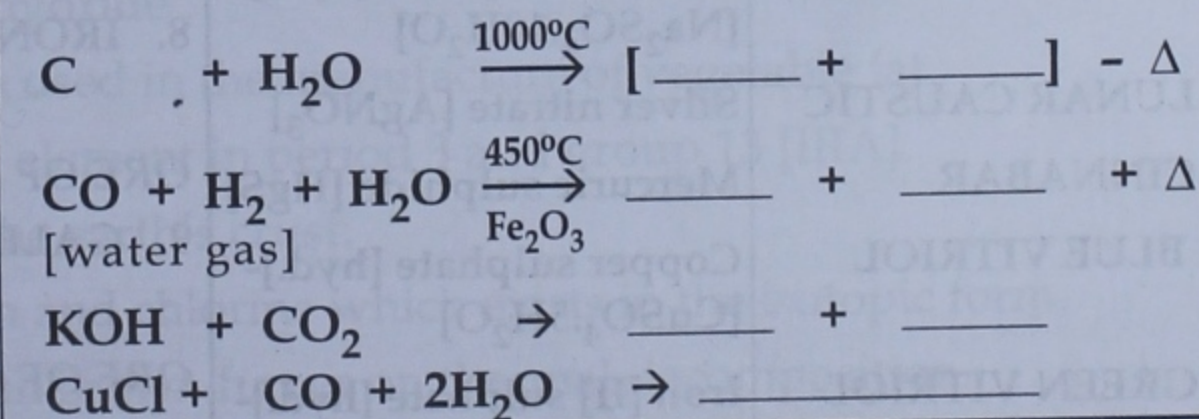
### Laboratory Method

- Zinc - With dil. HCl



### Industrial Method - Bosch process

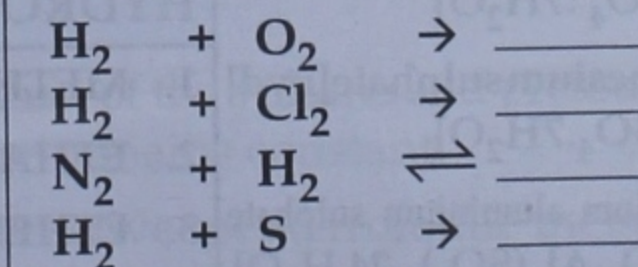
- Production of water gas
- Reduction of steam to H<sub>2</sub> by CO
- Removal of unreacted CO<sub>2</sub> & CO from the above mixture



### TESTS AND USES

#### CONVERSION OF HYDROGEN TO

- Water
- Hydrogen chloride
- Ammonia
- Hydrogen sulphide



#### HYDROGEN IN METALLURGY

- Zinc oxide
- Iron [III] oxide
- Lead oxide

