

CHART - 3 > Revision Equations - CHAPTER 6 - WATER

REACTIONS OF WATER -	
WITH METALS	
1. Potassium	$2K + 2H_2O \rightarrow 2KOH + H_2 \text{ [g]}$
2. Sodium	$2Na + 2H_2O \rightarrow 2NaOH + H_2 \text{ [g]}$
3. Calcium	$Ca + 2H_2O \rightarrow Ca(OH)_2 + H_2 \text{ [g]}$
4. Magnesium	$Mg + H_2O \rightarrow MgO + H_2 \text{ [g]}$
5. Aluminium	$2Al + 3H_2O \rightarrow Al_2O_3 + 3H_2 \text{ [g]}$
6. Zinc	$Zn + H_2O \rightarrow ZnO + H_2 \text{ [g]}$
7. Iron	$3Fe + 4H_2O \rightleftharpoons Fe_3O_4 + 4H_2 \text{ [g]}$
WITH NON-METALS	
8. Coke	$C + H_2O \xrightarrow{\text{[steam]}} \underset{\text{[water gas]}}{CO} + H_2$
9. Chlorine	$Cl_2 + H_2O \rightarrow HCl + HClO$
NON-METALLIC OXIDES	
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	$2NO_2 + H_2O \rightarrow HNO_2 + HNO_3$
METALLIC OXIDES	
14. Potassium oxide	$K_2O + H_2O \rightarrow 2KOH$
15. Calcium oxide	$CaO + H_2O \rightarrow Ca(OH)_2$
TESTS - FOR WATER	
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]
BIOLOGICAL IMPORTANCE - of dissolved gases in water	
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	$CaCO_3 + H_2O + CO_2 \rightarrow Ca(HCO_3)_2$
WATER AS A - CATALYST	
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 -	
WITH METALS	
1. Potassium	$\text{K} + \text{H}_2\text{O} \rightarrow \text{_____} + \text{_____} [\text{g}]$
2. Sodium	$\text{Na} + \text{H}_2\text{O} \rightarrow \text{_____} + \text{_____} [\text{g}]$
3. Calcium	$\text{Ca} + \text{H}_2\text{O} \rightarrow \text{_____} + \text{_____} [\text{g}]$
4. Magnesium	$\text{Mg} + \text{H}_2\text{O} \rightarrow \text{_____} + \text{_____} [\text{g}]$
5. Aluminium	$\text{Al} + \text{H}_2\text{O} \rightarrow \text{_____} + \text{_____} [\text{g}]$
6. Zinc	$\text{Zn} + \text{H}_2\text{O} \rightarrow \text{_____} + \text{_____} [\text{g}]$
7. Iron	$\text{Fe} + \text{H}_2\text{O} \rightleftharpoons \text{_____} + \text{_____} [\text{g}]$
WITH NON-METALS	
8. Coke	$\begin{array}{c} \text{C} + \text{H}_2\text{O} \rightarrow \text{_____} + \text{_____} \\ \text{[steam]} \qquad \text{[water gas]} \end{array}$
9. Chlorine	$\text{Cl}_2 + \text{H}_2\text{O} \rightarrow \text{_____} + \text{_____}$
NON-METALLIC OXIDES	
10. Sulphur dioxide	$\text{SO}_2 + \text{H}_2\text{O} \rightarrow \text{_____}$
11. Sulphur trioxide	$\text{SO}_3 + \text{H}_2\text{O} \rightarrow \text{_____}$
12. Carbon dioxide	$\text{CO}_2 + \text{H}_2\text{O} \rightarrow \text{_____}$
13. Nitrogen dioxide	$\text{NO}_2 + \text{H}_2\text{O} \rightarrow \text{_____} + \text{_____}$
METALLIC OXIDES	
14. Potassium oxide	$\text{K}_2\text{O} + \text{H}_2\text{O} \rightarrow \text{_____}$
15. Calcium oxide	$\text{CaO} + \text{H}_2\text{O} \rightarrow \text{_____}$
TESTS - FOR WATER	
16. Anhydrous copper sulphate	$\begin{array}{c} \text{CuSO}_4 + 5\text{H}_2\text{O} \rightarrow \text{_____} \\ \text{[white]} \qquad \qquad \qquad \text{[blue]} \end{array}$
17. Cobalt chloride	$\begin{array}{c} \text{CoCl}_2 + 6\text{H}_2\text{O} \rightarrow \text{_____} \\ \text{[blue]} \qquad \qquad \qquad \text{[pink]} \end{array}$
BIOLOGICAL IMPORTANCE	
- of dissolved gases in water	
18. Dissolved oxygen - respiration	$\text{C}_6\text{H}_{12}\text{O}_6 + \text{O}_2 \rightarrow \text{_____} + \text{_____} + \text{energy}$
19. Dissolved CO_2 - photosynthesis	$\text{CO}_2 + \text{H}_2\text{O} \rightarrow \text{_____} + \text{_____} + \text{_____}$
20. Dissolved CO_2 - formation of shells	$\text{CaCO}_3 + \text{H}_2\text{O} + \text{CO}_2 \rightarrow \text{_____}$
WATER AS A - CATALYST	
21. Synthesis of hydrogen chloride	$\text{H}_2 + \text{Cl}_2 \rightarrow \text{_____}$
22. Combustion of phosphorus	$\text{P} + \text{O}_2 \rightarrow \text{_____}$

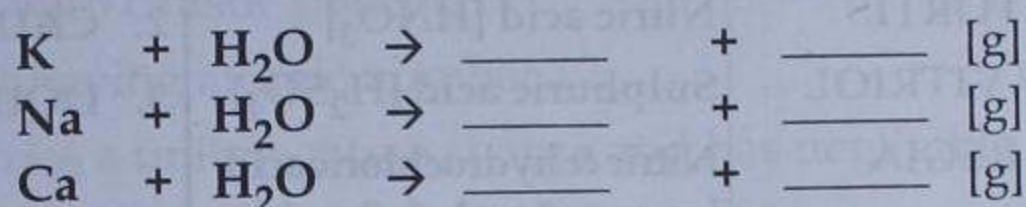
PREPARATIONS OF HYDROGEN - General Methods	
REACTIONS OF METALS -	
WITH COLD WATER	
1. Potassium	$2K + 2H_2O \rightarrow 2KOH + H_2 [g]$
2. Sodium	$2Na + 2H_2O \rightarrow 2NaOH + H_2 [g]$
3. Calcium	$Ca + 2H_2O \rightarrow Ca(OH)_2 + H_2 [g]$
WITH BOILING WATER OR STEAM	
4. Magnesium	$Mg + H_2O \rightarrow MgO + H_2 [g]$
5. Aluminium	$2Al + 3H_2O \rightarrow Al_2O_3 + 3H_2 [g]$
6. Zinc	$Zn + H_2O \rightarrow ZnO + H_2 [g]$
7. Iron	$3Fe + 4H_2O \rightleftharpoons Fe_3O_4 + 4H_2 [g]$
WITH DILUTE ACIDS	
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	$Fe + 2HCl \rightarrow FeCl_2 + H_2 [g]$
WITH ALKALI [conc. soln.]	
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	$2Al + 2NaOH + 2H_2O \rightarrow 2NaAlO_2 + 3H_2 [g]$
	$2Al + 2KOH + 2H_2O \rightarrow 2KAlO_2 + 3H_2 [g]$
Laboratory Method	
15. Zinc - With dil. HCl	$Zn + 2HCl \rightarrow ZnCl_2 + H_2 [g]$
Industrial Method - Bosch process	
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	$2KOH + CO_2 \rightarrow K_2CO_3 + H_2O$ $CuCl + CO + 2H_2O \rightarrow CuCl \cdot CO \cdot 2H_2O$
TESTS AND USES	
CONVERSION OF HYDROGEN TO	
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	$H_2 + S \rightarrow H_2S$
HYDROGEN IN METALLURGY	
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	$PbO + H_2 \rightarrow Pb + H_2O$

PREPARATIONS OF HYDROGEN - General Methods

REACTIONS OF METALS -

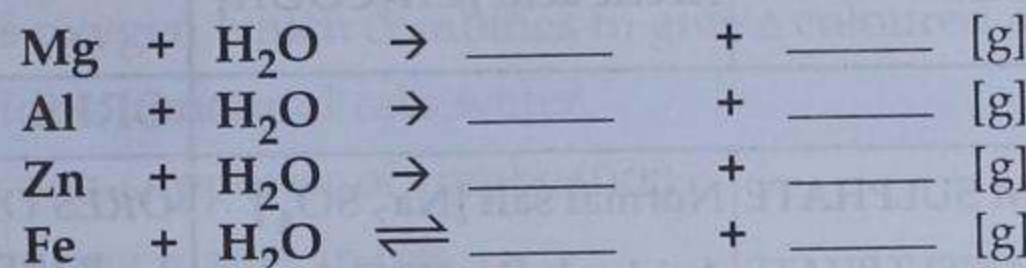
WITH COLD WATER

1. Potassium
2. Sodium
3. Calcium



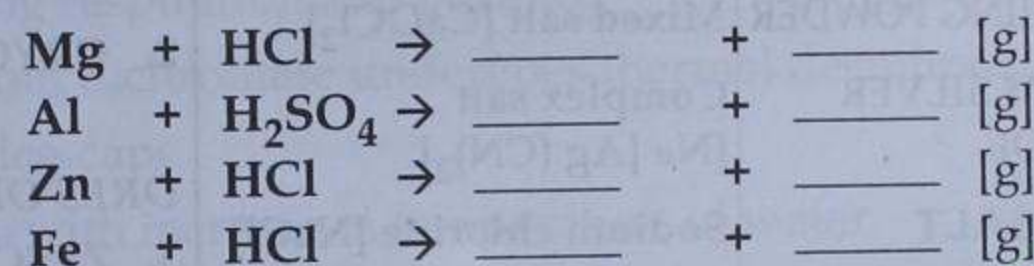
WITH BOILING WATER OR STEAM

4. Magnesium
5. Aluminium
6. Zinc
7. Iron



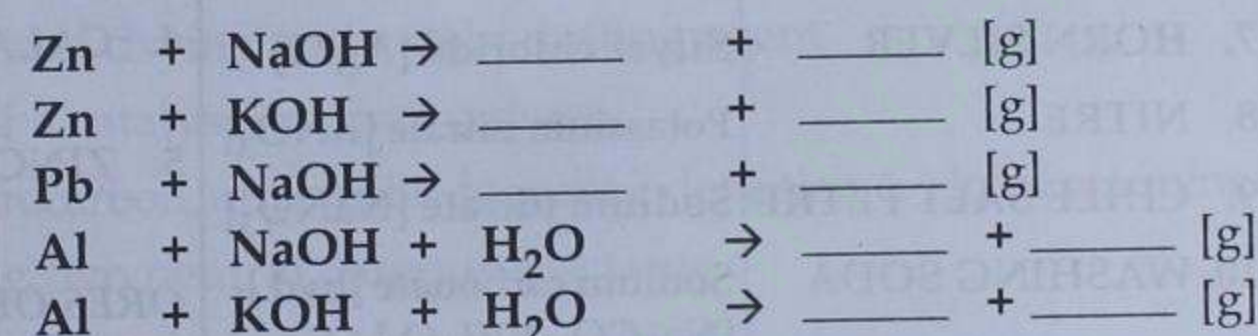
WITH DILUTE ACIDS

8. Magnesium
9. Aluminium
10. Zinc
11. Iron



WITH ALKALI [conc. soln.]

12. Zinc
13. Lead
14. Aluminium



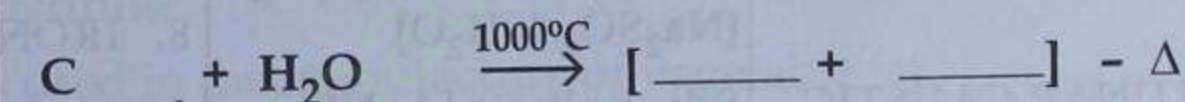
Laboratory Method

15. Zinc - With dil. HCl

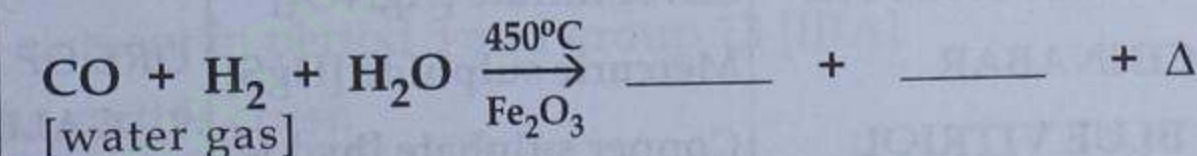


Industrial Method - Bosch process

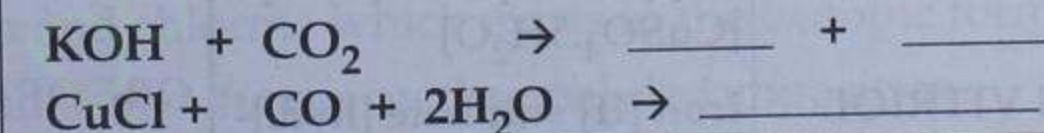
16. Production of water gas



17. Reduction of steam to H_2 by CO



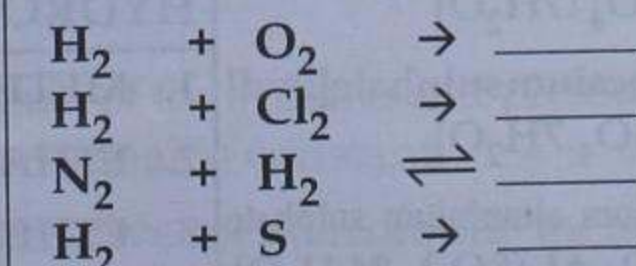
18. Removal of unreacted CO_2 & CO from the above mixture



TESTS AND USES

CONVERSION OF HYDROGEN TO

19. Water
20. Hydrogen chloride
21. Ammonia
22. Hydrogen sulphide



HYDROGEN IN METALLURGY

23. Zinc oxide
24. Iron [III] oxide
25. Lead oxide

