



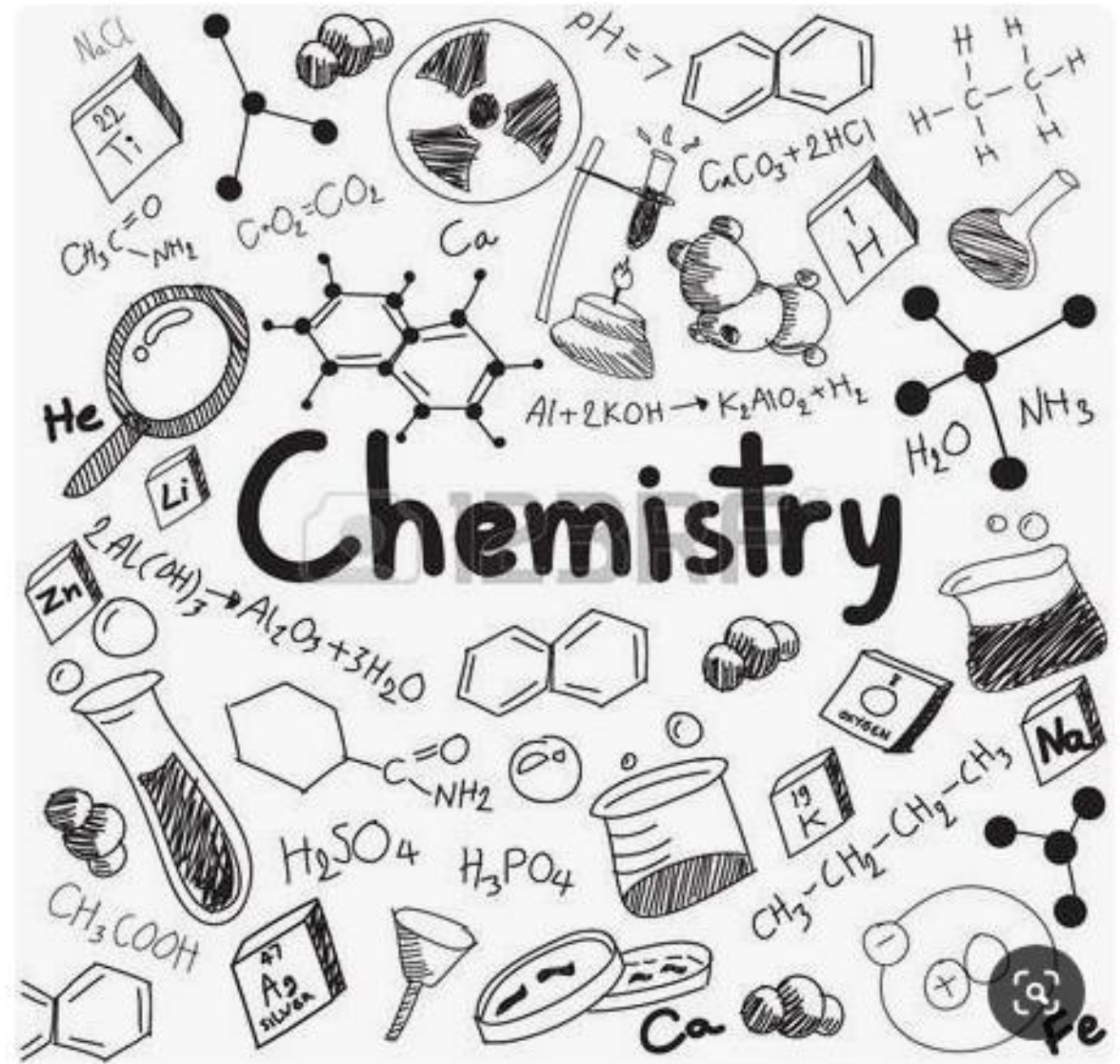
The National
Orthodox School
Shmaisani

Lesson : (Reactivity of
metals)

Scholastic Year: 2022-2023

Grade: 8CS

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Objective:

1. To investigate the reactivity of metals
2. To describe how metals react with oxygen, water & acid.

Resources:

Power point presentation

Videos

Complete Chemistry for Cambridge Secondary 1

Trends in the periodic table

1. As you go down the group, the atomic size **increases**.
2. As you go down the group (alkali metal& alkali earth metals), the reactivity **increases**.
3. As you go across the periodic table, the atomic radius **decreases**.
4. As you go down group 7(Halogens), the reactivity **decrease**.

Periodic Table of the Elements

| | | | | | | | | | | | | | | | | | |
|--------------------|--------------------|----------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|----------------------|--------------------|--------------------|
| 1 H 1.01 | 2 He 4.00 | | | | | | | | | | | | | | | | |
| 3 Li 6.94 | 4 Be 9.01 | 5 B 10.81 | 6 C 12.01 | 7 N 14.01 | 8 O 16.00 | 9 F 19.00 | 10 Ne 20.18 | | | | | | | | | | |
| 11 Na 22.99 | 12 Mg 24.31 | 13 Al 26.98 | 14 Si 28.09 | 15 P 30.97 | 16 S 32.06 | 17 Cl 35.45 | 18 Ar 39.95 | | | | | | | | | | |
| 19 K 39.10 | 20 Ca 40.08 | 21 Sc 44.96 | 22 Ti 47.88 | 23 V 50.94 | 24 Cr 51.99 | 25 Mn 54.94 | 26 Fe 55.85 | 27 Co 58.93 | 28 Ni 58.69 | 29 Cu 63.55 | 30 Zn 65.38 | 31 Ga 69.72 | 32 Ge 72.63 | 33 As 74.92 | 34 Se 78.97 | 35 Br 79.90 | 36 Kr 83.80 |
| 37 Rb 85.47 | 38 Sr 87.62 | 39 Y 88.91 | 40 Zr 91.22 | 41 Nb 92.91 | 42 Mo 95.95 | 43 Tc 98.91 | 44 Ru 101.07 | 45 Rh 102.91 | 46 Pd 106.42 | 47 Ag 107.87 | 48 Cd 112.41 | 49 In 114.82 | 50 Sn 118.71 | 51 Sb 121.76 | 52 Te 127.6 | 53 I 126.90 | 54 Xe 131.29 |
| 55 Cs 132.91 | 56 Ba 137.33 | 57-71 Lanthanides | 72 Hf 178.49 | 73 Ta 180.95 | 74 W 183.85 | 75 Re 186.21 | 76 Os 190.23 | 77 Ir 192.22 | 78 Pt 195.08 | 79 Au 196.97 | 80 Hg 200.59 | 81 Tl 204.38 | 82 Pb 207.20 | 83 Bi 208.98 | 84 Po [208.98] | 85 At 209.98 | 86 Rn 222.02 |
| 87 Fr 223.02 | 88 Ra 226.03 | 89-103 Actinides | 104 Rf [261] | 105 Db [262] | 106 Sg [266] | 107 Bh [264] | 108 Hs [269] | 109 Mt [278] | 110 Ds [281] | 111 Rg [280] | 112 Cn [285] | 113 Nh [286] | 114 Fl [289] | 115 Mc [289] | 116 Lv [293] | 117 Ts [294] | 118 Og [294] |

<https://www.rsc.org/periodic-table>

Reactions of metals

We can examine the reactivity of metals by observing their reactions with **oxygen, water, acid** and whether it displaces other metals in **displacement reactions**.

To do this, we need to do three tests for the elements:

1. Reactions with oxygen.
2. Reactions with water.
3. Reactions with acids.



Reactions with oxygen



Reactions with water



Reactions with acids

Reactions with oxygen

metal+ oxygen → metal oxide

Reaction with open air

- Most metals react with oxygen in the air. Some react fast, once they are exposed to open air, forming a layer of metal oxide, others need to be burned to allow the reaction to take place.

Burning metals

- When metals are burned in oxygen, they will give flames with different colours and different amounts of energy will be given out.

Understanding reactivity with oxygen <https://www.youtube.com/watch?v=RA3rQ2JXtLI>

| Metal | Symbol | Appearance | Observation |
|-----------|--------|---------------------|---|
| Magnesium | Mg | Grey colour | Strong reaction, a white flash appeared after burning it. It changed into a white powder which is magnesium oxide. |
| Copper | Cu | Red- brown colour | A thin layer of grey colour formed on the surface (copper oxide) An bluish- flame appeared during the test. |
| Iron | Fe | Grey colour | orange flash appeared during the test. The colour of iron wool changed into black forming iron oxide. |
| Zinc | Zn | Shiny silver colour | White flame is formed After burning, some of the zinc changed into white powder which is zinc oxide (size of the sample had changed) |



Mg



Cu



Fe



Zn

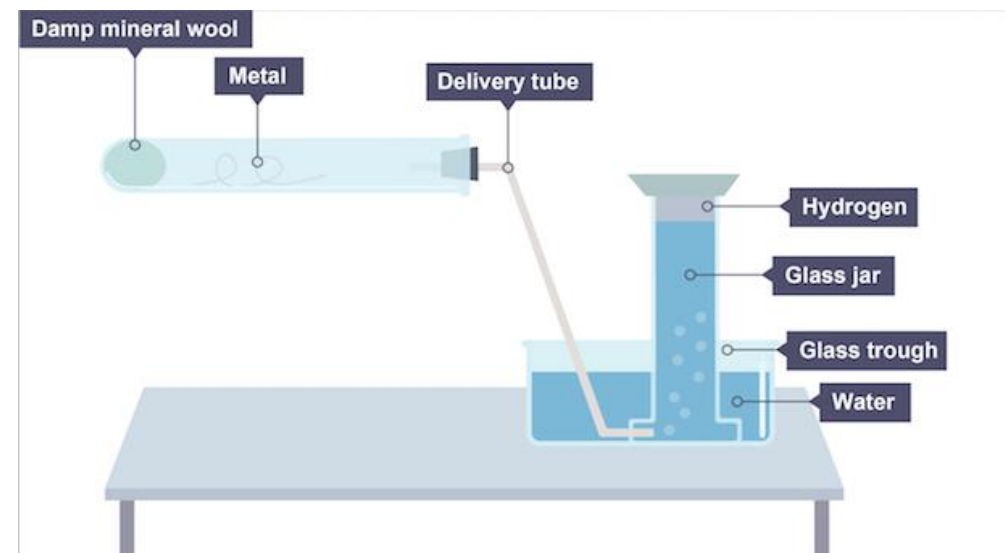
Reactions with water



Reaction with cold water

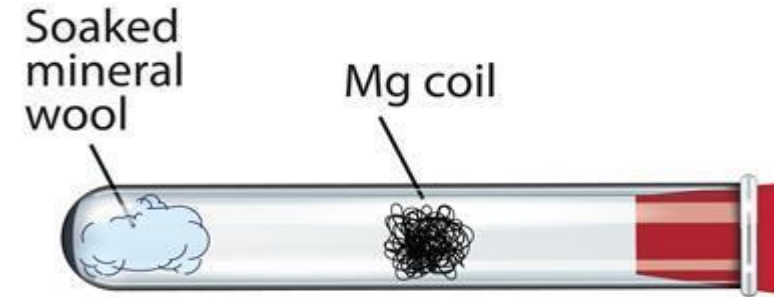
- Some metals react with cold water (water at room temperature) such as potassium, sodium, lithium and calcium, forming metal hydroxide and hydrogen gas.
- An indicator (litmus paper or universal indicator) can be used to help to compare the rate of reactivity of the metal. The faster the change of colour the higher the rate of reactivity.

Reaction with steam

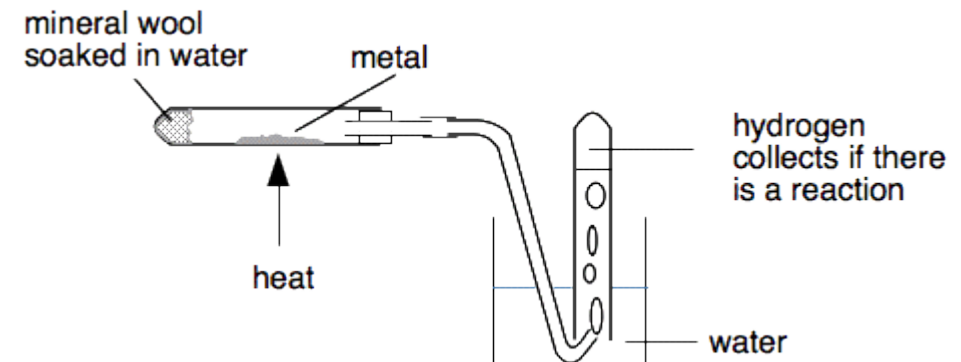


The damp mineral wool is heated to generate steam.

- The damp mineral wool is heated to generate steam.



- Steam will cause a chemical reaction with the metal sample.
- If the metal was reactive, hydrogen gas will be produced. The gas will pass through the delivery tube and then it will be collected in the measuring cylinder.
- The amount of gas produced helps to compare the reactivity rate of the metals. The more gas the higher the rate of reactivity.



Understanding reactivity with water/ steam

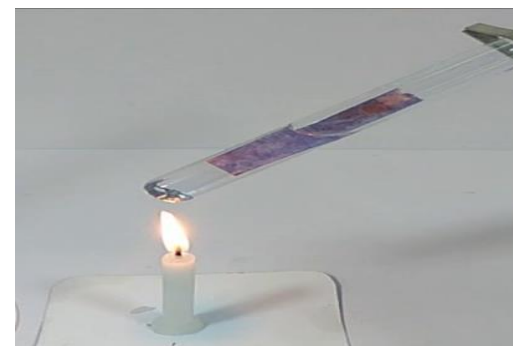
| Metal | Observations in water |
|---|---|
| Calcium https://www.youtube.com/watch?v=QDKkdhXGv5c | calcium metal begins to bubble vigorously as it reacts with water, producing hydrogen gas, and a cloudy white precipitate of calcium hydroxide. Rise in temperature (exothermic reaction) |
| Magnesium https://www.youtube.com/watch?v=1oscKlyi_pY | Magnesium reacts slowly with cold water forming small bubbles on the surface of the ribbon. It burns in steam to produce white magnesium oxide and hydrogen gas. |
| Zinc (aluminium/ iron) https://www.youtube.com/watch?v=dBGx2PFhoGw | Slow reaction with cold water (The color of litmus paper changes slowly) then the reaction gets faster with hot water. |
| Sodium https://www.youtube.com/watch?v=jl_JY7pqOM | Vigorous reaction with cold water, rapid change in color of the indicator, fizzing on the surface, hydrogen gas given out, exothermic reaction |



Ca



Mg



Zn



Na