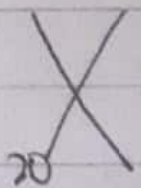
Periodic Table

Arrangements of elements according to increasing proton number.

Periodic Table

left to right
Period = ?
* no. of shells

top to bottom
~~Period~~ → Group = ?
* no. of e⁻ in valence shell/outermost shell



= 2, 8, 8, 2
Period = 4
Group = 2

Group 1

→ Alkali metals

Reactivity:- ability to share or transfer e^-

metals:- ability to lose e^-
non-metals:- ability to gain e^-

→ Soft Metals → cut them with a knife or
→ low M.P.

* → As the melting point decreases as you go down the group, because atomic radius increases.

→ reactive metals → react with air form oxide
→ react with cold water form hydroxide & hydrogen.

* → reactivity increases as you go down the group because the electrostatic force decreases due to an increase in radii.

~~They are~~

→ They are less dense than water.

Q) State the your observation when a piece of group 1 metal reacts with water.

Ans) → It floats on the surface.
→ fast / vigorous / violent reaction.
→ Size of metal reduces.
→ bubbles of colourless gas gas ~~gas~~ can be seen.

$$Li_{(s)} + H_2O_{(l)} \rightarrow LiOH_{(aq)} + \tfrac{1}{2}H_{2(g)}$$

$$Na_{(s)} + H_2O_{(l)} \rightarrow NaOH_{(aq)} + \tfrac{1}{2}H_{2(g)}$$

$$K_{(s)} + H_2O_{(l)} \rightarrow KOH_{(aq)} + \tfrac{1}{2}H_{2(g)}$$

Q) what is valency / oxidation state?
Ans) Ability to lose or gain electrons.
Group 1 has an oxidation state of 1+.

Q) what is stability?
Ans) Complete outermost shell.

Group II

✓ Alkaline Earth metals

✓ Group II metals react similarly to Group I, but less vigorously.

$$Mg_{(s)} + H_2O_{(l)} \rightarrow Mg(OH)_{2(aq)} + H_{2(g)}$$

$$Ca + 2H_2O \rightarrow Ca(OH)_2 + H_2$$

→ Melting point decrease as you go down the group.

→ Reactivity increases as you go down the group.

→ oxidation state :- $\boxed{2+}$

Group III

→ oxidation state :- 3+

Group IV

→ oxidation state :- ~~4+~~ 4I

Group V

→ oxidation state: -3

Group VI

→ oxidation state: -2

→ single particle with -ve charge = ide

O => Oxygen :- O^{2-} oxide
P => Phosphorus P^{3-} phosphide
H => Hydrogen H^- Hydride.

Group VII

→ Halogen (if it reacts with any metal it forms a salt)
→ they all exist in diatomic form.
→ state changes from gas to liquid to solid (from top to bottom)
→ colour changes from a lighter colour to a darker one (from top to bottom)

F_2 → pale yellow/colourless
Cl_2 → yellowish green/green
Br_2 → red-brown
I_2 → dark-brown/black → sublim → purple vapours
At_2 → black → radioactive

Gas
Liquid
solid

→ melting point/b.p increases as you go down the group.
→ reactivity decreases as you go down the group because the ability to gain electrons decreases.
→ Ion = Halide
→ valency = -1
oxidation state

Group VIII

→ noble gases or inert gases or zero group
→ They do not react because they have complete/stable arrangement of electrons in the valence shell.
→ Melting point/b.p increases down the group.
→ They are all monoatomic

Argon used for bulbs

SO_4^{2-} = sulfate
PO_4^{3-} = phosphate
NO_3^- = Nitrate
CO_3^{2-} = Carbonate

SO_3^{2-} = sulfite
$PO_3PO_4^{3-}$ = phosphite
NO_2^- = nitrite
CO_2^{2-} = carbonite

one less oxygen = ate → ite

Sulfide :- S^{2-}
Sulfate :- SO_4^{2-}
Sulfite :- SO_3^{2-}

Nitride :- N^{-3}
Nitrate :- NO_3^-
Nitrite :- NO_2^-

Transition Elements / Transition Metals

Q)
Q) What are the properties of transition elements?
Ans) ① They form colored compounds
② They have variable oxidation state (not fixed)
③ They are used as catalysts
④ They have high melting points and high densities.