

Hydrogen and its compound

H is first element

of periodic table

However its position is not fix in
the periodic table

because it resembles with alkali metal
and halogen

alkali metal = ns^1

halogen conf = $ns^2 np^5$

H = $1s^1$

Hydrogen has higher I.E than the alkali metal it more show

more resemblance with halogen in terms of

I.E

$$\text{Li} = 520 \text{ KJ/mole}$$

$$\text{F} = 1680 \text{ KJ/mole}$$

$$\text{H} = 1312 \text{ KJ/mole}$$

Like Halogen Hydrogen also form diatomic (H_2) and react with elements and form large number of covalent compound.

\Rightarrow H_2 is less reactive in compare to Halogen

\rightarrow Hydrogen form oxide Halide and sulphide
like alkali metal.



size of H^+

$$1.5 \times 10^{-3} \text{ pm}$$

it is very small size and it does not
exist in free form

size of normal cation is 50 pm to 200 pm

Di hydrogen element is most abundant element
in universe (70% by mass)

Giant planets like Jupiter and Saturn
principal element is Di hydrogen

due to lighter nature it is very low in earth
crust (0.15%)

Ques Which of the following element
form maximum number of compound

- (1) C (2) O (3) S ~~(4) H~~

Isotopes of hydrogen



p

Protium

$$e = 1$$

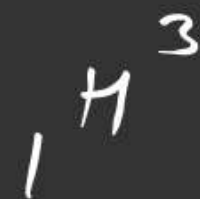
$$p = 1$$

$$n = 0$$



D

(Heavy hydrogen)



T

(Radioactive) Half life

12-33 years

it emits

 β^- particle

Conc. in earth crust

of T is 10^{18} atom

per protium

Physical prop.

$$\text{Size} = 74.14 \quad 74.14$$

relative
abundance

isotopes have ^{Same} chemical prop. because they have
 Same e^- conf. but they have diff rate of
 reaction due to their diff bond enthalpy

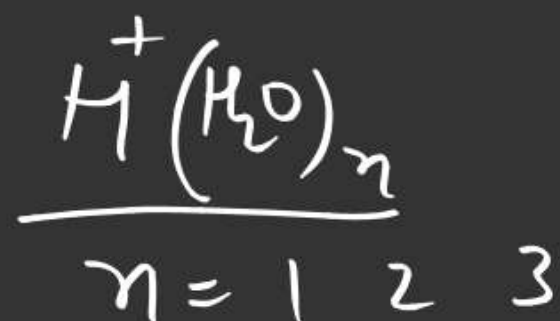
type of H

(i) based on oxidation

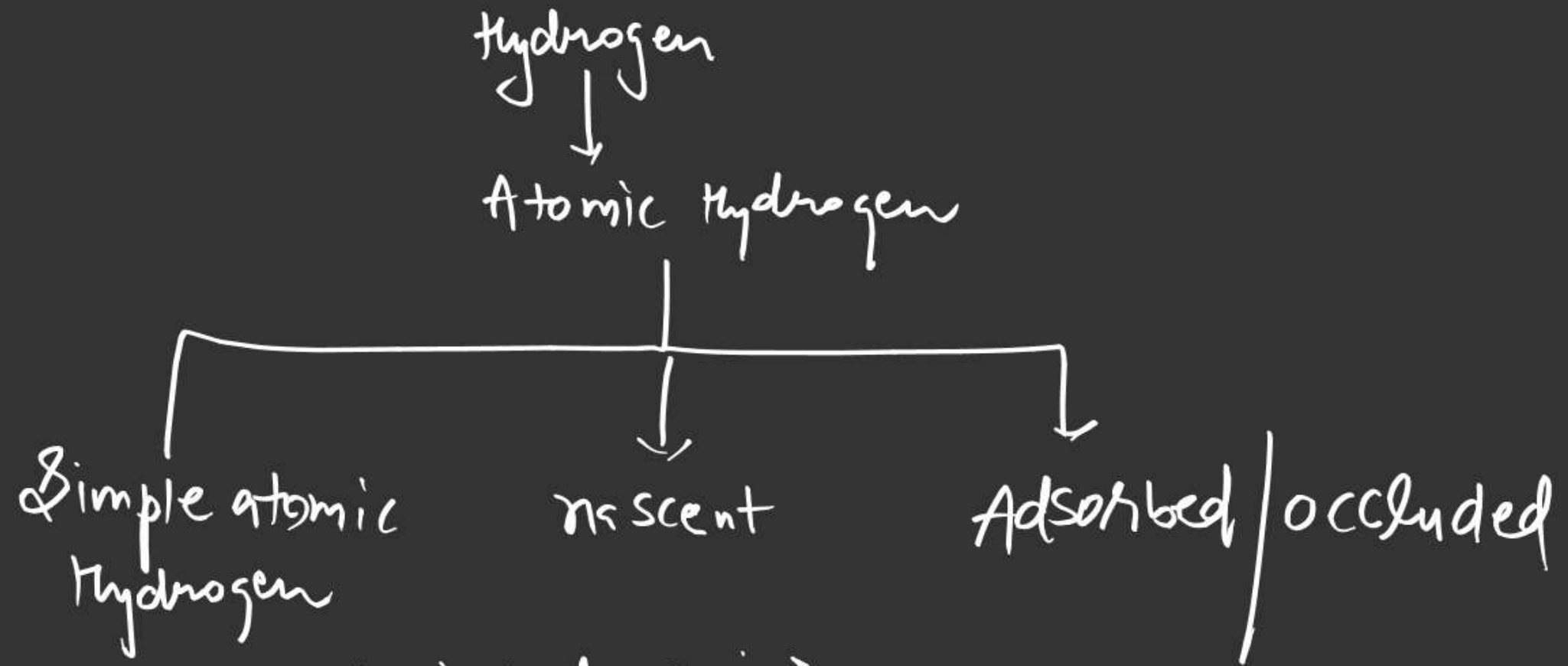
H^+	H	H^-
Proton	atomic hydrogen	Hydride ion

que In aq. solution hydrogen exist as

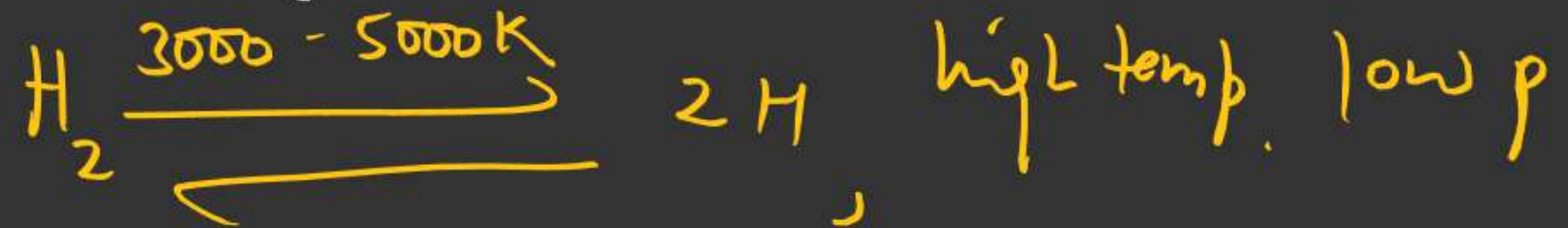
- (1) H^+ (2) H_2 (3) H^- (4) $H^+(H_2O)_n$



② based on reactivity



① Simple atomic hydrogen →



Na Sent Hydrogen \rightarrow during the reaction



Adsorbed / Occluded Hydrogen

Occlusion :- The prop. of metal to adsorb any gas at surface is called occlusion.

Order of reactivity

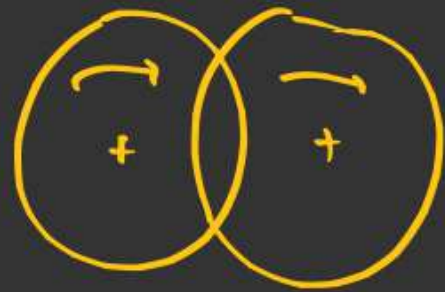
Simple atomic hydrogen > nascent > molecular hydrogen



based on nuclear spin

① ortho

② para



The molecular form of hydrogen
having same spin of nucleus

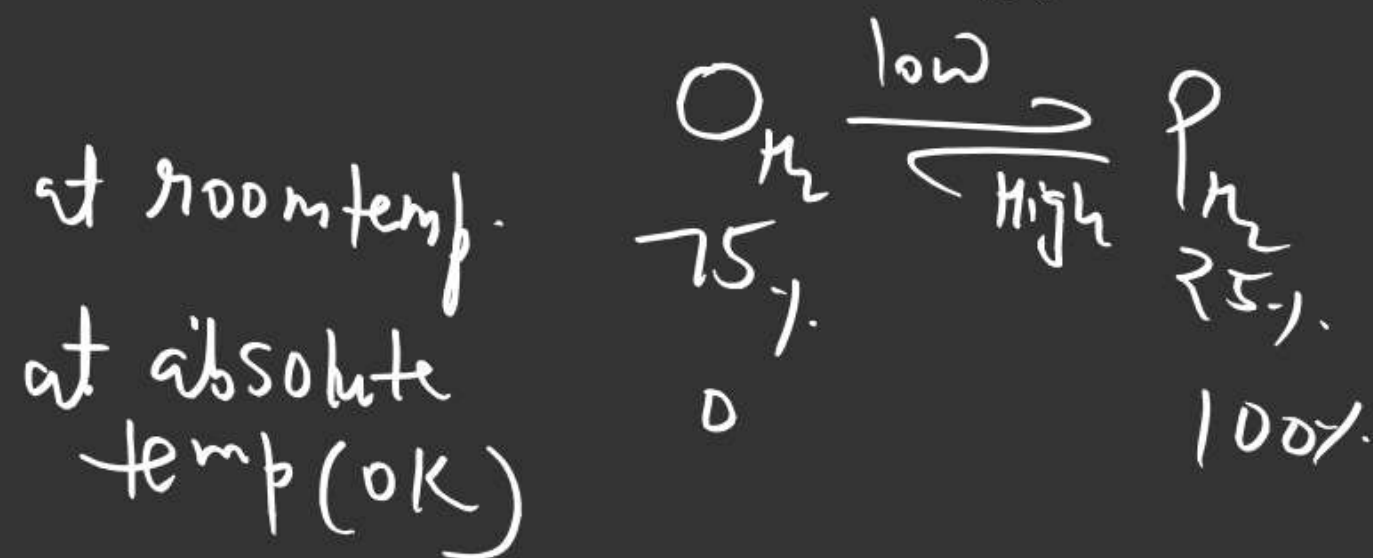


The molecular form of
hydrogen having diff
spin of nucleus

In ortho, spin of nucleus in same direction

So they will repel each other and the internal energy of ortho increases

Stability \Rightarrow stability of ortho and para hydrogen depends upon temp. at high temp. ortho is more stable than para, and at low temp. para is more stable than ortho.



We can obtain 100% para from ortho at low temp. but we can not get 100% ortho from para at high temp. because at high temp. para decompose.