

Standard Electrode potential

Electrode potential in standard condition is called standard electrode potential.

S.t.d Condition: Temp. = 298 K
P = 1 bar

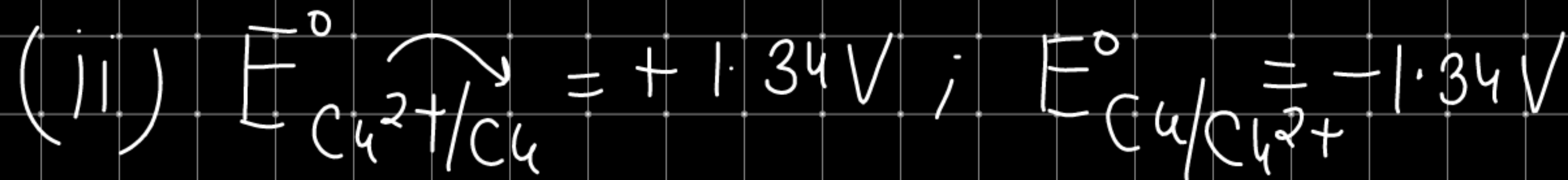
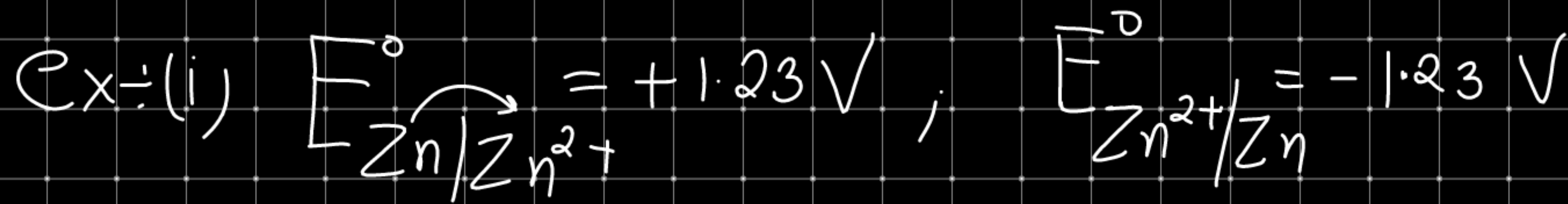
Conc. of Electrolytic Soln = 1 M

Standard Oxidation Potential (S.O.P.) = - Standard Reduction Potential (S.R.P.)
or $\boxed{SRP = -S.O.P.}$

Oxidation \propto Oxidation potential

Reduction \propto reduction potential.

Representation of S.O.P and S.R.P.



Standard electrode potential of Zn is -1.41 Volt
(S.R.P. of Zn) $E_{\text{Zn}^{2+}/\text{Zn}}^{\circ} = -1.41 \text{ V}$

A/C to I.U.P.A.C. Convention of S.R.P. is considered

Standard electrode potential.

~~It is impossible to determine electrode potential~~

of a single electrode, therefore we required an additional electrode, which potential is known as reference electrode.

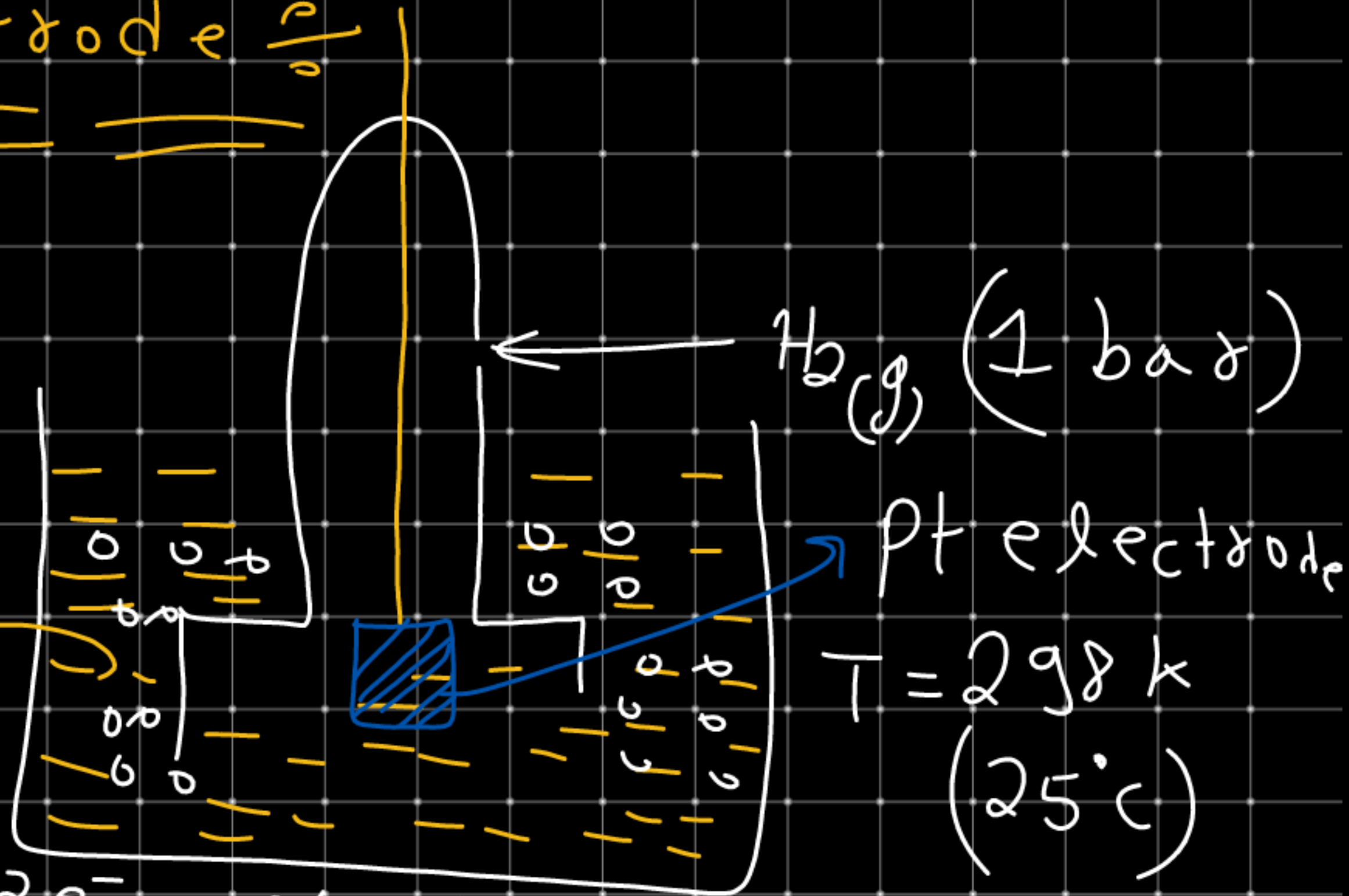
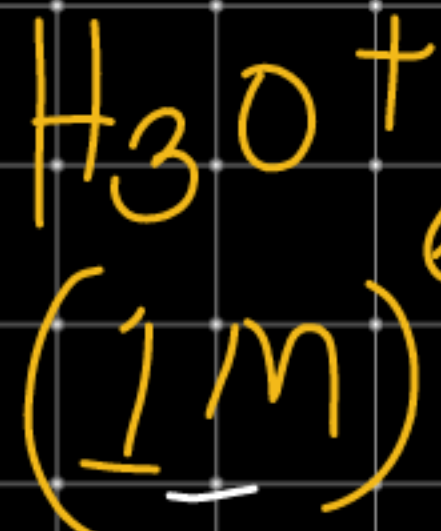
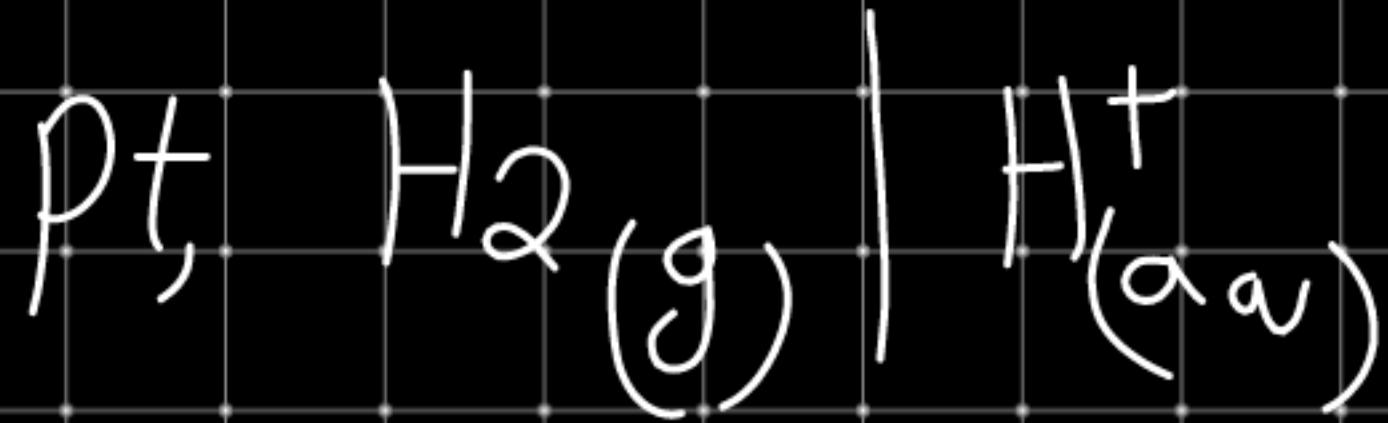
Reference electrode

↳ primary reference electrode

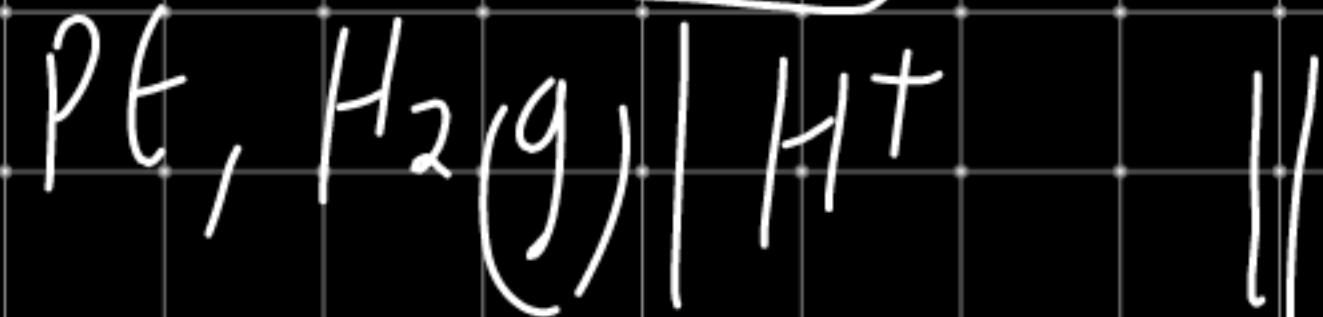
↳ ex: Standard Hydrogen electrode.
(S.H.E.)

Standard Hydrogen electrode

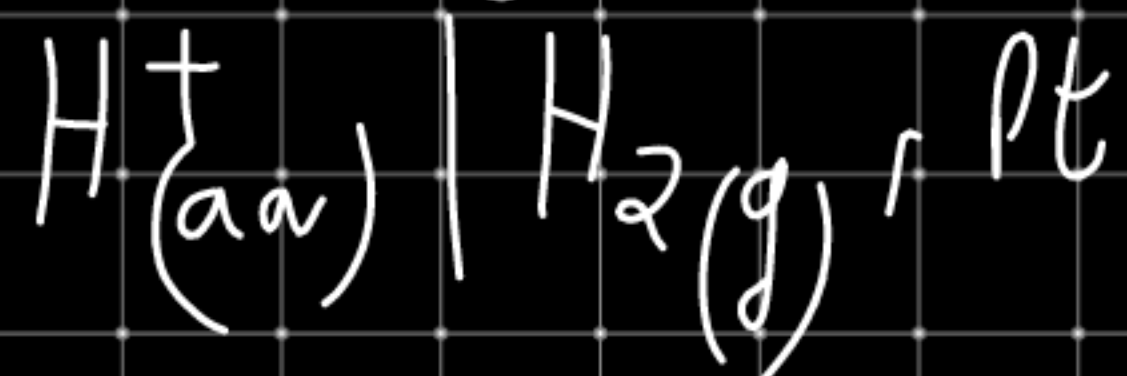
Representation :-



Act as anode :-



Act as cathode :- $2\text{H}^+ + 2\text{e}^- \rightarrow \text{H}_2(\text{g})$



Standard electrode potential of Hydrogen electrode is taken to be Zero.

$$\text{S.P. of H}_2 \text{ electrode} = -\text{S.O.P. of H}_2 \text{ electrode} = 0$$

Ex: $E^\circ_{\text{H}_2/\text{H}^+} = E^\circ_{\text{H}^+/\text{H}_2} = 0$

Electrochemical series \div [E.C.S.]_{or}

Arrangements of elements in increasing order of S.P.P. (decreasing of S.O.P.) is k/a electrochemical series.

Electrode	rxn	S.P.P. (Volts)
Li	$Li^+_{(aq)} + e^- \rightarrow Li_{(s)}$	-3.05 V
K		
Ba		
Ca		
Na		
Mg		
Al		
Mn		
<u>H₂O</u>		
Zn		
Cu		

↑ increasing order of R.A.

↓ increasing order of O.A.

Electrode	rxn	S.P.P. (V)
Fe		
Cd		
Co		
Ni		
Sn		
Pb		
H ₂	$2H^+ + 2e^- \rightarrow H_{2(g)}$	0.00
Cu		
H ₂		
Hg		

Ag $\frac{2}{31101}$

Br₂ $\frac{11515}{11515}$

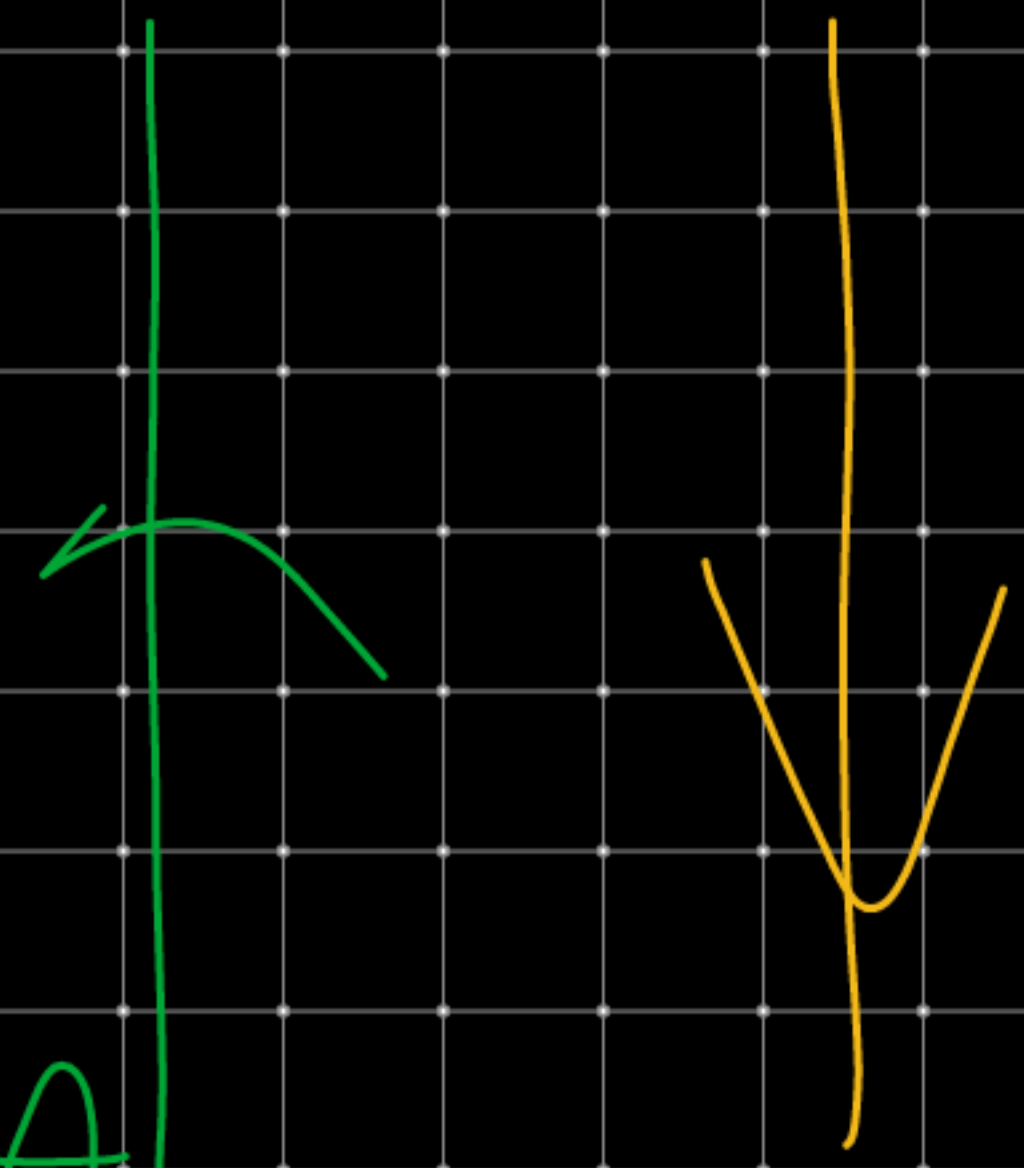
Pt $\frac{4150}{4150}$

O₂ $\frac{22}{312}$

Cl₂ $\frac{71100}{71100}$

Au $\frac{197}{197}$

F₂ $\frac{18}{18}$ $2e^- + F_2 \rightarrow 2F^-$



+2.87 V.

Down the series (Li to F₂) S.R.P. increases or S.o.p. decreases.

Li has min. S.R.P. or max. S.o.p.

F₂ has max S.R.P. or min. S.o.p.

S.R.P. of metal may be +ve or -ve but

S.R.P. of non metal always +ve.