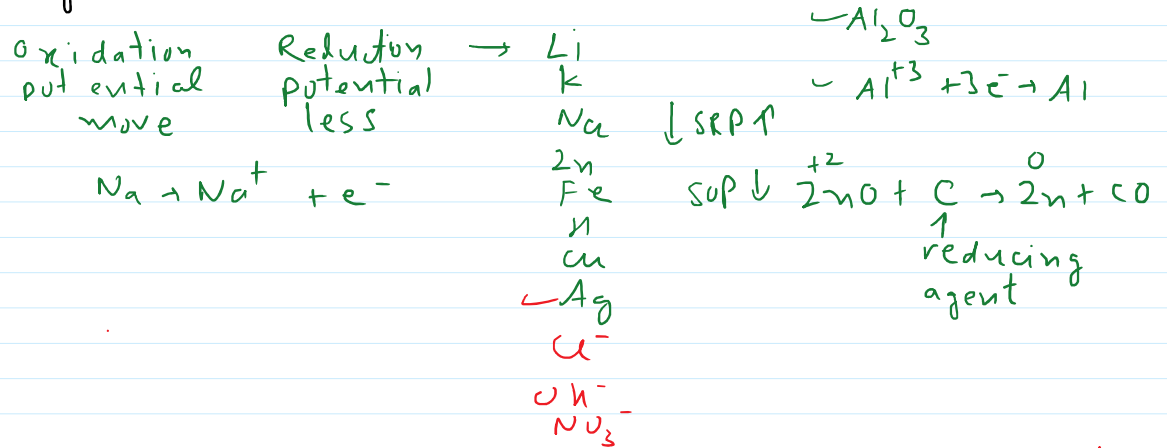


Question

Suggest a list of metals that are extracted electrolytically.



Answer:

Metals which have low reduction potential i.e. are at the top of electrochemical series cannot be reduced using common reducing agents like carbon. Such metals are extracted electrolytically. Example: Li, K, Na, Ca, Al.

Question

Predict the products of electrolysis in each of the following:

- i) An aqueous solution of AgNO<sub>3</sub> with silver electrodes.
- ii) An aqueous solution of AgNO<sub>3</sub> with platinum electrodes.
- iii) A dilute solution of H<sub>2</sub>SO<sub>4</sub> with platinum electrodes
- iv) An aqueous solution of CuCl<sub>2</sub> with platinum electrodes

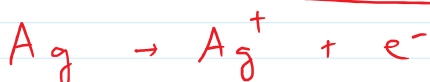
Answer:

i) Ions present: Ag<sup>+</sup>, NO<sub>3</sub><sup>-</sup>, H<sup>+</sup>, OH<sup>-</sup>

Species at anode  
(positive terminal)

NO<sub>3</sub><sup>-</sup>, OH<sup>-</sup>, Ag

Reaction at anode



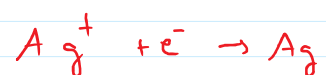
Ag has highest oxidation potential among given

Species at cathode  
(-ve terminal)

Ag<sup>+</sup>, H<sup>+</sup>

Reaction at cathode

(reduction)



Ag<sup>+</sup> has higher

Ag has highest oxidation potential among given species, hence gets oxidised at anode.

$Ag + e \rightarrow Ag$   
 $Ag^+$  has higher reduction potential than  $H^+$ , thus it is reduced.

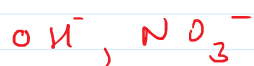
Net reaction:



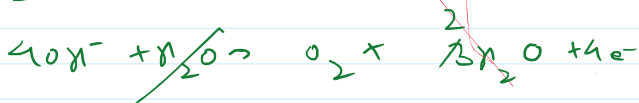
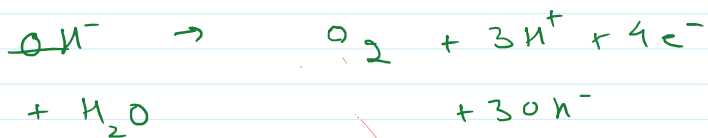
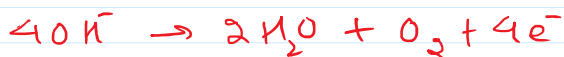
ii) Ions present:  $Ag^+$ ,  $NO_2^-$ ,  $H^+$ ,  $OH^-$

Platinum is inert electrode, hence do not participate in reaction.

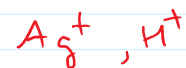
Species at anode  
 (positive terminal)



Reaction at anode

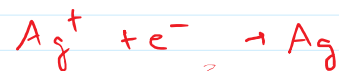


Species at cathode  
 (negative terminal)



Reaction at cathode  
 (reduction)

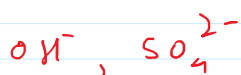
$Ag^+$  has higher reduction potential than  $H^+$ , thus gets reduced.



iii) Ions present:  $H^+$ ,  $OH^-$ ,  $SO_4^{2-}$ ,  $HSO_4^-$

Platinum is inert electrode, hence do not participate in reaction.

Species at anode  
 (positive terminal)



Reaction at anode

(...)

Species at cathode  
 (negative terminal)



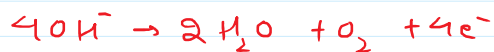
Reaction at cathode

(...)

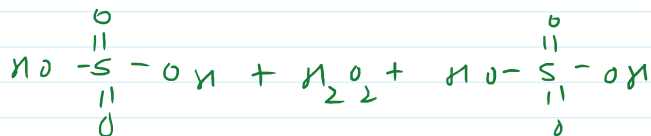
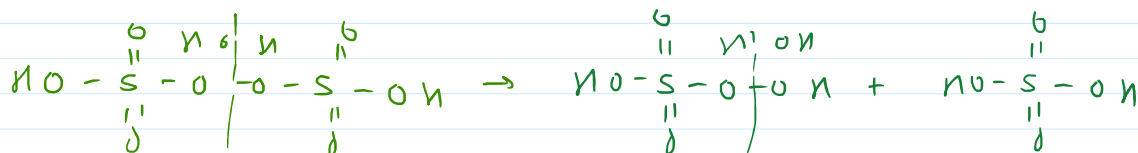
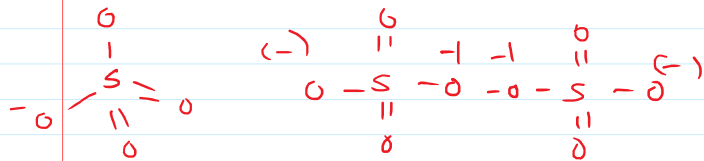
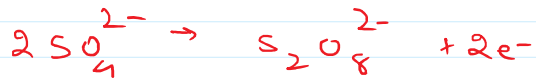
## Reaction at anode

(Oxidation)

For dilute  $H_2SO_4$ ,  $OH^-$  is oxidised



For concentrated  $H_2SO_4$ ,  $SO_4^{2-}$  is oxidised.

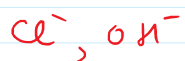


Q) ions present :  $Cu^{2+}$ ,  $Cl^-$ ,  $H^+$ ,  $OH^-$

Platinum is inert electrode, do not participate in reaction.

## Species at anode

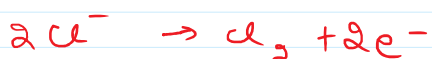
(positive terminal)



## Reaction at anode

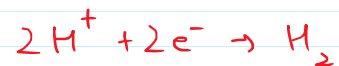
(Oxidation)

$OH^-$  has higher oxidation potential, but due to over-voltage of oxygen,  $Cl^-$  is oxidised at anode.



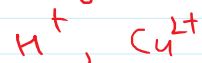
## Reaction at cathode

(Reduction)



## Species at cathode

(negative terminal)



## Reaction at cathode

(Reduction)

$Cu^{2+}$  has higher reduction potential than  $H^+$ , thus gets reduced.

