## The Activity Series

Consider the partial activity series.
 Which of the metal(s) can
 not be oxidized by H<sup>+</sup> ion? Aq(s)

Which metal(s) can be oxidized by the  $H^+$  ion? Co(s), Zn(s), Mg(s), Ba(s)

Can the following reaction occur? Why?

Co (s) + 2 Ag<sup>+</sup> (aq) 
$$\rightarrow$$
 Co<sup>2+</sup> (aq) + 2 Ag (s)  
Yes, because Co (s) can reduce any ion  
below it on the activity series

- 2. Which of the following metals will be oxidized by Pb(NO<sub>3</sub>)<sub>2</sub>: Zn, Cu, Fe? Zn and Fe
- 3. Can tin reduce copper (II) ion?
  Yes
- 4. Write a reaction for the reduction of lead(II) ion with solid zinc.

$$Zn(s) + Pb^{2+}(aq) \rightarrow Zn^{2+}(aq) + Pb(s)$$

5. Which of the following reactions will not occur?

Pt (s) + Ni<sup>2+</sup> (aq) 
$$\rightarrow$$
 Pt<sup>2+</sup> (aq) + Ni (s) No

Fe (s) + 
$$Cu^{2+}$$
 (aq)  $\rightarrow$  Fe<sup>2+</sup> (aq) +  $Cu$  (s) Yes

$$Mn(s) + Sn^{2+}(aq) \rightarrow Mn^{2+}(aq) + Sn(s) Yes$$

## Partial Activity Series

Ba (s) 
$$\rightarrow$$
 Ba<sup>2+</sup>(aq) + 2 e<sup>-1</sup>  
Mg (s)  $\rightarrow$  Mg<sup>2+</sup> (aq) + 2 e<sup>-1</sup>  
Zn (s)  $\rightarrow$  Zn<sup>2+</sup>(aq) + 2 e<sup>-1</sup>  
Co (s)  $\rightarrow$  Co<sup>2+</sup>(aq) + 2 e<sup>-1</sup>  
H<sub>2</sub> (g)  $\rightarrow$  2H<sup>+</sup> (aq) + 2 e<sup>-1</sup>  
Ag (s)  $\rightarrow$  Ag<sup>+</sup>(aq) + e<sup>-1</sup>

## **Activity Series of Metals** in Aqueous Solution

 $Li(s) \longrightarrow Li^+(aq) + e^ K(s) \longrightarrow K^{+}(aq) + e^{-}$  $Ba(s) \longrightarrow Ba^{2+}(aq) + 2e^{-}$  $Ca(s) \longrightarrow Ca^{2+}(aq) + 2e^{-}$  $Na(s) \rightarrow Na^{+}(aq) + e^{-}$  $Mg(s) \longrightarrow Mg^{2+}(aq) + 2e^{-}$ Al (s)  $\longrightarrow$  Al<sup>3+</sup> (aq) + 3 e<sup>-</sup>  $Mn(s) \rightarrow Mn^{2+}(aq) + 2e^{-}$  $Zn(s) \longrightarrow Zn^{2+}(aq) + 2e^{-}$  $Cr(s) \longrightarrow Cr^{3+}(aq) + 3e^{-}$ Fe (s)  $\longrightarrow$  Fe<sup>2+</sup>(aq) + 2 e<sup>-</sup>  $Co(s) \longrightarrow Co^{2+}(aq) + 2e^{-}$  $Ni(s) \rightarrow Ni^{2+}(aq) + 2e^{-}$  $\operatorname{Sn}(s) \longrightarrow \operatorname{Sn}^{2+}(aq) + 2 e^{-}$  $Pb(s) \longrightarrow Pb^{2+}(aq) + 2e^{-}$   $H_2(g) \longrightarrow 2H^{+}(aq) + 2e^{-}$  $Cu(s) \longrightarrow Cu^{2+}(aq) + 2e^{-}$  $Ag(s) \longrightarrow Ag^{+}(aq) + e^{-}$  $Hg(1) \rightarrow Hg^{2+}(aq) + 2e^{-}$ Pt (s)  $\longrightarrow$  Pt<sup>2+</sup>(aq) + 2 e<sup>-</sup>  $Au(s) \rightarrow Au^{3+}(aq) + 3e^{-}$