

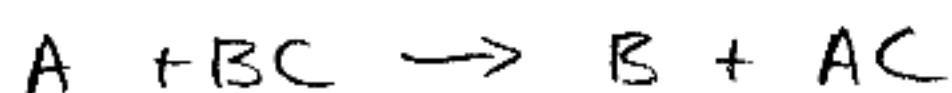
PREDICTING REDOX REACTIONS:

①

FOR SINGLE DISPLACEMENT REACTIONS WE CAN USE AN ACTIVITY SERIES:

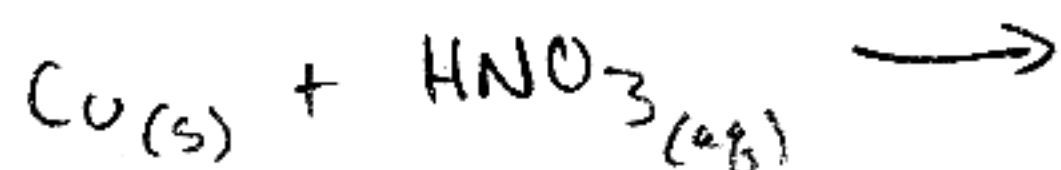
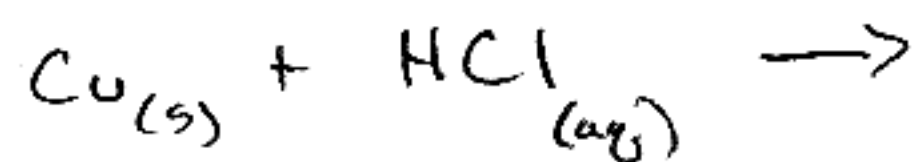
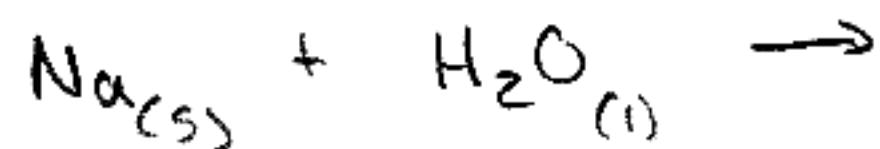
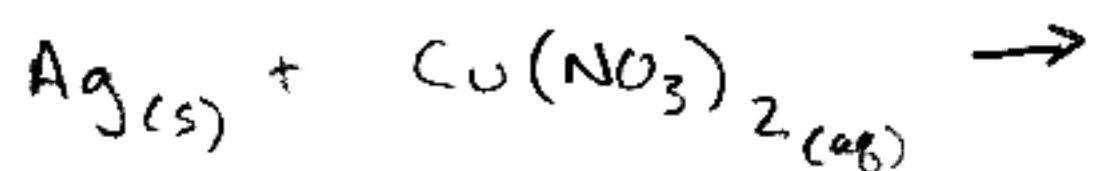
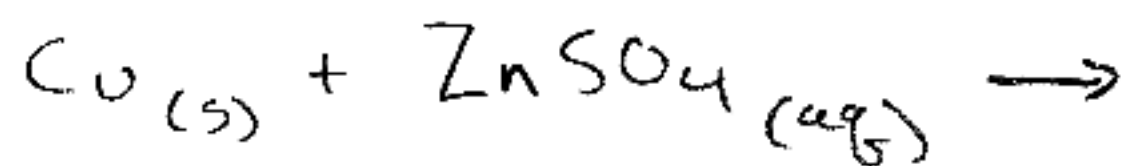
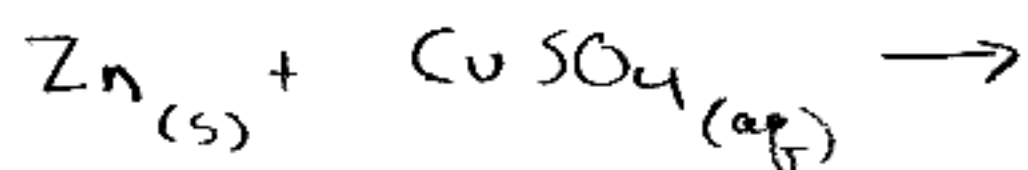
ACTIVITY SERIES	
highest activity	Li
	K
Replace H ₂ from H ₂ O	Ca
	Na
	Mg
	Al
	Zn
Replace H ₂ from acids	Cr → Cr ⁺³
	Fe → Fe ⁺²
	Cd
	Ni → Ni ⁺²
	Sn → Sn ⁺²
	Pb → Pb ⁺²
	Hydrogen
	Cu → Cu ⁺²
Will not replace H ₂ from acids	Ag
	Hg → Hg ⁺²
lowest activity	Au → Au ⁺³

SINGLE DISPLACEMENT:



IF "A" HAS HIGHER ACTIVITY THAN "B", THE REACTION WILL OCCUR.

FOR EXAMPLE:



WE CAN ALSO USE THE FOLLOWING TABLE;

NOTICE ALL REACTIONS ARE REDUCTIONS



Standard Reduction Potentials (at 25 °C)	E° (volts)
$F_2(g) + 2e^- \rightarrow 2F^-(aq)$	2.87
$O_3(g) + 2H^+(aq) + 2e^- \rightarrow O_2(g) + H_2O(l)$	2.07
$S_2O_8^{2-}(aq) + 2e^- \rightarrow 2SO_4^{2-}(aq)$	2.01
$Co^{3+}(aq) + e^- \rightarrow Co^{2+}(aq)$	1.82
$H_2O_2(aq) + 2H^+(aq) + 2e^- \rightarrow 2H_2O(l)$	1.78
$MnO_4^-(aq) + 8H^+(aq) + 5e^- \rightarrow Mn^{2+}(aq) + 4H_2O(l)$	1.49
$Ce^{4+}(aq) + e^- \rightarrow Ce^{3+}(aq)$	1.44
$Cl_2(g) + 2e^- \rightarrow 2Cl^-(aq)$	1.36
$Cr_2O_7^{2-}(aq) + 14H^+(aq) + 6e^- \rightarrow 2Cr^{3+}(aq) + 7H_2O(l)$	1.33
$O_2(g) + 4H^+(aq) + 4e^- \rightarrow 2H_2O(l)$	1.23
$Br_2(l) + 2e^- \rightarrow 2Br^-(aq)$	1.07
$NO_3^-(aq) + 4H^+(aq) + 3e^- \rightarrow NO(g) + 2H_2O(l)$	0.96
$2Hg^{2+}(aq) + 2e^- \rightarrow Hg_2^{2+}(aq)$	0.90
$Hg^{2+}(aq) + 2e^- \rightarrow Hg(l)$	0.85
$Hg_2^{2+}(aq) + 2e^- \rightarrow 2Hg(l)$	0.80
$Ag^+(aq) + e^- \rightarrow Ag(s)$	0.80
$Fe^{3+}(aq) + e^- \rightarrow Fe^{2+}(aq)$	0.77
$I_2(s) + 2e^- \rightarrow 2I^-(aq)$	0.54
$Cu^+(aq) + e^- \rightarrow Cu(s)$	0.52
$IO^-(aq) + H_2O(l) + 2e^- \rightarrow I^-(aq) + 2OH^-(aq)$	0.49
$Cu^{2+}(aq) + 2e^- \rightarrow Cu(s)$	0.34
$AgCl(s) + e^- \rightarrow Ag(s) + Cl^-(aq)$	0.22
$Cu^{2+}(aq) + e^- \rightarrow Cu^+(aq)$	0.16
$Sn^{4+}(aq) + 2e^- \rightarrow Sn^{2+}(aq)$	0.15
$Fe^{3+}(aq) + 3e^- \rightarrow Fe(s)$	-0.04
$Pb^{2+}(aq) + 2e^- \rightarrow Pb(s)$	-0.13
$Sn^{2+}(aq) + 2e^- \rightarrow Sn(s)$	-0.14
$Ni^{2+}(aq) + 2e^- \rightarrow Ni(s)$	-0.23
$Cd^{2+}(aq) + 2e^- \rightarrow Cd(s)$	-0.40
$Fe^{2+}(aq) + 2e^- \rightarrow Fe(s)$	-0.41
$Cr^{3+}(aq) + 3e^- \rightarrow Cr(s)$	-0.74
$Zn^{2+}(aq) + 2e^- \rightarrow Zn(s)$	-0.76
$2H_2O(l) + 2e^- \rightarrow H_2(g) + 2OH^-(aq)$	-0.83
$Al^{3+}(aq) + 3e^- \rightarrow Al(s)$	-1.66
$Mg^{2+}(aq) + 2e^- \rightarrow Mg(s)$	-2.38
$Na^+(aq) + e^- \rightarrow Na(s)$	-2.71
$Ca^{2+}(aq) + 2e^- \rightarrow Ca(s)$	-2.76
$K^+(aq) + e^- \rightarrow K(s)$	-2.92
$Li^+(aq) + e^- \rightarrow Li(s)$	-3.04

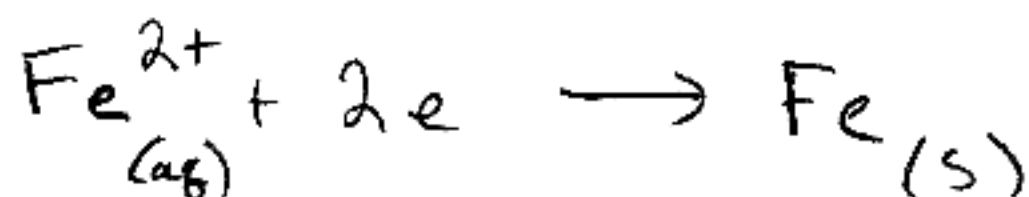
← THE MORE POSITIVE,
THE MORE SPONTANEOUS
IN THIS DIRECTION
(REDUCTION)

THE MORE NEGATIVE,
THE MORE SPONTANEOUS
IN THE REVERSE DIRECTION
(OXIDATION)

SO:

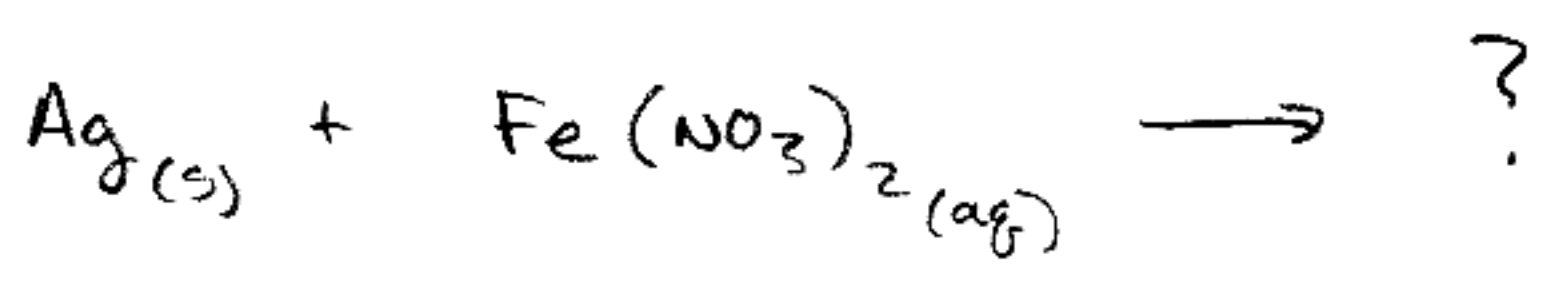


IS MORE LIKELY
TO OCCUR THAN

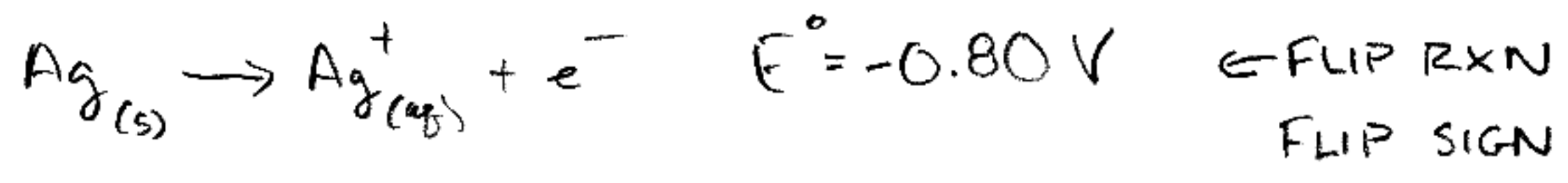
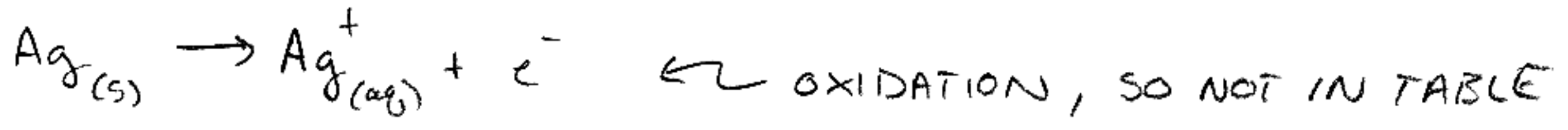


← HOW DO WE
PREDICT
REACTIONS

WILL THE FOLLOWING REACTION OCCUR?

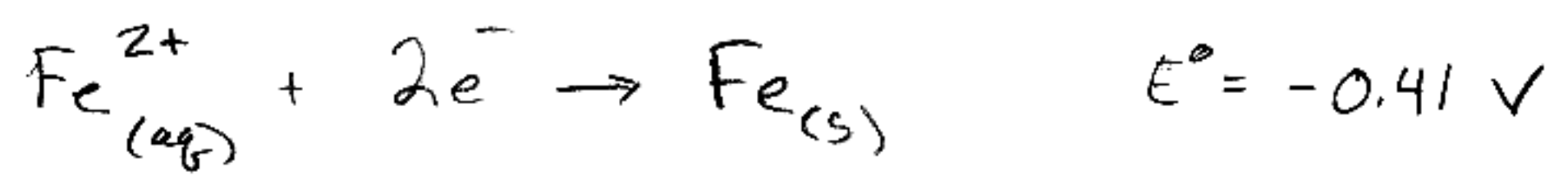


WHAT ARE THE HALF RXNS: (ASSUME NO₃⁻ IS SPECTATOR)

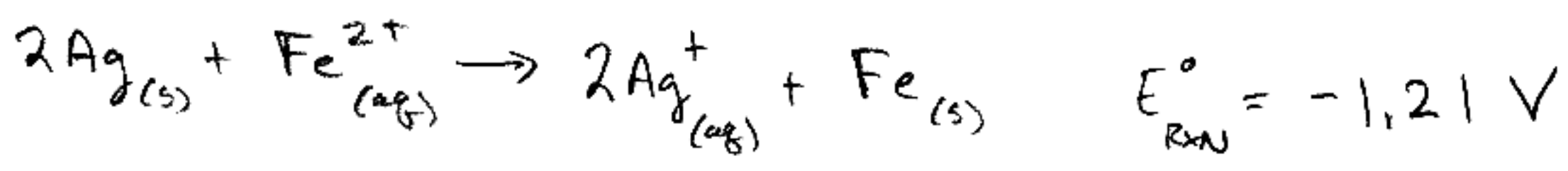


SO WILL REACTION OCCUR?

ADD HALF RXNS TOGETHER:



← EVEN THOUGH WE DOUBLE RXN, WE DON'T DOUBLE VALUE



↑ IF NEGATIVE, NO RXN