WRITING HALF EQUATIONS

STEP	EXAMPLE 1	EXAMPLE 2
1. Calculate oxidation states on each side of the equation.	$VO^{2+} \rightarrow VO_2^+$ V +4 V +5	$BrO_3^- \rightarrow Br_2$ Br+5 Br 0
2. Balance the element changing oxidation state.	$VO^{2+} \rightarrow VO_2^+$ *V already balanced*	$2\ BrO_3^- \rightarrow Br_2$ *2 Br on right so need 2 BrO_3^- on left*
3. Sort out electrons. If the oxidation state becomes more negative then it gains electrons. If the oxidation state becomes more positive then electrons are lost.	$VO^{2+} \rightarrow VO_2^+ + e^-$ *V becomes 1 more positive so 1 electron lost*	$2\ BrO_3^- + 10\ e^- \rightarrow Br_2$ *2x Br become 5 more negative so 10 electrons gained*
4. Sort out Os. For every O gained/lost, add/remove one H_2O molecule.	$VO^{2+} + H_2O \rightarrow VO_2^+ + e^-$ *1 less O on left so add 1 H_2O on the left*	$2\ BrO_3^- + 10\ e^- \rightarrow Br_2 + 6\ H_2O$ *6 more O on left so need 6 H_2O on the right*
5. Sort out Hs. For every H gained/lost, add/remove one H^+ ion.	$VO^{2+} + H_2O \rightarrow VO_2^+ + e^- + 2\ H^+$ *2 less H on right so add 2 H^+ to right*	$2\ BrO_3^- + 10\ e^- + 12\ H^+ \rightarrow Br_2 + 6\ H_2O$ *12 less H on left so add 12 H^+ to left*
6. Check – if the total electric charge on the left equals that on the right then it is probably correct. If it is not then you know you have gone wrong!	*Left = 2+, 0 = 2+* *Right = 1+, 1-, 2+ = 2+*	*Left = 2-, 10-, 12+ = 0* *Right = 0, 0 = 0*

a) $Na \rightarrow Na^+$ .....

b) $Pb^{4+} \rightarrow Pb^{2+}$ .....

c) $H_2 \rightarrow H^+$ .....

d) $Br^- \rightarrow Br_2$ .....

e) $Cr_2O_7^{2-} \rightarrow Cr^{3+}$ .....

f) $SO_4^{2-} \rightarrow S$ .....

g) $SO_4^{2-} \rightarrow H_2S$ .....

h) $SO_4^{2-} \rightarrow SO_2$ .....

i) $N_2 \rightarrow NO_3^-$ .....

j) $IO_3^- \rightarrow I_2$ .....

k) $Hg^{2+} \rightarrow Hg_2^{2+}$ .....

l) $VO^{2+} \rightarrow VO_2^+$ .....

m) $S_2O_3^{2-} \rightarrow S$ .....

n) $NO_3^- \rightarrow NO_2^-$ .....