Balancing Redox Equations WorkSheet

Oxidation Number Method for Balancing Redox Equations

1. Assign oxidation numbers to all elements and identify those that are oxidized and reduced. If only one element is both oxidized and reduced (disproportionation), write it down twice (then recombine it after the equation is balanced).
2. Balance electron loss and gain by adding coefficients to the reactants.
3. Balance the elements oxidized and reduced by adding coefficients to the products. (If one of the elements appears in more than one product and with the same oxidation number in each, don't balance it yet). (If one of the elements appears in products unchanged as well as oxidized or reduced, balance only the ones with a new oxidation number).
4. Balance everything except H and O by inspection. (If no ions are present, finish balancing the equation by inspection. Check to see that each element is balanced.)
5. If ions are present, balance the charge by adding H^+ for acid solutions or OH^- for basic solutions.
6. Finish balancing the equation by adding H_2O.
7. Check to see that each element is balanced <u>and</u> that the charge is balanced.

Balance the following equations: Underline the oxidizing agent.

1. $H_2S + HNO_3 \rightarrow S + NO + H_2O$

2. $H_2SO_4 + HBr \rightarrow SO_2 + Br_2 + H_2O$

3. $H_2SO_4 + HI \rightarrow H_2S + I_2 + H_2O$

4. $N_2O + H_2 \rightarrow H_2O + NH_3$

5. $K + KNO_3 \rightarrow N_2 + K_2O$

6. $Fe_2O_3 + S \rightarrow Fe + SO_2$

7. $NH_3 + O_2 \rightarrow NO + H_2O$

8. $N_2H_4 + H_2O_2 \rightarrow HNO_3 + H_2O$

9. $NO_2 + H_2O \rightarrow HNO_3 + NO$

10. $MnO_2 + HBr \rightarrow Br_2 + MnBr_2 + H_2O$

11. $HClO_4 + ClO_2 + H_2O \rightarrow HClO_3$

12. $PbO_2 + Sb + NaOH \rightarrow PbO + NaSbO_2 + H_2O$

13. $KMnO_4 + HCl \rightarrow MnCl_2 + Cl_2 + KCl + H_2O$

14. $C_3H_7OH + Na_2Cr_2O_7 + H_2SO_4 \rightarrow Cr_2(SO_4)_3 + Na_2SO_4 + H_2O + HC_3H_5O_2$

The following reactions occur in acidic solution:

15. $Cu + NO_3^- \rightarrow Cu^{2+} + NO$

16. $MnO_4^- + H_2S \rightarrow Mn^{2+} + S$

17. $As_2O_3 + NO_3^- \rightarrow H_3AsO_4 + N_2O_3$

18. $Zn + NO_3^- \rightarrow Zn^{2+} + NH_4^+$

19. NO_2 → NO_3^- + NO

20. H_2O_2 + Cr^{3+} → $Cr_2O_7^{2-}$

21. $Cr_2O_7^{2-}$ + I^- → Cr^{3+} + I_3^-

22. ClO_3^- + Cl^- → Cl_2 + ClO_2

23. MnO_4^- + $C_2O_4^{2-}$ → CO_2 + Mn^{2+}

24. $Cr_2O_7^{2-}$ + Cl^- → Cr^{3+} + Cl_2

The following reactions occur in basic solution:

25. Al + OH^- → AlO_2^- + H_2 (Drano)

26. $Cu(NH_3)_4^{2+}$ + $S_2O_4^{2-}$ → SO_3^{2-} + Cu + NH_3

27. NO_2 → NO_3^- + NO_2^-

28. Cl_2 → ClO_3^- + Cl^-

29. MnO_4^- + $C_2O_4^{2-}$ → CO_2 + MnO_2

30. Zn + NO_3^- → $Zn(OH)_4^{2-}$ + NH_3