

Chemistry 12 Electrochemistry Worksheet No. 2

1. Determine the oxidation number of phosphorus in each of the following:

- 1 a. phosphorus pentoxide, P_2O_5 +5
- 2 b. phosphorus trioxide, P_2O_3 +3
- 3 c. hypophosphoric acid, $H_4P_2O_6$ +4
- 4 d. hydrogen diphosphide, P_2H_4 -2
- 5 e. hypophosphorus acid, H_3PO_2 1
- 6 f. phosphine, PH_3 -3
- 7 g. phosphite, PO_3^{3-} +3
- 8 h. phosphorus acid, H_3PO_3 +3
- 9 i. metaphosphoric acid, HPO_3 +5
- 10 j. white phosphorus, P_4 0

2. Indicate the change in oxidation number for each of the following conversions:

- a. gallium III, Ga^{3+} is converted to $H_2GaO_3^-$ +3 \rightarrow +3 no change
- b. americium III, Am^{3+} is converted to AmO_2^{2+} +3 \rightarrow +6 increases by 3
- c. selenate, SeO_4^{2-} is converted to selenous acid, H_2SeO_3 +6 \rightarrow +4 decreases by 2.
- d. thiosulphate, $S_2O_3^{2-}$ is converted to tetrathionate, $S_4O_6^{2-}$ +2 \rightarrow +5/2 increases by 1/2
- e. magnetite, Fe_3O_4 is converted to iron, Fe +8/3 \rightarrow 0 decreases by 8/3

3. For each of the following compounds find the oxidation number of the indicated atom:

a. potassium	K	K	0
b. potassium oxide	K_2O	K	+1
		O	-2
c. chlorine	Cl_2	Cl	0
d. magnesium chloride	$MgCl_2$	Mg	+2
		Cl	-1
e. hydrogen peroxide	H_2O_2	H	+1
		O	-1
f. sodium sulphate	Na_2SO_4	Na	+1
		S	+6
		O	-2
g. ammonia	NH_3	N	-3
		H	+1
h. potassium permanganate	$KMnO_4$	K	+1
		Mn	+7
		O	-2

4. Balance the following reactions using either half reactions or the oxidation number method:

- error \rightarrow a. $Cr_2O_7^{2-} + HNO_2 \rightarrow Cr^{3+} + NO_3^-$ (acidic) $Cr_2O_7^{2-} + 3HNO_2 + 5H^+ \rightarrow 2Cr^{3+} + 3NO_3^- + 4H_2O$
- b. $IO_3^- + N_2O \rightarrow I_2 + NO$ (acidic) $2IO_3^- + 5N_2O + 2H^+ \rightarrow I_2 + 10NO + H_2O$
- c. $MnO_4^- + Te \rightarrow MnO_2 + TeO_3^{2-}$ (basic) $4MnO_4^- + 3Te + 2OH^- \rightarrow 4MnO_2 + 3TeO_3^{2-} + H_2O$
- d. $P_4 + NO_2^- \rightarrow H_2PO_2^- + N_2O$ (basic) $P_4 + 2NO_2^- + 3H_2O + 2OH^- \rightarrow 4H_2PO_2^- + N_2O$
- e. $HPO_2^- \rightarrow PO_4^{3-} + P_4$ (basic) $20HPO_2^- + 4OH^- \rightarrow 8PO_4^{3-} + 3P_4 + 12H_2O$
- f. $N_2O \rightarrow N_2H_4 + NO_3^-$ (basic) $7N_2O + 5H_2O + 6OH^- \rightarrow 4N_2H_4 + 6NO_3^-$