Name: …… Section: ……. Date: ……..

**HW 5.4B – GALVANIC CELLS**

**1) lead-acid battery**

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|---|---|
| Where are most lead-acid batteries found? | in cars |
| Write the equation for the half-reaction taking place at the cathode | $PbO_2 + 2H^+ + H_2SO_4 + 2e^- \rightarrow PbSO_4 + 2H_2O$ |
| Write the equation for the half-reaction taking place at the anode | $Pb + H_2SO_4 \rightarrow PbSO_4 + 2H^+ + 2e^-$ |
| Write the overall equation for the reaction. | $PbO_2 + Pb + 2H_2SO_4 \rightarrow 2PbSO_4 + 2H_2O$ |
| Which atom is oxidized and what is the increase in oxidation number? | Pb, from 0 to +2 |
| Which atom is reduced and what is the decrease in oxidation number? | Pb, from +4 to +2 |
| State one advantage of a lead-acid cell | it can sustain a large current and is easily rechargeable |
| State one disadvantage of a lead-acid cell | it is very heavy |
| What is the chemical reaction taking place as the cell is being re-charged? | $2PbSO_4 + 2H_2O \rightarrow PbO_2 + Pb + 2H_2SO_4$ |

**Answer either Q2 or Q3 – you will get extra credit for answering both questions but it is not required.**

**2) alkali battery**

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|---|---|
| Give an example of a device which uses an alkali battery | Eg flashlight, TV remote control |
| Write the equation for the half-reaction taking place at the cathode | $2MnO_2 + H_2O + 2e^- \rightarrow Mn_2O_3 + 2OH^-$ |
| Write the equation for the half-reaction taking place at the anode | $Zn + 2OH^- \rightarrow ZnO + H_2O + 2e^-$ |
| Write the overall equation for the reaction. | $Zn + 2MnO_2 \rightarrow ZnO + Mn_2O_3$ |
| Which atom is oxidized and what is the increase in oxidation number? | Zn, from 0 to +2 |
| Which atom is reduced and what is the decrease in oxidation number? | Mn, from +4 to +3 |
| State one advantage of an alkali battery | It is easily portable |
| State one disadvantage of an alkali battery | It cannot be recharged |

Name: …… Section: ……. Date: ……..

### 3) lithium-ion battery

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|---|---|
| Give an example of a device which uses a lithium-ion battery | Cellphones |
| Write the equation for the half-reaction taking place at the cathode | $Li^+ + CoO_2 + e^- \rightarrow LiCoO_2$ |
| Write the equation for the half-reaction taking place at the anode | $Li \rightarrow Li^+ + e^-$ |
| Write the overall equation for the reaction. | $Li + CoO_2 \rightarrow LiCoO_2$ |
| Which atom is oxidized and what is the increase in oxidation number? | Li, from 0 to +1 |
| Which atom is reduced and what is the decrease in oxidation number? | Co, from +4 to +3 |
| State one advantage of an lithium-ion battery | Powerful, light and easily rechargeable |
| State one disadvantage of a lithium-ion battery | Expensive materials |