

**Answers**

**Question #1:** (10 points) This reaction was studied at 25.0 °C:  $\text{P}_4\text{O}_{10}(\text{s}) + 6 \text{H}_2\text{O}(\text{l}) \rightarrow 4 \text{H}_3\text{PO}_4(\text{l})$

Use the data acquired to **calculate values for  $\Delta H^\circ_{\text{rxn}}$ ,  $\Delta S^\circ_{\text{rxn}}$  and finally  $\Delta G^\circ_{\text{rxn}}$ .**

Species	$\Delta H_f^\circ$ (kJ/mol)	$S^\circ$ (J/K·mol)
$\text{P}_4\text{O}_{10}(\text{s})$	-2984.0	228.9
$\text{H}_2\text{O}(\text{l})$	-285.8	69.95
$\text{H}_3\text{PO}_4(\text{l})$	-1279.0	110.5

$$\Delta H_{\text{rxn}} = -417.2 \text{ kJ/mol}$$

$$\Delta S_{\text{rxn}} = -206.6 \text{ J/mol}$$

$$\Delta G_{\text{rxn}} = -355.6 \text{ kJ/mol}$$

**Question #2:** (5 points) One kind of battery used in watches contains mercury(II) oxide. As current flows, the mercury(II) oxide is reduced to mercury:  $\text{HgO}(\text{s}) + \text{H}_2\text{O}(\text{l}) + 2 \text{e}^- \rightarrow \text{Hg}(\text{l}) + 2 \text{OH}^-(\text{aq})$

If  $2.3 \times 10^{-5}$  amperes flows continuously for 1200 days, what mass of  $\text{Hg}(\text{l})$  is produced?

$$2.5 \text{ g Hg}$$

**Question #3:** (5 points) Write a balanced chemical equation for the following reaction in an **acidic** solution.

