

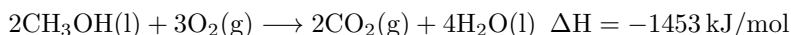
Non Sibi High School

Andover's Chem 300: Accelerated/Honors Chemistry

Chapter 13, Review Quiz 1

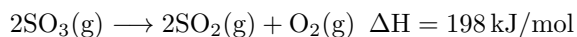
1

If 125 kilograms of methanol, CH_3OH , is burned according to the combustion equation below, how much heat will be released?



2

If 3.55 kJ of heat are absorbed during the decomposition reaction below, how many milliliters of sulfur trioxide gas, measured at 22°C and 712 mmHg, will decompose?

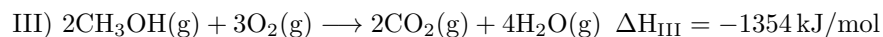
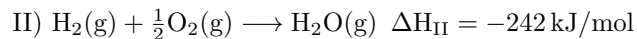
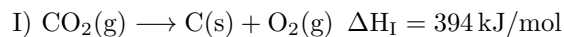


3

For the reaction $2\text{C}_3\text{H}_7\text{OH}(g) + 9\text{O}_2(g) \longrightarrow 6\text{CO}_2(g) + 8\text{H}_2\text{O}(g)$, estimate ΔH using average bond energies.

4

Calculate ΔH for the reaction $\text{C}(s) + 2\text{H}_2(g) + \frac{1}{2}\text{O}_2(g) \longrightarrow \text{CH}_3\text{OH}(g)$ using the following three reactions:



5

Write the balanced formation reaction, including physical states, for solid sodium iodate, NaIO_3 .

6

Calculate ΔH° for the reaction $2\text{NO}(\text{g}) + \text{O}_2(\text{g}) \longrightarrow 2\text{NO}_2(\text{g})$ using the following information:

Compound	ΔH_f° (kJ/mol)
$\text{NO}(\text{g})$	90.
$\text{NO}_2(\text{g})$	33

7

The specific heat of magnesium metal is $1.05 \text{ J/g}\cdot^\circ\text{C}$. How much heat in kilojoules is lost when a 225 gram sample of magnesium metal is cooled from 625°C to 125°C ?

8

In an insulated calorimeter, a 475 gram piece of tin metal originally at 132°C was added to 135 grams of water originally at 19°C . The final temperature of the tin-water mixture was 36°C . Determine the specific heat of tin.

9

The specific heat of tungsten metal is $0.13 \text{ J/g}\cdot^\circ\text{C}$. In an insulated calorimeter, a 955 gram piece of tungsten metal originally at 375°C was added to 725 grams of water originally at 18°C . Determine the final temperature of the tungsten-water mixture.

10

In an insulated calorimeter, 18.2 grams of solid cesium hydroxide at 22.3°C was dissolved in 135.7 grams of water also at 22.3°C , after which the final temperature of the mixed solution was 36.9°C . If the specific heat of the mixed solution was $3.87 \text{ J/g}\cdot^\circ\text{C}$, determine ΔH for the dissolving process $\text{CsOH}(\text{s}) \longrightarrow \text{CsOH}(\text{aq})$ in kJ/mol CsOH .

11

In an insulated calorimeter, 55.7 mL of 1.91 M acetic acid was mixed with 62.6 mL of 1.83 M sodium hydroxide, with both solutions originally at 18.2°C. The final temperature of the mixed solutions was 30.1°C. The density of the mixed solutions was 1.03 g/mL and the specific heat of the mixed solutions was 3.96 J/g·°C. Write a balanced molecular equation, including physical states, and determine ΔH for the neutralization reaction in kJ/mol of water formed.

12

Consider the following data for methanol, CH₃OH:

$$\begin{aligned} \text{melting point} &= -98^\circ\text{C} \\ \text{boiling point} &= 65^\circ\text{C} \\ \Delta H_{\text{fusion}} &= 3.2 \text{ kJ/mol} \\ \Delta H_{\text{vaporization}} &= 38 \text{ kJ/mol} \\ \text{specific heat of liquid methanol} &= 2.5 \text{ J/g}\cdot^\circ\text{C} \\ \text{specific heat of methanol vapor} &= 1.7 \text{ J/g}\cdot^\circ\text{C} \end{aligned}$$

Sketch a heating curve that depicts solid methanol at -98°C being heated to 88°C and then calculate the total amount of heat in kilojoules absorbed when 77 grams of methanol undergoes this process.

13

Given the reaction $2\text{H}_2\text{O}(\text{g}) \longrightarrow 2\text{H}_2(\text{g}) + \text{O}_2(\text{g})$ $\Delta H = 484 \text{ kJ/mol}$, use the table of average bond energies to calculate the H–H bond energy.

14

Given the reaction $2\text{C}_2\text{H}_2(\text{g}) + 5\text{O}_2(\text{g}) \longrightarrow 4\text{CO}_2(\text{g}) + 2\text{H}_2\text{O}(\text{l})$ $\Delta H^\circ = -2602 \text{ kJ/mol}$, use the information below to calculate the standard enthalpy of formation, ΔH_f° , for C₂H₂(g):

Compound	ΔH_f° (kJ/mol)
CO ₂ (g)	-394
H ₂ O(l)	-286

15

ΔH for the dissolving process $\text{KClO}_3(\text{s}) \rightarrow \text{KClO}_3(\text{aq})$ is $+41.4 \text{ kJ/mol KClO}_3$. In an insulated calorimeter, 14.1 grams of solid KClO_3 at 24.6°C was dissolved in 102.5 grams of water also at 24.6°C . If the specific heat of the mixed solution was $3.91 \text{ J/g}\cdot^\circ\text{C}$, determine the final temperature in the calorimeter.

16

Consider the reaction $\text{Sr}(\text{OH})_2(\text{aq}) + 2\text{HNO}_3(\text{aq}) \rightarrow 2\text{H}_2\text{O}(\text{l}) + \text{Sr}(\text{NO}_3)_2(\text{aq})$ $\Delta H^\circ = -112 \text{ kJ/mol}$. In an insulated calorimeter, 65.4 mL of 2.96 M strontium hydroxide at 22.5°C was mixed with 72.6 mL of 2.84 M nitric acid also at 22.5°C . If the density of the mixed solution was 1.06 g/mL and the specific heat of the mixed solution was $3.89 \text{ J/g}\cdot^\circ\text{C}$, determine the final temperature in the calorimeter.

17

If 8.5 grams of ice at -12°C is added to an insulated calorimeter containing 65 grams of water at 75°C , and all the ice melts, sketch a heating/cooling curve for the process and determine the final temperature of the liquid water in the calorimeter.



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