Non Sibi High School

Andover's Chem 250: Introductory/Basic 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?

$$2CH_3OH(l) + 3O_2(g) \longrightarrow 2CO_2(g) + 4H_2O(l) \;\; \Delta H = -1453\,\text{kJ/mol}$$

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?

$$2SO_3(g) \longrightarrow 2SO_2(g) + O_2(g) \;\; \Delta H = 198\,\text{kJ/mol}$$

3

For the reaction $2C_3H_7OH(g) + 9O_2(g) \longrightarrow 6CO_2(g) + 8H_2O(g)$, estimate ΔH using average bond energies.

4

Calculate ΔH for the reaction $C(s) + 2H_2(g) + \frac{1}{2}O_2(g) \longrightarrow CH_3OH(g)$ using the following three reactions:

I) $CO_2(g) \longrightarrow C(s) + O_2(g) \;\; \Delta H_I = 394\,\text{kJ/mol}$

II) $H_2(g) + \frac{1}{2}O_2(g) \longrightarrow H_2O(g) \;\; \Delta H_{II} = -242\,\text{kJ/mol}$

III) $2CH_3OH(g) + 3O_2(g) \longrightarrow 2CO_2(g) + 4H_2O(g) \;\; \Delta H_{III} = -1354\,\text{kJ/mol}$

5

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

6

Calculate ΔH° for the reaction $2NO(g) + O_2(g) \longrightarrow 2NO_2(g)$ using the following information:

Compound	ΔH_f° (kJ/mol)
NO(g)	90.
NO_2(g)	33

7

The specific heat of magnesium metal is 1.05 J/g·°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 J/g·°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 J/g·°C, determine ΔH for the dissolving process $CsOH(s) \longrightarrow CsOH(aq)$ 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, CH_3OH:

melting point = -98°C
boiling point = 65°C
ΔH_{fusion} = 3.2 kJ/mol
$\Delta H_{vaporization}$ = 38 kJ/mol
specific heat of liquid methanol = 2.5 J/g·°C
specific heat of methanol vapor = 1.7 J/g·°C

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.

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