

PENANG SANGAM HIGH SCHOOL

P.O.BOX 44, RAKIRAKI

LESSON NOTES

WEEK 15

Year/Level: 13A/B

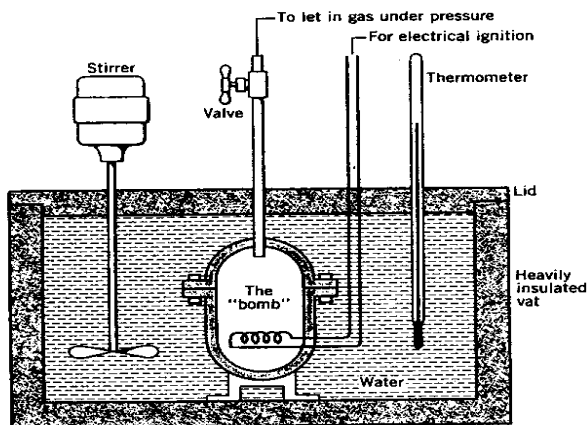
Subject: Chemistry

Strand 3	Reactions
Sub Strand 3.2	Thermochemistry
Content Learning Outcome	By the end of this lesson students should be able: Define calorimetry and identify the two types of calorimeter.

Okay so the second type of Calorimetry is:

Bomb Calorimeter

- ★ Used to find heat of combustion.
- ★ Weighed amount of reactants are placed inside a rigid stainless steel container called a bomb.
- ★ The bomb is sealed, filled with oxygen and is placed in a large insulated vat of water.
- ★ Reactants in the bomb are ignited by passing an electric spark and heat released due to combustion increases the temperature of the vat.
- ★ Change in temperature and heat capacity of the calorimeter assembly, heat of combustion can be calculated.



Example:

A 0.3938g sample of octane (C_8H_{18}) is burnt in a bomb calorimeter that has a heat capacity of $11.59\text{kJ}/^\circ\text{C}$. The temperature of the calorimeter increases by 1.64°C . Calculate the heat of combustion of octane per gram and per mole.

Solution

$$C = \frac{\Delta H}{T \Delta}$$

$$\Delta H = C \times \Delta T$$

$$= 1.64^{\circ}\text{C} \times 11.59\text{Kj}/^{\circ}\text{C}$$

$$= 19.0\text{kJ}$$

19.0kJ of heat is released when 0.3938g of octane is burnt.

$$\text{Heat released per gram} = \frac{19.0\text{kJ}}{0.3938\text{g}}$$

$$= 48.2\text{kJ/g}$$

$$\text{Heat released per mole} = \text{heat released per gram} \times \text{molar mass}$$

$$= 48.2\text{kJ/g} \times 114.2\text{g/mol}$$

$$= 5.50 \times 10^3\text{kJ/mol}$$

Exercise

1. A student was testing the heat of reaction of HCl and sodium hydroxide. She dissolved 10g of sodium hydroxide in excess HCl in a calorimeter and determined that 1.44kJ of energy was released. The amount of heat released when 1 mole of NaOH reacts with 1 mol of HCl is:
2. A 0.75g of octane was burnt in a bomb calorimeter of heat capacity 12.05kJ/°C. The temperature of calorimeter increases by 3.9°C. calculate the heat of combustion of octane/gram.

Refer to Year 13 Chemistry Text book for additional questions: pg 134-136 (1-3)

That brings us to the end of our lesson, please go back to the achievement indicators and self reflect yourself, tick the indicators after completion of the exercise.

Thank you for successful completion of this lesson