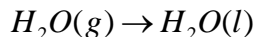


Thermochemistry

1. If 0.315 moles of hexane (C_6H_{14}) burn in a bomb calorimeter containing 5.65 liters of water, what's the molar heat of combustion of hexane (the water temperature rises $55.4^\circ C$)? The heat capacity of water is $4.184 J/g^\circ C$.
 - a) **4150 kJ/mol**
 - b) 1310 kJ/mol
 - c) 4150 J/mol
 - d) 1310 J/mol
2. If I burn 22.0 grams of propane (C_3H_8) in a bomb calorimeter containing 3.25 liters of water, what's the molar heat of combustion of propane if the water temperature rises $88.5^\circ C$?
 - a) 1.20×10^3 kJ
 - b) **2.40×10^3 kJ/mol.**
 - c) 1.20×10^3 J
 - d) 2.40×10^3 J/mol.
3. What units of energy are commonly used in chemistry?
 - a) **Joules**
 - b) Liters
 - c) Kilogram
 - d) Calories

Which of the following statements correctly describes the signs of q and w for the following exothermic process at $P = 1$ atm and $T = 370$ K?



- A) q and w are negative
 - B) q is positive, w is negative
 - C) **q is negative, w is positive**
 - D) q and w are both zero
4. What is the units for heat capacity?
 - a) J
 - b) $g / ^\circ C$
 - c) $J / g \cdot ^\circ C$
 - d) **$J / ^\circ C$**

5. A piece of silver of mass 362 g has a heat capacity of $85.7 \text{ J} \cdot ^\circ\text{C}^{-1}$. What is the specific heat of silver?
- a) **$0.237 \text{ J} / ^\circ\text{C}$**
 - b) $237 \text{ J} / ^\circ\text{C}$
 - c) $23 \text{ J} / ^\circ\text{C}$
 - d) $47 \text{ J} / ^\circ\text{C}$
6. Calculate the amount of heat liberated (in kJ) from 366 g of mercury (specific heat of mercury $0.139 \text{ J} / \text{g} \cdot ^\circ\text{C}$) when it cools from 77.0 to $12.0 \text{ } ^\circ\text{C}$.
- a) 33.1 kJ
 - b) **-3.31 kJ**
 - c) 3.31 J
 - d) 1000 J
7. A 6.22 kg piece of copper metal (specific heat of copper $0.385 \text{ J} / \text{g} \cdot ^\circ\text{C}$) is heated from $20.5 \text{ } ^\circ\text{C}$ to $324.3 \text{ } ^\circ\text{C}$. Calculate the heat absorbed (in kJ) by the metal.
- a) 728 J
 - b) **728 kJ**
 - c) 72 J
 - d) 27 kJ
8. SI unit of work is
- a) Atmosphere
 - b) **Joule**
 - c) Calories
 - d) Second
9. A chemical reaction that absorbs heat from the surroundings is said to be _____ and has a _____ ΔH at constant pressure
- a) **endothermic, positive**
 - b) endothermic, negative
 - c) exothermic, negative
 - d) exothermic, positive
10. Which one of the following statements is true?
- a) Enthalpy is an intensive property.
 - b) The enthalpy is not a state function
 - c) **Enthalpy is a state function.**
 - d) H is the value of q measured under conditions of constant volume.

11. ΔH for an endothermic process is _____ while ΔH for an exothermic process is _____.

- a) zero, positive
- b) zero, negative
- c) positive, negative
- d) negative, positive

12. Of the following, which one is a state function?

- a) **E**
- b) q
- c) w
- d) All of the above

13. When a system _____ ΔE is always negative.

- a) absorbs heat and does work
- b) gives off heat and does work
- c) absorbs heat and has work done on it
- d) none of the above is always negative

14. Consider the following standard heats of formation:

$\text{P}_4\text{O}_{10}(\text{s}) = -3110 \text{ kJ/mol}$, $\text{H}_2\text{O}(\text{l}) = -286 \text{ kJ/mol}$, $\text{H}_3\text{PO}_4(\text{s}) = -1279 \text{ kJ/mol}$

Calculate the change in enthalpy for the following process:



- a) **290 kJ**
- b) 2117 kJ
- c) 1720 kJ
- d) 0 kJ

15. Calculate the work for the expansion of CO_2 from 1.0 to 2.5 liters against a pressure of 1.0 atm at constant temperature.

- a) 1.5 liter \cdot atm
- b) 2.5 liter \cdot atm
- c) **-1.5 liter \cdot atm**
- d) -2.5 liter \cdot atm

16. One mole of an ideal gas is expanded from a volume of 1.00 liter to a volume of 10.00 liters against a constant external pressure of 1.00 atm. How much work (in joules) is performed on the surroundings? ($T = 300 \text{ K}$; $1 \text{ L atm} = 101.3 \text{ J}$)

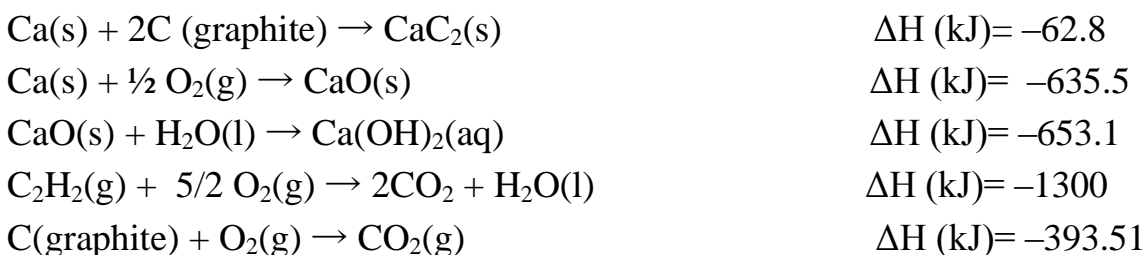
- a) 456 J
- b) **912 J**
- c) 2740 J

d) 2870 J

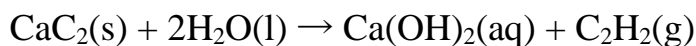
17.A 25.0 g piece of aluminum (which has a molar heat capacity of **24.03J/°C mol**) is heated to 82.4°C and dropped into a calorimeter containing water (specific heat capacity of water is **4.18J/g°C**) initially at 22.3°C. The final temperature of the water is 24.9°C. Calculate the mass of water in the calorimeter.

- a) 187 g
- b) 6.57 g
- c) 3180 g
- d) 2120 g

18 Consider the following data:



Use Hess's law to find the change in enthalpy at 25° C for the following equation:



- a) -713 kJ
- b) 713 kJ
- c) -318.8 kJ
- d) -3045 kJ