

### Chapter 5 Mock Test - Thermochemistry

#### The Nature of Energy

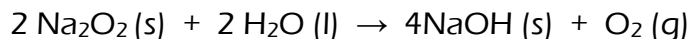
1. What is the difference between kinetic and potential energy? Give an example of each.
2. At what velocity (m/s) must a 96.1 kg jogger travel to have the kinetic energy of 1054 J?
3. The kinetic energy of a 0.0306 kg golf ball traveling 64.0 m/s is \_\_\_\_\_ J.
4. Convert 548.7 J to calories. Remember: 1 cal = 4.184 J.
5. Convert 67.8 cal to Joules.

#### The First Law of Thermodynamics

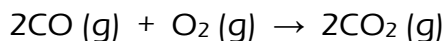
6. What is the first law of thermodynamics state?
7. The value of  $\Delta E$  for a system that performs 7,655 J of work on its surroundings and releases 2,500 J of heat is \_\_\_\_\_. **J. Is this reaction endothermic or exothermic?**
8. The value of  $\Delta E$  for a system that absorbs 9,500 J of heat and has 7,655 J of work done on it by its surroundings is \_\_\_\_\_. **J. Is this reaction endothermic or exothermic?**
9. What is the difference between endothermic and exothermic? Give a real life example of each.

## Enthalpies of Reaction

10. The value of  $\Delta H^\circ$  for the reaction below is -126 kJ. \_\_\_\_\_ kJ are released when 54.7 grams of NaOH is formed in the reaction?



11. The value of  $\Delta H^\circ$  for the reaction below is -482 kJ. How many grams of  $\text{CO}_2$  is produced during an enthalpy change of -5784 kJ?



## Calorimetry \*q = Cs x m x $\Delta T$

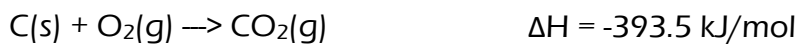
12. The temperature of a 15-g sample of lead metal increases from 22 °C to 37 °C upon the addition of 29.0 J of heat. The specific heat capacity of the lead is \_\_\_\_\_ J/g-K.

13. When a 5.08 g sample of solid ammonium nitrate dissolves in 50 g of water in a coffee-cup calorimeter, the temperature drops from 23.0°C to 18.9°C. Calculate  $\Delta H$  (in **kJ/mol  $\text{NH}_4\text{NO}_3$** ) for the solution. Assume that the specific heat of the solution is the same as that of pure water 4.18 J/g°C. Remember  $q_{\text{soln}} = -q_{\text{rxn}}$

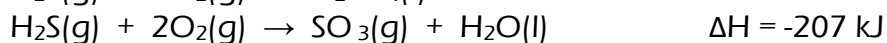
14. Approximately 6.45 grams of starch goes through combustion in a bomb calorimeter. If the temperature increased from 23.4°C to 26.6°C and the heat capacity of the calorimeter is 7.54 kJ/ °C, then determine the heat of combustion of starch,  $\text{C}_6\text{H}_{10}\text{O}_5$  in **kJ/mol AND kJ/gram**. Remember  $q = -C_{\text{cal}} \times \Delta T$

## Hess's Law

15.  $\Delta H$  for the reaction  $\text{CS}_2(\text{l}) + 3\text{O}_2(\text{g}) \rightarrow \text{CO}_2(\text{g}) + 2\text{SO}_2(\text{g})$  is \_\_\_\_\_ kJ, give the data below.



16. Find the  $\Delta H$  for the reaction  $\text{H}_2\text{SO}_4(\text{l}) \rightarrow \text{SO}_3(\text{g}) + \text{H}_2\text{O}(\text{g})$ , given the following reactions and subsequent  $\Delta H$  values:



## Enthalpies of Formation

17. When will values of  $\Delta H^\circ$  be zero?

18. Given the data in the table below,  $\Delta H^\circ_{\text{rxn}}$  for the reaction

$\text{C}_2\text{H}_5\text{OH}(\text{l}) + \text{O}_2(\text{g}) \rightarrow \text{CH}_3\text{CO}_2\text{H}(\text{l}) + \text{H}_2\text{O}(\text{l})$  is \_\_\_\_\_ kJ.

Substance	$\Delta H_f^\circ$ (kJ/mol)
$\text{C}_2\text{H}_4(\text{g})$	52.3
$\text{C}_2\text{H}_5\text{OH}(\text{l})$	-277.7
$\text{CH}_3\text{CO}_2\text{H}(\text{l})$	-484.5
$\text{H}_2\text{O}(\text{l})$	-285.8