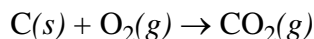
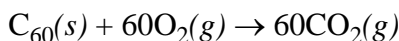


Chapter 7 Wrap-Up Problems

1. Carbon is found in several forms. Graphite and diamond are common forms that have been known for millennia; other forms, such as buckyballs, have been known for only decades. Combustion of graphite in the presence of oxygen, forms carbon dioxide

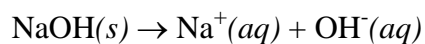


releasing 394 kJ of energy per mole of C atoms. Combustion of buckyballs, C_{60}



releases approximately 26100 kJ of energy is released per mole of C_{60} . Which of these two forms of carbon has the stronger average carbon-carbon bond? Assume that for graphite and buckyballs, the number of bonds per carbon atom is the same. Clearly explain your reasoning.

2. In an experiment to determine the enthalpy of dissolution for solid NaOH

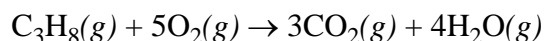


a student dissolves 2.0 g of solid NaOH in 100.0 mL of water in a calorimeter and observes a temperature increase. In a second experiment she uses 4.0 g of NaOH and 200.0 mL of water. Will the change in temperature in the second experiment be:

- (a) the same
- (b) approximately twice that of the first experiment
- (c) approximately four times that of the first experiment
- (d) approximately one-half of that for the first experiment
- (e) approximately one-fourth of that for the first experiment?

Explain your reasoning.

3. Propane, C_3H_8 , is a gas at room temperature. To transport propane over a long distance, however, it is stored in liquid form. In the spring of 1996 five tank cars containing propane derailed in Weyauwega, WI forcing evacuation of the town for over a week due to the risk of a potential explosion. Residents within a square mile of the accident site were unable to return to their homes for over two weeks. Assuming that each tank car had a capacity of 126,800 L, knowing that the density of liquid propane at its boiling point ($-44.5^\circ C$) is 0.5853 g/mL and assuming that the propane vaporized and warmed to $25^\circ C$, how many kJ of heat would have evolved if the propane in all five tanks reacted explosively with oxygen in the air according to the following reaction?



The standard state enthalpy of formation for $C_3H_8(g)$, which is not listed in Appendix B.16 of your textbook, is -104 kJ/mol.

The explosive decomposition of TNT ($C_7H_5N_3O_6$) has an enthalpy change of -1066.1 kJ per mole of TNT. How many kg of TNT are needed to provide an energy equivalent to that produced by the combustion of five tank cars of propane?