DATE: NAME: CLASS:

ANSWER KEY	Chapter 9 Test Answer Key	BLM 9.3.1A

Answers to Multiple-Choice Questions

1. d
2. b
3. b
4. a
5. b
6. c
7. d
8. d
9. b
10. b

Answers to Numerical Response Questions

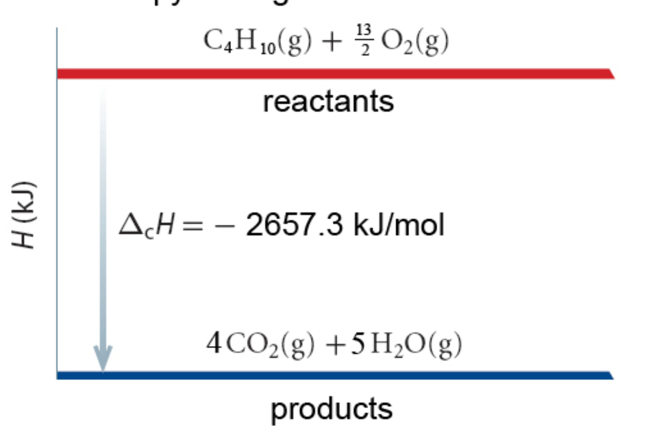
11.	11.1 J
12.	0.495 J/g °C
13.	18.7 kJ
14.	12.6 g
15.	4.45×10^2 kJ

Answers to Written Response Questions

16. a)

$$C_4H_{10}(g) + \frac{13}{2}O_2(g) \rightarrow 4CO_2(g) + 5H_2O(g) \quad \Delta H_c = -2657.3 \text{ kJ/mol}$$

Molar Enthalpy Change for Combustion of Butane



b) $Q = mc\Delta t$

$$= (250\,\cancel{g})\left(\frac{4.19\,\cancel{J}}{g\bullet\cancel{°C}}\right)(80\,\cancel{°C} - 10\,\cancel{°C})\left(\frac{1\text{ kJ}}{1000\,\cancel{J}}\right)$$

$$= 73\text{ kJ}$$

$$\Delta H = n\Delta Hc$$

$$n = \frac{\Delta H}{\Delta Hc}$$

$$= \frac{-73\,\cancel{kJ}}{-2657.3\,\cancel{kJ}/\text{mol } C_4H_{10}(g)}$$

$$= 0.028\text{ mol } C_4H_{10}(g)$$

$$n = \frac{m}{M}$$

$$m = nM$$

$$= (0.028\,\cancel{\text{mol } C_4H_{10}(g)})\left(\frac{58.14\text{ g } C_4H_{10}(g)}{\cancel{\text{mol } C4H10(g)}}\right)$$

$$= 1.6\text{ g } C_4H_{10}(g)$$

c) $$\text{x cups} = 35\,\cancel{\text{g } C_4H_{10}(g)} \times \frac{1\text{ cup}}{1.6\,\cancel{\text{g } C_4H_{10}(g)}}$$

$$= 21.8\text{ cups}$$

$$= 21\text{ cups (should round down)}$$

d) No, the calculation uses only theoretical values, which assumes that all of the energy that is stored in the butane is absorbed by the water as it burns. Some of the energy released during combustion will be lost to the surroundings, including the air surrounding the cup, the cup itself, and the curling iron. As well, the calculations assume complete combustion of the butane, which is not likely the case. We would expect that significantly less than 21 cups could be made from one butane canister.

17**.** Sources of experimental error: heat loss to the surrounding results in too small a temperature change in the water and calorimeter; failure to stir the water results in inaccurate temperature readings; evaporation of water results in incorrect mass of water used in the calculation; heat losses will result in a different temperature change for the water than for the calorimeter.

18. a) Specific heat capacity is the quantity of heat required to change the temperature of 1.0 g of a substance by 1 ^{o}C. Heat capacity is the amount of energy required to raise the temperature of the entire calorimeter by 1 ^{o}C.

b) The heat capacity takes into account that not all of the parts of the calorimeter lose or gain the same amount of heat. In addition, by using the heat capacity of the bomb calorimeter, the mass of the calorimeter does not have to be found.