Chapter 5	Thermochemistr	y Extra Credit	Name:	
1. Label the f	ollowing reactions/	processes as endothermic or	exothermic:	
(A) Ice melts	at 0 °C.		Exo	
(B) When an i	onic solid is added	to water, the temperature of	the water decreases.	
(C) Gasoline is	s burned in a car er	gine.	_	Ехо
(D) When HN	O_3 (aq) reacts with	NaOH (aq), the temperature o	of the resulting solution increases	
2. Carry out th	ne following conver	sions:		
<mark>(A)</mark> 145 J to ca	al 3	5.66 cal		
(B) 210 kcal tc	ſ			
(C) 95 Cal to k	:J 3	97480 J		

3. A system does 175 J of work and loses 45 J of heat. What is the change in internal energy of this system?

$\Delta E = -220 J$

4. How much heat, in joules and in calories, must be added to a 275.0 g iron block with a specific heat of 0.449 J/g °C to increase its temperature from 100. °C to its melting temperature of 1535 °C?

q = 177186.6 J or 177.2 kJ

5. How much would the temperature of 275 g of water increase if 36.5 kJ of heat were added?

ΔT = 31.72 °C

- 6. A piece of unknown substance weighs 44.7 g and requires 2110 J to increase its temperature from 23.2 °C to 89.6 °C.
 - (A) What is the specific heat of the substance?

$0.7109~J/g~^\circ C$

(B) If it is one of the substances found in the table of specific heats in Chapter 5, what is the identity of the substance?

 How many grams of water can be heated form 20.0 °C to 45.0 °C by the heat released from 215.0 g of Iron that cools from 95.0 °C to 25.0 °C? The specific heat of Iron is 0.45 J/g°C.

$64.75 \text{ g } H_2O$

8. How many milliliters of water at 23 °C with a density of 1.00 g/mL must be mixed with 180 mL (about 6 oz) of coffee at 95 °C so that the resulting combination will have a temperature of 60 °C? Assume that coffee and water have the same density and the same specific heat.

170mL

9. Dissolving 3.0 g of $CaCl_2(s)$ in 150.0 g of water in a calorimeter at 22.4 °C causes the temperature to rise to 25.8 °C. What is the approximate amount of heat involved in the dissolution, assuming the heat capacity of the resulting solution is 4.18 J/g °C? Is the reaction exothermic or endothermic?

q_{rxn} = -2.17 kJ Exothermic

10. When 1.0 g of fructose, $C_6H_{12}O_6(s)$, a sugar commonly found in fruits, is burned in oxygen in a bomb calorimeter, the temperature of the calorimeter increases by 1.58 °C. If the heat capacity of the calorimeter and its contents is 9.90 kJ/°C, what is q for this combustion? What is ΔH for the reaction in kJ/mole?

q_{rxn} = - 15.642 kJ Δ Hrxn = -2793.2 kJ/mol

11. Consider the reaction $N_2 + 3H_2 \rightarrow 2NH_3$ $\Delta H^0_{rxn} = -92 \text{ kJ}$ How many kilojoules are released when 50.0 g of NH₃ are formed?

- 132.3 kJ

12. Calculate ΔH° for the process Zn(s) + S(s) + 2O₂(g) \rightarrow ZnSO₄(s)

from the following information:

Zn(s)+S(s)→ZnS(s)	ΔH°=-206.0kJ
ZnS(s)+2O₂(g)→ZnSO₄(s)	∆H°=–776.8kJ

 ΔH = - 982.8 kJ

13. Calculate ΔH for the process Hg₂Cl₂(s) \rightarrow 2Hg(l)+Cl₂(g)

from the following information:

$Hg(I)+CI_2(g) \rightarrow HgCI_2(s)$	∆H=-224kJ
$Hg(I)+HgCl_2(s) \rightarrow Hg_2Cl_2(s)$	∆H=-41.2kJ

 ΔH = 265.2 kJ

14. Using the data in the appendix of text, calculate the standard enthalpy change for each of the following reactions:

(A) Si(s) + $2F_2(g) \rightarrow SiF_4(g)$

 ΔH = - 2065 kJ

(B) $2C(s) + 2H_2(g) + O_2(g) \rightarrow CH_3CO_2H(I)$

 ΔH = - 484.3 kJ

(C) $CH_4(g) + N_2(g) \longrightarrow HCN(g) + NH_3(g)$

 $\Delta H = 164.2 \text{ kJ}$

(D) $CS_2(g)$ + $3Cl_2(g) \rightarrow CCl_4(g)$ + $S_2Cl_2(g)$

 ΔH = - 232.3 kJ