

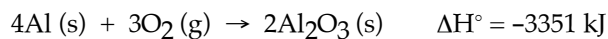
Name \_\_\_\_\_

**MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.**

- 1) A chemical reaction that absorbs heat from the surroundings is said to be \_\_\_\_\_ and has a \_\_\_\_\_  $\Delta H$  at constant pressure.

A) endothermic, positive  
B) endothermic, negative  
C) exothermic, negative  
D) exothermic, positive  
E) exothermic, neutral

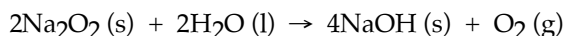
- 2) The reaction



is \_\_\_\_\_, and therefore heat is \_\_\_\_\_ by the reaction.

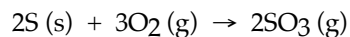
A) exothermic, released  
B) exothermic, absorbed  
C) endothermic, released  
D) endothermic, absorbed  
E) thermoneutral, neither released nor absorbed

- 3) The value of  $\Delta H^\circ$  for the reaction below is  $-126 \text{ kJ}$ . How much heat (in kJ) is released when  $2.00 \text{ mol}$  of  $\text{NaOH}$  is formed in the reaction?



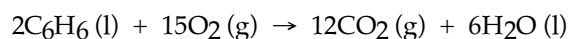
A) 252                      B)  $-126$                       C) 7.8                      D) 63                      E) 3.9

- 4) The value of  $\Delta H^\circ$  for the reaction below is  $-790 \text{ kJ}$ . The enthalpy change accompanying the reaction of  $0.95 \text{ g}$  of  $\text{S}$  is \_\_\_\_\_ kJ.



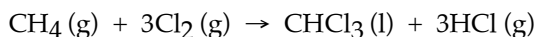
A)  $-23$                       B) 12                      C)  $-12$                       D) 23                      E)  $-790$

- 5) The value of  $\Delta H^\circ$  for the reaction below is  $-6535 \text{ kJ}$ . How many kJ of heat are released in the combustion of  $16.0 \text{ g}$  of  $\text{C}_6\text{H}_6\text{(l)}$ ?



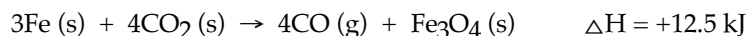
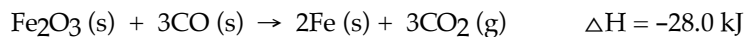
A) 673                      B)  $2.68 \times 10^3$                       C)  $5.23 \times 10^4$                       D)  $-6535$                       E)  $1.34 \times 10^3$

- 6) The value of  $\Delta H^\circ$  for the reaction below is  $-336$  kJ. Calculate the heat (kJ) released to the surroundings when 23.0 g of HCl is formed.

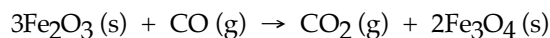


- A) 211                      B) 177                      C) 70.7                      D)  $-336$                       E)  $2.57 \times 10^3$
- 7) The specific heat capacity of lead is  $0.13$  J/g-K. How much heat (in J) is required to raise the temperature of 15 g of lead from  $22^\circ\text{C}$  to  $37^\circ\text{C}$ ?  
A) 29                      B)  $5.8 \times 10^{-4}$                       C)  $-0.13$                       D) 2.0                      E) 0.13
- 8) The specific heat of liquid bromine is  $0.226$  J/g-K. How much heat (J) is required to raise the temperature of 10.0 mL of bromine from  $25.00^\circ\text{C}$  to  $27.30^\circ\text{C}$ ? The density of liquid bromine:  $3.12$  g/mL.  
A) 16.2                      B) 10.4                      C) 32.4                      D) 5.20                      E) 300
- 9) The specific heat capacity of methane gas is  $2.20$  J/g-K. How many joules of heat are needed to raise the temperature of 5.00 g of methane from  $36.0^\circ\text{C}$  to  $75.0^\circ\text{C}$ ?  
A) 22.9                      B) 88.6                      C) 429                      D) 0.0113                      E) 1221
- 10) The  $\Delta H$  for the solution process when solid sodium hydroxide dissolves in water is  $-44.4$  kJ/mol. When a 13.9-g sample of NaOH dissolves in 250.0 g of water in a coffee-cup calorimeter, the temperature increases from  $23.0^\circ\text{C}$  to \_\_\_\_\_ $^\circ\text{C}$ . Assume that the solution has the same specific heat as liquid water, i.e.,  $4.18$  J/g-K.  
A)  $14.0^\circ\text{C}$                       B)  $37.8^\circ\text{C}$                       C)  $40.2^\circ\text{C}$                       D)  $37.0^\circ\text{C}$                       E)  $35.2^\circ\text{C}$

- 11) Given the following reactions



the enthalpy of the reaction of  $\text{Fe}_2\text{O}_3$  with CO



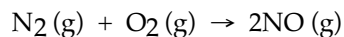
is \_\_\_\_\_ kJ.

- A) 40.5                      B) +109                      C)  $-15.5$                       D)  $-109$                       E)  $-59.0$

12) Given the following reactions



the enthalpy of the reaction of the nitrogen to produce nitric oxide



is \_\_\_\_\_ kJ.

A) -47.8

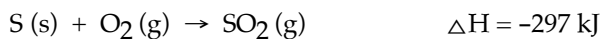
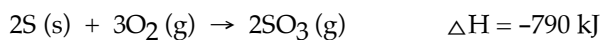
B) 47.8

C) 180.6

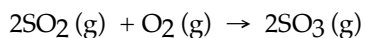
D) -180.6

E) 90.3

13) Calculate  $\Delta H^\circ$  (in kJ) for reaction 3.



the enthalpy of the reaction in which sulfur dioxide is oxidized to sulfur trioxide



is \_\_\_\_\_ kJ.

A) -196

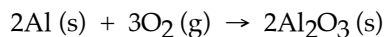
B) -543

C) 1087

D) 196

E) -1384

14) The value of  $\Delta H^\circ$  for the following reaction is -3351 kJ:



The value of  $\Delta H_f^\circ$  for  $\text{Al}_2\text{O}_3(\text{s})$  is \_\_\_\_\_ kJ.

A) -3351

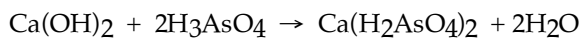
B) -1676

C) +3351

D) -16.43

E) -32.86

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



is \_\_\_\_\_ kJ.

Substance	$\Delta H_f^\circ$ (kJ/mol)
$\text{Ca}(\text{OH})_2$	-986.6
$\text{H}_3\text{AsO}_4$	-900.4
$\text{Ca}(\text{H}_2\text{AsO}_4)_2$	-2346.0
$\text{H}_2\text{O}$	-285.9

A) -4219

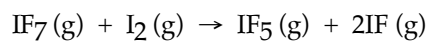
B) -130.4

C) -4519

D) -76.4

E) -744.9

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



is \_\_\_\_\_ kJ.

Substance	$\Delta H_f^\circ$ (kJ/mol)
IF (g)	-95
IF <sub>5</sub> (g)	-840
IF <sub>7</sub> (g)	-941

- A) 311 kJ
- B) 69 kJ
- C) -1991 kJ
- D) -69 kJ
- E) The  $\Delta H_f^\circ$  of  $\text{I}_2(\text{g})$  is needed for the calculation.

## Answer Key

Testname: CH\_06\_PRAC\_TEST.TST

**MULTIPLE CHOICE.** Choose the one alternative that best completes the statement or answers the question.

- 1) A  
ID: chem9b 5.1-32
- 2) A  
ID: chem9b 5.1-33
- 3) D  
ID: chem9b 5.1-35
- 4) C  
ID: chem9b 5.1-37
- 5) A  
ID: chem9b 5.1-38
- 6) C  
ID: chem9b 5.1-40
- 7) A  
ID: chem9b 5.1-54
- 8) A  
ID: chem9b 5.1-57
- 9) C  
ID: chem9b 5.2-5
- 10) D  
ID: chem9b 5.1-58
- 11) E  
ID: chem9b 5.1-63
- 12) C  
ID: chem9b 5.1-64
- 13) A  
ID: chem9b 5.1-66
- 14) B  
ID: chem9b 5.1-74
- 15) B  
ID: chem9b 5.1-81
- 16) E  
ID: chem9b 5.1-83

3

$$2.00 \text{ mol NaOH} \times \frac{-126 \text{ kJ}}{4 \text{ mol NaOH}} = -63 \text{ kJ}$$

$\Delta H = -63.0 \text{ kJ}$  63 kJ released (D)

$$0.95 \text{ g S} \times \frac{1 \text{ mol S}}{32.06 \text{ g S}} \times \frac{-790 \text{ kJ}}{2 \text{ mol S}} = -12 \text{ kJ}$$

$\Delta H = -12 \text{ kJ}$  (C)

$$16.0 \text{ g C}_6\text{H}_6 \times \frac{1 \text{ mol C}_6\text{H}_6}{78.12 \text{ g C}_6\text{H}_6} \times \frac{-6535 \text{ kJ}}{2 \text{ mol C}_6\text{H}_6} = -669 \text{ kJ}$$

$\Delta H = -669 \text{ kJ}$   
669 kJ are released (A)

$\frac{12.01 \times 6 = 72.06}{1.01 \times 6 = 6.06} = \frac{78.12 \text{ g/mol}}$

$$23.0 \text{ g HCl} \times \frac{1 \text{ mol HCl}}{36.46 \text{ g HCl}} \times \frac{-336 \text{ kJ}}{3 \text{ mol HCl}} = -70.7 \text{ kJ}$$

$\Delta H = -70.7 \text{ kJ}$   
70.7 kJ are released (C)

$\frac{35.45}{1.01} = 36.46 \text{ g/mol}$

7  $q = MC\Delta T$

$$= (15 \text{ g}) \left( \frac{0.13 \text{ J}}{\text{g}^\circ\text{K}} \right) (15 \text{ K})$$

$37 - 22 = 15^\circ\text{C}$   
 $310 \text{ K} - 295 \text{ K} = 15 \text{ K}$

$= 29 \text{ J}$  (A)

8  $q = MC\Delta T = (31.2 \text{ g}) \left( \frac{0.226 \text{ J}}{\text{g}^\circ\text{K}} \right) (2.30 \text{ K})$

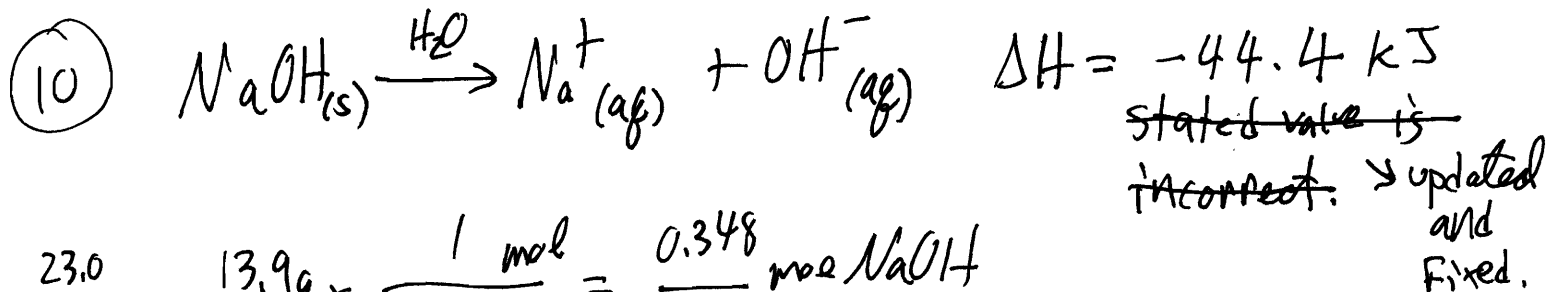
$m = 10.0 \text{ mL} \times \frac{3.12 \text{ g}}{\text{mL}} = 31.2 \text{ g}$

$= 16.2 \text{ J}$  (A)

$\frac{27.30}{-25.00} = 2.30^\circ\text{C}$

9  $q = MC\Delta T$   
 $= (5.00g) \left( \frac{2.20 J}{gK} \right) (39.0K)$   
 $= 429 J$  (C)

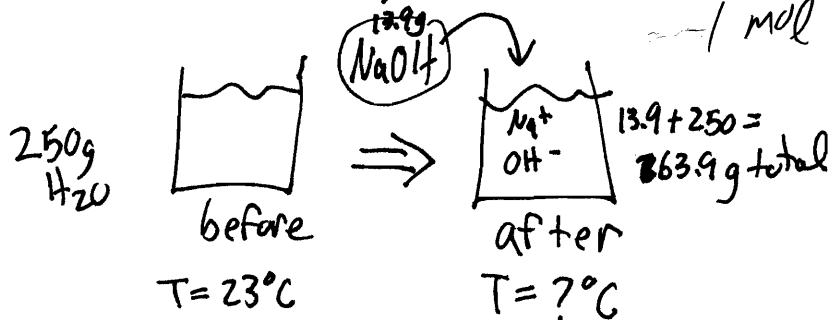
$$\begin{array}{r} 75.0 \\ -36.0 \\ \hline 39.0^\circ C \quad 39.0K \end{array}$$



$$13.9g \times \frac{1 \text{ mol}}{40.0g} = 0.348 \text{ mol NaOH}$$

$$\begin{array}{r} 23.0 \\ 16.0 \\ 1.0 \\ \hline 40g/mol \end{array}$$

$$0.348 \text{ mol NaOH} \times \frac{-44.4 kJ}{1 \text{ mol}} = -15.5 kJ$$



$\Delta H$  for NaOH dissolving = -15.5 kJ  
 thus  $\Delta H$  for water = +15.5 kJ

water's C  $\approx$  solution's C

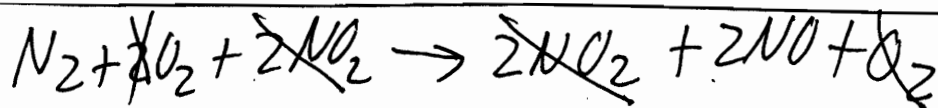
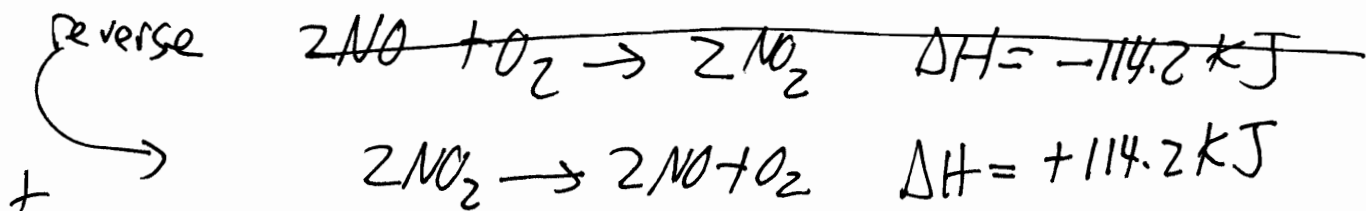
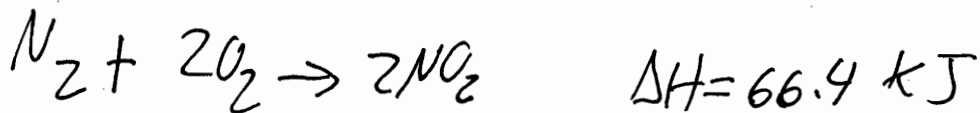
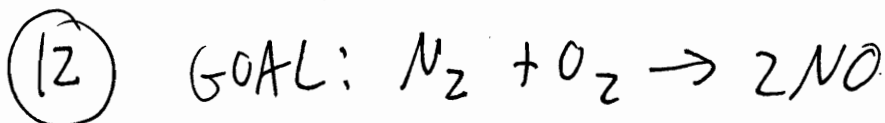
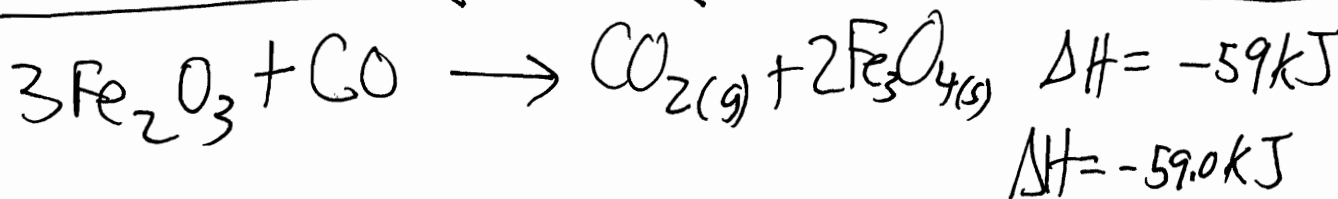
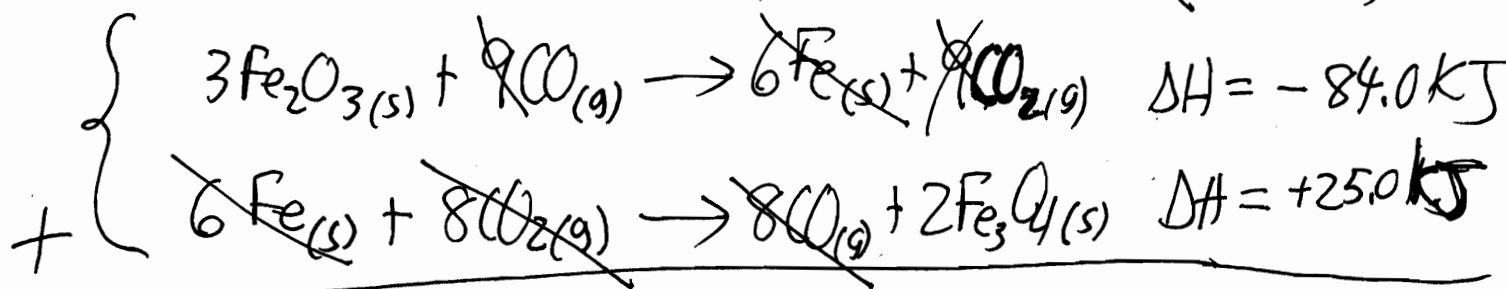
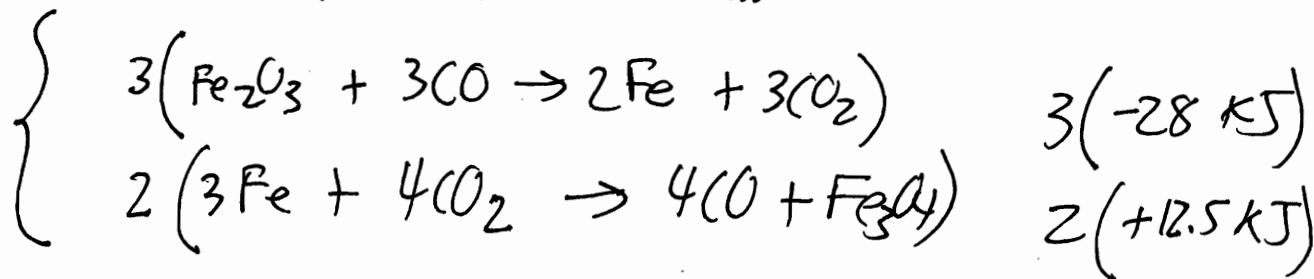
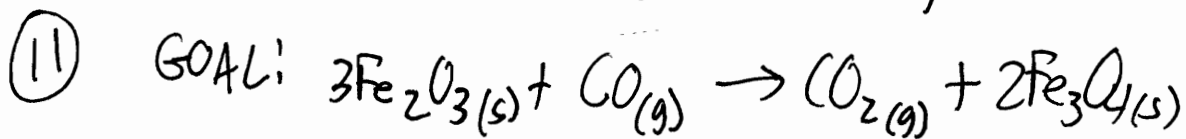
$$q = MC\Delta T$$

$$15500 J = (13.9g + 250.0g) \left( 4.18 \frac{J}{gK} \right) (\Delta T)$$

$$\frac{15500 J}{(263.9g) \left( 4.18 \frac{J}{gK} \right)} = 14.0K = \Delta T = T_f - T_i$$

$$23.0^\circ C + 14.0^\circ C = 37.0^\circ C$$

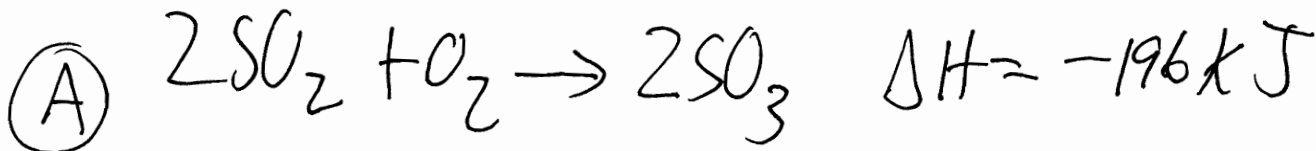
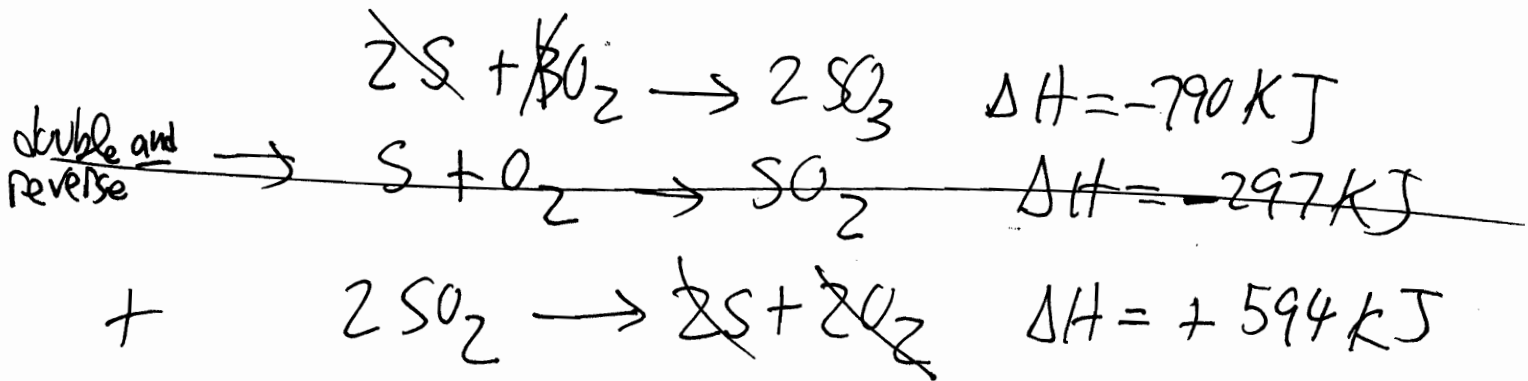
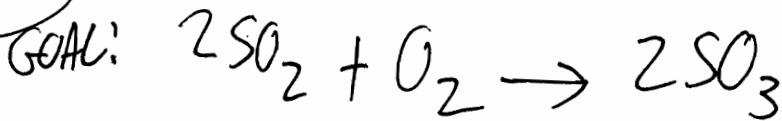
$$T_i + \Delta T = T_f$$



C



13



14

Because this reaction shows the formation of  $\text{Al}_2\text{O}_3$  from its elements, the  $\Delta H^\circ$  for the formation of only one mole would be  $\frac{1}{2}$  of the given  $\Delta H^\circ$ .

$$1 \text{ mol Al}_2\text{O}_3 \times \frac{-3351 \text{ kJ}}{2 \text{ mol Al}_2\text{O}_3} = \underline{-1676 \text{ kJ}} \quad \text{(B)}$$

15

$$\begin{aligned} \Delta H_{\text{rxn}}^\circ &= [(1)(-2346) + (2)(-285.9)] - [(-986.6) + (2)(-900.4)] \\ &= [-2346 + -571.8] - [(-986.6) + (-1800.8)] \\ &= -2917.8 - -2787.4 \\ &= \underline{-130.4 \text{ kJ}} \quad \text{(B)} \end{aligned}$$

16 E, because

$I_2$  is a solid in its standard state  
(I would have told you, " $I_2$  is a solid at  
 $25^\circ C$  and  $1 \text{ atm}$ " if I were to have put  
this on a test.)