

Assignment #2 - Answers

①



2) $q = mc\Delta T$ assume $q = 1$ for all

$\therefore \Delta T = \frac{1}{c}$

$\frac{1}{c_{\text{water}}} = \frac{1}{4.18}$
 $= 0.239$

$\frac{1}{c_{\text{methanol}}} = \frac{1}{2.918}$
 $= 0.343$

$\frac{1}{c_{Al}} = \frac{1}{0.900}$
 $= 1.11$

aluminum

3) $q = mc\Delta T$
 $= (4.5 \times 10^4)(3.340)(20)$
 $= \underline{3.0 \times 10^6 \text{ kJ}}$

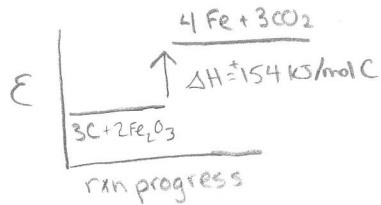
$m = 4.5 \times 10^7 \text{ g} = 4.5 \times 10^4 \text{ kg}$

$\Delta T = 38 - 18 = 20^\circ\text{C} = 20 \text{ K}$



$\Delta H = +462 \text{ kJ}$

$\Delta H = +154 \text{ kJ/mol C}$



$\Delta H_f^\circ = -925 \text{ kJ}$



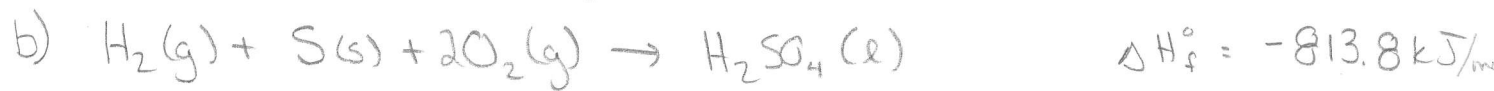
$\Delta H_{\text{comb}}^\circ = -2018 \text{ kJ}$



$\Delta H_{\text{decomp}}^\circ = +240 \text{ kJ}$

6) $m_{Ca} = 40.1$
 $n_{Ca} = 12$ $\therefore n = \frac{12}{40.1} = 0.299 \text{ mol}$

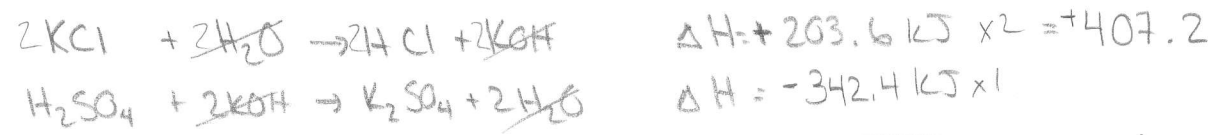
$\Delta H = n \Delta H^\circ$
 $= (0.299)(-636)$ (heat)
 $= -190 \text{ kJ} = 190 \text{ kJ}$



8) a) $2 \times (-267.0) = -534 \text{ kJ}$

b) $2 \times (+46.0) = 92 \text{ kJ}$

9)



10)



$2(-46.0) + (-394.0)$ $(-333.5) + (-286.0)$
 -486 -619.5

$\Delta H^\circ = \sum_p - \sum_r = (-619.5) - (-486) = -133.5 \text{ kJ/mol}$



$(-3824) + (9(0))$ $6(-394.0) + 6(-286.0)$
 -3824 -4080

$\Delta H^\circ = \sum_p - \sum_r = -4080 - (-3824) = -256 \text{ kJ/mol}$

13) $m = 3.0 \text{ g}$
 $mm_{N_2H_4} = 32 \text{ g/mol}$ $\rightarrow n = \frac{3.0}{32} = 0.09375 \text{ mol}$ $3.9 \text{ L} = 3900 \text{ g}$

$$n \Delta H_{\text{comb}} = mc \Delta T$$

$$(0.09375) \Delta H_{\text{comb}} = (3900)(4.18)(3.5)$$

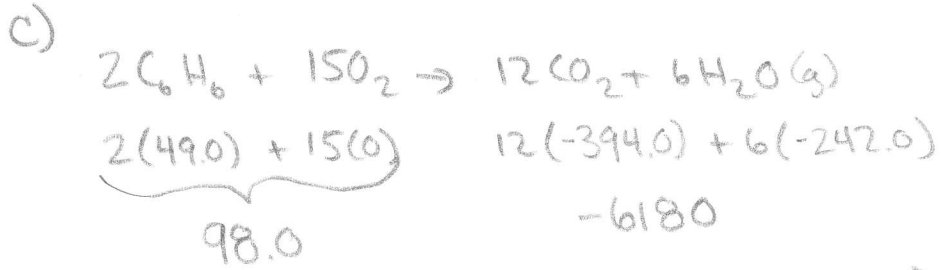
$$\Delta H_{\text{comb}} = 608608 \text{ J} = -609 \text{ kJ (exothermic)}$$



b) $m = 2.1 \text{ g}$
 $mm = 78 \text{ g/mol}$ $\rightarrow n = \frac{m}{mm} = \frac{2.1}{78} = 0.0269 \text{ mol}$

$$(0.0269) \Delta H_{\text{comb}} = 3800 (4.18)(5.2)$$

$$\Delta H_{\text{comb}} = 3070513 \text{ J} = -3071 \text{ kJ}$$



$$\Delta H = \sum P - \sum R = (-6180) - (98.0) = -6278 \text{ kJ}$$

$$\div 2$$

$$= -3139 \text{ kJ/mol}$$

C_6H_6

d) $100 - \left(\frac{3071}{3139} \times 100\% \right) = 2.2\%$

- 15) #3) a) + b) - c) +
 #10) a) - b) - c) +

- 16) various
 17) various
 18) various