

551534 – Chemistry
Group 02 Pretest 4.2 answers

Answers

1 D

3 B

4 C

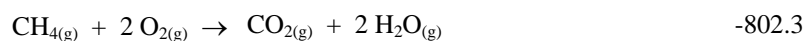
5 B

6 A

7 A

8 A

9 Work : (example)

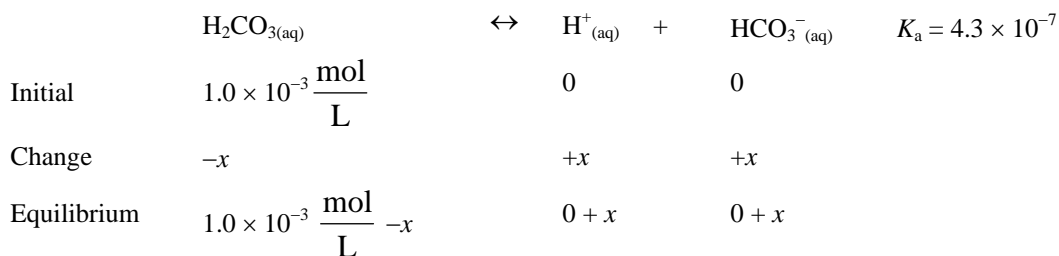


Result : -802.3 kJ

10 Example of an appropriate procedureFind the concentration of the H_2CO_3

$$\text{Moles of } \text{H}_2\text{CO}_3 = \frac{3.1 \times 10^{-2} \text{ g}}{62 \frac{\text{g}}{\text{mol}}} = 5.0 \times 10^{-4} \text{ mol}$$

$$\text{Molarity} = \frac{5.0 \times 10^{-4} \text{ mol}}{0.500 \text{ L}} = 1.0 \times 10^{-3} \frac{\text{mol}}{\text{L}}$$

Find the concentration of the $\text{H}^+_{(\text{aq})}$ 

$$K_a = \frac{[\text{H}^+_{(\text{aq})}][\text{HCO}_3^-_{(\text{aq})}]}{[\text{H}_2\text{CO}_{3(\text{aq})}]}$$

$$4.3 \times 10^{-7} = \frac{(x)(x)}{1.0 \times 10^{-3} \frac{\text{mol}}{\text{L}} - x} = \frac{x^2}{1.0 \times 10^{-3} \frac{\text{mol}}{\text{L}}}$$

(note : assume x is negligible when subtracted from $1.0 \times 10^{-3} \frac{\text{mol}}{\text{L}}$)

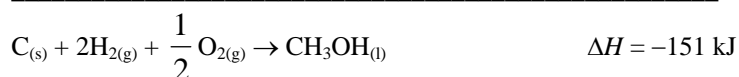
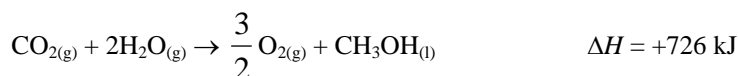
$$4.3 \times 10^{-10} = x^2$$

$$2.1 \times 10^{-5} \frac{\text{mol}}{\text{L}} = x = [\text{H}^+_{(\text{aq})}]$$

$$\text{pH} = -\log[\text{H}^+_{(\text{aq})}] = -\log(2.1 \times 10^{-5}) = 4.68$$

Answer : The pH of this solution is 4.68.**11 Example of an appropriate procedure**

Application of Hess' law

**Answer**The molar heat of formation of methanol is -151 kJ/mol .

Work is complete and the result is correct. Example :

- ◆ From the experimental results, the molar heat of reaction 1 and 2 must be determined.

REACTION 1 :

- Heat absorbed by the water from the reaction of 4 g of calcium.

$$Q_{(\text{water})} = m_{(\text{water})} \cdot c_{(\text{water})} \cdot \Delta T_{(\text{water})}$$

$$Q_{(\text{water})} = 1.000 \text{ kg} \cdot 4.19 \text{ kJ/kg} \cdot ^\circ\text{C} \times 10.3^\circ\text{C}$$

$$Q_{(\text{water})} = 43.2 \text{ kJ}$$

- Heat for one mole of calcium

$$43.2 \text{ kJ}/4.0 \text{ g} \times 40 \text{ g/mol} = 432 \text{ kJ/mol}$$

REACTION 2 :

- Heat absorbed by the water from the reaction of 5.6 g calcium oxide

$$Q_{(\text{water})} = m_{(\text{water})} \cdot c_{(\text{water})} \cdot \Delta T_{(\text{water})}$$

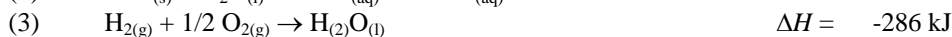
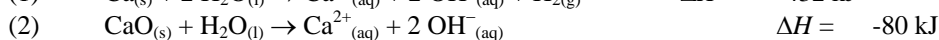
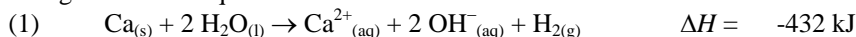
$$Q_{(\text{water})} = 1000 \text{ kg} \cdot 4.19 \text{ kJ/kg} \cdot ^\circ\text{C} \cdot 1.9^\circ\text{C}$$

$$Q_{(\text{water})} = 8.0 \text{ kJ}$$

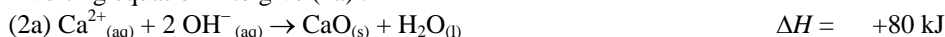
- Heat for one mole of calcium oxide

$$8.0 \text{ kJ}/5.6 \text{ g} \times 56 \text{ g/mol} = 80 \text{ kJ/mol}$$

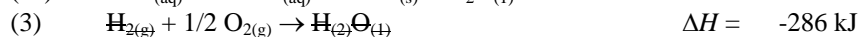
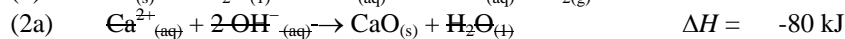
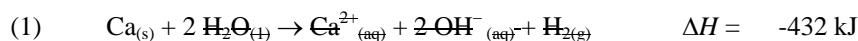
- Using these three equations the molar heat of combustion of calcium can be calculated :



Inverting equation 2 to give (2a) :



Addition of equations 1, 2a and 3 gives the equation for the combustion of calcium :



Other complete work to give the correct answer.

