

Names _____

School _____

Team # _____

Score: _____ / 110

Chemistry Lab Test

created by kenniky

Part I. Thermodynamics [60 pt]

1. What are the four laws of thermodynamics? (6 pt)

(0)

(1)

(2)

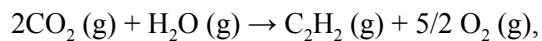
(3)

2. A spherical balloon 30.0 cm in diameter is expanded until its diameter is 40.0 cm. If the pressure on the balloon is 1.00 atm, how much work was done on the balloon? (5 pt)

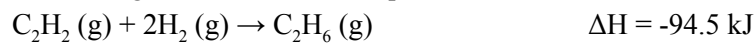
3. What is ΔH for the system in question 2 if ΔE is +4.00 J? (1 atm cm³ = 0.1 J) (3 pt)

4. From questions 2 and 3, is the system endothermic or exothermic? (1 pt)

5. Find ΔH° for the reaction



given the following reactions and subsequent ΔH° values:



6. For a particular reaction, $\Delta H = +145 \text{ kJ}$. If the temperature is 273 K , for what values of ΔS is the reaction spontaneous? (3 pt)

7. A 10.00 mL container of water is at $10.0 \text{ }^\circ\text{C}$. A 2.23 g piece of zinc at $121 \text{ }^\circ\text{C}$ is dropped into the container. What is the final temperature of the system? ($c_{\text{Zn}} = 0.384 \text{ J/g }^\circ\text{C}$) (5 pt)

8. After the temperature of the system in question 7 has settled, the zinc is removed and heated to $98.6 \text{ }^\circ\text{C}$ along with a 0.441 g piece of titanium. Both metals are then released back into the water simultaneously. What is the final temperature of this new system? ($c_{\text{Ti}} = 0.523 \text{ J/g }^\circ\text{C}$) (8 pt)

9. At 273 K , the reaction



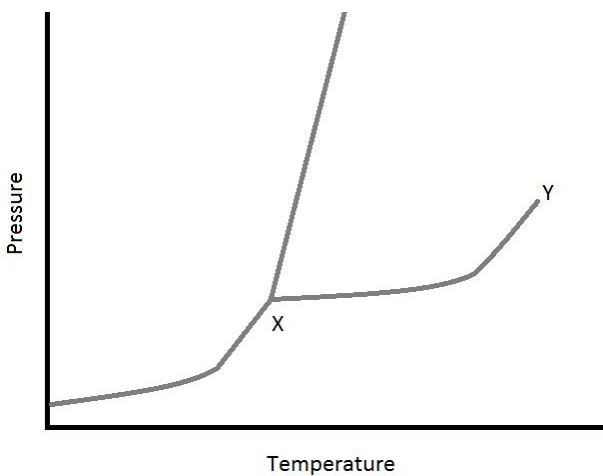
has an equilibrium constant of 375 . What is ΔG° for the reaction? (4 pt)

10. At 298 K , the equilibrium constant of the reaction in question 9 is 525 . What are ΔH° and ΔS° for the reaction? (6 pt)

11. The reaction in question 9 is in equilibrium when half the amount of existing B is removed from the system. If the temperature is 400.0 K, what is ΔG ? (7 pt)

12. You have a 1.00 mol sample of water at $-30.0\text{ }^\circ\text{C}$ and you heat it until you have gaseous water at $140.0\text{ }^\circ\text{C}$. Calculate q for the entire process. Use the following data:

c_{ice}	$2.03\text{ J/g }^\circ\text{C}$	
c_{water}	$4.18\text{ J/g }^\circ\text{C}$	
c_{steam}	$2.02\text{ J/g }^\circ\text{C}$	
$\text{H}_2\text{O (s)} \rightarrow \text{H}_2\text{O (l)}$	$\Delta H_{\text{fusion}} = 6.02\text{ kJ/mol}$	
$\text{H}_2\text{O (l)} \rightarrow \text{H}_2\text{O (g)}$	$\Delta H_{\text{vaporization}} = 40.7\text{ kJ/mol}$	(5 pt)



13. Above is my expertly drawn phase diagram. Label the three regions with the appropriate phase (solid, liquid, or gas), and below name and define the points X and Y. (5 pt)

X:

Y:

Part II. Physical Properties [50 pt]

1. At what temperature is water the most dense? (2 pt)
2. Which two elements are liquid at room temperature? (2 pt)
3. Graphite and diamond are both made of pure carbon; however, graphite is very soft while diamond is one of the hardest substances known. Explain. (4 pt)
4. Explain the difference between an intensive and an extensive property, and give an example of each. (3 pt)
5. Why is salt soluble in water, but sugar not? (4 pt)

