AP Chem Heat Review

	MP (°C)	BP (°C)	Cp_s (J/g°C)	Cp_l (J/g°C)	Cp_g (J/g°C)	H_{fus} (J/g)	H_{vap} (J/g)
H_2O	0	100	2.06	4.18	2.02	334	2260
Q	-40	80	1.0	1.2	0.9	250	1400

1. Define the following terms
   a. Isolated system
   b. Open system
   c. Closed system
   d. Lattice energy
   e. Heat of hydration
   f. Heat of fusion
   g. Heat of formation

2. What is the first law of thermodynamics?

3. What is the proper way to mix acid and water? Why?

4. Given the following data:
   $2O_{3(g)} \dashrightarrow 3O_{2(g)}$ $\Delta H^\circ = -327$ kJ
   $O_{2(g)} \dashrightarrow 2O_{(g)}$ $\Delta H^\circ = +195$ kJ
   $NO_{(g)} + O_{3(g)} \dashrightarrow NO_{2(g)} + O_{2(g)}$ $\Delta H^\circ = -199$ kJ
   Calculate ΔH° for the reaction $NO_{(g)} + O_{(g)} \dashrightarrow NO_{2(g)}$

5. Find the energy needed to warm 17 g of water from 10 °C to 150°C.

6. Find the energy needed to warm 30 g of Q from -50 °C to 50°C.

7. If 70 g of Q is at 79°C when it is dropped into 50 g of water at 10°C, find the final temperature.

8. 80 g of X at -10°C is added to 60 g of water at 50°C. The final temp is 41°C. Find the specific heat of X.

9. It took 200 kJ to vaporize 150 g of Substance Z at its boiling point. Find the heat of vaporization of Z.

10. A student tried to find the heat of fusion of ice in a lab. He added 10 g of ice at 0°C to 50 g of water at 30°C. The final temperature was 8°C. Find his value for the heat of fusion and his percent error.

11. If 8 g of C_2H_6 burn, how much heat is released?

12. $H_2SO_4 + 2NaOH \rightarrow 2H_2O_{(l)} + Na_2SO_4$
    If 4 g NaOH are used and the heat produced is used to warm 100 g of water, find the change in temperature of the water.

13. Write the formation equation and show ΔH_f for
    a. Carbon dioxide
    b. Sodium hydroxide

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14. Find the heat released when 10 g of CO_2 is formed.

15. Find the heat absorbed or released when 10 g of NaOH dissociates.

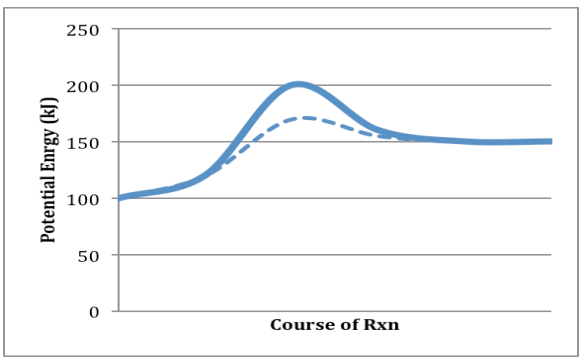
16. If 10 g of ammonium nitrate dissolved in 50 g of water at 40° C, find the final temperature of the water.

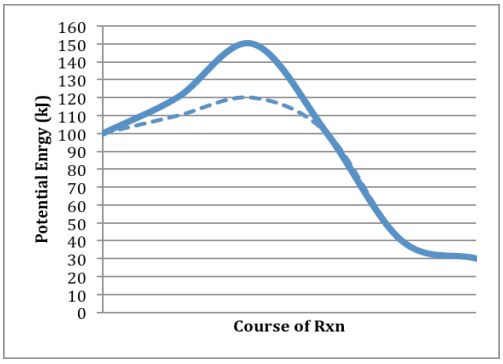
17. If 200 kJ of heat is released when MgO is formed, what mass of MgO forms?

18. 4 g of magnesium chloride are dissolved in 90 g of water at 20°C. Find the final temperature of the water.

19. $2C_3H_6 + 9O_2 \rightarrow 6CO_2 + 6H_2O_{(g)}$ $\Delta H_{rxn} = -2785\ kJ/mol_{rxn}$
Find ΔH_f for C_3H_6.

20. For each curve, find
    i. ΔH_{rxn}
    ii. ΔH_{rxn} reverse
    iii. Activation energy
    iv. Activation energy of the reverse rxn
    v. Catalyzed activation energy
    vi. Catalyzed activation energy of the reverse rxn





21. The heat produced from the burning of methane (CH_4) is used to take 2000 g of water from 10°C to 95°C. What mass of methane is burned?

22. 5 g of octane, C_8H_{18}, are burned and the energy released melts 3000 g of ice. Find
    a. The molar heat of combustion of octane
    b. ΔH_f for octane

23. Know how to read phase diagrams