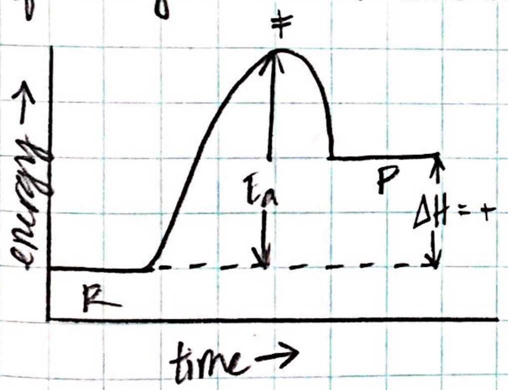
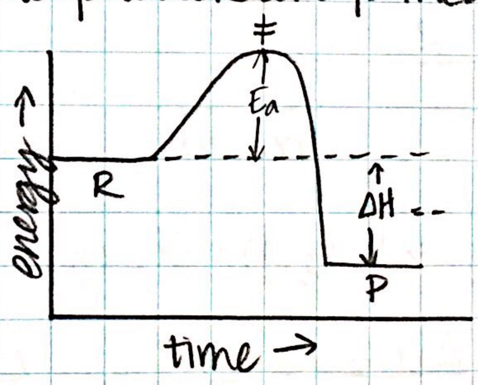
Chunk #4 Cont

14. $Q_1 = 40g \times 334 \frac{J}{g} = 13360\ J$
$Q_2 = 40g \times 4.18 \frac{J}{g \cdot °C} \times 100°C = 16720\ J$
$Q_3 = 40g \times 2260 \frac{J}{g} = 90400\ J$
$Q_4 = 40g \times 1.87 \frac{J}{g \cdot °C} \times 30°C = 2244\ J$
$Q = 122724\ J$

15. $Q_1 = 3g \times 2.09 \frac{J}{g \cdot °C} \times 15°C = 94.05\ J$
$Q_2 = 3g \times 334 \frac{J}{g} = 1002\ J$
$Q_3 = 3g \times 4.18 \frac{J}{g \cdot °C} \times 100°C = 1254\ J$
$Q_4 = 3g \times 2260 \frac{J}{g} = 6780\ J$
$Q_5 = 3g \times 1.87 \frac{J}{g \cdot °C} \times 50°C = 280.5\ J$
$Q = 9410.55\ J$

16. Thermo involves the study of reaction heat and the direction that the heat moves with regards to systems and surroundings. The energy in these reactions are studied to determine whether or not the reaction will take place. Kinetics studies the speed of the reaction and how quickly reactants are used while products are formed.

17. 

18. 

19. Factors that can speed up / slow down rxn:
- Temperature
- Concentration
- Surface Area
- Catalyst

20. $\frac{10g\ Na_2S}{200\ mL\ soln} \times \frac{1\ mol\ Na_2S}{78.05g\ Na_2S} \times \frac{1000\ mL}{1\ L} =$ **$0.641\ M\ Na_2S$**

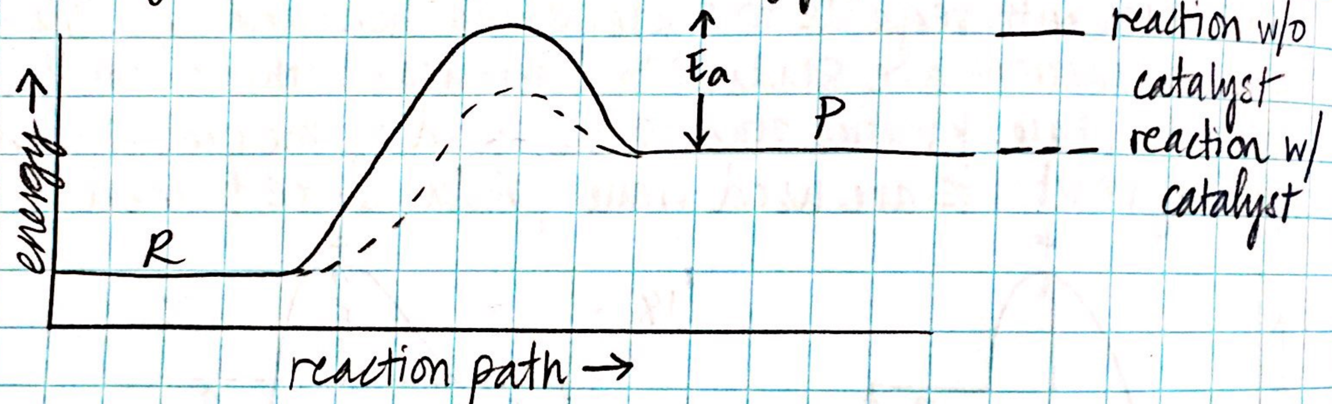
21. $\frac{30g\ K_2SO_4}{100mL\ soln} \times \frac{1\ mol\ K_2SO_4}{174.27\ g\ K_2SO_4} \times \frac{1000\ mL}{1\ L} =$ **$1.72\ M\ K_2SO_4$**

22. $390\ mL \times \frac{1\ L}{1000\ mL} \times \frac{0.587\ mol\ CaCl_2}{1\ L} \times \frac{110.98\ g\ CaCl_2}{1\ mol\ CaCl_2} =$ **$25.407\ g\ CaCl_2$**

23. Collision theory states that reactants must collide in order to react and must have "effective collisions." This means that the particles must be moving fast enough and have correct orientation.

24. When you change Temp and [conc], the particles change in speed and in the number of possible effective collisions. ↑ temp and ↑ [conc] will cause rates to also ↑, while ↓ temp and ↓ [conc] will cause rates to ↓.

25. Catalysts are chemicals added to a rxn that do not get used up during the rxn. They help orient molecules to reach transition state faster, so you don't need as much energy.



26. $PCl_5(g) \rightarrow PCl_3(g) + Cl_2(g)$

$$Rate = -\frac{\Delta[PCl_5]}{\Delta t} = \frac{\Delta[PCl_3]}{\Delta t} = \frac{\Delta[Cl_2]}{\Delta t}$$

$2HI(g) \rightarrow H_2(g) + I_2(g)$

$$Rate = -\frac{\Delta[HI]}{2\Delta t} = \frac{\Delta[H_2]}{\Delta t} = \frac{\Delta[I_2]}{\Delta t}$$

$2NO(g) + H_2(g) \rightarrow N_2O(g) + H_2O(g)$

$$Rate = -\frac{\Delta[NO]}{2\Delta t} = -\frac{\Delta[H_2]}{\Delta t} = \frac{\Delta[N_2O]}{\Delta t} = \frac{\Delta[H_2O]}{\Delta t}$$

27. $P_4(s) + 5O_2(g) \rightarrow P_4O_{10}(s)$ Rate $= -\frac{\Delta[P_4]}{\Delta t} = -\frac{\Delta[O_2]}{5\Delta t} = \frac{\Delta[P_4O_{10}]}{\Delta t}$

$$\text{Rate} = -\frac{\Delta[O_2]}{\Delta t} = -\frac{(0.000\ M - 0.400\ M)}{(20 s)} = \boxed{0.02\ M/s}$$

28. $H_2(g) + Cl_2(g) \rightarrow 2HCl(g)$ Rate $= -\frac{\Delta[H_2]}{\Delta t} = -\frac{\Delta[Cl_2]}{\Delta t} = \frac{\Delta[HCl]}{2\Delta t}$

$$\text{Rate} = \frac{\Delta[HCl]}{\Delta t} = \frac{(1.500\ M - 0.000\ M)}{(5.42\ s)} = \boxed{0.277\ M/s}$$

Chunk # 5

1. Equilibrium is the state at which the rate of the forward reaction and the rate of the backwards reaction are equal.

2. Rates are equal at equilibrium, but not necessarily concentrations.

3. Factors that can shift an equilibrium:
   - Temperature
   - Concentration (of gases and solutions)
   - Pressure (of gases and solutione)

   } excludes solids and liquids!

4. ←

5. ←

6. increases

7. decreases

8. no change

9. decreases

10. increases

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