Date         Class #         Comb.         Proble           Nov         11         19 √         Concepts, Candle, Fireplace, Premixed, Diffusion         1         June           13         20 √         Enthalpies         2         #11           18         #1         Stoichiometry, Equilibrium Constants         3         #2,#           Adiabatic Flame Temperature, Multi-Component         4         #4           20         22         Equilibrium, NASA-Lewis Code         4         #4           27         Enthalpies         1         1         #14         #14           28         Thanksgiving         -         -         -         #14           29         Thanksgiving         -         5         #5         #5           24         26         NOx Mechanisms, Soot         6         #6         #6         #6         #6         #6         #6         #3	Outline						
Date         Class #         Lecture         Due           Nov         11         19 V         Concepts, Candle, Fireplace, Premixed, Diffusion         1         1           13         20 √         Enthalpies         2         #11           18         #14         Stoichiometry, Equilibrium Constants         3         #2,#           20         22         Equilibrium, NASA-Lewis Code         4         #44           27         Equilibrium, NASA-Lewis Code         4         #44           28         Thanksgiving         5         #55           29         E         Heterogeneous Combustion         5         #56           4         26         NOx Mechanisms, Soot         6         #66           9         27         Filame Speeds, Turbulence, Explosions         7         #77           11         28         Review         8         #88					Comb.	Problem	
Nov     11     19     Concepts, Candle, Freplace, Premixed, Diffusion     1       Heats of Formation, Heats of Reaction, Heat Capacities,     1     4       13     20     Enthalpies     2     #11       18     Stoichiometry, Equilibrium Constants     3     #2,#       Adiabatic Flame Temperature, Multi-Component     4     #4       27     BYU Friday, NO Class     4       28     Thanksgiving     5       Dec     2     25     Heterogeneous Combustion     5       4     26     NO <sub>X</sub> Mechanisms, Soot     6     #6       9     27     Fiame Speeds, Turbulence, Explosions     7     #7       11     28     Review     8     #8		Date	Class #		Lecture	Due	
Heats of Formation, Heats of Reaction, Heat Capacities,       #         13       20 V       Enthalpies       2       #1         18       #       Stoichiometry, Equilibrium Constants       3       #2,#         20       22       Equilibrium, NASA-Lewis Code       4       #4         27       BYU Friday, NO Class       7       #7         Dec       2       25       Heterogeneous Combustion       5       #5         4       26       NO <sub>X</sub> Mechanisms, Soot       66       #6         9       27       Flame Speeds, Turbulence, Explosions       7       #7         11       28       Review       8       #8	Nov	11	19 🔨	Concepts, Candle, Fireplace, Premixed, Diffusion	1		
13     20 √     Enthalpies     2     #1       18     Stoichiometry, Equilibrium Constants     3     #2,#       Adiabatic Flame Temperature, Multi-Component     4     #4       20     22     Equilibrium, NASA-Lewis Code     4     #4       27     BYU Friday, NO Class     4     #4       28     Thanksgiving     5     #5       4     26     Nox Mechanisms, Soot     66     #6       9     27     Flame Speeds, Turbulence, Explosions     7     #7       11     28     Review     8     #8				Heats of Formation, Heats of Reaction, Heat Capacities,			
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Adiabatic Flame Temperature, Multi-Component     Adiabatic Flame Temperature, Multi-Component       20     22     Equilibrium, NASA-Lewis Code     4     #4       27     BYU Friday, NO Class     4     #4       28     Thanksgiving     5     #5       Dec     2     25     Heterogeneous Combustion     5     #5       4     26     NOx Mechanisms, Soot     6     #6       9     27     Flame Speeds, Turbulence, Explosions     7     #7       11     28     Review     8     #8		18	<b>**</b>	Stoichiometry, Equilibrium Constants	3	#2,#3	
20         22         Equilibrium, NASA-Lewis Code         4         #4           27         BYU Friday, NO Class         4         8           28         Thanksgiving         5         5           Dec         2         25         Heterogeneous Combustion         5         #5           4         26         Nox Mechanisms, Soot         6         #6         #6           9         27         Flame Speeds, Turbulence, Explosions         7         #7           11         28         Review         8         #8				Adiabatic Flame Temperature, Multi-Component			
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4         26         NOx Mechanisms, Soot         6         #6           9         27         Flame Speeds, Turbulence, Explosions         7         #7           11         28         Review         8         #8	Dec	2	25	Heterogeneous Combustion	5	#5	
9         27         Flame Speeds, Turbulence, Explosions         7         #7           11         28         Review         8         #8		4	26	NO <sub>x</sub> Mechanisms, Soot	6	#6	
11 28 Review 8 #8		9	27	Flame Speeds, Turbulence, Explosions	7	#7	
		11	28	Review	8	#8	



## Progress (cont.)

- ✓ How does a candle work?
- ✓ How does a fireplace work?
- Regimes of heterogeneous combustion
  Sources of NOx
  Single particle vs. cloud combustion
  As rec'd, dry, and daf bases for coal
  Turbulence effects

- Swirl
- Use of NASA-Lewis code
- Elementary step reaction sequences vs. global mechanisms

## **Equilibrium Constants**

- Find values of  $K_{eq}$  Find  $\Delta G_f^0$  for each species at each T

  - Compute  $\Delta G_{rxn}$  at each T Find K<sub>eq</sub> at each T ( $\Delta G_{rxn}$  = -RT In K<sub>eq</sub>)
- Find values of K<sub>v</sub>  $- K_{eq} = K_v K_{Ptot}$
- Find expression for  $K_y$  in terms of  $y_i$  Use extent of reaction  $(n_{i,0} x)$ 
  - Get expressions for y<sub>i</sub> in terms of x  $-K_v = \Pi y_i^{vl}$
- Solve for x and then calculate yi's

