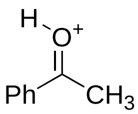
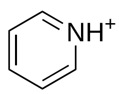
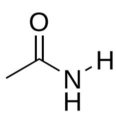
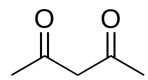
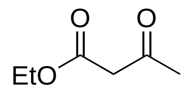
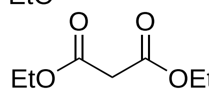
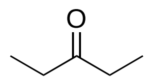
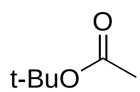
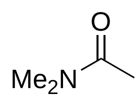
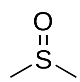
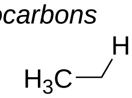
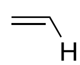
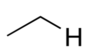
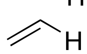
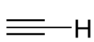
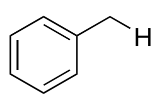
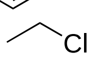
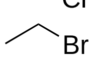
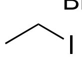
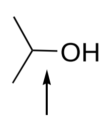
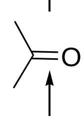
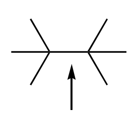
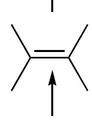
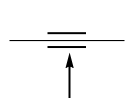
pKa's. Numbers are approximations for outside the range -2 - 16, but useful to know.
For an extensive list, see http://www.chem.wisc.edu/areas/reich/pkatable/

Substrate	H_2O	DMSO
Inorganics		
CF_3SO_3H	-14	
HCl	-8	
CH_3SO_3H	-3	2
H_3O+	-2	
NH_4Cl	9	
H_2O	16	
Organic X-H		
	-6	
Me_2OH+	-4	
AcOH	5	12
	5	3
PhOH	10	18
	15	26
MeOH	16	28
tBuOH	17	29
$(iPr)_2NH$		36
NH_3	38	41

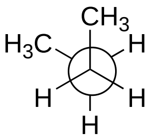
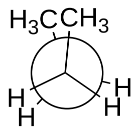
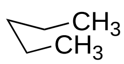
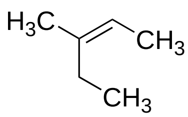
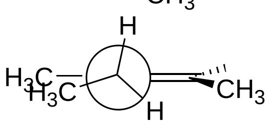
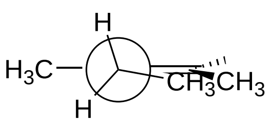
Substrate	H_2O	DMSO
EWG-CH		
	9	13
	11	14
	13	16
NO_2-CH_3	10	17
	20	27
	25	30
		35
	33	35
Hydrocarbons		
	50	
	44	
R—≡—H	23	
H−H	35	

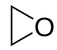
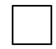
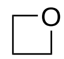
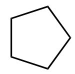
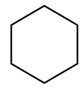
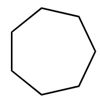
Bond Strength. Take from Lowry and Richardson; by definition, ΔH for: $A-B \longrightarrow A + B^{\bullet}$

Bond	BDE (Kcal/mol)
	98
	103
	125
	85
	82
	69
	54
HO−H	119
HO_2-H	90
HO−OH	50
H−H	104
Hydrogen bond X---H	2-10

Bond	BDE (Kcal/mol)
	84
	172 (2nd bond = 88)
	81
	148 (2nd bond = 67)
	194 (3rd bond = 46)

Strain energy (energetic penalty for indicated strain)

Strain		Penalty (kcal/mol)
	gauche	0.8
	eclipsed	2.2
	syn-pentane	3.7
olefin conformations		
for 		
	$A_{1,2}$	2.7
	$A_{1,3}$	3.9

Strain	Penalty (kcal/mol)
ring strain	
 or 	28
 or 	26
	6
	0
	6

Kinetics and Thermodynamics

equilibrium processes

key equation: $\Delta G = -RT\ln(K)$

for K = 10, T = 298, **ΔG = -1.4kcal**
K = 100, T = 298 ΔG = -2.8kcal
i.e. for every 1.4kcal difference in energy there is an order of magnitude change in K_{eq}

reaction rate

2nd key equation

$$k = \frac{k_B T}{h}\exp\left(\frac{-\Delta G^\ddagger}{RT}\right) \quad \text{or} \quad \Delta G^\ddagger = -RT\ln\frac{kh}{k_B T}$$

k = rate constant
h = Plank's constant
kb = Boltzmann's constant
$-\Delta G^\ddagger$ = free energy difference between ground state and transition state

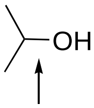
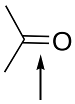
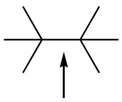
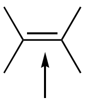
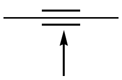
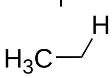
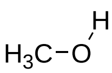
for T = 298, k = $1s^{-1}$
$\Delta G^\ddagger$ = 17.5 kcal/mol
i.e. activation energy for rxn occuring once a second is 17.5
As above, if k = 10s-1, $\Delta G^\ddagger$ = 17.5 - 1.4 = 16.1

For T = 308 and $\Delta G^\ddagger$ = 17.5, k = $2.5s^{-1}$
i.e. increase in temp of 10K gives ~2.5 fold increase in rate

relative rates

for a system with 2 possible reaction pathways (e.g. kinetic enolization or asymmetric catalysis) for
k_{fast}/k_{slow} = 10 (would give 82% ee), **$\Delta\Delta G^\ddagger$ = 1.4kcal/mol**
k_{fast}/k_{slow} = 100 (would give 99% ee), **$\Delta\Delta G^\ddagger$ = 2.8kcal/mol**

Bond distances

bond	length (angstroms [10^{-10}m])
	1.43
	1.23
	1.53
	1.34
	1.20
	1.1
	0.97
X - - -H (hydrogen bond)	1.5 - 2.4