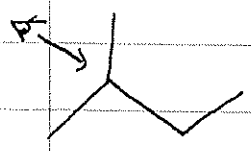
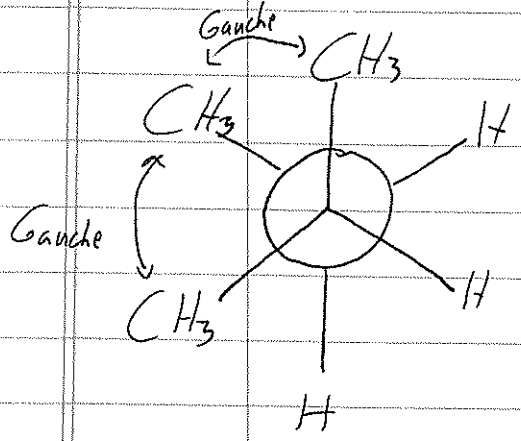
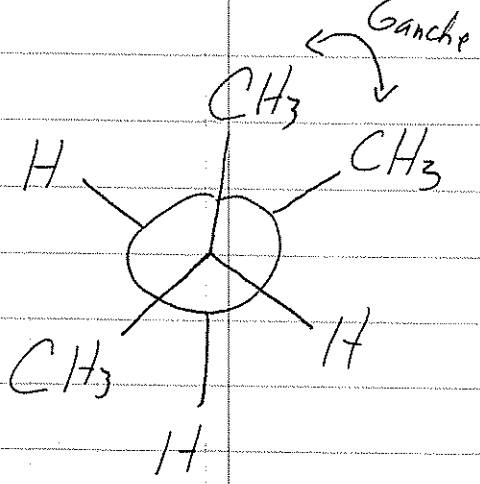
Part II

Answer Key

1.







2 Gauche interactions

$2 \times 3.8 = 7.6$ kJ/mol strain energy

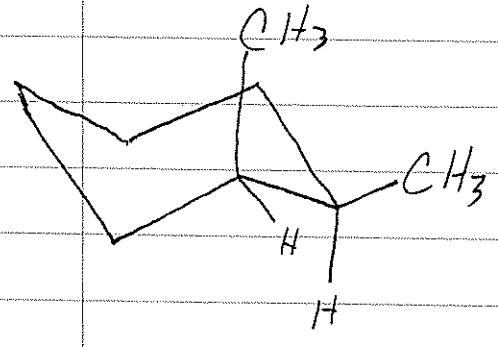
1 Gauche interaction

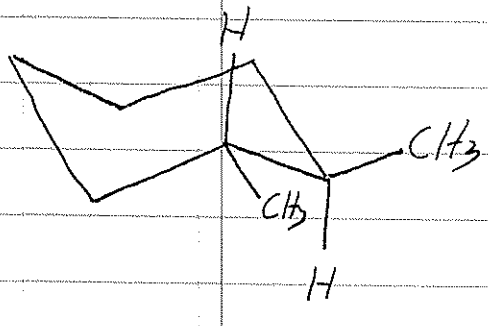
3.8 kJ/mol strain energy

∴ More stable conformation

Difference in energy = $7.6 - 3.8 = 3.8$ kJ/mol

2.





Cis

3 Gauche interactions

$3 \times 3.8 = 11.4$ kJ/mol strain

trans

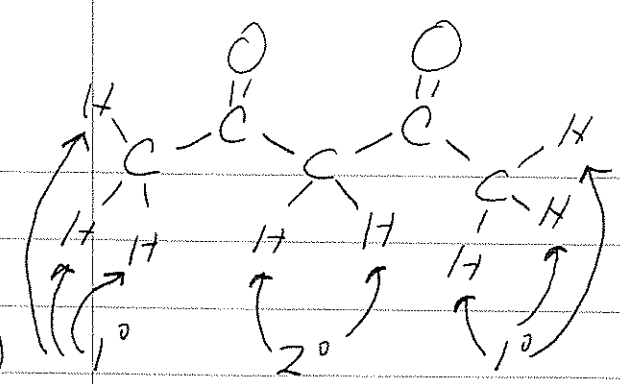
1 Gauche interaction

3.8 kJ/mol strain energy

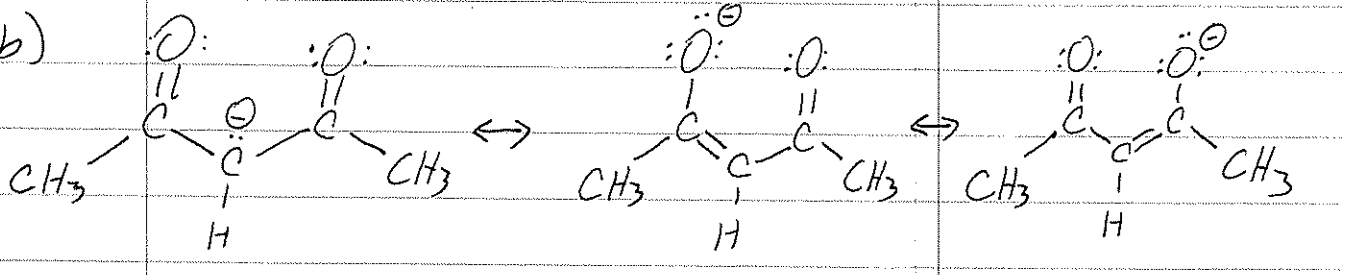
More stable isomer

Difference in energy = $11.4 - 3.8 = 7.6$ kJ/mol

3.



a)



b)

c) From Section 2.8:

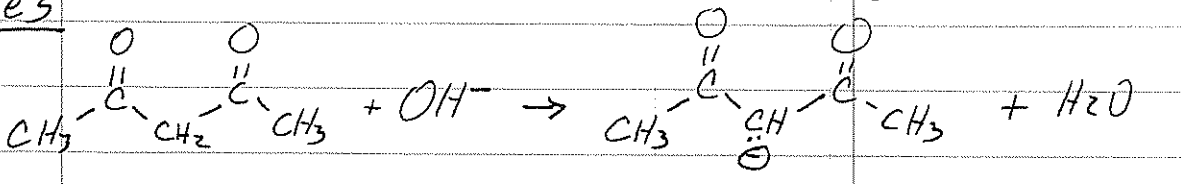
The bigger the K_a, the stronger the acid.
The smaller the pK_a, the stronger the acid.

An acid with a lower pK_a will donate a proton to the conjugate base of an acid with a higher pK_a.

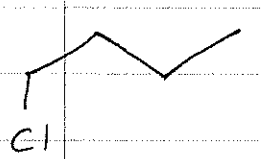
2,4-pentanedione $pK_a = 9$
H_2O $pK_a = 15.74$

} Therefore, 2,4-pentanedione is the stronger acid and will donate a proton to the conjugate base of water, OH^-.

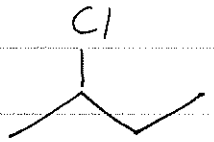
Yes



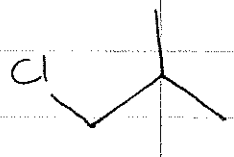
4.



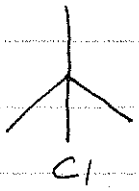
1-chlorobutane



2-chlorobutane



1-chloro-2-methylpropane



2-chloro-2-methylpropane