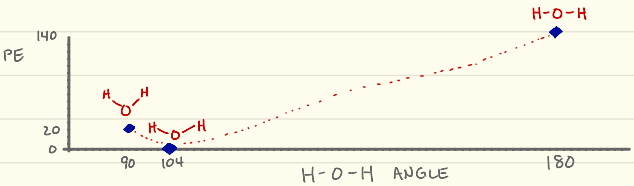
ACTIVITY #6 — ANSWERS to SELECTED QUESTIONS & CHALLENGES

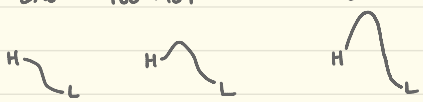
Q#1 Lowest PE: H–O–H HIGH PE: H–O–H

Q#2



Q#3 DOWNHILL "EXO": 90 → 104; 180 → 104 UPHILL "ENDO": 104 → 90; 104 → 180

Q#8



H LIFETIME < H LIFETIME < H LIFETIME

Q#10 ECLIPSED C_2H_6 → STAGGERED C_2H_6 (EXOTHERMIC; $\Delta PE < 0$)

Q#16 BULLET 2 180° (anti) CONFORMER DOMINATES POPULATION

3 60° & 300° (gauche) CONFORMERS ALSO PRESENT IN APPRECIABLE AMOUNTS

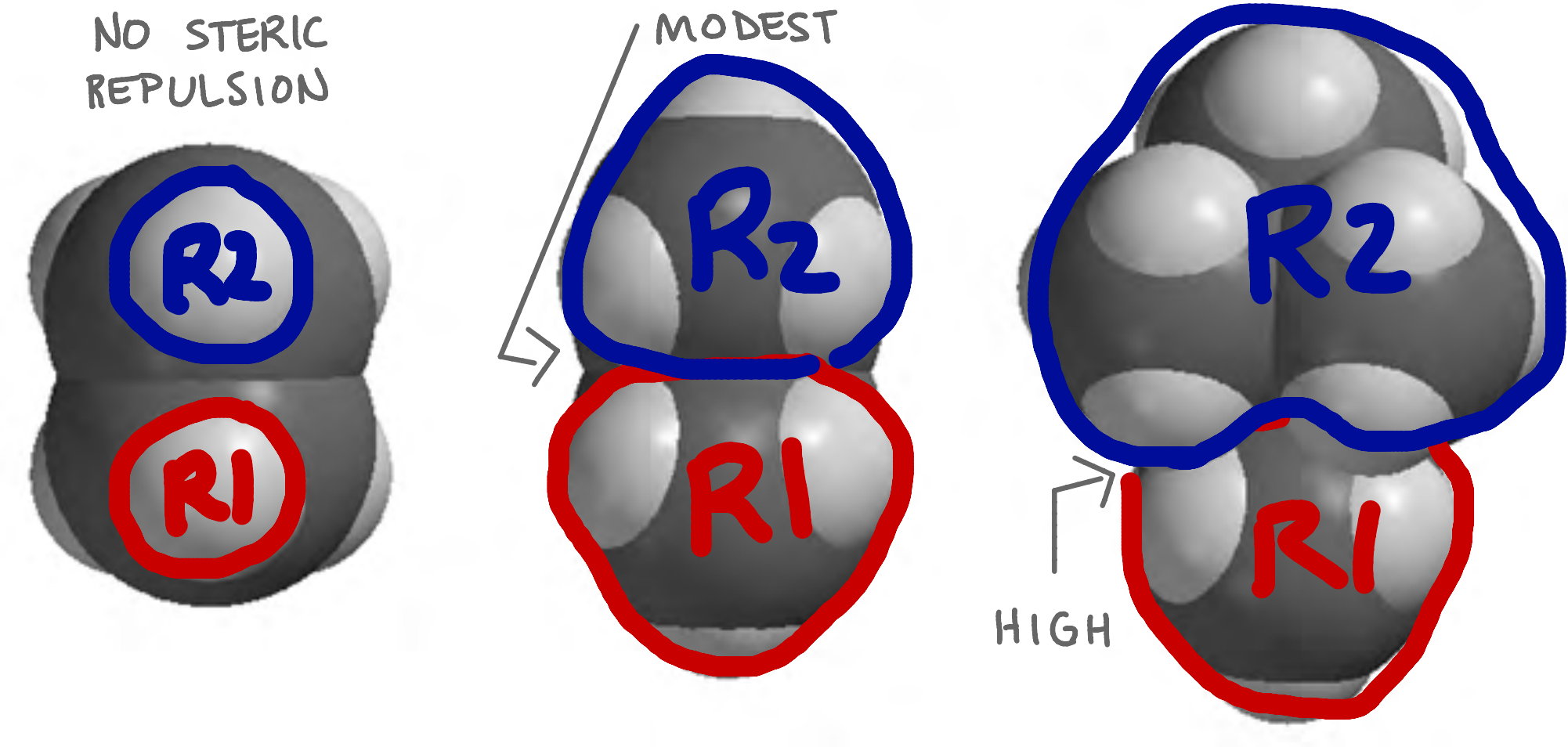
4A "AT EQUILIBRIUM" POPULATIONS DO NOT CHANGE

4B IDENTICAL # OF MOLECULES

Q#22 $R_1-CH_2CH_2-R_2$ $H-CH_2CH_2-H$ $CH_3-CH_2CH_2-CH_3$ $CH_3-CH_2CH_2-C(CH_3)_3$

RELATIVE VAN DER WAALS RADII: $H << CH_3 << C(CH_3)_3$

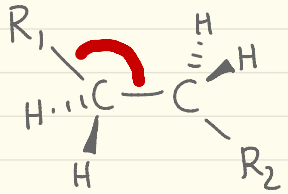
~1.2Å 2Å? 3Å?

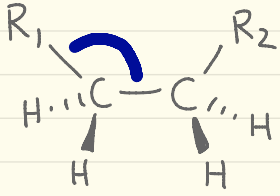

NO STERIC REPULSION
R2
R1
MODEST
R2
R1
R2
R1
HIGH

CHALLENGE PROBLEMS

#1 The table contains a serious typo. The RIGHT-MOST column should read: $R_1CC(°)$ for $R_1CCR_2 = 0°$

The table compares two bond angles:





ethane	110.57	small angle change; $R_1 \cdot\cdot H$ repulsion is small	110.78	large angle change due to increasing $R_1 \cdot\cdot R_2$ repulsion
butane	113.16		116.69	
2,2-diMeC$_5$	115.76		124.48	

#2 The drawings in #1 represent the geometries that define ΔPE $(= PE_{R1/R2=0°} - PE_{R1/R2=180°})$. As we proceed ethane → butane → 2,2-dimethyl..., steric repulsion in the "180" geometry changes little, but steric repulsion in the "0" geometry rises a lot (as indicated by R_1-C-C bond angle). So ΔPE rises too.