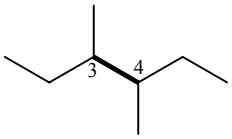
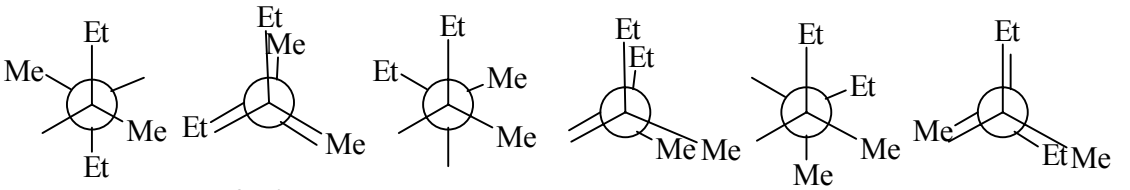
Construct Newman projections for all of the unique rotational conformations of **3,4-dimethylhexane** (focus down $C_3$-$C_4$). Identify the lowest ($E_{min}$) and highest ($E_{max}$) energy conformations and determine the barrier to rotation in KJ/mol (difference between $E_{max}$ and $E_{min}$). Use the data provided (Me = methyl; Et = ethyl). How many unique conformations are there? _____

| **Interaction** | **energy cost (KJ/mol)** |
|---|---|
| Me-Me gauche | 3.8 |
| Me-Et gauche | 4.1 |
| Et-Et gauche | 4.5 |
| H-H eclipse | 4.0 |
| Me-H eclipse | 6.0 |
| Et-H eclipse | 7.0 |
| Me-Me eclipse | 11.0 |
| Me-Et eclipse | 12.0 |
| Et-Et eclipse | 13.0 |

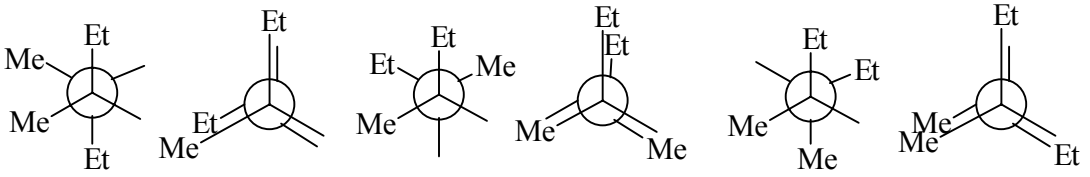



There are 2 possible series of conformers depending on which stereoisomer is used (see CH 9). Either series is corre




8.2 lowest | 25.0 | 12.4 | 28.0 highest | 12.4 | 25.0 KJ/mol

**ΔE = 19.8 KJ/mol**

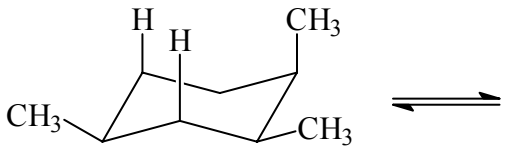


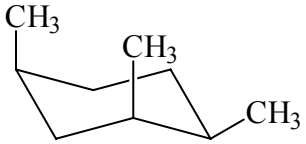

12.0 | 23.0 | 12.7 | 25.0 highest | 8.3 lowest | 25.0 KJ/mol highest

**ΔE = 16.7 KJ/mol**

Consider the molecule **1,2,4-trimethylcyclohexane** where the methyl groups are all *cis*. The *less stable* conformation has an energy of approximately **26.8 KJ/mol**. Draw the two chair conformations of this compound and determine the energy of the more stable conformation using the data below. How much steric strain (KJ/mol) does a methyl – methyl 1,3-diaxial interaction contribute to the less stable conformation? ***Also***, draw a Newman projection of the *more stable* conformation sighting along $C_{1,2}$ and $C_{5,4}$.

| **Interaction** | **Energy (kJ/mol)** |
|---|---|
| Methyl-Methyl gauche | 3.8 |
| Methyl -H 1,3-diaxial | 3.8 |
| Methyl-Methyl 1,3-diaxial | **??** |




Energy: 2 1,3-diaxial interactions
1 gauche Me-Me interaction
**11.4 KJ/mol**

Energy: 2 1,3-diaxial int.
1 gauche Me-Me int.
**11.4 KJ/mol**
+ methyl-methyl 1,3 diaxial int.
26.8 KJ/mol
**methyl-methyl 1,3-diaxial = 15.4 KJ/mol**