

# ANSWER KEY

## Chemistry

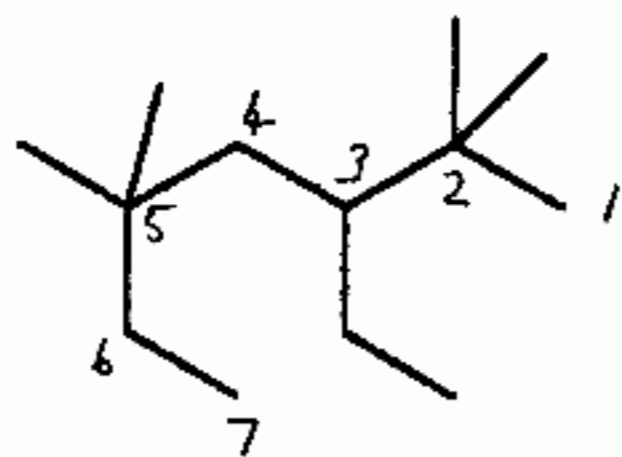
### First Practice Test

M.A. Walker

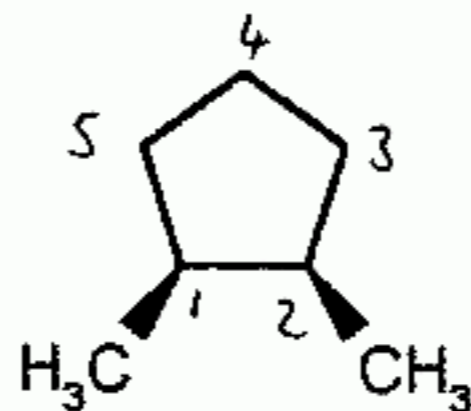
150 points total, 50 minutes duration. Fill in the answers directly on to the question sheet.

Note: If we don't complete lesson 4 (i.e. latter part of Chap 4 in book), omit question 4. (We won't have this)

1. (14 points) Give a systematic name for both of the following compounds.



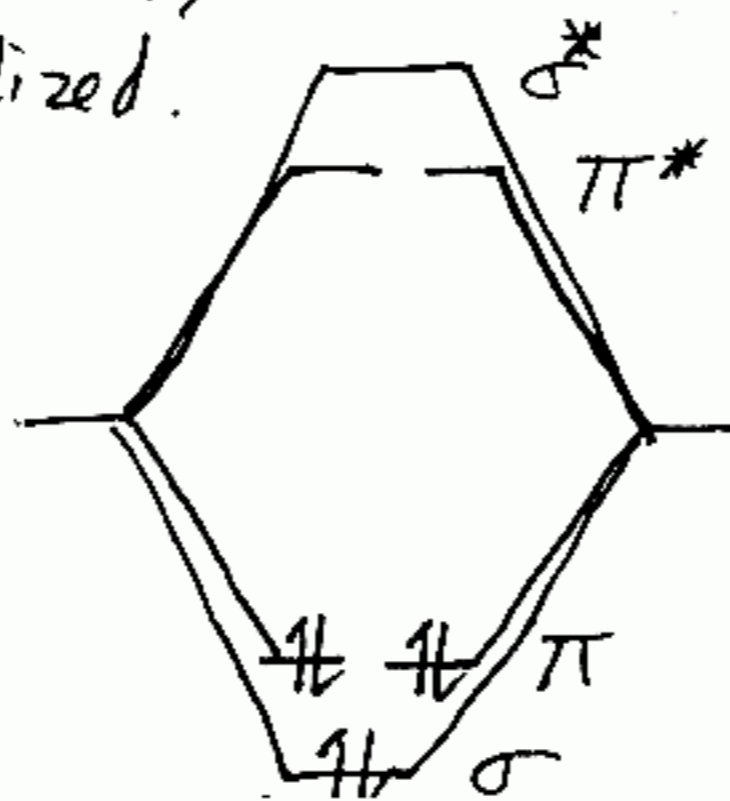
3-ethyl-2,2,5,5-tetramethylheptane



Remember, with rings the major substituent is always placed at position 1  
cis-1,2-dimethylcyclopentane

2. (24 points) (a) Draw an MO energy diagram for the C≡N bond in H-C≡N, showing where the electrons lie.

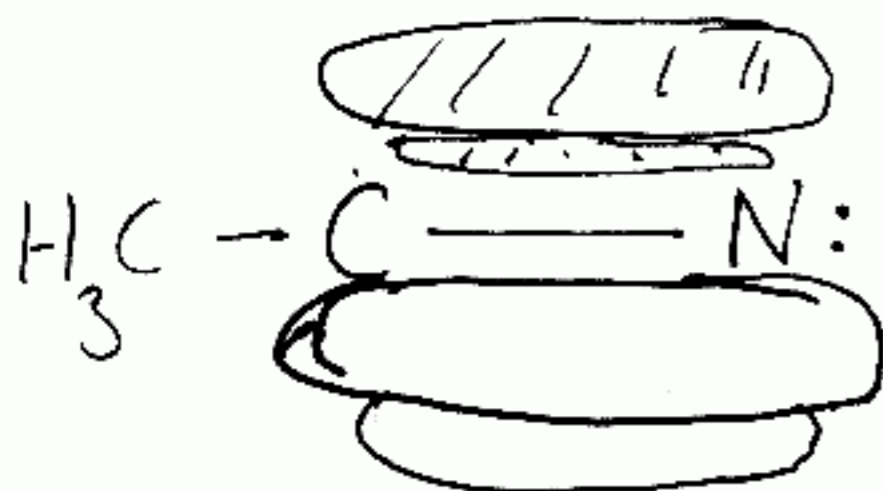
This case is very like HC≡CH, Both C and N are sp hybridized.



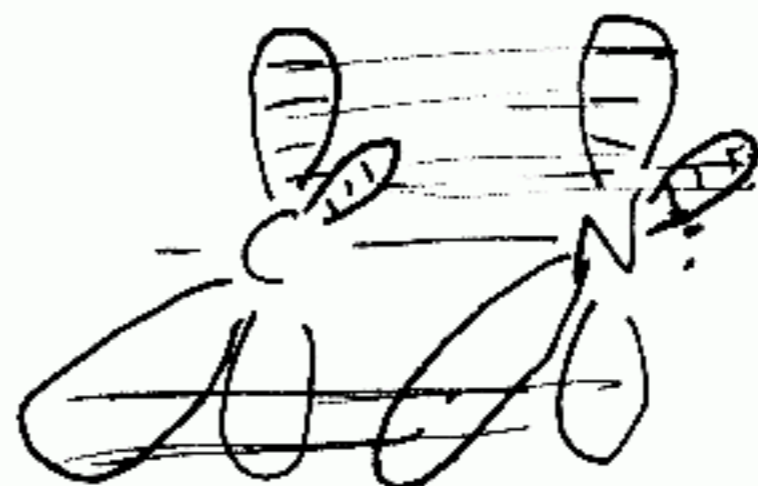
All six electrons

(triple bond  $\equiv 6e^-$ ) go into bonding orbitals.

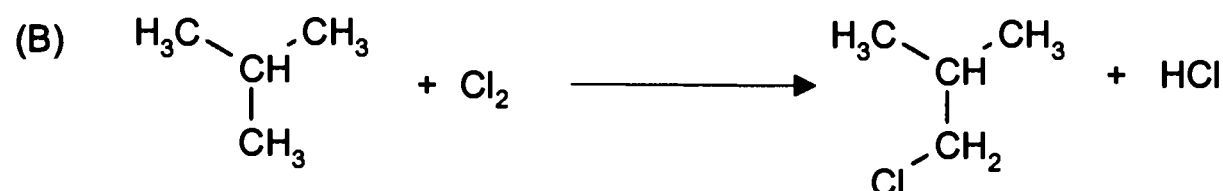
Answer for new version- should ideally have a "sausage" for the sigma bond, not a line



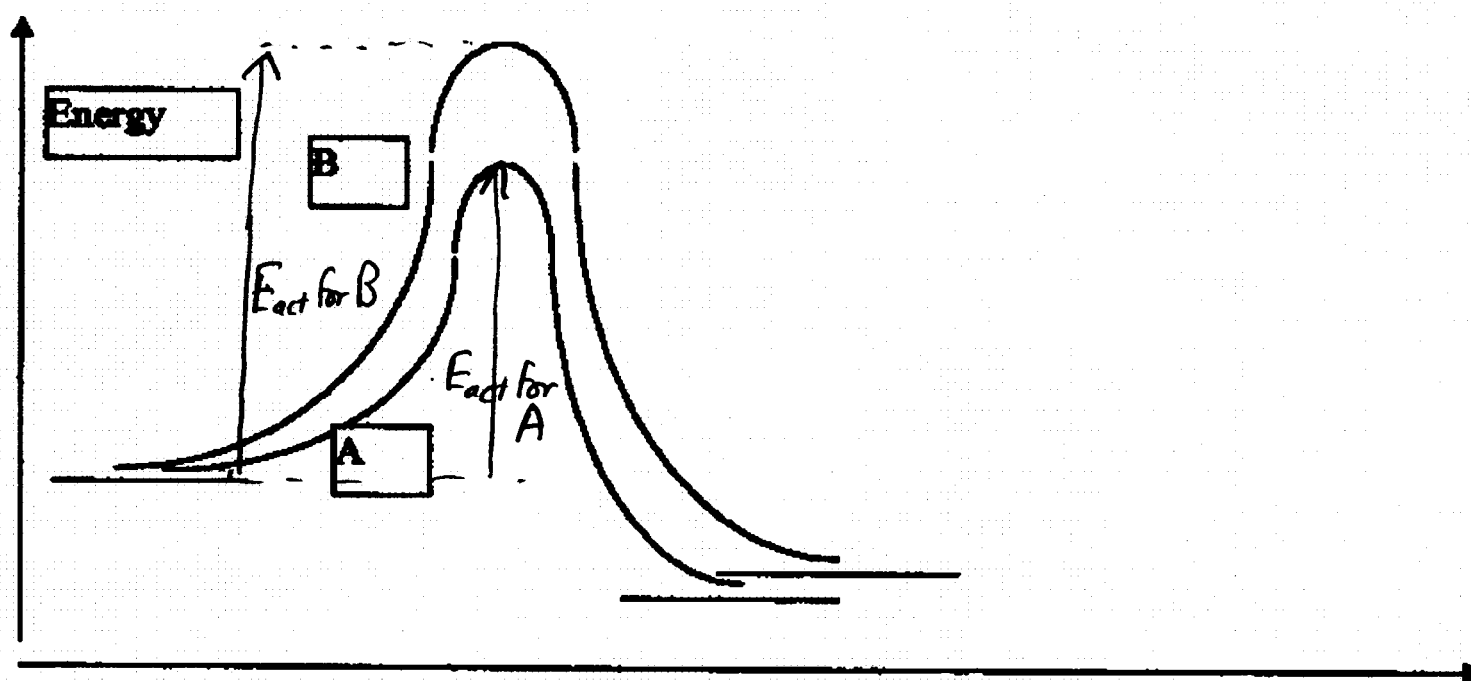
or I would accept



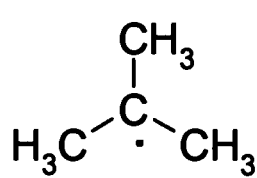
4. (20 points) In the free radical chlorination of 2-methylpropane there are two possible products, as shown:



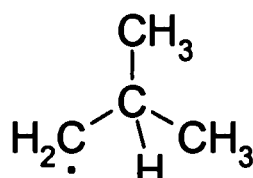
The energy diagram for the reaction is shown:



(a) Show the structures of the two intermediates,  $\text{Int}_A$  and  $\text{Int}_B$



$\text{Int}_A$



$\text{Int}_B$

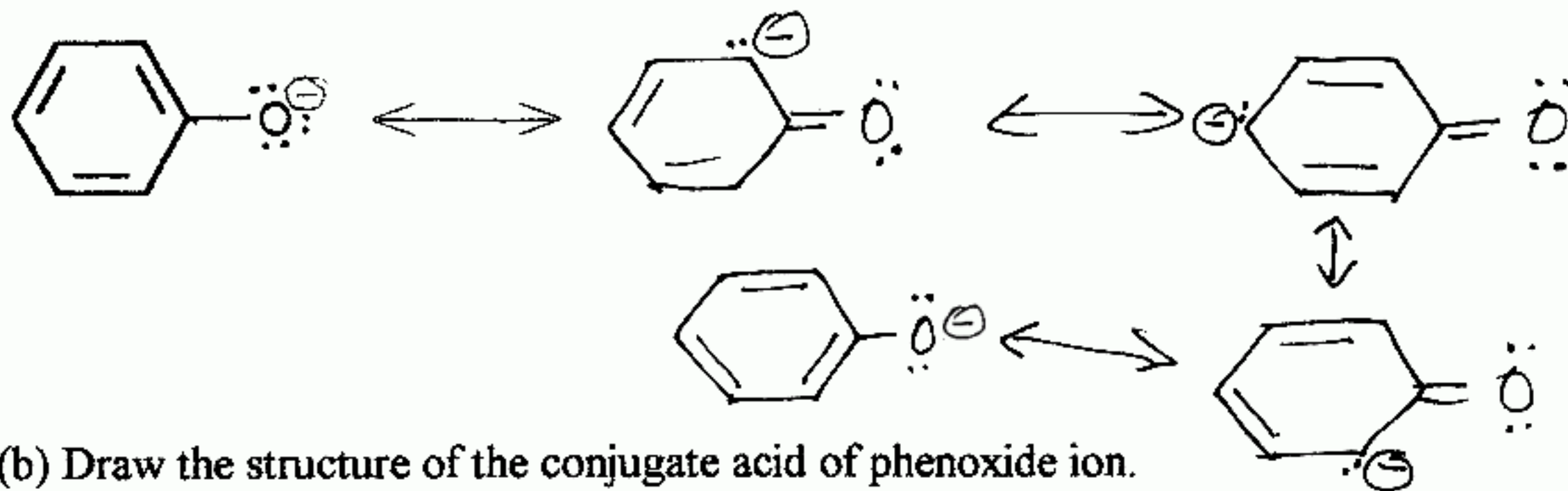
(b) Show the activation energy for each reaction, by drawing it on to the above diagram.

(c) Which is the more stable product? Which product forms more quickly?

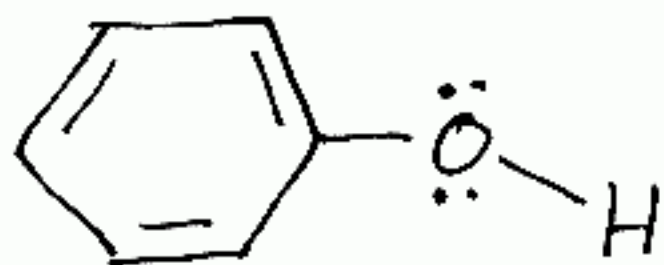
A leads a product of lower energy, so more stable. This product also forms more quickly, as it has a lower activation energy.

Note to 2004 students- this last part would not be on this test.

3. (20 points) (a) Show all major resonance forms for phenoxide ion:

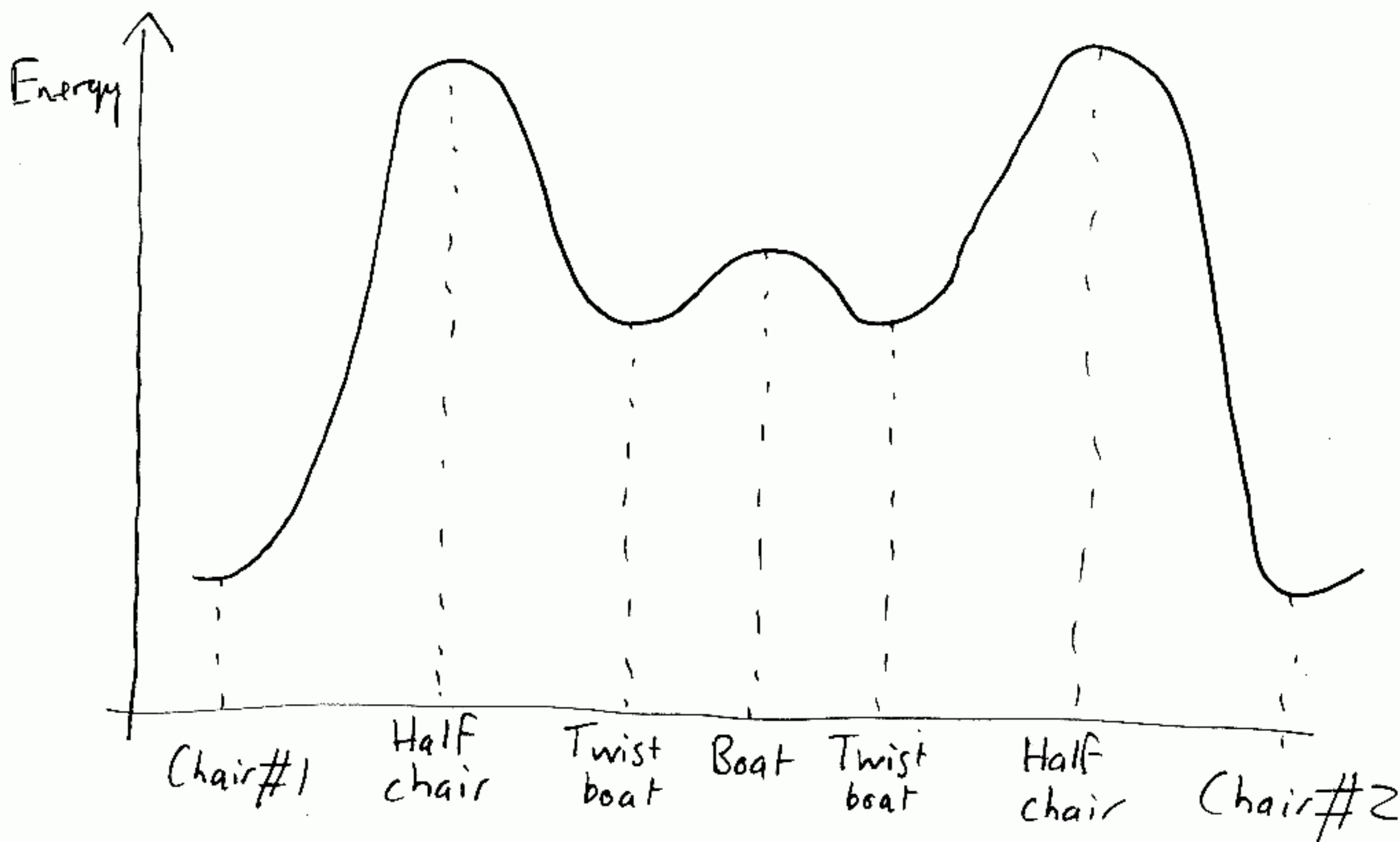


(b) Draw the structure of the conjugate acid of phenoxide ion.



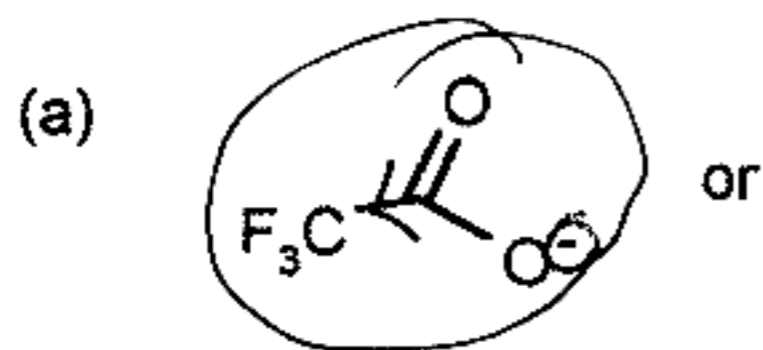
(c) A phenol, an aromatic ring

(20 points) Draw an energy curve for the flipping of cyclohexane from one chair to another. Show which minima and maxima correspond to the chairs, half-chairs, twist boats and boat (you need not draw these, merely label them).

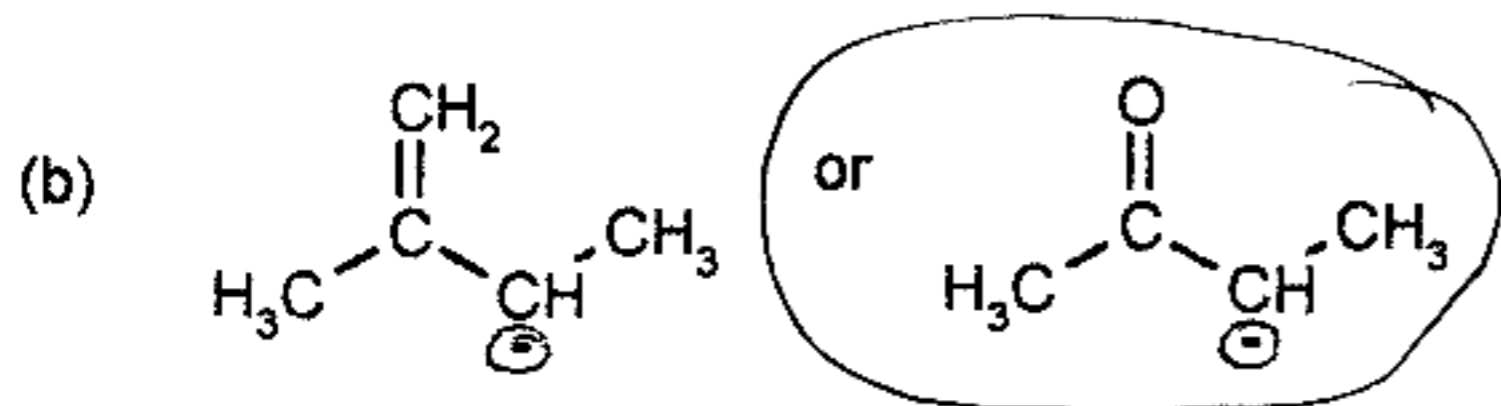




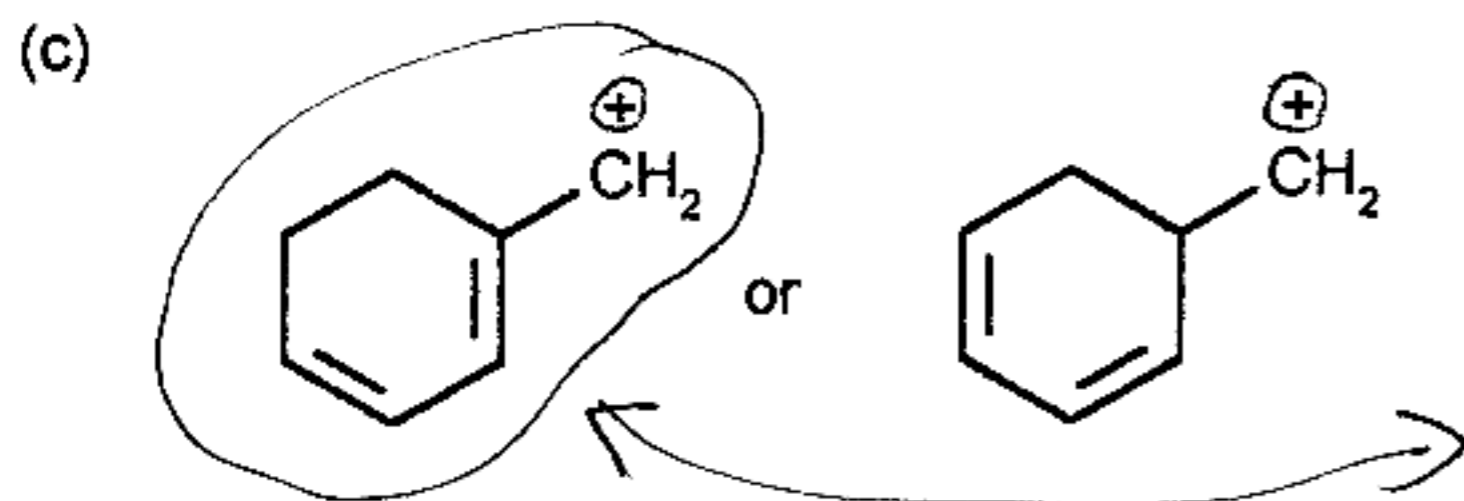
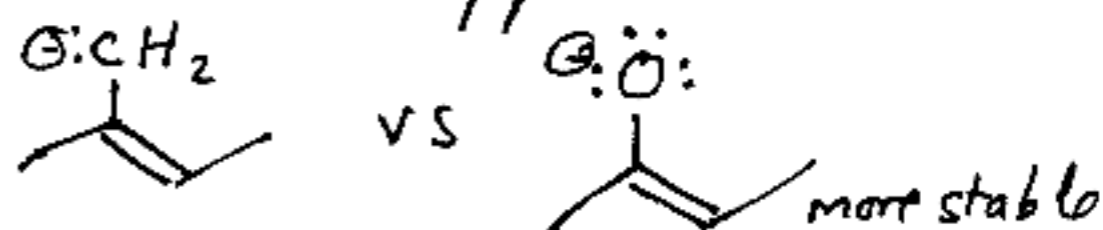
6. (40 points) Circle the more stable of each of the following pairs.



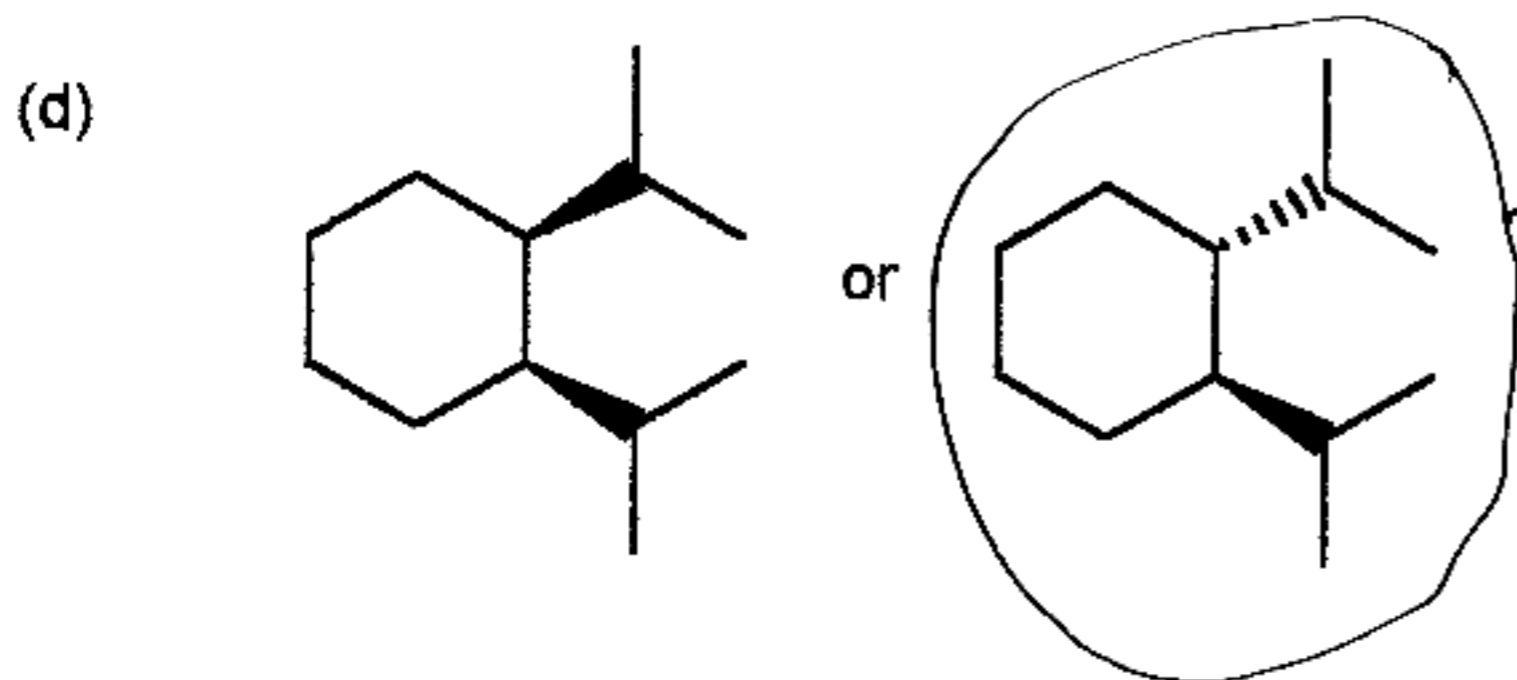
F is more electronegative, so it can "suck off" some of the negative charge to stabilize the  $\ominus$  ion



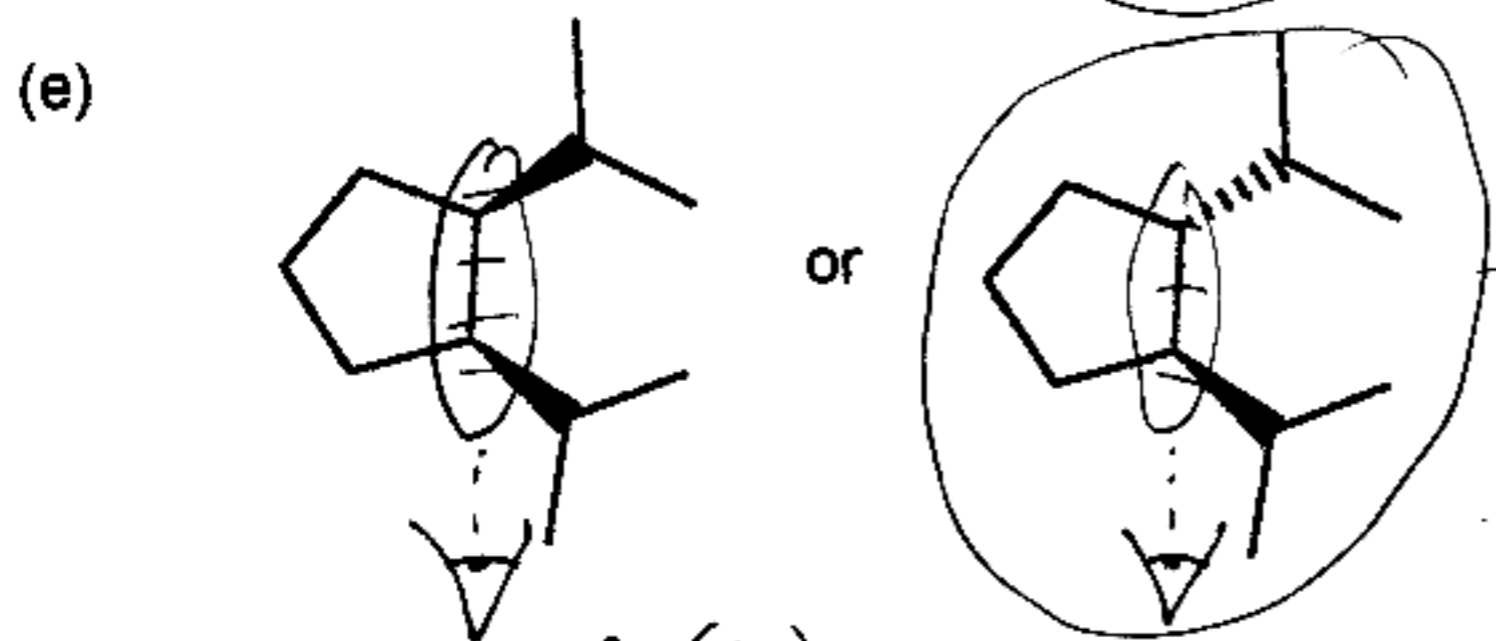
Both ~~form~~ structures can give resonance forms, but the one with  $\ominus$  on oxygen is more stable



Left hand one can do resonance, other can't



This can have both bulky isopropyl groups equatorial. Other one has one bulky group axial - ~~less~~ less stable (steric crowding)



Here the bulky groups are at  $120^\circ$  to one another. In the other one they are eclipsing one another - less stable

