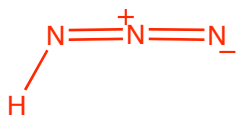
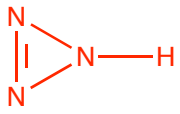
Test 1 109a winter 2004

Draw the bond line formula for HN_3. Assign the formal charges as needed. 9pts

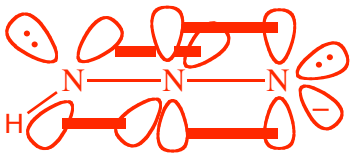


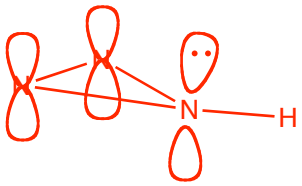
or



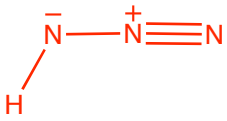
What is the hybridization of the central nitrogen atom? 4pts. sp or sp^2

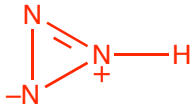
Draw the molecule in 3D showning the placement of the π, σ and lone pairs of electrons. The angles between π bonds and π bonds and lone pairs of electrons should be clearly evident.



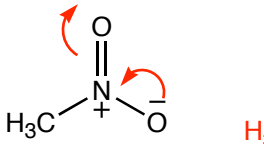


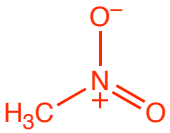
Draw another resonance structure of your structure.

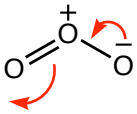


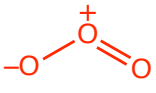


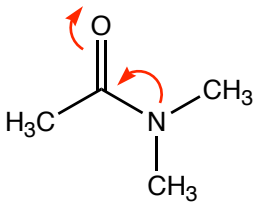
Draw all resonance contributors of neutral compounds and all resonance contributors of the following radicals, cations and anions. Show the flow of electrons in starting structure with the appropriate arrow and how that gives one of the new structures. Circle the major contributor or label as degenerate.

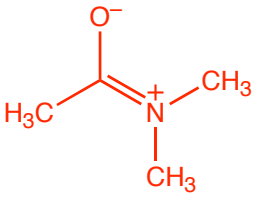


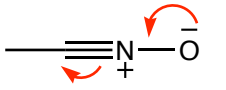


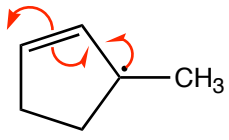


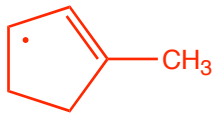


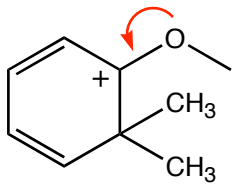


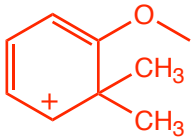


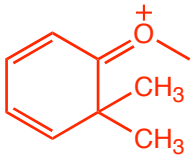


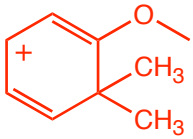






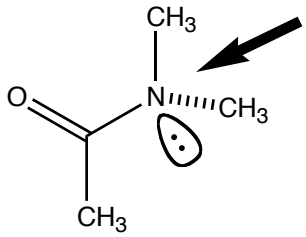




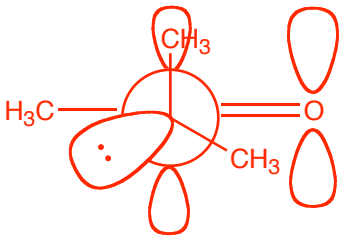


there are three for the above

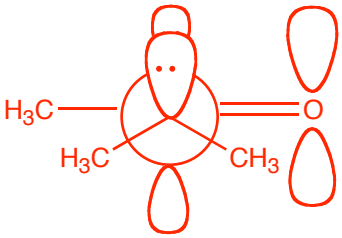
Draw the Newman projection of the molecule below looking down the bond shown. Then draw the most stable conformation reflecting reasonance stabilization. 12pts



most stable conformers



initial drawing



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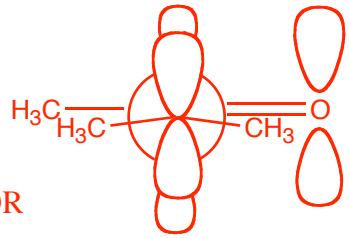
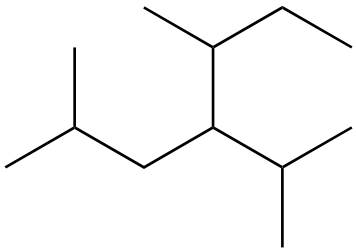
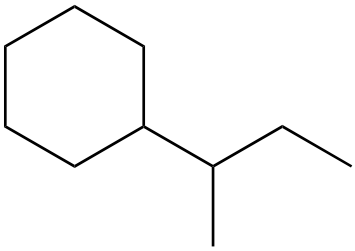


eclipsing, N is sp^2

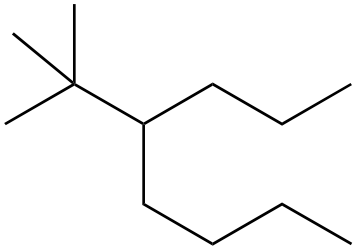
Name the following compounds. 12pts



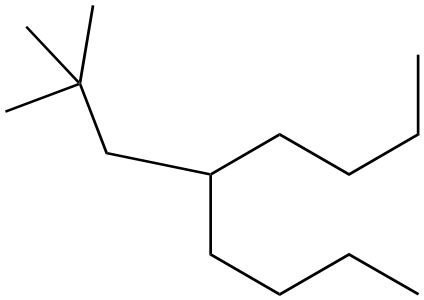
4-Isopropyl-2,5-dimethyl-heptane



sec-Butyl-cyclohexane

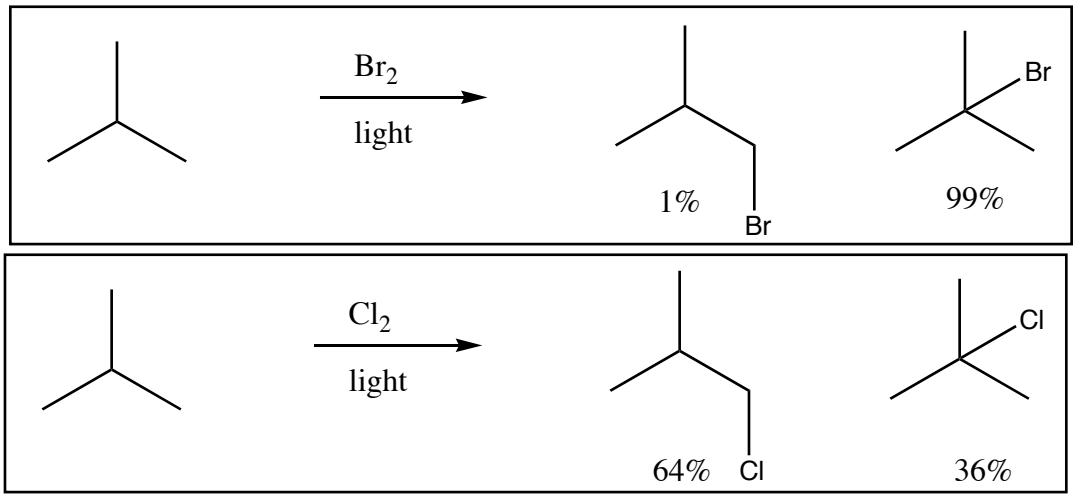


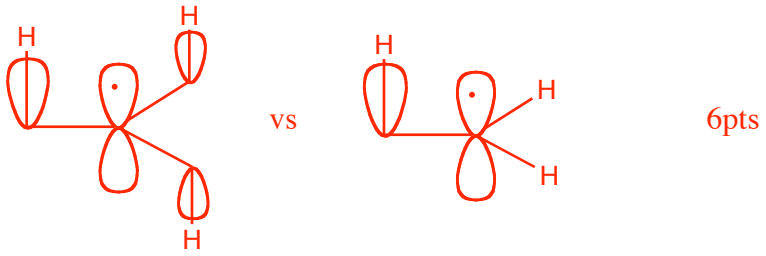
4-*tert*-Butyl-octane



5-(2,2-Dimethyl-propyl)-nonane

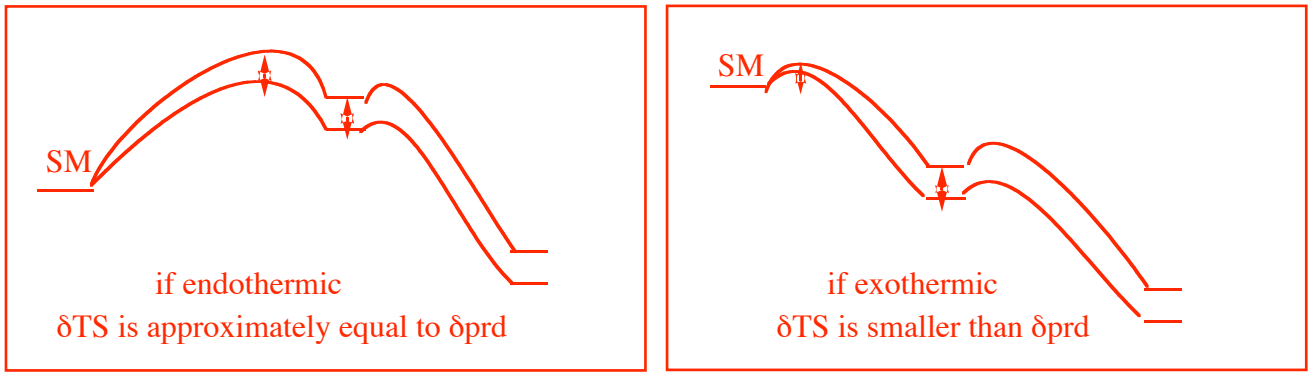
The following two radical reactions were reported in your book. The products arise from primary and tertiary radicals respectively. Use two pictures to explain the relative stability of a 1° verses a 3° radical. Now draw two energy diagrams with two curves on each. Why is bromination more selective than the chlorination. Your answer need only be relative. You do not need to know bond energies to sketch the curves because the ratio themseleves tell you what the curves must look like. Who postulated this relationship which is useful when drawing diagrams?





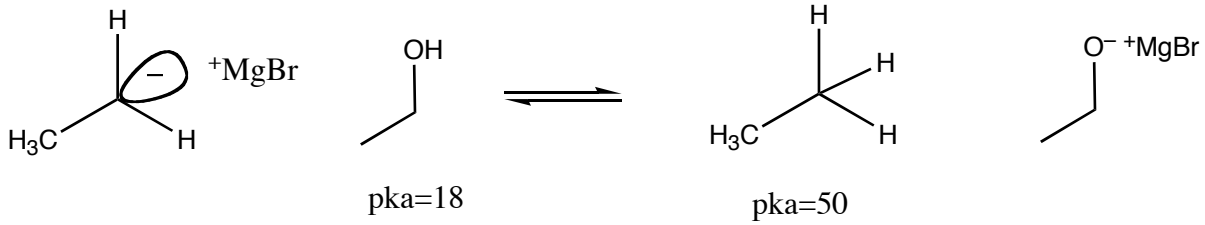
6pts

6pts

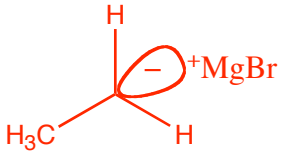


Hammond

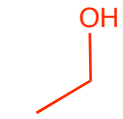
Consider the following reactions. Which side of the equation is preferred and by how much. 6pts. Which anion is the least stable? 4pts. Which is the stronger acid. 4pts



pka=18 pka=50



least stable anion



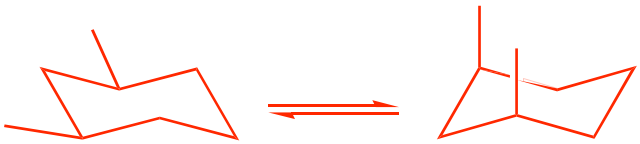
strongest acid

10^{50-18}

Write the full mechanism for the monobromination of methane including the propagation, intiation and termination steps. Make sure they are arranged in the correct order. Calculate the DH for the formation of the intermediates and the overall process. 10pts Sketch the curve. 5pts.

	Init	Br_2	$2Br\bullet$	
Br–Br 46Kcals	prop 1	$Br\bullet + CH_4$	$HBr + \bullet CH_3$	105-87=+18
$H–CH_3$ 105Kcals				
H–Br 87Kcals	prop 2	$\bullet CH_3 + Br_2$	$BrCH_3 + Br\bullet$	46-70=-24
$Br–CH_3$ 70Kcals				
R–R' 110Kcals	term.	$R\bullet + R'\bullet$	R-R'	-6Kcals = ΔH total

Draw cis 1,3-dimethylcylcohexane and its ringflip. The A-Values for methyl is 1.7 Kcals. Gauche interactions add 0.9 Kcals and 1,3 diaxial inetractions between methyls add 0.3Kcals. Circle the most stable and give the difference in Kcals between the two structures. 15pts. T



1.7+1.7+0.3 Kcals less stable
diaxial system is 3.7kcals less stable