

Name _____

1-10 are True / False. (10pts)

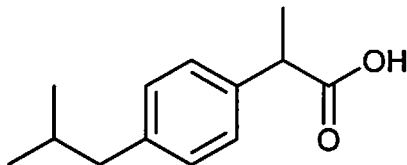
- 1) Organic chemistry is the study of carbon containing compounds.
- 2) A triple bond has two π bonds and one σ bond.
- 3) Equilibrium constant is related to the change in Gibbs free energy.
- 4) Chlorine has a smaller atomic radius than Iodine.
- 5) Cyclopropane has more ring strain than cyclopentane.
- 6) Aluminum has 5 valence electrons.
- 7) The rate determining step is the step with the highest energy transition state.
- 8) The conjugate base of Nitric Acid (HNO_3) is the NO_3^- anion.
- 9) Hexane and cyclohexane have the same molecular formula.
- 10) An ionic bond must contain ions.

11) Circle the **acid** on the left hand side of each of these equations. (2pts)



12) Define a LEAVING GROUP. (2pts)

13) (9pts) For the following molecule, calculate the number of ...

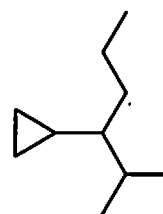
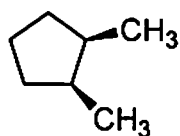


- a) carbon atoms
- b) hydrogen atoms
- c) π bonds
- d) oxygen atoms
- e) sp^2 hybridized carbons
- f) sp^3 hybridized carbons
- g) carbons in the ring
- h) lone pairs (non bonding pairs) of electrons
- i) the O-C-O bond angle.

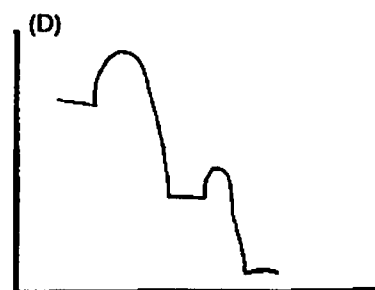
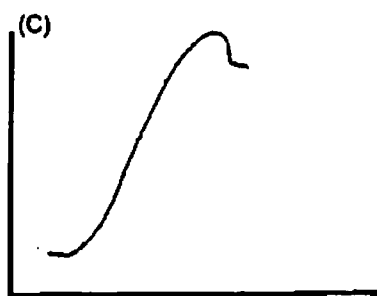
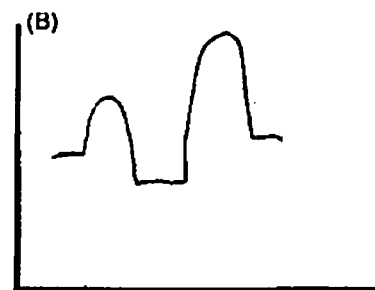
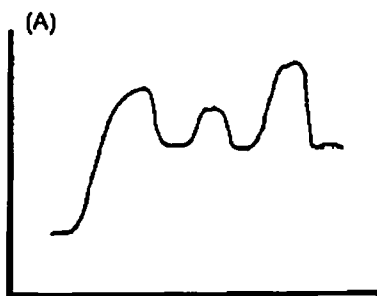
14) Draw the following molecule in line angle (*stick figure*) form. (3pts)

3-ethyl-2-methylheptane

15) Name the following molecules in IUPAC form: (3+3pts)



16) Using these four energy level diagrams (A-D), pick the most appropriate. (3pts)



a) which is the most *exothermic*?

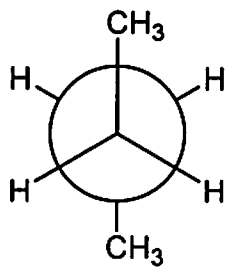
b) which has the most steps?

c) which has the *rate determining step* as the 2nd step?

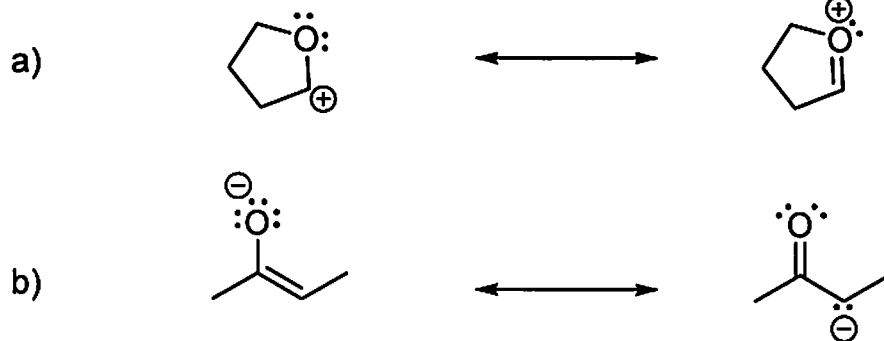
17) What is meant by the scientific term *radical species* (1pt)?

18) Draw any two molecules that are *isomers*, and **state** whether the pair you drew are *stereoisomers* or *structural isomers*. (2+1=3pts)

19) Redraw this Newman projection using sticks and wedges. (2pts)

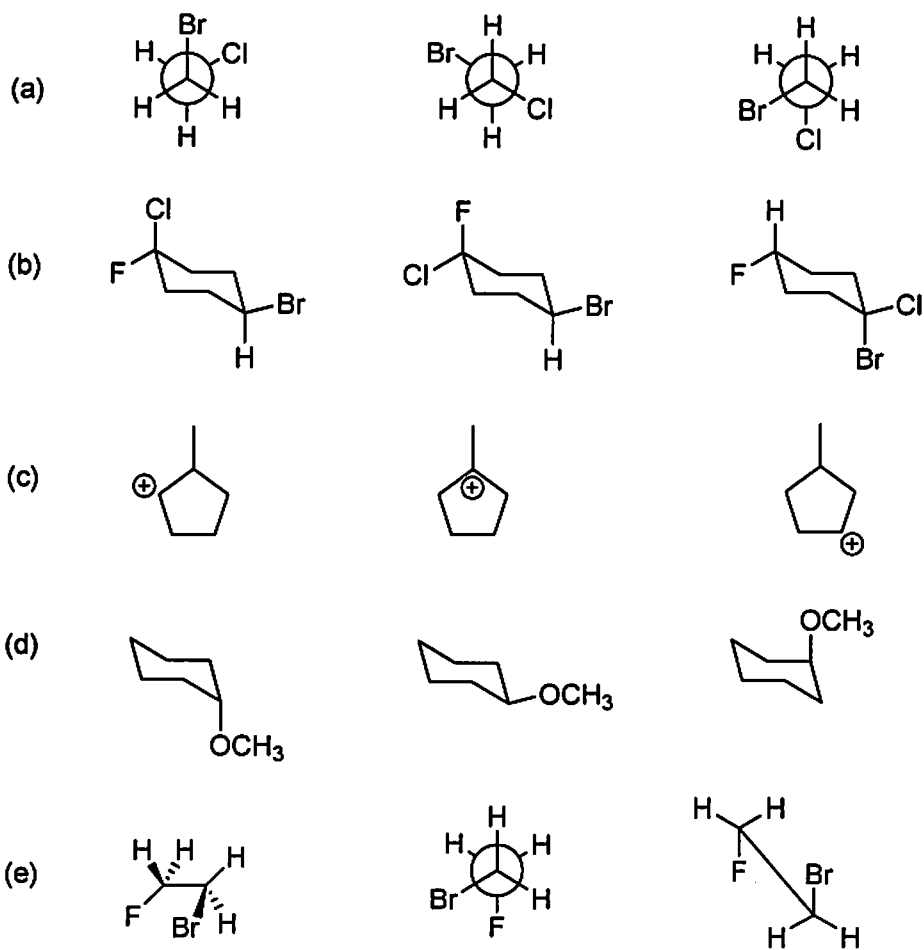


20) Show the electron movement (curly arrows) that convert the left resonance structure into the right hand side resonance form. (3pts)



21) For part 20b, underline the major contributor. (1pt)

22) Circle the *most stable* member of each threesome. (5pts)



****Bonus Question for up to 2 points****

What do the initials **IUPAC** stand for?

hydrogen 1 1.0079 H	beryllium 4 9.0122 Be	lithium 3 6.941 Li	boron 5 10.811 B	helium 2 4.0026 He
potassium 19 39.098 K	calcium 20 40.078 Ca	sodium 11 22.990 Na	carbon 6 12.011 C	neon 10 20.180 Ne
rubidium 37 85.468 Rb	strontium 38 87.62 Sr	magnesium 12 24.305 Mg	nitrogen 7 14.007 N	argon 18 39.948 Ar
cesium 55 132.91 Cs	barium 56 137.33 Ba	yttrium 39 88.906 Y	oxygen 8 15.999 O	potassium 19 39.098 K
francium 87 223 Fr	radium 88 226 Ra	zinc 30 65.39 Zn	fluorine 9 18.998 F	calcium 20 40.078 Ca
		gallium 31 69.723 Ga	neon 10 20.180 Ne	scandium 21 44.956 Sc
		silicon 14 28.086 Si	argon 18 39.948 Ar	titanium 22 47.867 Ti
		phosphorus 15 30.974 P	potassium 19 39.098 K	vanadium 23 50.942 V
		sulfur 16 32.065 S	calcium 20 40.078 Ca	chromium 24 51.996 Cr
		chlorine 17 35.453 Cl	yttrium 39 88.906 Y	manganese 25 54.938 Mn
		argon 18 39.948 Ar	zinc 30 65.39 Zn	iron 26 55.845 Fe
		potassium 19 39.098 K	gallium 31 69.723 Ga	cobalt 27 58.933 Co
		strontium 38 87.62 Sr	germanium 32 72.61 Ge	nickel 28 58.693 Ni
		barium 56 137.33 Ba	arsenic 33 74.922 As	copper 29 63.546 Cu
		radium 88 226 Ra	selenium 34 78.96 Se	zinc 30 65.39 Zn
			bromine 35 79.904 Br	iron 26 55.845 Fe
			krypton 36 83.80 Kr	cobalt 27 58.933 Co
			rubidium 37 85.468 Rb	nickel 28 58.693 Ni
			strontium 38 87.62 Sr	cadmium 48 112.41 Cd
			yttrium 39 88.906 Y	silver 47 107.87 Ag
			zirconium 40 91.224 Zr	gold 79 196.97 Au
			niobium 41 92.906 Nb	mercury 80 200.59 Hg
			molybdenum 42 95.94 Mo	thallium 81 204.38 Tl
			technetium 43 98 Tc	lead 82 207.2 Pb
			ruthenium 44 101.07 Ru	tin 50 118.71 Sn
			rhodium 45 102.91 Rh	antimony 51 121.76 Sb
			palladium 46 106.42 Pd	tellurium 52 127.60 Te
			silver 47 107.87 Ag	iodine 53 126.90 I
			cadmium 48 112.41 Cd	astatine 85 85 At
			indium 49 114.82 In	radon 86 86 Rn
			tin 50 118.71 Sn	
			antimony 51 121.76 Sb	
			tellurium 52 127.60 Te	
			iodine 53 126.90 I	
			astatine 85 85 At	
			radon 86 86 Rn	

* Lanthanide series

lanthanum 57 138.91 La	cerium 58 140.12 Ce	praseodymium 59 140.91 Pr	neodymium 60 144.24 Nd	promethium 61 144.91 Pm	samarium 62 150.36 Sm	europium 63 151.96 Eu	gadolinium 64 157.25 Gd	terbium 65 158.93 Tb	dyprosium 66 162.50 Dy	holmium 67 164.93 Ho	erbium 68 167.26 Er	thulium 69 168.93 Tm	ytterbium 70 173.04 Yb
actinium 89 Ac	thorium 90 Th	protactinium 91 Pa	uranium 92 U	neptunium 93 Np	plutonium 94 Pu	americium 95 Am	curium 96 Cm	berkelium 97 Bk	californium 98 Cf	einsteinium 99 Es	fermium 100 Fm	mendelevium 101 Md	nobelium 102 No

** Actinide series

Name

Sue Narmi

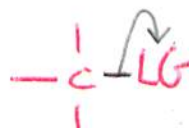
1-10 are True / False. (10pts)

- 1) Organic chemistry is the study of carbon containing compounds. T
- 2) A triple bond has two π bonds and one σ bond. T
- 3) Equilibrium constant is related to the change in Gibbs free energy. T
- 4) Chlorine has a smaller atomic radius than Iodine. T
- 5) Cyclopropane has more ring strain than cyclopentane. T
- 6) Aluminum has 5 valence electrons. false
- 7) The rate determining step is the step with the highest energy transition state. T
- 8) The conjugate base of Nitric Acid (HNO_3) is the NO_3^- anion. T
- 9) Hexane and cyclohexane have the same molecular formula. false
- 10) An ionic bond must contain ions. T

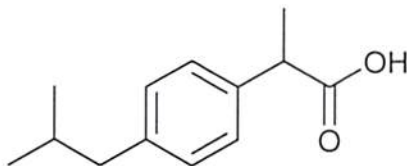
11) Circle the **acid** on the left hand side of each of these equations. (2pts)

12) Define a LEAVING GROUP. (2pts)

A group that disconnects, taking with it the two previously bond electrons.



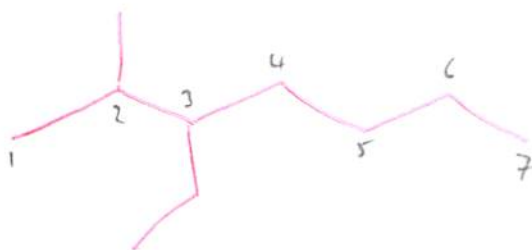
13) (9pts) For the following molecule, calculate the number of ...



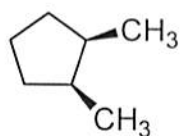
- a) carbon atoms 13
- b) hydrogen atoms 18
- c) π bonds 4
- d) oxygen atoms 2
- e) sp^2 hybridized carbons 7
- f) sp^3 hybridized carbons 6
- g) carbons in the ring 6
- h) lone pairs (non bonding pairs) of electrons 4
- i) the O-C-O bond angle. 120°

14) Draw the following molecule in line angle (*stick figure*) form. (3pts)

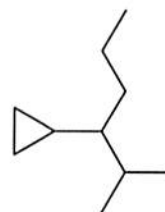
3-ethyl-2-methylheptane



15) Name the following molecules in IUPAC form: (3+3pts)

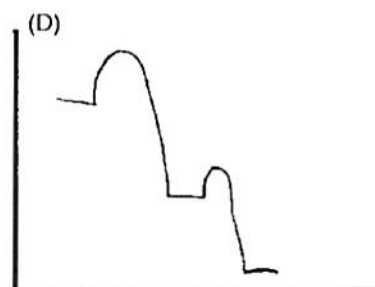
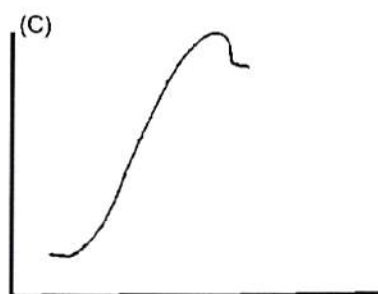
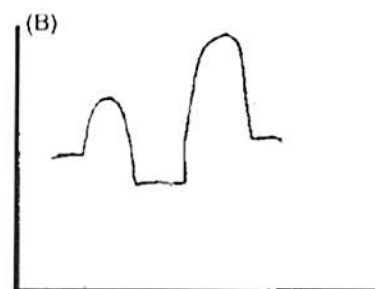
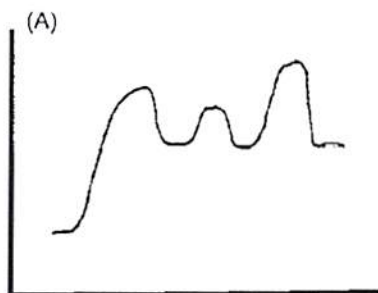


CIS-1,2-DIMETHYL CYCLOPENTANE



3-Cyclopropyl-2-methylhexane

16) Using these four energy level diagrams (A-D), pick the most appropriate. (3pts)



a) which is the most *exothermic*? D

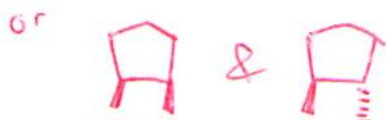
b) which has the most steps? A

c) which has the *rate determining step* as the 2nd step? B

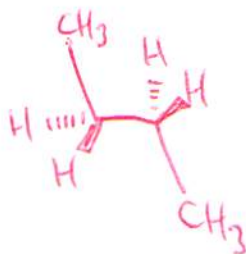
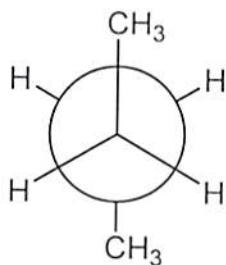
17) What is meant by the scientific term *radical species* (1pt)?

A radical is a species with an odd number of valence electrons and therefore an unpaired electron.

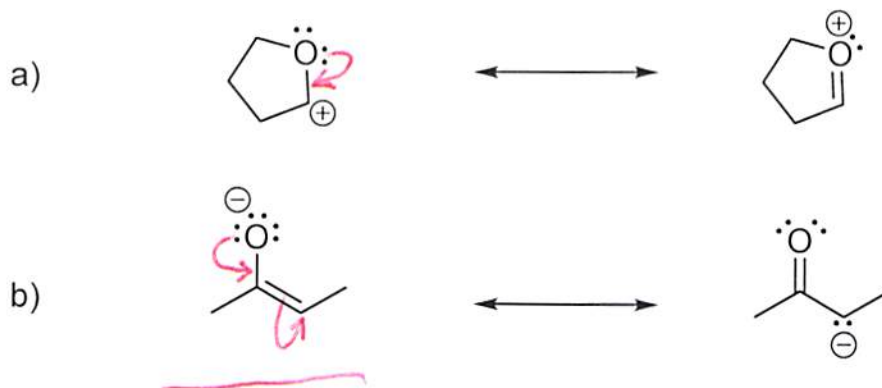
18) Draw any two molecules that are *isomers*, and **state** whether the pair you drew are *stereoisomers* or *structural isomers*. (2+1=3pts)



19) Redraw this Newman projection using sticks and wedges. (2pts)



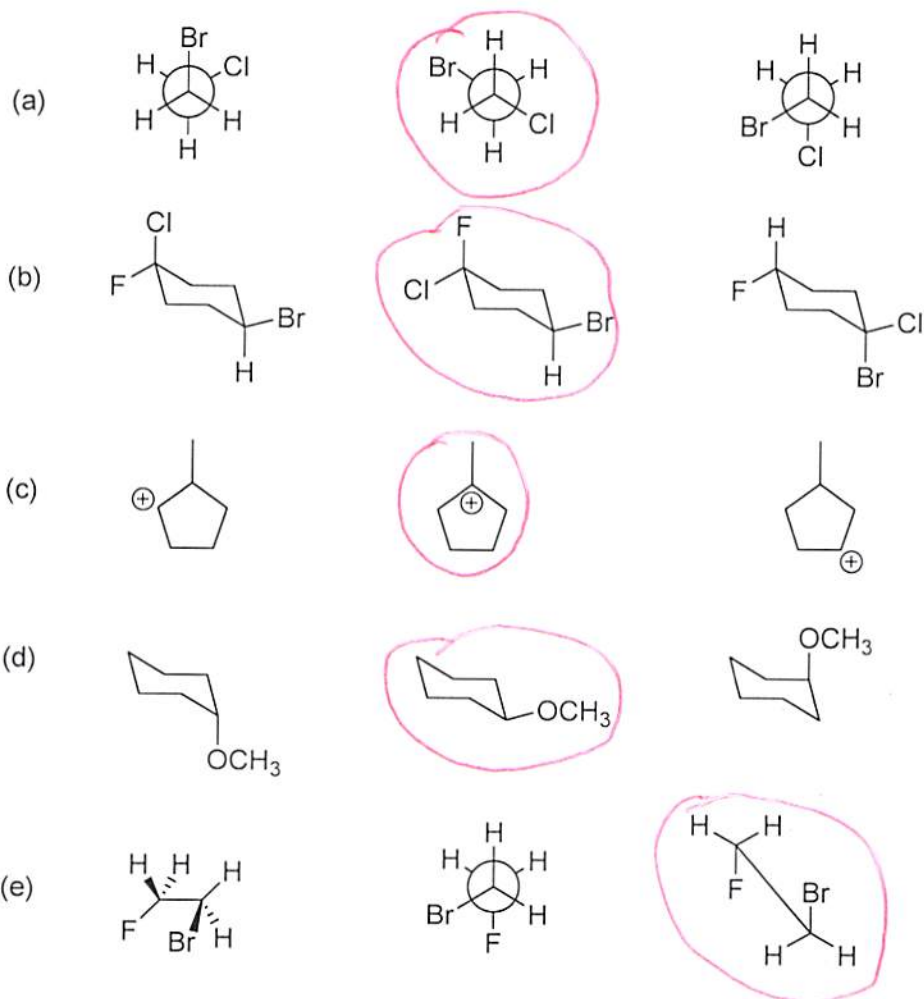
20) Show the electron movement (curly arrows) that convert the left resonance structure into the right hand side resonance form. (3pts)



21) For part 20b, underline the major contributor. (1pt)

above

22) Circle the *most stable* member of each threesome. (5pts)



Bonus Question for up to 2 points

What do the initials **IUPAC** stand for?

International
Union of
Pure and
Applied
Chemistry