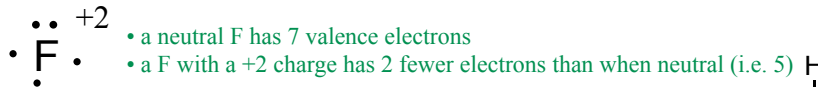


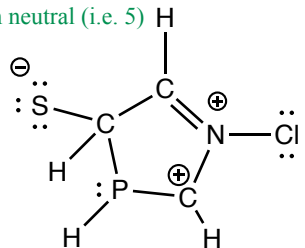
Organic Chemistry I for the Life Sciences
CHM 223
Test 1
Chapters 1-4

Name _____

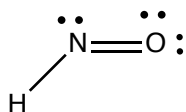
1. Draw a complete Lewis dot structure for F^{+2} :



2. Draw in missing lone pairs for the following molecule:



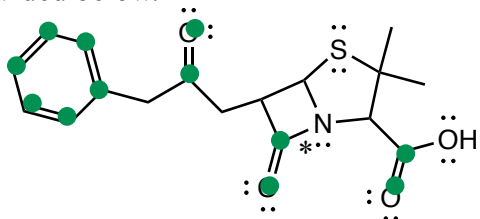
3. What is the expected hybridization of the nitrogen atom in a molecule of HNO ? Provide supporting evidence for your answer.



• the nitrogen atom has a steric number of 3

the nitrogen atom is **SP²** hybridized

4. Answer the following questions based on the skeletal (bond-line) structure of penicillin G provided below.

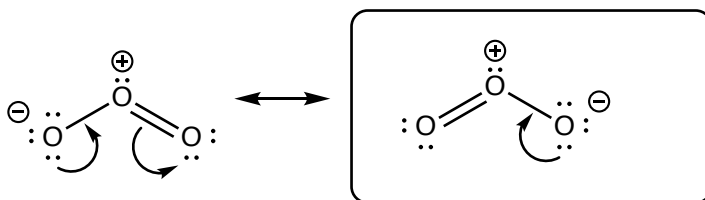


1. How many total pi bonds total are present? **6**

2. How many total SP² atoms are present? **12** ●

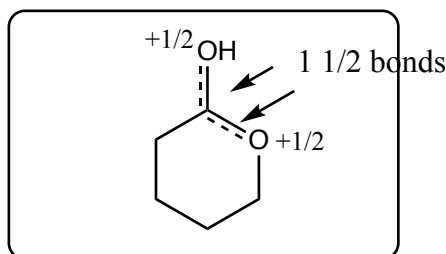
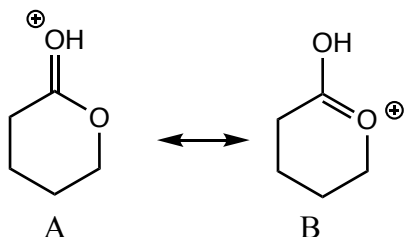
3. The bond marked with a * is formed by overlap of which two types of hybridized orbitals? **SP² (C) and SP³ (N)**

5. Using curved arrows properly, draw the other important resonance form for ozone.



resonance form

6. Two resonance forms for a structure are provided below. Using the template provided, draw the expected hybrid form for this compound that clearly shows expected charges on charged atoms, and bond orders where appropriate



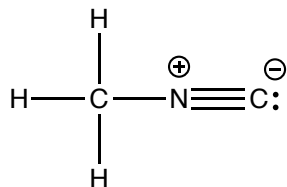
hybrid form

7. Which of the following bonds places a partial *positive* charge on the carbon atom (may be more than one answer)?

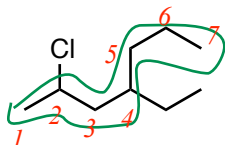
- A. C-F B. C-B C. C-O D. C-Si

• carbon will have a δ^+ whenever it is attached to an atom that is MORE electronegative

8. Draw a good Lewis dot structure for methyl isocyanide, H_3CNC (the C,N,C atoms are connected in the order as provided).

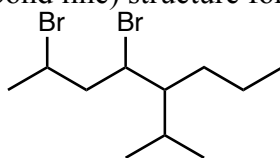


9. Provide the IUPAC name for the following molecule:

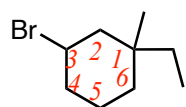


2-chloro-4-ethylheptane

10. Draw the skeletal (bond line) structure for 2,4-dibromo-5-isopropyloctane

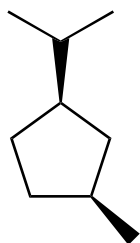


11. Provide the IUPAC name for the following molecule:



3-bromo-1-ethyl-1-methylcyclohexane

12. Clearly draw the structure of cis-1-isopropyl-3-methylcyclopentane



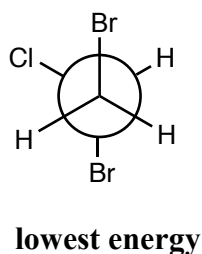
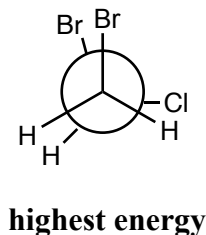
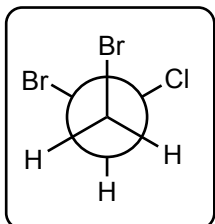
13. What is the relationship between the following two compounds?

cis-1,2-dibromocycloheptane *and* trans-1,3-dibromocycloheptane

- A. identical B. stereoisomers C. no relationship D. constitutional isomers E. BFFs

• they are both dibromocycloheptanes so they have the same molecular formula
• that they have the same molecular formula, but different names means they are isomers
• that one is 1,2- and the other is 1,3- means they have different connectivities
• isomers with different connectivities = constitutional isomers

14. The following Newman projection is that for one conformation of 1,2-dibromo-2-chloroethane. Using the templates below, draw Newman projections corresponding to its **highest** energy conformation and **lowest** energy conformation.



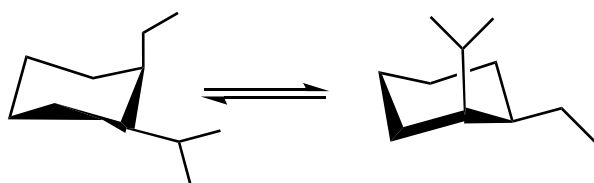
- the highest energy conformation will be an eclipsed structure in which the two largest groups (the size of Br > Cl) are eclipsed
- the lowest energy conformation will be a staggered structure in which the two largest groups are anti relative to one another

15. The type of strain experienced by a substituent in the axial position of a cyclohexane chair conformation is primarily that of:

- A. torsional strain B. angle strain C. chair-chair strain (D) steric strain E. back strain

- 1,3-diaxial interactions are a form of steric strain

16. **Clearly** draw the two chair forms for cis-1-ethyl-2-isopropylcyclohexane. Which of the two chair conformations drawn, A or B, is most stable? Briefly explain.



A

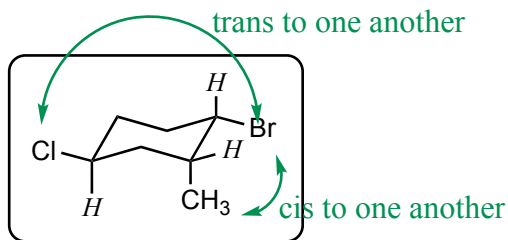
1 ax ethyl
1 eq isopropyl

B

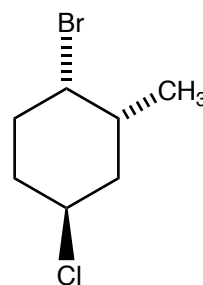
1 ax isopropyl
1 eq ethyl

- the 3 carbon isopropyl group is larger than the 2 carbon ethyl group
- since the larger group has greater preference for the equatorial position, chair form A (as drawn here) will be the more stable!

17. The molecule below is drawn in its chair form. Complete the structure of this molecule drawn in the planar form that clearly shows the stereochemical relationships of the substituents:



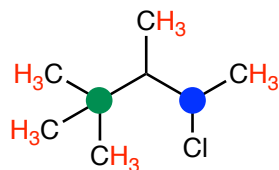
planar form



18. Which one of the following statements is true about the bent conformation of cyclobutane relative to the hypothetical planar form?

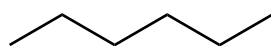
- (A) The bent conformation is more stable even though the angle strain is greater than in the planar conformation
 B. The planar conformation is more stable even though the angle strain is greater than in the bent conformation
 C. The bent conformation is more stable even though the torsional strain is greater than in the planar conformation
 D. The planar conformation is more stable even though the torsional strain is greater than in the bent conformation

19. Provide answers for the questions about the structure below



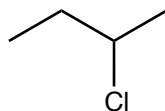
- A. How many 1° hydrogen atoms are present? 15 (in red)
- B. How many 2° carbon atoms are present? 1 (●)
- C. How many 4° carbon atoms are present? 1 (●)

20. Which of the following properly ranks the boiling points of compounds A-D below (all four compounds have approximately the same molecular weight):



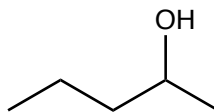
A

• non polar



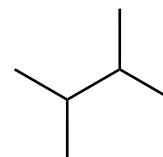
B

• polar



C

• polar
• H-bonding



D

• nonpolar
• branched

- A. $D > A > C > B$
 B. $C > A > B > D$
 C. $B > D > C > A$
 D. $C > B > A > D$
 E. $A > D > C > B$

- polar compounds will generally have higher boiling points than nonpolar compounds (i.e., B and C will boil higher than A and D)
- a polar hydrogen bonding compound (one that has an NH or OH in its structure) will have a higher boiling point than a polar compound that is incapable of hydrogen bonding (i.e., $C > B$)
- branching will decrease boiling points relative to unbranched isomers (i.e., $A > D$)