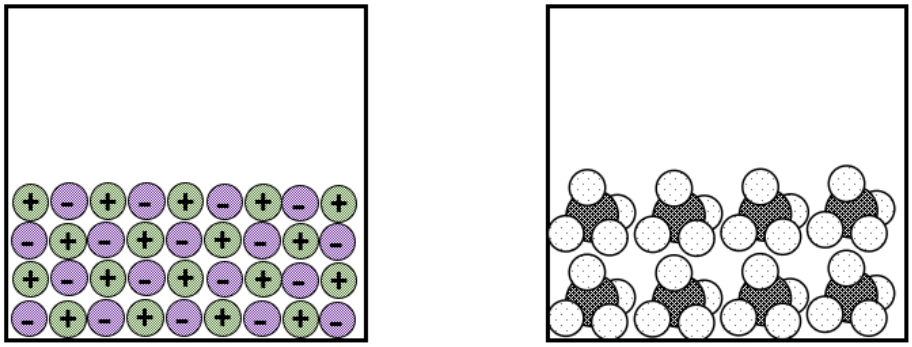
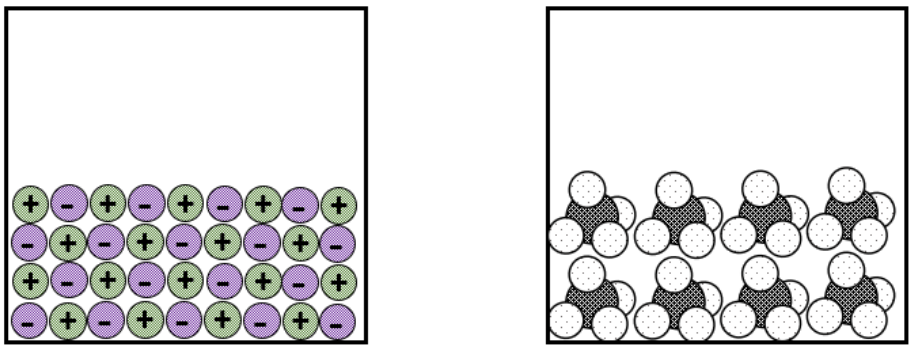
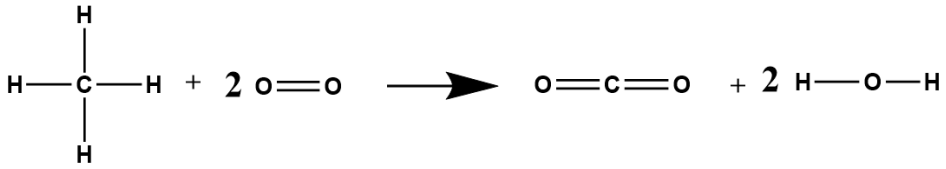
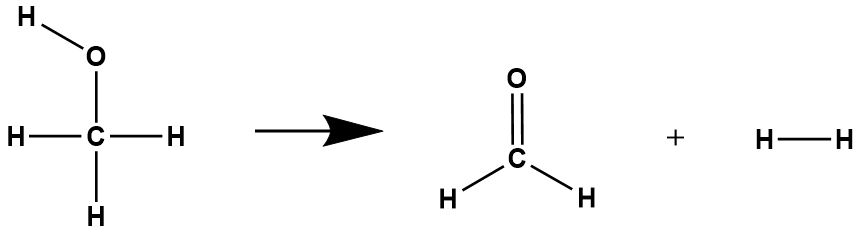
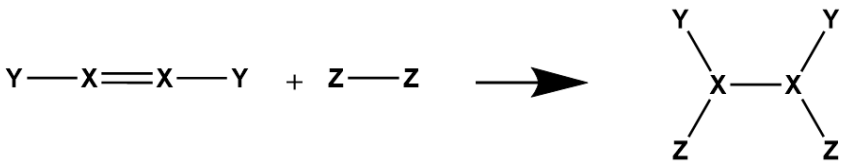
Faculty Submitting: Allison Kelly

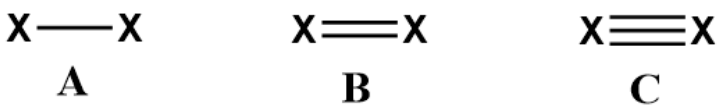
Specify here whether "Pre" or "End" of Unit and the Unit #: End Unit 7

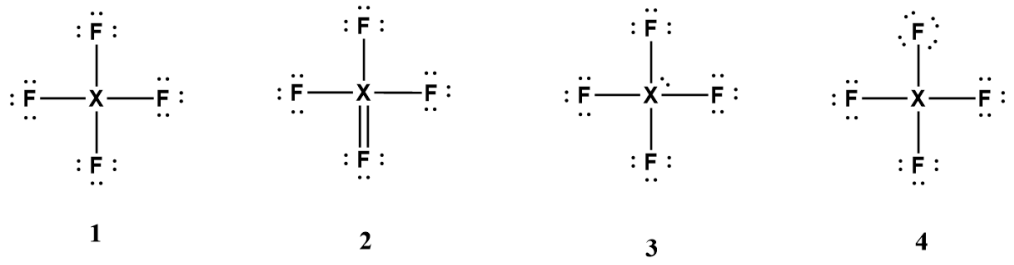
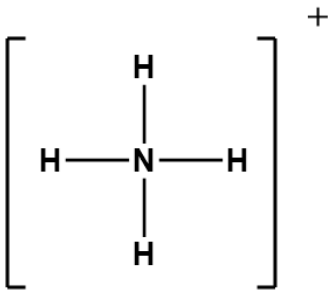
LOs:	
Describe the difference between ionic and covalent bonding and differentiate between ionic and covalent compounds	
Unit 7_ Question 1	**Canvas Question Type:** Multiple Answer
	Select all of the ionic compounds Correct Answer: $MnCl_2$ $Be(NO_3)_2$ NH_4Cl Wrong Answer: SO_2 H_2O
Read More	https://openstax.org/books/chemistry-2e/pages/7-1-ionic-bonding
Unit 7_ Question 2	**Canvas Question Type:** Multiple Answer
	Select all of the covalent compounds Correct Answer: $HC_2H_3O_2$ NH_3 CS_2 Wrong Answer: KNO_3 FeO
Read More	https://openstax.org/books/chemistry-2e/pages/7-2-covalent-bonding
Unit 7_ Question 3	**Canvas Question Type:** Multiple Choice QUESTION GROUP

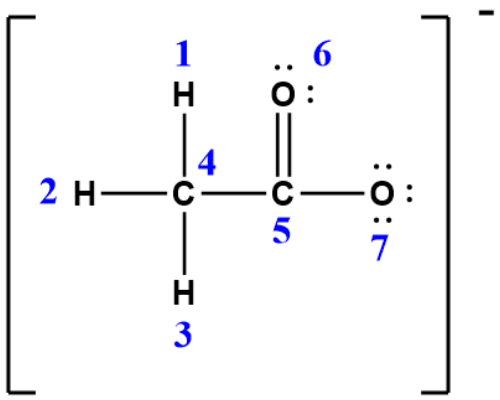
3a	Which of the following diagrams depicts the bonding in an ionic solid?  **A** **B** ALT TEXT: The figure shows two molecular depictions in boxes. In Box A there are two types of atoms, one with a positive charge and one with a negative charge, they are arranged in an orderly fashion with alternating charges.
	Correct Answer: A Wrong Answer: B
3b	Which of the following diagrams depicts the bonding in a covalent solid?  **A** **B** ALT TEXT: The figure shows two molecular depictions in boxes. In Box A there are two types of atoms, one with a positive charge and one with a negative charge, they are arranged in an orderly fashion with alternating charges.
	Correct Answer: B Wrong Answer: A
Read More	https://openstax.org/books/chemistry-2e/pages/7-2-covalent-bonding
Unit 7_ Question 4	**Canvas Question Type:** Multiple Choice QUESTION GROUP
4a	Which of the following will have the largest lattice energy?

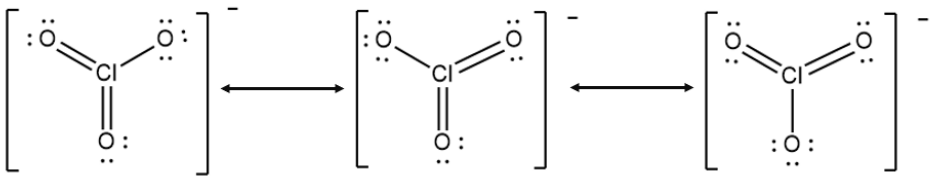
	Correct Answer: MgO Wrong Answers: CaO RbCl CsCl
4b	Which of the following will have the smallest lattice energy?
	Correct Answer: CsCl Wrong Answers: RbCl CaO MgO
Read more	https://openstax.org/books/chemistry-2e/pages/7-5-strengths-of-ionic-and-covalent-bonds
Unit 7_ Question 5	**Canvas Question Type:** Numeric
	Calculate the ΔH_{rxn} in kJ for the following reaction using the bond energies in Table 7.2  ALT TEXT: The reaction shows a carbon with four single bonds to hydrogen atoms reacting with an oxygen molecule where two oxygen atoms are connected by a double bond to form carbon dioxide, where two oxygen atoms are connected to a central carbon atom with double bonds and water where two hydrogen atoms are connected to a central oxygen atom with a single bond.
	[4*415+2*498]-[2*741+4*464] -682 kJ
Read more	https://openstax.org/books/chemistry-2e/pages/7-5-strengths-of-ionic-and-covalent-bonds
Video	Youtube: https://youtu.be/gzhOopYEieo Gdrive: https://drive.google.com/file/d/1OMFHCW37jj0E6A5qTZmwzjul0iPYY96K/view?usp=sharing
Unit 7_ Question 6	**Canvas Question Type:** Numeric

	Calculate the ΔH_{rxn} in kJ for the following reaction using the bond energies in Table 7.2  ALT TEXT: The reaction shows a carbon with three single bonds to hydrogen atoms and one single bond to oxygen which also has a single bond to hydrogen. This reacts to form a molecule containing carbon with a double bond to oxygen and two single bonds to hydrogen atoms, and a hydrogen molecule that is a single bond between two hydrogen atoms.
	[3*415+350+464]-[2*415+741+436] 52 kJ
Read more	https://openstax.org/books/chemistry-2e/pages/7-5-strengths-of-ionic-and-covalent-bonds
Unit 7_ Question 7	**Canvas Question Type:** Formula
	The enthalpy of reaction for the following reaction is [H] kJ/mol. Given the bond energies below, what is the bond energy of the X=X bond? **Bond** / **Energy (kJ/mol)** X-Y / [xy] Z-Z / [zz] X-Z / [xz] X-X / [xx]  ALT TEXT: The figure shows a reaction. A molecule in which Y is connected to X by a single bond which is connected to X by a double bond which is connected to Y by a single bond reacts with a molecule that is to Z atoms connected by a single bond. It forms a molecule where to X

	atoms are connected by a single bond and each X atom has a single bond to Y and a single bond to Z.
	H-zz+xx+(2*xz) H: 100-200 kJ/mol All bonds: 200-400 kJ/mol
Read more	https://openstax.org/books/chemistry-2e/pages/7-5-strengths-of-ionic-and-covalent-bonds
Unit 7_ Question 8	**Canvas Question Type:** Multiple Choice
	Consider a series of bonds, which is most likely to be true  A B C ALT TEXT: This shows a series of bonds between two X atoms, Bond A is a single bond, Bond B is a double bond and Bond C is a triple bond
	Correct Answer: A is the longest bond, A is the weakest bond Wrong Answers: A is the longest bond, A is the strongest bond A is the shortest bond, A is the weakest bond A is the shortest bond, A is the strongest bond
Read more	https://openstax.org/books/chemistry-2e/pages/7-5-strengths-of-ionic-and-covalent-bonds
Draw Lewis symbols, structures and resonance structures; use formal charge to rank likely Lewis structures	
Unit 7_ Question 9	**Canvas Question Type:** Multiple Choice
	Consider the following unknown compound XF_4, where X is an element with six valence electrons and an electronegativity of 2.7. What is the most likely Lewis Structure for this compound

	 1 2 3 4 ALT TEXT: Lewis structure 1 is X bonded to four fluorine atoms via single bonds with three lone pairs on each fluorine atom. Lewis structure 2 is X bonded to three fluorine atoms via single bonds and one fluorine atom via a double bond; all fluorine atoms have three lone pairs. Lewis structure 3 is X bonded to four fluorine atoms via single bonds with three lone pairs on each fluorine atom and one lone pair on the X. Lewis structure 4 is X bonded to four fluorine atoms via single bonds; three fluorine atoms have three lone pairs and one has four lone pairs.
	Correct Answer: 3 Wrong Answers: 1,2 or 4
Read more	https://openstax.org/books/chemistry-2e/pages/7-3-lewis-symbols-and-structures
Video	Youtube: https://youtu.be/InAHUEbW7w0 Gdrive: https://drive.google.com/file/d/1kpwWBcYwAosdnHTFabeJ7hZH5p0i84IX/view?usp=sharing
Unit 7_ Question 10	**Canvas Question Type:** Fill in Multiple Blanks
	Assign the formal charge for each atom in the following structure. Be sure to include + or – as necessary (e.g. +1 or -2)  ALT TEXT: This shows an ion with an overall +1 charge. Where a central nitrogen atom is bond to four hydrogens via single bond

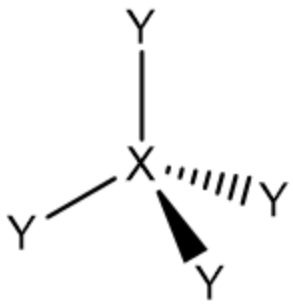
	N [+1] H [0]
Read more	https://openstax.org/books/chemistry-2e/pages/7-4-formal-charges-and-resonance
Unit 7_ Question 11	**Canvas Question Type:** Fill in Multiple Blanks
	Assign the formal charge for each atom in the following structure  ALT TEXT: This structure shows a carbon that is has three single bonds to hydrogen, bond to another carbon via a single bond. The second carbon is double bonded to an oxygen atom with two lone pairs and single bonded to an oxygen with three lone pairs. Atom 1: [one] Atom 2: [two] Atom 3: [three] Atom 4: [four] Atom 5: [five] Atom 6: [six] Atom 7: [seven]
Read more	https://openstax.org/books/chemistry-2e/pages/7-4-formal-charges-and-resonance
Video	Youtube: https://youtu.be/GG76wUp2A9s Gdrive: https://drive.google.com/file/d/1h0nYltxj4-JFVHrWbz_SJhC2s4xzSfHt/view?usp=sharing

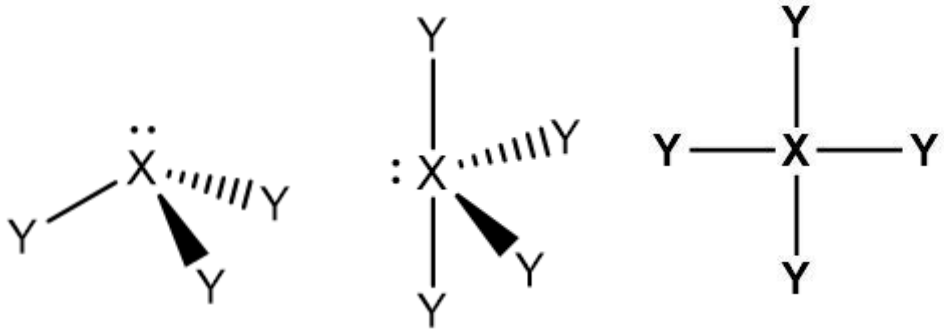
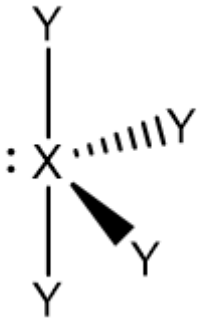
Unit 7_ Question 12	**Canvas Question Type:** Numeric
	How many lone pairs are on the central atom in CH_2O? 0
Read more	https://openstax.org/books/chemistry-2e/pages/7-3-lewis-symbols-and-structures
Unit 7_ Question 13	**Canvas Question Type:** Multiple Choice
	Rank the resonance structures below based on how likely they are to contribute to the resonance hybrid  Structure 1 Structure 2 Structure 3 ALT TEXT: Each structure shows three oxygen atoms bond to chlorine, with a lone pair on the chlorine. In the first structure, two of the oxygens on the left and center have a double bond and two lone pairs, the right oxygen has a single bond and three lone pairs. In the second structure, the left oxygen has a single bond and three lone pairs, the center and right oxygen have double bonds and two lone pairs. In the third structure, the center oxygen has a single bond and three lone pairs, and the left and right oxygen has double bonds and two lone pairs.
	Correct Answer: They are all equal contributors Wrong Answer: Structure 1 > Structure 2 > Structure 3 Structure 3 > Structure 2 > Structure 1 Structure 1 > Structure 3 > Structure 2 Structure 3 > Structure 1 > Structure 2 Structure 2 > Structure 1 > Structure 3 Structure 2 > Structure 3 > Structure 1
Read more	https://openstax.org/books/chemistry-2e/pages/7-4-formal-charges-and-resonance
Unit 7_ Question 14	**Canvas Question Type:** Multiple Choice
	Which of the following Lewis structures is less likely?

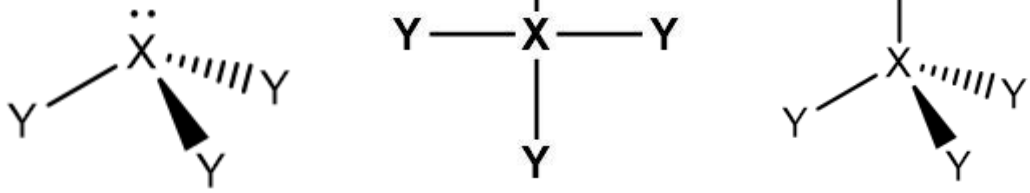
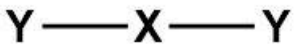
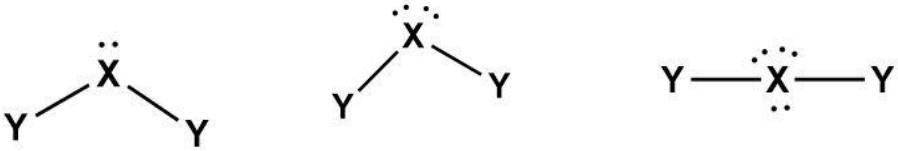
	 Structure 1 Structure 2 ALT TEXT: Structure one shows two oxygens connected by double bonds to a central carbon, each oxygen has two lone pairs. Structure two shows two oxygens connected to a central carbon; the left oxygen has a single bond and three lone pairs, the right oxygen has a triple bond and one lone pair.
	Correct Answer: Structure 2 is less likely because it does not minimize formal charge Wrong Answers: Structure 2 is less likely because it breaks the octet rule Structure 1 is less likely because it breaks the octet rule Structure 1 is less likely because it does not minimize formal charge
Read more	https://openstax.org/books/chemistry-2e/pages/7-4-formal-charges-and-resonance
Use VSEPR to determine atomic orbital hybridization, predict electron pair and molecular geometry for molecules and ions	
Unit 7_ Question 15	**Canvas Question Type:** Multiple Choice
	Rank the following species in terms of increasing N—H bond angle NH_4^+, NH_2^-, NH_3
	Correct Answer: $NH_2^- < NH_3 < NH_4^+$ Wrong Answers: $NH_4^+ < NH_3 < NH_2^-$ $NH_3 < NH_4^+ < NH_2^-$ $NH_3 < NH_2^- < NH_4^+$ $NH_4^+ < NH_2^- < NH_3$ $NH_2^- < NH_4^+ < NH_3$
Read more	https://openstax.org/books/chemistry-2e/pages/7-6-molecular-structure-and-polarity
Unit 7_ Question 16	**Canvas Question Type: Multiple DropDowns**
	Identify the geometry and bond angles for the following unknown compound:

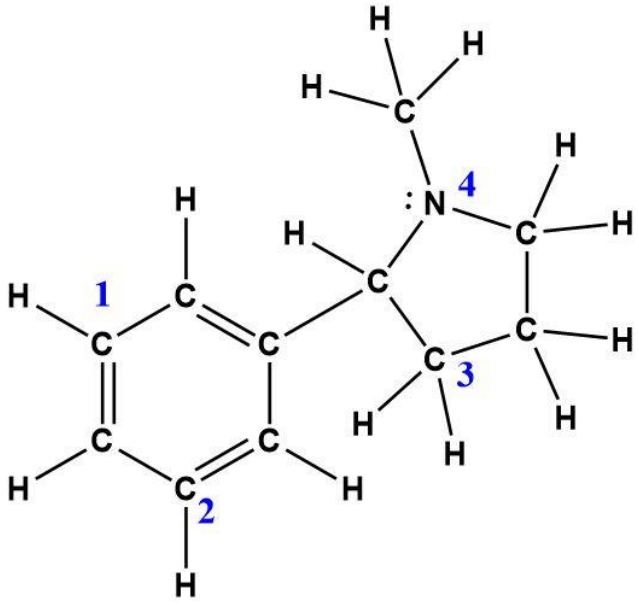
	XF_5, where X is an element below the third period, with seven valence electrons and an electronegativity of 2.9 Geometry: [dropone] Bond Angle: [droptwo]
	Dropone: square pyramidal linear trigonal planar bent tetrahedral trigonal pyramidal trigonal bipyramidal see-saw T-shaped octahedral square planar Droptwo: < 90° 180° 120° <120° 109.5° <109.5° 120°, 90° <120°, <90° 90°
Read more	https://openstax.org/books/chemistry-2e/pages/7-6-molecular-structure-and-polarity
Unit 7_ Question 17	**Canvas Question Type: Multiple DropDowns**
	Identify the geometry and bond angles for the following unknown compound: XF_4, where X is an element below the third period, with six valence electrons and an electronegativity of 2.6 Geometry: [dropone] Bond Angle: [droptwo]

	Dropone: see-saw linear trigonal planar bent tetrahedral trigonal pyramidal trigonal bipyramidal T-shaped octahedral square planar square pyramidal Droptwo: <120°, <90° 180° 120° <120° 109.5° <109.5° 120°, 90° 90° <90°
Read more	https://openstax.org/books/chemistry-2e/pages/7-6-molecular-structure-and-polarity
Unit 7_ Question 18	**Canvas Question Type: Multiple DropDowns**
	Identify the geometry and bond angles for the following unknown compound: $XOCl_2$, where X is an element with four valence electrons and an electronegativity of 2.4 Geometry: [dropone] Bond Angle: [droptwo]
	Dropone: trigonal planar Linear trigonal pyramidal bent tetrahedral trigonal bipyramidal T-shaped octahedral

	square planar square pyramidal see-saw Droptwo: 120° 180° <120° 109.5° <109.5° 120°, 90° 90° <90° <120°, <90°
Read more	https://openstax.org/books/chemistry-2e/pages/7-6-molecular-structure-and-polarity
Unit 7_ Question 19	**Canvas Question Type: Multiple Choice** QUESTION GROUP: Pick 2
19a	What is the geometry for an unknown molecule, XH_4, where X is an element with 4 valence electrons and an electronegativity of 2.6
	Correct Answer:  Tetrahedal: A central X atom with two Y bonds in plane and one out of plane and one into the plane Wrong Answers

	 Trigonal Pyramical: A central X atom with three Y bonds, one in plane and two in and out of plane See-Saw: A central X atom with four Y bonds, two in plane 180 degrees from eachother and two in and out of plane Cross: A central X atom with four Y bonds 90 degrees all in the same plane
19b	What is the geometry for an unknown molecule, XCl_4, where X is an element with 6 valence electrons and an electronegativity of 2.6
	Correct Answer:  Wrong Answers:

	
19c	What is the geometry for an unknown molecule, XS_2, where X is an element with 4 valence electrons and an electronegativity of 2.4
	Correct Answer:  Wrong Answers: 
Read more	https://openstax.org/books/chemistry-2e/pages/7-6-molecular-structure-and-polarity
Describe sigma and pi bonding in hybrid and molecular orbitals. Understand the differences between valence bond and molecular orbital theory.	
Unit 7_ Question 20	**Canvas Question Type: Multiple DropDowns** **QUESTION GROUP, PICK TWO**
20a	Assign the hybridization and bond angles at each of the labelled atoms



nicotine

Atom 1: Bond Angle: [Dropone] Hybridization: [Droptwo]
Atom 2: Bond Angle: [Dropthree] Hybridization: [DropFour]
Atom 3: Bond Angle: [Dropfive] Hybridization: [Dropsix]
Atom 4: Bond Angle: [Dropseven] Hybridization: [Dropeight]

Dropone: 120°

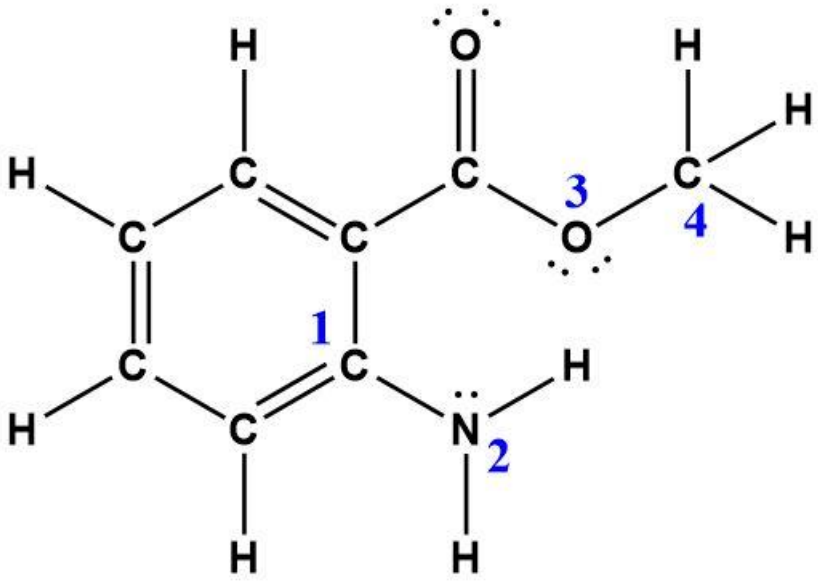
180°
<120°
109.5°
<109.5°
120°, 90°
90°
<90°
<120°, <90°

droptwo: sp2

sp, sp3, sp3d, sp3d2

dropthree: 120°

	180° <120° 109.5° <109.5° 120°, 90° 90° <90° <120°, <90° dropfour: sp2 sp, sp3, sp3d, sp3d2 dropfive: 109.5° 180° <120° 120° <109.5° 120°, 90° 90° <90° <120°, <90° dropsix: sp3 sp, sp2, sp3d, sp3d2 Dropseven: <109.5 180° <120° 120° 109.5° 120°, 90° 90° <90° <120°, <90° dropeight: sp3 sp, sp2, sp3d, sp3d2
20b	Assign the hybridization and bond angles at each of the labelled atoms



methyl anthranilate

Atom 1: Bond Angle: [Dropone] Hybridization: [Droptwo]

Atom 2: Bond Angle: [Dropthree] Hybridization: [DropFour]
Atom 3: Bond Angle: [Dropfive] Hybridization: [Dropsix]
Atom 4: Bond Angle: [Dropseven] Hybridization: [Dropeight]

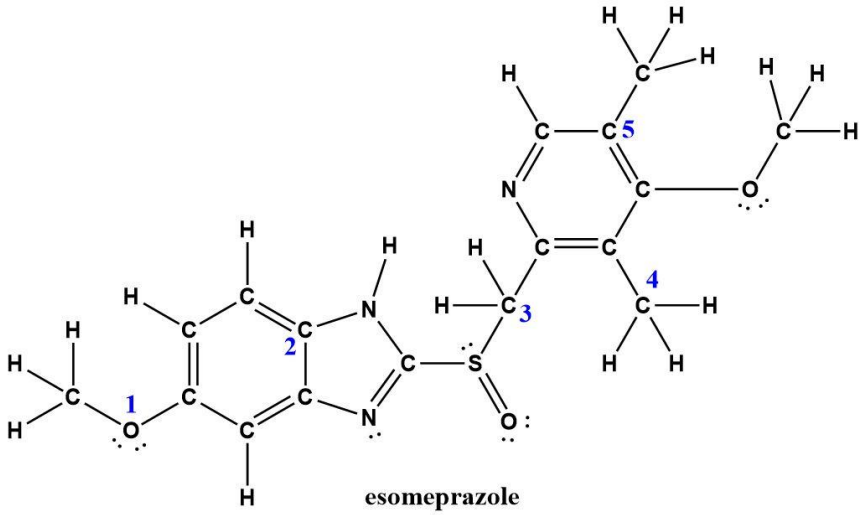
Dropone: 120°

180°
<120°
109.5°
<109.5°
120°, 90°
90°
<90°
<120°, <90°

droptwo: sp2

sp, sp3, sp3d, sp3d2

	dropthree: <109.5° 180° 120° 109.5° <120° 120°, 90° 90° <90° <120°, <90° dropfour: sp3 sp, sp2, sp3d, sp3d2 dropfive: <109.5° 180° 120° <120° 109.5° 120°, 90° 90° <90° <120°, <90° dropsix: sp3 sp, sp2, sp3d, sp3d2 Dropseven: 109.5 180° 120° <120° <109.5° 120°, 90° 90° <90° <120°, <90° dropeight: sp3 sp, sp2, sp3d, sp3d2
20c	Assign the hybridization and bond angles at atoms 1-4



Atom 1: Bond Angle: [Dropone] Hybridization: [Droptwo]

Atom 2: Bond Angle: [Dropthree] Hybridization: [DropFour]
Atom 3: Bond Angle: [Dropfive] Hybridization: [Dropsix]
Atom 4: Bond Angle: [Dropseven] Hybridization: [Dropeight]

Dropone: <109.5°

180°
120°
<120°
109.5°
120°, 90°
90°
<90°
<120°, <90°

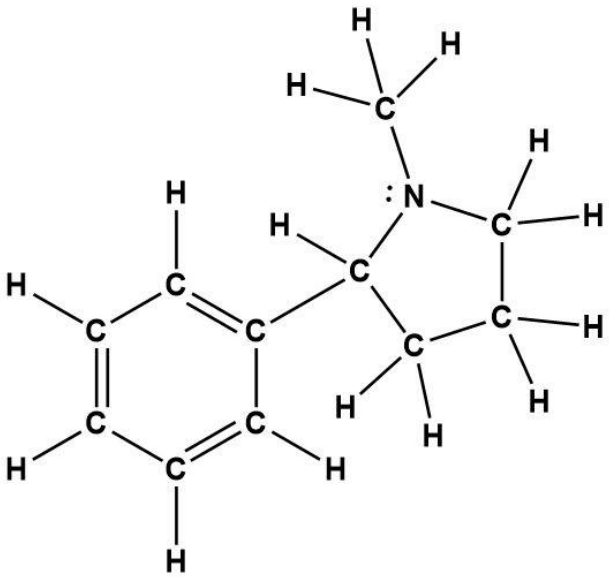
droptwo: sp3

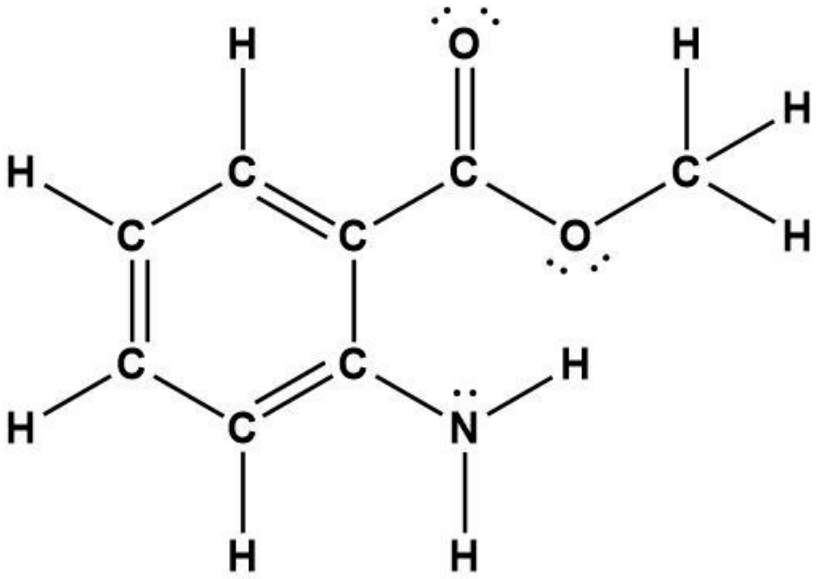
sp, sp2, sp3d, sp3d2

dropthree: 120°

180°
<109.5°
<120°
109.5°

	120°, 90° 90° <90° <120°, <90° dropfour: sp2 sp, sp3, sp3d, sp3d2 dropfive: 109.5° 180° 120° <120° <109.5° 120°, 90° 90° <90° <120°, <90° dropsix: sp3 sp, sp2, sp3d, sp3d2 Dropseven: 109.5 180° 120° <120° <109.5° 120°, 90° 90° <90° <120°, <90° dropeight: sp3 sp, sp2, sp3d, sp3d2
Read more	https://openstax.org/books/chemistry-2e/pages/8-2-hybrid-atomic-orbitals
Unit 7_ Question 21	**Canvas Question Type: Fill in Multiple Blank**
	How many sigma (σ) and pi (π) bonds are in the following molecule?

	 **nicotine** Sigma: [28, twenty eight] Pi: [3, three]
Read more	https://openstax.org/books/chemistry-2e/pages/8-2-hybrid-atomic-orbitals
Unit 7_ Question 22	**Canvas Question Type: Fill in Multiple Blank**
	How many sigma (σ) and pi (π) bonds are in the following molecule?

	 **methyl anthranilate** Sigma: [twenty] Pi: [four]
Read more	https://openstax.org/books/chemistry-2e/pages/8-2-hybrid-atomic-orbitals
Use the concept of electronegativity to predict bond covalency, bond polarity, and the dipole moment of molecules	
Unit 7_ Question 23	**Canvas Question Type: Multiple Answer** **QUESTION GROUP**
23a	Select all of the polar bonds
	Correct Answers: H—Cl H—O S—O Wrong Answers: F—F C—H P—H

23b	Select all of the nonpolar bonds
	Correct Answers: F—F C—H P—H Wrong Answers: H—Cl H—O S—O
Read more	https://openstax.org/books/chemistry-2e/pages/7-6-molecular-structure-and-polarity
Unit 7_ Question 24	**Canvas Question Type: Multiple Drop Down**
	Use Figure 7.6 to indicate which atom in each polar covalent bond would have the partial negative charge and which would have the partial positive charge [dropone] H—Cl [droptwo] [dropthree] Br—C [dropfour] [dropfive] P—O [dropsix] [dropseven] F—N [dropeight]
	Dropone: δ+ δ- DropTwo: δ- δ+ DropThree: δ- δ+ Dropfour: δ+ δ- Drop Give: δ+ δ- Dropsix: δ- δ+ Dropseven: δ- δ+

	Dropeight: δ+ δ-
Read more	https://openstax.org/books/chemistry-2e/pages/7-6-molecular-structure-and-polarity
Unit 7_ Question 25	**Canvas Question Type: Multiple Answer**
	Which of the following molecules will have a dipole moment
	Correct Answers: H_2O NH_3 CH_2O Wrong Answers XeF_2 CH_4
Read more	https://openstax.org/books/chemistry-2e/pages/7-6-molecular-structure-and-polarity
Unit 7_ Question 26	**Canvas Question Type: Multiple Choice**
	Consider the unknown compound JO_2, where J is an unknown element with 4 valence electrons and an electronegativity of 2.4. Determine whether this molecule is polar or nonpolar.
	Correct Answer: nonpolar wrong Answer: polar
Read more	https://openstax.org/books/chemistry-2e/pages/7-6-molecular-structure-and-polarity