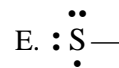
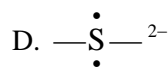
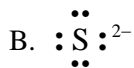
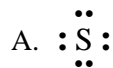


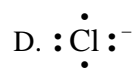
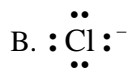
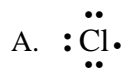
Chapter 5: 3, 5, 7 and 9

Chapter 6: 23, 25, 29, 31, 35, 37, 39, 41, 53, 57, 59, 73 and 79

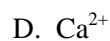
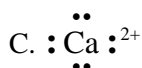
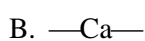
Chapter 7: 7, 9, 11, 13, 19, 21, 35, 37, 39, 43, 45, 47, 49, 79 and 83

6. The Lewis dot symbol for the S^{2-} ion is

7. The Lewis dot symbol for the chloride ion is



8. The Lewis dot symbol for the calcium ion is

16. The electron dot formula for O_2 shows

A. a single covalent bond

B. a double covalent bond

C. an ionic bond

D. a total of $8 \times 2 = 16$ electron dots

E. a total of 32 electron dots

17. The number of lone electron pairs in the N_2 molecule is ____.

A. 1

B. 2

C. 3

D. 4

E. 5

18. The electron dot structure for AsCl_3 shows

A. a total of 84 electron dots

B. three single bonds and 10 lone pairs

C. two single bonds, one double bond, and 9 lone pairs

D. one single bond, two double bonds, and 8 lone pairs

E. three single bonds and one lone pair

19. The total number of bonding electrons in a molecule of formaldehyde (H_2CO) is

A. 3

B. 4

C. 6

D. 8

E. 18

20. The total number of lone pairs in NCl_3 is

A. 6

B. 8

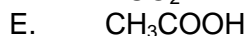
C. 9

D. 10

E. 13

21. What is the Lewis structure for CS_2 ?22. Draw Lewis dot structures obeying the octet rule for (a) ClO^- , (b) ClO_2^- , (c) ClO_3^- , (d) ClO_4^-

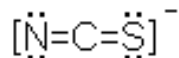
23. Which of the following species can have resonance structures?



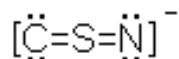
24. Resonance forms can be written for
A. NH_3 B. H_2S C. H_2O D. OF_2 E. SO_2

25. How many resonance forms can be written for the NCS^- ion?

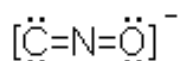
26. For the Lewis structure below, what are the formal charges on N, C, and S?



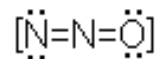
27. For the Lewis structure below, what are the formal charges on C, S, and N?



28. For the Lewis structure below, what are the formal charges on C, N, and O?



29. For the Lewis structure below, considering the atoms from left to right, the formal charges on N, N, and O, respectively, are



30. How many lone pairs are around Xe in XeO_2 ?

31. Which of the following would have a Lewis structure most like that of ICl_2^+ ?
A) XeF_2 B) CO_2 C) XeO_2 D) I_3^- E) O_3

VSEPR Theory and Molecular Shape and Hybridization

1. What is the O–Cl–O bond angle in ClO_4^- ?

2. What is the O–C–O bond angle in CO_3^{2-} ?

3. What is the F–S–F bond angle in SF_2 ?

4. Predict the shape FCl_2^+

5. Predict the shape of AsF_5

6. Predict the shape of AsF_3

7. Predict the shape of SbH_3

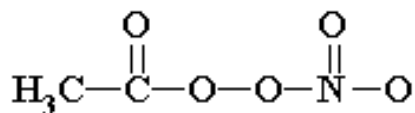
8. Predict the shape of SeO_2

9. Predict the shape of IO_4^-

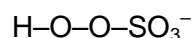
10. Predict the shape of ICl_4^-
11. Predict the shape of TeF_6
12. Predict the shape of SiO_4^{4-}
13. Predict the shape of ICl_2^-
14. Which of the following molecules would be expected to be polar?
A. HBr B. POCl_3 C. CH_2O D. SnCl_4 E. SbCl_5
15. What is the shape of a molecule that has a VSEPR formula of AX_3E ?
16. What is the shape of a molecule with no multiple bonds and a central atom with five bonding pairs of electrons?
17. What is the shape of a molecule with no multiple bonds and a central atom with 2 bonding pairs and 1 lone pair of electrons?
18. What is the shape of a molecule that has a VSEPR formula of AX_4E ?
19. What is the shape of a molecule that has a VSEPR formula of AX_5E ?
20. The Lewis structure of the nitrite ion (NO_2^-) shows around the central nitrogen atom
A. 2 single-bonded oxygens and 2 lone pairs of electrons.
B. 2 double-bonded oxygens.
C. 2 single-bonded oxygens and 1 double-bonded oxygen.
D. 1 single-bonded oxygen, 1 double-bonded oxygen, and 1 lone pair of electrons.
E. 3 single-bonded oxygens and 1 lone pair of electrons.
21. How many electron pairs (both bonding and lone pairs) are on the sulfur atom in SF_4 ?
22. In the Lewis structure of SeF_3^+ , the central atom has
A. 1 lone pair and 6 bonding pairs of electrons.
B. 2 lone pairs of electrons.
C. 1 lone pair of electrons.
D. 2 lone pairs and 3 bonding pairs of electrons.
E. 3 lone pairs of electrons.
23. Which of the following molecules is polar?
A. COS B. S_2 C. CO_2 D. CS_2 E. O_2

24. Which of the following molecules is polar?
 A. XeF₄ B. CH₄ C. SF₆ D. PCl₅ E. IF₅

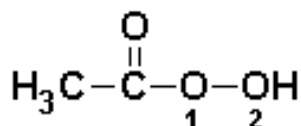
25. What type of hybrid orbitals best describe the bond between the two oxygen atoms in peroxyacetylnitrate (you will have to fill in the lone pairs)?



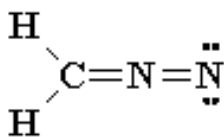
26. What type of hybrid orbitals best describe the bond between the two oxygen atoms in peroxymonosulfate (fill in lone pairs)?



27. What type of orbitals best describe the bond between carbon and oxygen atom 1 in peroxyacetic acid?



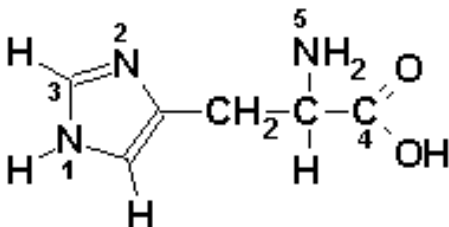
One of the dominant resonance forms of diazomethane is



28. Describe the hybrid orbitals used to form the C–N bond and the N–N bond
29. What are the values of the H–C–N and C–N–N bond angles?
30. What set of hybrid orbitals are used by Xe in XeF₄?
31. What set of hybrid orbitals are used by As in AsF₅?
32. What set of hybrid orbitals are used by S in SF₄?
33. What set of hybrid orbitals are used by Si in SiH₄?
34. What set of hybrid orbitals are used by C in COCl₂?
35. What set of hybrid orbitals is used by N in NO₂⁻?

36. How many sigma and how many pi bonds are present in $\text{H}_3\text{C}-\text{CH}=\text{CH}-\text{CH}_2-\text{OH}$? (Hint-draw showing all bonds and lone pairs)
37. How many sigma and how many pi bonds are present in $\text{CH}_2=\text{C}=\text{CH}_2$?
38. How many sigma and how many pi bonds are present in $\text{H}_3\text{C}-\text{SCN}$?

The structure of the amino acid histidine is shown below is for questions 39-42.

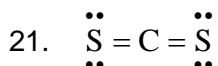


39. What hybrid orbitals are used on ring nitrogen 1 and 2?
40. Describe the hybrid orbitals used to form the bond between ring nitrogen 1 and ring carbon 3.
41. What hybrid orbitals are used on the amino nitrogen 5?
42. What hybrid orbitals are used on carbon 4?

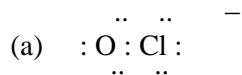
Answers:

Chemical Bonding and Lewis Structures

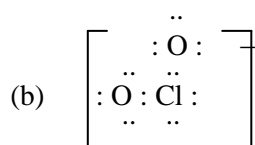
- | | | | |
|-------|-------|-------|-------|
| 1. A | 2. B | 3. B | 4. C |
| 5. C | 6. B | 7. B | 8. D |
| 9. E | 10. C | 11. E | 12. D |
| 13. B | 14. B | 15. A | 16. B |
| 17. B | 18. B | 19. D | 20. D |



22.

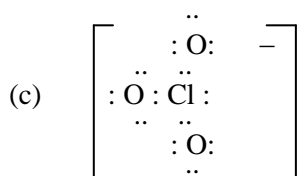


23. B

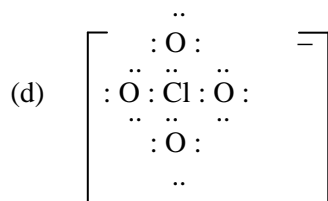


24. E

25. 3



26. -1, 0, 0 (N,C,S)



27. -2, +2, -1 (C,S,N)

28. -2, +1, 0 (C,N,O)

29. -1, +1, 0 (N,N,O)

30. 2

31. C

VSEPR Theory and Molecular Shape and Hybridization

- | | | | |
|---|--------------------------------------|--------------------------------------|--------------------------------------|
| 1. equal to 109° | 2. equal to 120° | 3. <109° | 4. bent |
| 5. trigonal bipyramidal | 6. trigonal pyramidal | 7. trigonal pyramidal | 8. bent |
| 9. tetrahedral | 10. square planar | 11. octahedral | 12. tetrahedral |
| 13. linear | 14. a, b and c | 15. trigonal pyramidal | |
| 16. trigonal bipyramidal | 17. angular | 18. seesaw | 19. square pyramidal |
| 20. D | 21. 5 | 22. C | 23. A |
| 24. E | 25. sp ³ -sp ³ | 26. sp ³ -sp ³ | 27. sp ² -sp ³ |
| 28. sp ² -sp; sp-sp ² | 29. 120° and 180° | 30. sp ³ d ² | 31. sp ³ d |
| 32. sp ³ d | 33. sp ³ | 34. sp ² | 35. sp ² |
| 36. 12 sigma and 1 pi | 37. 6 sigma and 2 pi | 38. 6 sigma and 2 pi | |
| 39. N1 is sp ³ ; N2 is sp ² | 40. sp ³ -sp ² | 41. sp ³ | 42. sp ² |