

Covalent Bonding and Molecular Geometry Sample Multiple Choice Questions Fall 2021

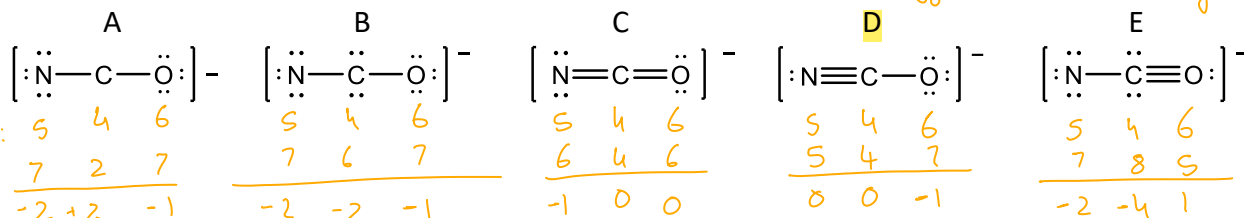
The number of sample questions does not reflect the number of questions that may appear on an In-term test.

1. Based on electronegativity trends, which of these is the MOST polar bond?

A. F-F B. F-Cl C. O-F D. S-Cl **E. F-I**

2. Which of these is the best Lewis structure for the isocyanate ion $[\text{NCO}]^-$?

because oxygen is more electronegative



3. Consider the two resonance structures for nitrous acid (HNO_2) shown below. What is the formal charge on the oxygen atom indicated by the arrow in each of the two resonance structures respectively?



A. +1, 0 B. -1, 0 C. 0, 0 **D. 0, +1** E. 0, -1

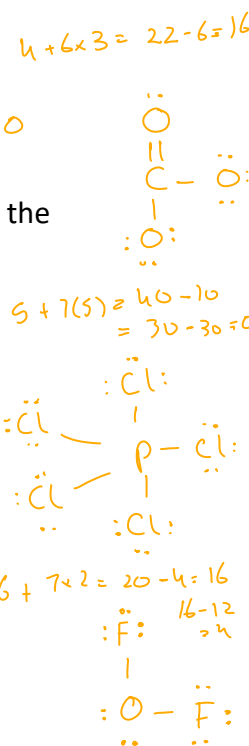
4. For which one of the following molecule or ions do we invoke resonance in describing the bonding?

A. N_2 B. CCl_4 **C. CO_3** D. PCl_5 E. OF_2

5. The molecular geometry (shape) of a molecule with the general formula AB_2 can be:

A. linear or bent
 B. linear or trigonal planar
 C. T-shaped only
 D. linear or T-shaped
 E. trigonal planar only

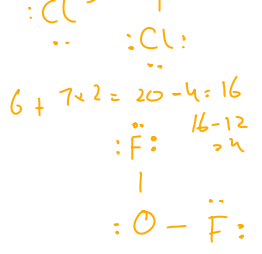
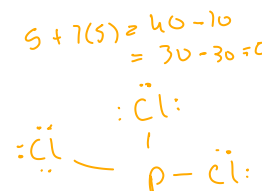
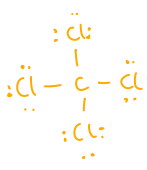
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*valence electrons:
- electrons assigned*

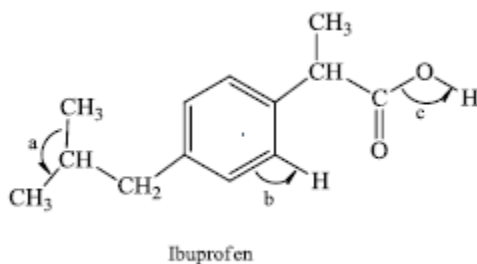
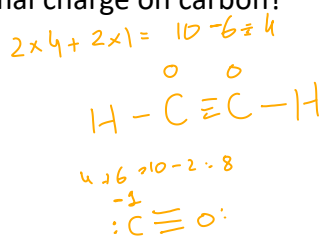
$10 - 2 = 8 - 6 = 2$

$\text{N}\equiv\text{N}$
 $4 + 4 \times 7 = 32 - 8 = 24 - 24 = 0$



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6. Of the inter-halogen compounds ICl, ICl₃ and ICl₅, which statement concerning their molecular dipole moments is correct?
- None have a net molecular dipole.
 - All have a net molecular dipole.
 - Only ICl has a net molecular dipole.
 - Only ICl₃ has a net molecular dipole.
 - Only ICl and ICl₃ have net molecular dipoles.
7. Assuming that *the octet rule applies* to all these structures, which of the molecules: HC≡CH, HCN, CO has a non-zero formal charge on carbon?
- HC≡CH
 - HCN
 - CO
 - HCN and CO
 - none of them

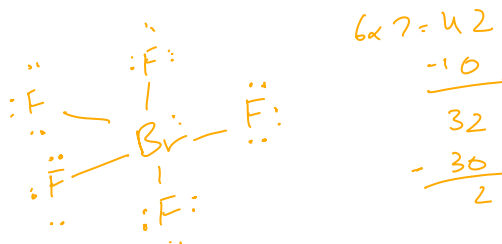


- 120, 120, 120
- 120, 109, 180
- 180, 120, 120
- 109, 120, 109
- 109, 109, 120

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9. The number of **electron pairs** (bonding and non-bonding) around the Br atom in the best Lewis structure of BrF_5 is

- A. 5 bonding, 0 non-bonding
- B. 5 bonding, 1 non-bonding**
- C. 6 bonding, 0 non-bonding
- D. 6 bonding, 1 non-bonding
- E. 5 bonding, 2 non-bonding



10. How many F–Br–F bond angles are approximately 90° in BrF_5 ?

- A.0 B.1 C.8 D.6 E.4

11. The molecular shape of the PHCl_2 molecule is?

- A. Trigonal planar
- B. Trigonal pyramidal
- C. Bent
- D. T-shaped
- E. Tetrahedral

12. Which of the following statements about formal charges is INCORRECT?

- A.** In calculating formal charge, shared electrons are assigned to the more electronegative atom.
- B. In calculating formal charge, unshared electrons ^{lone pairs} are assigned to the atom on which they are found.
- C. In general, the Lewis structure in which the atoms bear the lowest formal charges is the preferred one. ✓
- D. In general, the Lewis structure in which any negative charge resides on the more electronegative element is the preferred one. ✓
- E. Formal charges do not represent the real charges on atoms. ✓

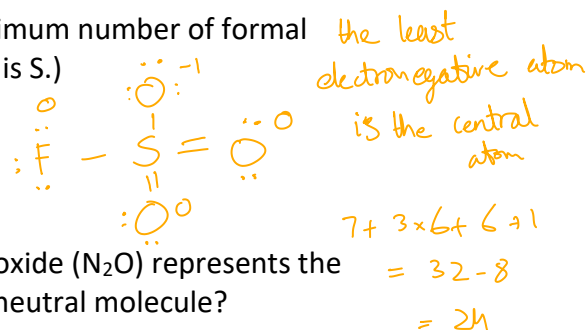
13. What is the molecular geometry of SF_4 ?

- A. seesaw
- B. tetrahedral
- C. square pyramidal
- D. square planar
- E. T-shaped

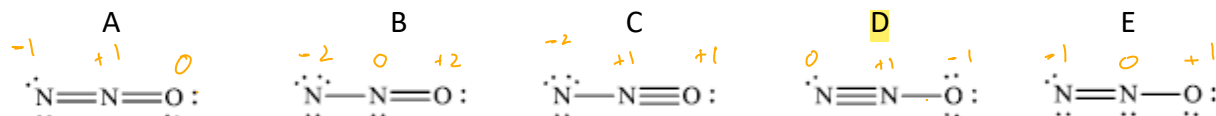
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14. How many equivalent resonance structures (having the minimum number of formal charges) are possible for the ion $[\text{SFO}_3]^-$? (The central atom is S.)

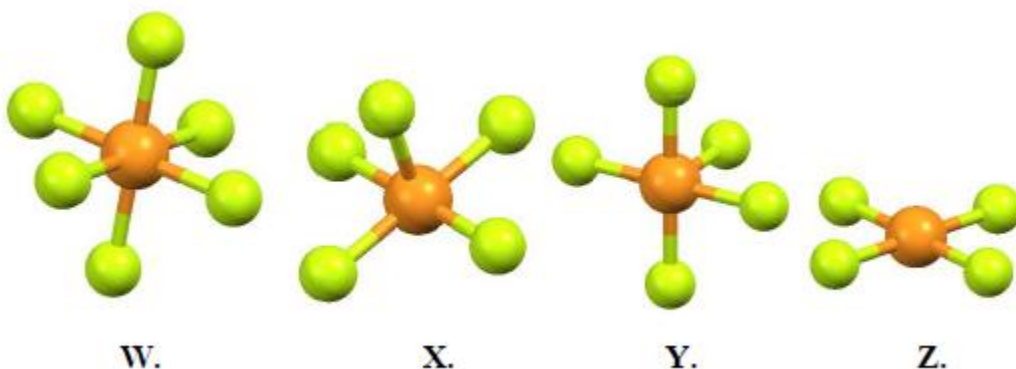
- A. 1 B. 2 **C. 3** D. 4 E. 5



15. Which one of the following resonance structures of nitrous oxide (N_2O) represents the most significant contributor to the resonance hybrid in this neutral molecule?



Use the structures below to answer the following three questions.



16. Which of the above structures is/are based on an octahedral **electron region geometry**?

- A. W only B. X only C. W, X & Y only D. Z only E. all of them

17. For the structure labeled **W** above, what atom would be the central atom **A** if the formula of the molecule is AF_6 ?

- A. Sn B. Sb C. Te D. I E. Xe

18. How many lone pairs does the central atom of structure **Z** (above) possess?

- A. 2 B. 1 C. 0 D. 4 E. indeterminable

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19. The triiodide ion (I_3^-) is known but the trifluoride ion (F_3^-) is not. Which of the following statements best explains the reason there's no such ion as F_3^- ?

- A. Iodine is more likely to be electron-deficient.
- B. Fluorine is too electronegative to form negative ions.
- C. Iodine has a larger electron affinity than fluorine.
- D. Fluorine can't accommodate three lone pairs and two bonds.**
- E. I_2 is known but F_2 is not.

20. In which of the following compounds does every atom have an octet of electrons (8 electrons) in the Lewis structure?

A. SiF_4

B. C_2H_4

C. IF_5

D. NO_2

E. KH

21. What is the molecular geometry of $[\text{SnCl}_5]^-$?

- A. Tetrahedral
- B. See-saw
- C. Octahedral
- D. Trigonal pyramidal
- E. Trigonal bipyramidal

22. How many of the molecules SiCl_4 , SeCl_2 , SeCl_4 and ICl have a molecular dipole moment of zero?

A. 0

B. 1

C. 2

D. 3

E. 4

23. Which molecule has a T-shaped molecular structure?

A. GaBr_3

B. NH_3

C. BrF_3

D. AsH_3

E. PCl_3

24. Which of these ionic compounds has the highest crystal lattice energy?

A. KCl

B. CaCl_2

C. Sc_2O_3

D. CaO

E. ScCl_3

from the relationship $E_{\text{lattice}} \propto \frac{Q_1 Q_2}{r}$

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25. In what situation is the molecular shape the same as the shape of the electron-domain arrangement?

- A. When the central atom does not obey the octet rule
- B. When the central atom does obey the octet rule
- C. When all of the electron pairs on the central atom are involved in bonding
- D. When all but one of the electron pairs on the central atom are involved in bonding
- E. More than one of the above are correct.

26. How many non-bonding lone pairs are there in the best Lewis structure of TeCl_2 ?

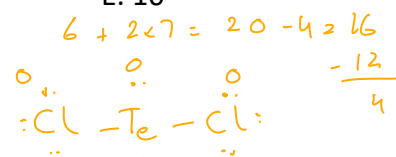
A. 0

B. 6

C. 8

D. 9

E. 10



27. Which of these molecules contains the longest bond?

A. F-F

B. F-Cl

C. O-F

D. N-Cl

E. F-I



pg 241- Atomic size increases going down the periodic table

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Question	Answer
1	E
2	D
3	D
4	C
5	A
6	B
7	C
8	D
9	B
10	C
11	B
12	A
13	A
14	C
15	D
16	E
17	C
18	A
19	D
20	A
21	E
22	B
23	C
24	C
25	C
26	C
27	E