

SC2 – O'Malley

SAT II Review (Bonding)

For questions 1 - 4

- a. an ionic substance
 - b. a polar covalent substance
 - c. a nonpolar covalent substance
 - d. an amorphous substance
 - e. a metallic network
1. KCl(s) is
 2. HCl(g) is
 3. CH₄(g) is
 4. Li(s) is

For questions 5 - 8

- a. hydrogen bond
 - b. ionic bond
 - c. polar covalent bond
 - d. pure covalent bond
 - e. metallic bond
5. The type of bond between atoms of potassium and chloride in a crystal of potassium chloride
 6. The type of bond between the atoms in a nitrogen molecule
 7. The type of bond between atoms in a molecule of CO₂ (electronegativity difference = ~1)

8. The type of bond between atoms of calcium in a crystal of calcium is

For questions 9 - 11

- a. zero
 - b. one
 - c. two
 - d. three
 - e. four
9. The number of bonds predicted for O₂
 10. The number of bonds predicted for N₂
 11. The number of bonds predicted for H₂

For questions 12 - 15

- a. Linear geometry
 - b. Bent geometry
 - c. Tetrahedral geometry
 - d. Pyramidal geometry
 - e. Equilateral triangle geometry
12. NH₃ has a
 13. H₂O has a
 14. BeF₂ has a
 15. CH₄ has a

For questions 16 - 18

- a. BeF₂
 - b. NH₃
 - c. CH₄
 - d. CH₂CH₂
 - e. CCl₄
16. This species has sp² hybrid orbitals
 17. This species has sp hybrid orbitals
 18. This species contains a pi bond

For questions 19 - 22

- a. hydrogen bonding
 - b. ionic bonding
 - c. metallic bonding
 - d. nonpolar covalent bonding
 - e. polar covalent bonding
19. This holds a sample of barium iodide, BaI₂, together
 20. This allows many solids to conduct electricity
 21. This attracts atoms of hydrogen to each other in a H₂ molecule
 22. This is responsible for the relatively high boiling point of water

Q	Statement I	Because	Statement II
23.	Nonmetallic atoms of the same element combine covalently.	Because	The two elements have the same electronegativities.
24.	A nonpolar molecule can have polar bonds	Because	Polar bonds can be symmetrically arranged in a molecule so that there are no net poles
25.	The bond in an O ₂ molecule is considered to be nonpolar	Because	The oxygen atoms in an O ₂ molecule share the bonding electrons equally
26.	An ionic solid is a good conductor of electricity	Because	An ionic solid is composed of positive and negative ions joined together by electrostatic forces
27.	The hybrid orbitals of carbon in acetylene are believed to be the sp form	Because	Acetylene is a linear compound with a triple bond between the carbons
28.	Atom A with 7 valence electrons forms AB ₂ with atom B with two valence electrons	Because	B donates its electrons to fill the outer shell of A
29.	Water is a polar substance	Because	The bonding electrons in water are shared equally
30.	He ₂ is not known to commonly form	Because	He is lighter than air
31.	CCl ₄ is a nonpolar molecule	Because	The dipole moments in CCl ₄ cancel each other out
32.	One of the most important factors in determining the chemical properties of an element is the number of electrons in its outermost shell	Because	The number of electrons in the outer shell determines the bonding characteristics of an element

33. An sp² configuration is represented by which orientation
 - a. Tetrahedral
 - b. Planar
 - c. Linear
 - d. Trigonal planar
 - e. Square
34. When the electrons are shared unequally by two atoms, the bond is said to be
 - a. covalent
 - b. polar covalent
 - c. coordinate covalent
 - d. ionic
 - e. metallic
35. Which of the following contains a coordinate covalent bond?
 - a. HCl
 - b. H₂O
 - c. H₂
 - d. H₃O⁺
 - e. NaCl
36. Which of the following elements can form bonds with sp³ hybridization?
 - a. Sodium
 - b. Nitrogen
 - c. Carbon
 - d. Oxygen
 - e. Fluorine
37. A triple bond may be best described as
 - a. two sigma bonds and one pi bond
 - b. one sigma bond and two pi bonds
 - c. two sigma bonds and two pi bonds
 - d. three sigma bonds
 - e. three pi bonds
38. Molecules of sodium chloride
 - a. display ionic bonding
 - b. display polar covalent bonding
 - c. are polar
 - d. dissociate in water solution
 - e. do not exist
39. Which of the following molecules is polar?
 - a. BH₃

- b. NF_3
- c. C_2H_6
- d. SF_6
- e. CCl_4

- b. trigonal pyramidal
- c. linear
- d. trigonal planar
- e. tetrahedral

- b. CCl_4
- c. H_2O
- d. CsF
- e. CO_2

40. Which of the following molecules has a trigonal pyramidal geometry?

- a. BH_3
- b. H_2O
- c. CH_4
- d. NH_3
- e. AlCl_3

42. The structure of BeCl_2 can best be described as

- a. linear
- b. bent
- c. trigonal
- d. tetrahedral
- e. square

44. The complete loss of an electron of one atom to another atom with the consequent formation of electrostatic charges is said to be

- a. A covalent bond
- b. A polar covalent bond
- c. An ionic bond
- d. A coordinate covalent bond
- e. A pi bond between p orbitals

41. The shape of a PCl_3 molecule is described as

- a. bent

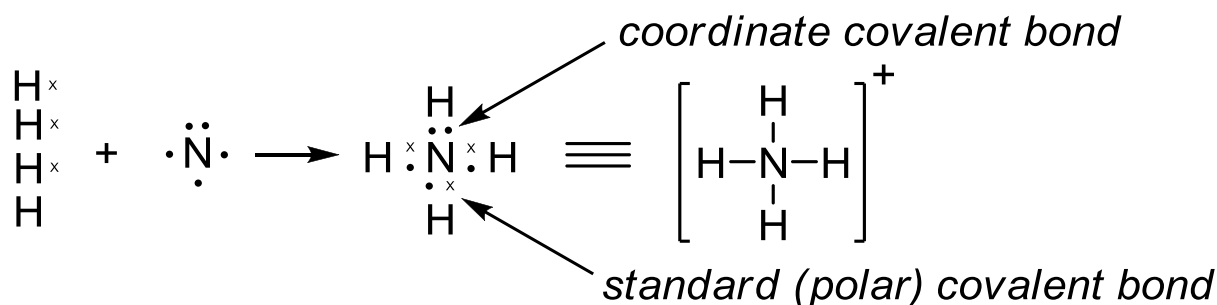
43. All of the following have covalent bonds EXCEPT

- a. HCl

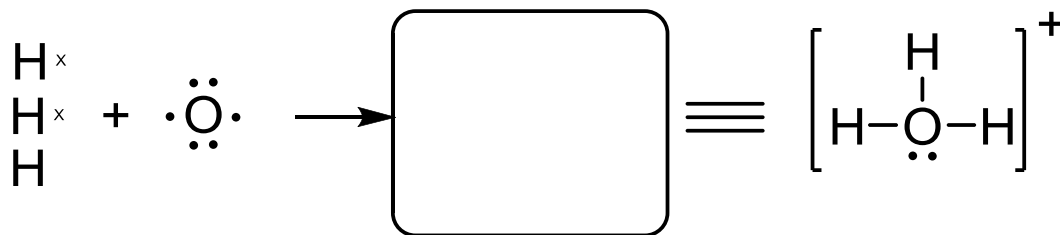
Coordinate Covalent Bonding

A *coordinate covalent bond* is a covalent bond in which the shared electrons are originally contributed from only one of the atoms forming the bond. Look at the first example below which shows how a coordinate covalent bond is formed. Then complete the other two examples.

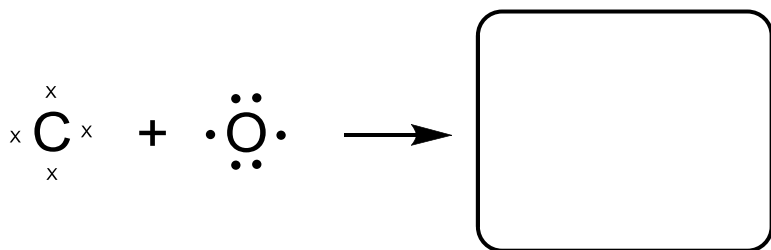
EX 1 – ammonium (NH_4^+)



EX 2 – hydronium (H_3O^+)



EX 3 – carbon monoxide (CO) (Two of the electrons in the triple bond can be classified as coordinate covalent... Show how!)



1. A
2. B
3. C
4. E
5. B
6. D
7. C
8. E
9. C
10. D
11. B
12. D
13. B
14. A
15. C
16. D
17. A
18. D
19. B
20. C
21. D
22. A
23. T, T, CE
24. T, T, CE
25. T, T, CE
26. F, T
27. T, T, CE
28. F, T
29. T, F
30. T, T
31. T, T, CE
32. T, T, CE
33. D
34. B
35. D
36. C
37. B
38. E
39. B
40. D
41. B
42. A
43. D
44. C