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Bonding: Lewis Structure

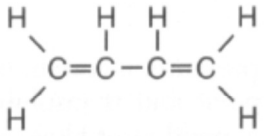
1. What is the total number of electron pairs shared between the two atoms in an O_2 molecule?

   A) 1 B) 2 C) 6 D) 4

2. The nitrogen atoms in a molecule of N_2 share a total of

   A) one pair of electrons
   B) one pair of protons
   C) three pairs of electrons
   D) three pairs of protons

3. Base your answer to the following question on Given the formula of a substance:



   What is the total number of shared electrons in a molecule of this substance?

   A) 9 B) 22 C) 11 D) 6

4. Base your answer to the following question on What is the total number of electrons shared in the bonds between the two carbon atoms in a the molecule shown below?

   H–C≡C–H

   A) 6 B) 8 C) 2 D) 3

5. Which element has atoms that can form single, double, and triple covalent bonds with other atoms of the same element?

   A) fluorine B) carbon
   C) hydrogen D) oxygen

6. Multiple covalent bonds exist in a molecule of

   A) H_2 B) F_2 C) Br_2 D) N_2

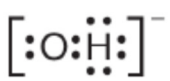
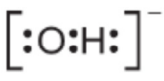
7. Which is the correct electron-dot formula for a hydrogen molecule at STP?

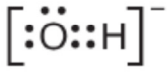
   A) H· B) H·H C) H:H D) H:

8. Atoms of which element can bond to each other to form chains, rings, and networks?

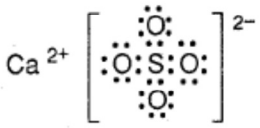
   A) carbon B) fluorine
   C) hydrogen D) oxygen

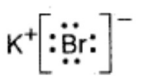
9. Which Lewis electron-dot diagram correctly represents a hydroxide ion?

   A)  B) 

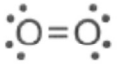
   C)  D) 

10. Which electron-dot diagram best represents a compound that contains both ionic and covalent bonds?

    A)  B) 

    C)  D) 

11. Base your answer to the following question on Given a formula for oxygen:



    What is the total number of electrons shared between the atoms represented in this formula?

    A) 1 B) 2 C) 8 D) 4

12. The bond between Br atoms in a Br_2 molecule is

    A) ionic and is formed by the transfer of two valence electrons
    B) covalent and is formed by the transfer of two valence electrons
    C) covalent and is formed by the sharing of two valence electrons
    D) ionic and is formed by the sharing of two valence electrons

13. Which molecule contains a triple covalent bond?

    A) N_2 B) Cl_2 C) O_2 D) H_2

14. Which molecule will have a double covalent bond?

    A) O_2 B) Cl_2 C) F_2 D) N_2

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Base your answers to questions **15** and **16** on the information below.

In 1864, the Solvay process was developed to make soda ash. One step in the process is represented by the balanced equation below.

$$NaCl + NH_3 + CO_2 + H2O \rightarrow NaHCO_3 + NH_4Cl$$

15. In the space draw a Lewis electron-dot diagram for the reactant containing nitrogen in the equation.

16. Write the chemical formula for *one compound in the equation that contains both ionic bonds and covalent bonds.*

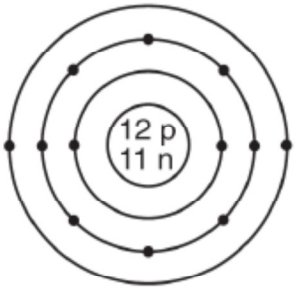
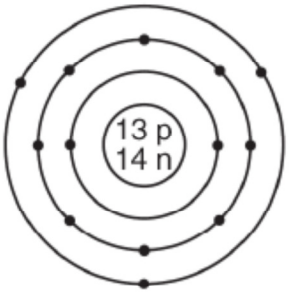
_____

17. What is the total number of electron pairs shared between the carbon atom and one of the oxygen atoms in a carbon dioxide molecule?

18. Base your answer to the following question on the information below.

Atomic Diagrams of Magnesium and Aluminum

Key
• = electron

Element	Lewis Electron-Dot Diagram	Electron-Shell Diagram
magnesium	Mg:	
aluminum	Al:	

Explain why Lewis electron-dot diagrams are generally more suitable than electron-shell diagrams for illustrating chemical bonding.

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19. Base your answer to the following question on the following information.

Carbon and oxygen are examples of elements that exist in more than one form in the same phase.

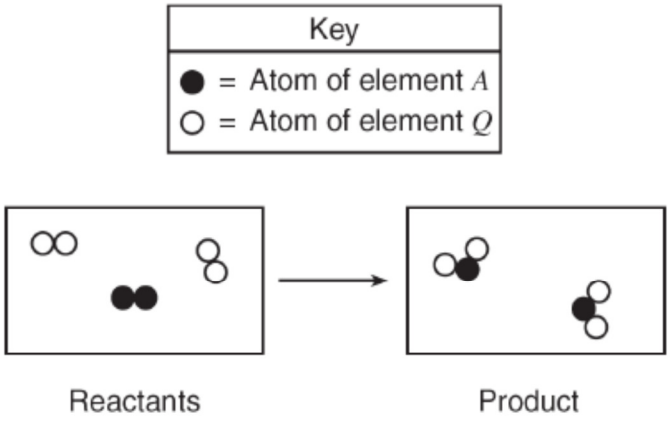
Graphite and diamond are two crystalline arrangements for carbon. The crystal structure of graphite is organized in layers. The bonds between carbon atoms within each layer of graphite are strong. The bonds between carbon atoms that connect different layers of graphite are weak because the shared electrons in these bonds are loosely held by carbon atoms. The crystal structure of diamond is a strong network of atoms in which the shared electrons are strongly held by the carbon atoms. Graphite is an electrical conductor, but diamond is not. At 25°C, graphite has a density of 2.2 g/cm^3 and diamond a density of 3.51 g/cm^3.

The element oxygen can exist as diatomic molecules, O_2, and as ozone, O_3. At standard pressure the boiling point of ozone is 161 K.

Explain, in terms of electrons, why graphite is an electrical conductor and diamond is *not*. Your response must include information about both graphite and diamond.

Base your answers to questions **20** through **22** on the information below.

The particle diagrams below represent the reaction between two nonmetals, A_2 and Q_2.



20. Compare the total mass of the reactants to the total mass of the product.

21. Identify the type of chemical bond between an atom of element *A* and an atom of element *Q*.

22. Using the symbols *A* and *Q*, write the chemical formula of the product.

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23. Explain, in terms of valence electrons, why the bonding in magnesium oxide, MgO, is similar to the bonding in barium chloride, $BaCl_2$.