

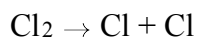
1. What occurs as two atoms of fluorine combine to become a molecule of fluorine?

- A) A bond is formed as energy is absorbed.
- B) A bond is formed as energy is released.
- C) A bond is broken as energy is absorbed.
- D) A bond is broken as energy is released.

2. What occurs in order to break the bond in a Cl_2 molecule?

- A) Energy is absorbed.
- B) Energy is released.
- C) The molecule creates energy.
- D) The molecule destroys energy.

3. Given the balanced equation representing a reaction:



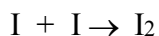
What occurs during this reaction?

- A) A bond is broken as energy is absorbed.
- B) A bond is broken as energy is released.
- C) A bond is formed as energy is absorbed.
- D) A bond is formed as energy is released.

4. As energy is released during the formation of a bond, the stability of the chemical system generally will

- A) decrease
- B) increase
- C) remain the same

5. Given the equation:



As the atoms of the iodine react to form molecules of iodine, the stability of the iodine

- A) decreases
- B) increases
- C) remains the same

6. Which electron-dot diagram represents H_2 ?

- A) $\text{H} \cdot \text{H}$
- B) $\text{H} \bullet \text{H}$
- C) $\begin{array}{c} \bullet \bullet \\ \bullet \text{H} \bullet \text{H} \bullet \\ \bullet \bullet \end{array}$
- D) $\begin{array}{c} \bullet \bullet \bullet \bullet \\ \bullet \text{H} \bullet \text{H} \bullet \\ \bullet \bullet \bullet \bullet \end{array}$

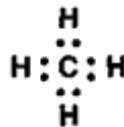
7. Which atom in the ground state has a stable valence electron configuration?

- A) Ar
- B) Al
- C) Si
- D) Na

8. Which symbol represents an atom in the ground state with the most stable valence electron configuration?

- A) B
- B) O
- C) Li
- D) Ne

9. Given the Lewis electron-dot diagram:



Which electrons are represented by all of the dots?

- A) the carbon valence electrons, only
- B) the hydrogen valence electrons, only
- C) the carbon and hydrogen valence electrons
- D) all of the carbon and hydrogen electrons

10. Which of these elements has an atom with the most stable outer electron configuration?

- A) Ne
- B) Cl
- C) Ca
- D) Na

11. Which is the correct electron-dot formula for a molecule of chlorine?

- A) $\begin{array}{c} \cdot \cdot \quad \cdot \cdot \\ \cdot \text{Cl} : \text{Cl} \cdot \\ \cdot \cdot \quad \cdot \cdot \end{array}$
- B) $\begin{array}{c} \cdot \cdot \quad \cdot \cdot \\ : \text{Cl} : : \text{Cl} : \end{array}$
- C) $\begin{array}{c} \cdot \cdot \quad \cdot \cdot \\ : \text{Cl} : : \text{Cl} : \\ \cdot \cdot \quad \cdot \cdot \end{array}$
- D) $\begin{array}{c} \cdot \cdot \quad \cdot \cdot \\ : \text{Cl} : \text{Cl} : \\ \cdot \cdot \quad \cdot \cdot \end{array}$

12. Which property is used to determine the degree of polarity between two bonded atoms?

- A) density
- B) electronegativity
- C) pressure
- D) temperature

13. Two atoms with an electronegativity difference of 0.4 form a bond that is

- A) ionic, because electrons are shared
- B) ionic, because electrons are transferred
- C) covalent, because electrons are shared
- D) covalent, because electrons are transferred

14. Given the electron dot formula:



Which atom represented as X would have the *least* attraction for the electrons that form the bond?

- A) F
- B) Cl
- C) I
- D) Br

15. Which compound would most likely have the greatest ionic character?
A) CO B) KF C) CaO D) LiH
16. Which term refers to how strongly an atom of an element attracts electrons in a chemical bond with an atom of a different element?
A) entropy
B) electronegativity
C) activation energy
D) first ionization energy
17. Which of the following elements is most likely to form a compound with radon?
A) iodine B) fluorine
C) sodium D) calcium
18. Which compound has the least ionic character?
A) KCl B) CaCl₂
C) AlCl₃ D) CCl₄
19. Which compound would have the greatest degree of ionic character?
A) Na₂O B) H₂O
C) CO₂ D) NO₂
20. Which type of bonds are formed when calcium atoms react with oxygen atoms?
A) polar covalent
B) coordinate covalent
C) ionic
D) hydrogen
21. Which is the formula of an ionic compound?
A) SO₂ B) CO₂
C) CH₃OH D) NaOH
22. When a metal atom combines with a nonmetal atom, the nonmetal atom will
A) lose electrons and decrease in size
B) lose electrons and increase in size
C) gain electrons and decrease in size
D) gain electrons and increase in size
23. In which compound have electrons been transferred to the oxygen atom?
A) CO₂ B) NO₂
C) N₂O D) Na₂O
24. Element *X* is in Group 2 and element *Y* is in Group 17. What happens when a compound is formed between these two atoms?
A) *X* loses electrons to *Y* to form an ionic bond.
B) *X* loses electrons to *Y* to form a covalent bond.
C) *X* gains electrons from *Y* to form an ionic bond.
D) *X* gains electrons from *Y* to form a covalent bond.
25. Compared to the boiling point and the freezing point of water at 1 atmosphere, a 1.0 M CaCl₂(aq) solution at 1 atmosphere has a
A) lower boiling point and a lower freezing point
B) lower boiling point and a higher freezing point
C) higher boiling point and a lower freezing point
D) higher boiling point and higher freezing point
26. A crystalline solid has a high melting point and is a good conductor of electricity in the liquid state. This solid could be
A) CO₂ B) Hg
C) C₆H₁₂O₆ D) KCl
27. The water solution of which of the following substances is the best conductor of electricity?
A) KCl B) C₆H₁₂O₆
C) CO₂ D) CO
28. The bonding in NH₃ is most similar to the bonding in
A) H₂O B) NaCl C) MgO D) KF
29. What is the number of electrons shared between the carbon atoms in a molecule of ethyne?
A) 6 B) 2 C) 8 D) 4
30. Which atoms are most likely to form covalent bonds?
A) metal atoms that share electrons
B) metal atoms that share protons
C) nonmetal atoms that share electrons
D) nonmetal atoms that share protons
31. Which formula represents a molecular solid?
A) NaCl(s) B) C₆H₁₂O₆(s)
C) Cu(s) D) KF(s)

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32. Which elements can react to produce a molecular compound?
- A) calcium and chlorine
B) hydrogen and sulfur
C) lithium and fluorine
D) magnesium and oxygen
33. Which terms describe a substance that has a low melting point and poor electrical conductivity?
- A) covalent and metallic
B) covalent and molecular
C) ionic and molecular
D) ionic and metallic
34. Which substance contains particles held together by metallic bonds?
- A) Ni(s) B) Ne(s) C) N₂(s) D) I₂(s)
35. Which properties do naturally occurring metal compounds generally possess?
- A) high stability and low solubility in water
B) high stability and high solubility in water
C) low stability and low solubility in water
D) low stability and high solubility in water
36. At STP, which substance has metallic bonding?
- A) ammonium chloride
B) barium oxide
C) iodine
D) silver
37. Atoms of which element can bond to each other to form chains, rings, and networks?
- A) carbon B) fluorine
C) hydrogen D) oxygen
38. The table below shows properties of four solids, *A*, *B*, *C*, and *D*.

Substance	Melting Point	Conductivity in Solid State	Solubility in Water
<i>A</i>	high	no	soluble
<i>B</i>	high	yes	insoluble
<i>C</i>	high	no	insoluble
<i>D</i>	low	no	insoluble

Which substance could represent diamond, a network solid?

- A) *A* B) *B* C) *C* D) *D*
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39. The table below contains data for compounds *A*, *B*, *C*, and *D*.

COMPOUND	MELTING POINT (°C)	BOILING POINT (°C)	ELECTRICAL CONDUCTIVITY (Stats)	SOLUBILITY IN WATER
<i>A</i>	800.4	1413	excellent (liquid)	good
<i>B</i>	1710	2230	very poor (solid)	insoluble
<i>C</i>	42.5	216.3	poor (solid)	poor
<i>D</i>	1063	2582	excellent (solid)	insoluble

Which list identifies the type of bonding characteristic of each compound's solid phase?

- A) *A* -ionic *B* -network *C* -metallic *D* -molecular
 B) *A* -network *B* -ionic *C* -molecular *D* -metallic
 C) *A* -metallic *B* -molecular *C* -network *D* -ionic
 D) *A* -ionic *B* -network *C* -molecular *D* -metallic

40. What type of bond exists in a molecule of iodine?

- A) ionic B) polar covalent
 C) nonpolar covalent D) metallic

41. Which type of bond is present in a water molecule?

- A) polar covalent B) nonpolar covalent
 C) ionic D) electrovalent

42. Which molecule contains a nonpolar covalent bond?

- A) I₂ B) NH₃ C) H₂O D) CO





43. Which molecule contains a nonpolar covalent bond?

- A) $\text{H} \overset{\cdot\cdot}{\underset{\cdot\cdot}{\text{N}}} \text{H}$ B) $\text{H} \overset{\cdot\cdot}{\underset{\cdot\cdot}{\text{Cl}}}$
 C) $\text{H} \overset{\cdot\cdot}{\underset{\cdot\cdot}{\text{O}}} \text{H}$ D) $\text{H} \overset{\cdot\cdot}{\underset{\cdot\cdot}{\text{H}}}$

44. Which formula represents a polar molecule?

- A) O₂ B) CO₂ C) NH₃ D) CH₄

45. Which diagram best represents a polar molecule?

- A)  Cl₂ B)  H₂
 C)  HCl D)  NaCl

46. Which is a nonpolar covalent substance?

- A) CCl₄ B) NH₃ C) H₂O D) KCl

47. Base your answer to the following question on the number of the substance, chosen from the table below, that best answers that question.

Substance	Melting Point °K.	Boiling Point °K.
(1) sodium chloride	1,074	1,686
(2) helium	1	4
(3) diamond	3,773	4,473
(4) water	273	373

Which substance forms a molecular solid made up of polar molecules?

- A) 1 B) 2 C) 3 D) 4