

Bonding – Practice Questions

- The forces between atoms that create chemical bonds are the result of interactions between
 - nuclei
 - electrons
 - protons and electrons
 - protons and nuclei
- According to Reference Table S, which sequence correctly places the elements in order of increasing ionization energy?
 - H → Li → Na → K
 - I → Br → Cl → F
 - O → S → Se → Te
 - H → Be → Al → Ga
- Electronegativity is a measure of an atom's ability to
 - attract the electrons in the bond between the atom and another atom
 - repel the electrons in the bond between the atom and another atom
 - attract the protons of another atom
 - repel the protons of another atom
- If the electronegativity difference between the elements in compound NaX is 2.0, what is element X?
 - bromine
 - chlorine
 - fluorine
 - oxygen
- An element with an electronegativity of 0.9 bonds with an element with an electronegativity of 3.1. Which phrase best describes the bond between these elements?
 - mostly ionic in character and formed between two nonmetals
 - mostly ionic in character and formed between a metal and a nonmetal
 - mostly covalent in character and formed between two nonmetals
 - mostly covalent in character and formed between a metal and a nonmetal
- Which type of bond exists between an atom of carbon and an atom of fluorine?
 - ionic
 - metallic
 - polar covalent
 - nonpolar covalent
- Which pair of atoms is held together by a covalent bond?
 - HCl
 - LiCl
 - NaCl
 - KCl
- Which substance contains nonpolar covalent bonds?
 - H₂
 - H₂O
 - Ca(OH)₂
 - CaO
- Given the reaction: **Cl (g) + Cl (g) → Cl₂ (g) + energy** Which statement best describes the reaction?
 - A bond is formed and energy is absorbed.
 - A bond is formed and energy is released.
 - A bond is broken and energy is absorbed.
 - A bond is broken and energy is released.
- The primary forces of attraction between water molecules in H₂O (l) are

3. A double carbon-carbon bond is found in a molecule of

- (1) pentane
- (2) pentene
- (3) pentyne
- (4) pentanol

4. At STP, fluorine is a gas and bromine is a liquid because, compared to fluorine, bromine has

- (1) stronger covalent bonds
- (2) stronger intermolecular forces
- (3) weaker covalent bonds
- (4) weaker intermolecular forces

5. Which term indicates how strongly an atom attracts the electrons in a chemical bond?

- (1) alkalinity
- (2) atomic mass
- (3) electronegativity
- (4) activation energy

6. Magnesium nitrate contains chemical bonds that are

- (1) covalent, only
- (2) ionic, only
- (3) both covalent and ionic
- (4) neither covalent nor ionic

7. A solid substance is an excellent conductor of electricity. The chemical bonds in this substance are most likely

- (1) ionic, because the valence electrons are shared between atoms
- (2) ionic, because the valence electrons are mobile
- (3) metallic, because the valence electrons are stationary
- (4) metallic, because the valence electrons are mobile

8. When sodium and fluorine combine to produce the compound NaF, the ions formed have the same electron configuration as atoms of

- (1) argon, only
- (2) neon, only
- (3) both argon and neon
- (4) neither argon nor neon

9. Atoms of which element have the greatest tendency to gain electrons?

- (1) bromine
- (2) chlorine
- (3) fluorine
- (4) iodine

10. Which polyatomic ion contains the greatest number of oxygen atoms?

- (1) acetate
- (2) carbonate
- (3) hydroxide
- (4) peroxide

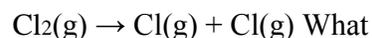
11. Which formula represents an ionic compound?

- (1) H₂
- (2) CH₄
- (3) CH₃OH
- (4) NH₄Cl

12. Which liquid has the highest vapor pressure at 75°C?

- (1) ethanoic acid
- (2) ethanol
- (3) propanone
- (4) water

13. Given the balanced equation representing a reaction:



What occurs during this change?

- (1) Energy is absorbed and a bond is broken.
- (2) Energy is absorbed and a bond is formed.
- (3) Energy is released and a bond is broken.
- (4) Energy is released and a bond is formed.

14. At standard pressure, a certain compound has a low boiling point and is insoluble in water. At

STP, this compound most likely exists as

- (1) ionic crystals
- (2) metallic crystals
- (3) nonpolar molecules
- (4) polar molecules

15. Which group on the Periodic Table of the Elements contains elements that react with oxygen to form compounds with the general formula X_2O ?

- (1) Group 1 (3) Group 14 (2) Group 2 (4) Group 18

16. Which two substances are covalent compounds?

- (1) $C_6H_{12}O_6(s)$ and $KI(s)$
(2) $C_6H_{12}O_6(s)$ and $HCl(g)$
(3) $KI(s)$ and $NaCl(s)$
(4) $NaCl(s)$ and $HCl(g)$

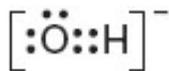
17. Which compound has hydrogen bonding between its molecules?

- (1) CH_4 (3) KH
(2) CaH_2 (4) NH_3

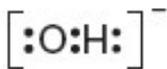
18. Which Lewis electron-dot diagram correctly represents a hydroxide ion?



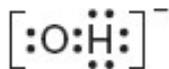
(1)



(3)



(2)

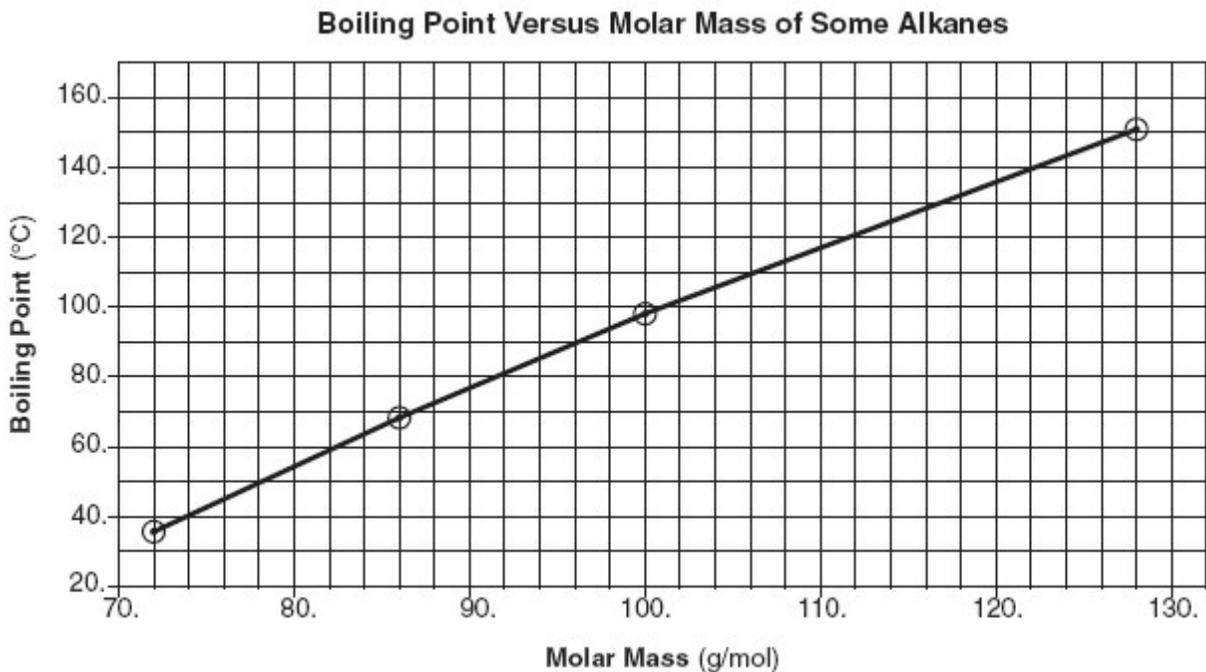


(4)

19. Explain, in terms of electronegativity, why a P–Cl bond in a molecule of PCl_5 is more polar than a P–S bond in a molecule of P_2S_5 . [1]

Base your answers to questions 20 and 21 on the information below.

The graph below shows the relationship between boiling point and molar mass at standard pressure for pentane, hexane, heptane, and nonane.



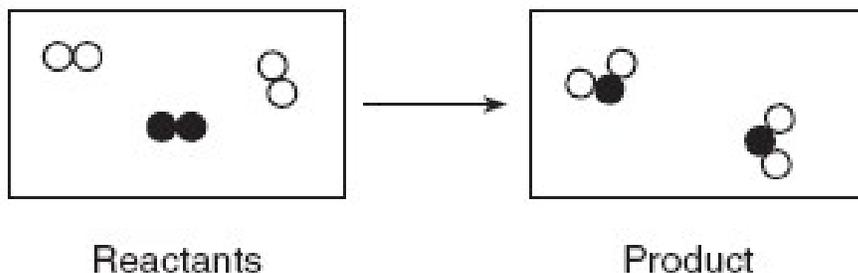
20. Octane has a molar mass of 114 grams per mole. According to this graph, what is the boiling point of octane at standard pressure? [1] _____

21. State the relationship between molar mass and the strength of intermolecular forces for the selected alkanes. [1]

Base your answers to questions 22 through 24 on the information below.

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

Key	
●	= Atom of element <i>A</i>
○	= Atom of element <i>Q</i>



22. Using the symbols *A* and *Q*, write the chemical formula of the product. [1]

23. Identify the type of chemical bond between an atom of element *A* and an atom of element *Q*. [1]
24. Compare the total mass of the reactants to the total mass of the product. [1]
25. Explain, in terms of molecular structure or distribution of charge, why a molecule of methane is nonpolar.
 [1]
26. A liquid boils when the vapor pressure of the liquid equals the atmospheric pressure on the surface of the liquid. Using Reference Table *H*, determine the boiling point of water when the atmospheric pressure is 90.
 kPa. [1]

Base your answers to questions 27 through 30 on the information below.

Have you ever seen an insect called a water strider “skating” across the surface of a calm pond? Have you ever “floated” a sewing needle on the water in a glass? If you have, then you’ve observed one of water’s many amazing properties. Water’s surface tension keeps the water strider and the sewing needle from sinking into the water. Simply stated, the surface tension is due to the forces that hold the water molecules together. Without these intermolecular forces, the water strider and the sewing needle would sink below the surface of the water. The surface tension of water at various temperatures is given in the data table below.

Surface Tension at Different Water Temperatures

Water Temperature (°C)	Surface Tension (mN/m)
10.	74.2
25	72.0
50.	67.9
75	63.6
100.	58.9

27. On a piece of graph paper, plot the data from the data table. Circle and connect the five points. [1]

28. According to your graph, what is the surface tension of water at 60.°C? [1]
_____ mN/m

29. State the relationship between the surface tension and the temperature of water. [1]

30. The surface tension of liquid tetrachloromethane, CCl_4 , at 25°C is 26.3 millinewtons/meter (mN/m). Compare the intermolecular forces between molecules of CCl_4 to the intermolecular forces between molecules of water, H_2O , at 25°C. [1]