

Assessment**Chapter 4****BLM 4-8****Chapter 4 Test****Goal**

Assess your understanding of the concepts you studied in Chapter 4.

Part 1:**Multiple Choice**

Choose the best answer from each of the following choices given.

- Which of the following is true when a chemical bond forms between two atoms?
 - The molecule formed is more stable than the individual atoms.
 - The molecule formed is less stable than the individual atoms.
 - The bonding electrons are shared equally between the atoms.
 - An increase of energy results from such bond formation.
- Which of the following atoms will likely form a covalent bond with the atoms of chlorine?
 - K
 - Mg
 - Fe
 - P
- Which of the molecules listed has a triple covalent bond?
 - NH₃
 - O₂
 - F₂
 - N₂
- Which of the following compounds is composed of polar covalent molecules?
 - CsCl
 - CO₂
 - CCl₄
 - H₂S
- The lattice energy of sodium chloride is -781 kJ/mol. What does this measure?
 - the bond energy between Na⁺_(g) and Cl⁻_(g) ions
 - the energy required to melt sodium chloride
 - the net amount of energy produced when the elements sodium and chlorine react
 - the sum of the ionization energy for sodium and the electron affinity for chlorine
- Oxygen is a gas at temperatures above 155 K. Very little energy is required to change oxygen from solid to liquid, and from liquid to gas. However, temperatures of thousands of degrees Kelvin do not cause appreciable decomposition of the O₂ molecules. What type of bonding/forces is primarily responsible for holding the two oxygen atoms together in a molecule of oxygen gas, O₂?
 - ionic bonding
 - gravitational forces
 - electrostatic forces
 - free-electron bonding

7. Which of the following in the liquid state is expected to be the best conductor of electricity?
- (a) CCl_4 (b) CaF_2 (c) I_2 (d) CS_2
8. Why are metals generally better conductors of heat and electricity than non-metals?
- (a) Metals have higher melting points.
(b) Valence electrons in metals are more mobile.
(c) Metals contain more electrons.
(d) Metals have higher ionization energies.
9. Why are alkali metals softer than most of the other metals?
- (a) Alkali metals have smaller atomic radii.
(b) Alkali metals are less electronegative.
(c) Alkali metals have fewer valence electrons.
(d) Electron configurations of alkali metals are closer to the noble gas electron configurations.
10. Which pair of electron configurations represents two elements that are expected to form the strongest ionic bonding between their atoms?
- (a) $1s^2 2s^2 2p^1$ and $1s^2 2s^2 2p^5$ (b) $1s^2 2s^2 2p^1$ and $1s^2 2s^2 2p^6 3s^2$
(c) $1s^2 2s^2 2p^5$ and $1s^2 2s^2 2p^6 3s^1$ (d) $1s^2 2s^2 2p^1$ and $1s^2 2s^2 2p^6 3s^1$
11. Which of the following types of molecules has the strongest dispersion forces between molecules?
- (a) Molecules that have a large number of electrons and are at a small distance apart.
(b) Molecules that have a large number of electrons and are at a great distance apart.
(c) Molecules that have a small number of electrons and are at a great distance apart.
(d) Molecules that have a small number of electrons and are at a small distance apart.
12. At room temperature, fluorine and chlorine are gases, bromine is a liquid, and iodine is a solid. Which of these elements has the greatest intermolecular forces between the molecules?
- (a) iodine (b) bromine (c) chlorine (d) fluorine

13. Which of the following compounds in liquid state has the strongest hydrogen bonding?
(a) PH_3 (b) CH_4 (c) NH_3 (d) H_2S
14. A solid consists of ions bound in a crystal lattice. Which of the following properties is unlikely to be a physical property of the solid?
(a) The solid has a high melting point.
(b) The solid is hard and brittle.
(c) The solid is a good conductor in aqueous solution.
(d) The solid is soluble in non-polar solvents.
15. A transparent crystalline substance is found to be rather soft and have a low melting point. What type of solid is the substance?
(a) molecular solid (b) ionic solid
(c) network solid (d) metallic solid
16. Which of the following is a physical property of a network solid?
(a) It is a good electrical conductor.
(b) It has a high melting point.
(c) It is very malleable.
(d) It has a low boiling point.
17. Which of the following compound(s) show great attraction for water molecules and, therefore, high solubility in water?
I. CH_4 II. CH_2Cl_2 III. CH_3OH
IV. CCl_4 V. CHOOH
(a) V only (b) I and IV (c) III and V (d) II and V
18. X and Y are two elements in the same group of the periodic table. XO_2 is a gas at room temperature while YO_2 melts at about 1700°C . Which of the following accounts for this big difference in melting point?
(a) XO_2 is non-polar, but YO_2 is polar.
(b) $\text{XO}_{2(s)}$ is a molecular solid, but $\text{YO}_{2(s)}$ is a covalent or network solid.
(c) The Y — O bond in YO_2 is much stronger than the X — O bond in XO_2 .
(d) The Y — Y bond is stronger than the X — X bond.

19. Which of the following explains why water has a higher boiling point than hydrogen sulfide?
- (a) Water has smaller molecules.
 - (b) Water has a smaller molecular mass.
 - (c) Water has stronger dispersion attractions.
 - (d) Water has stronger dipole-dipole attractions.
20. Glass is one of the best known amorphous substances. Which of the following properties is typical of an amorphous solid?
- (a) The building blocks of the solid are linked by covalent bonds.
 - (b) The building blocks of the solid are held together by dispersion forces only.
 - (c) The building blocks of the solid are not arranged in any order.
 - (d) The building blocks of the solid can only be atoms.
- Part 2:**
Short Answer
21. Indicate which of the following molecules are polar and which are non-polar.
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| (a) CO_2 | (b) SO_2 | (c) CH_3OH | (d) $\text{CH}(\text{OH})\text{O}$ |
| (e) PCl_3 | (f) CCl_4 | (g) XeF_2 | (h) XeF_4 |
22. Explain why the $\text{H} - \text{N} - \text{H}$ bond angle in ammonia (NH_3) is less than the $\text{H} - \text{C} - \text{H}$ bond angle in methane (CH_4).
23. What is the measure of the $\text{O} - \text{C} - \text{O}$ bond angle in carbon dioxide (CO_2)?
24. Predict the shape of the following molecules.
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|--------------------|---------------------|--------------------|--------------------|
| (a) NF_3 | (b) ClF_3 | (c) SF_6 | (d) XeF_2 |
| (e) PCl_3 | (f) CHCl_3 | (g) XeF_4 | |