Takehome

Multiple Choice  (2 points each)

Mark the choice on your Scantron form that is the best answer. There is only one correct answer for each question.

1. As one descends a group on the periodic table, atomic radius generally
   A. increases.  B. decreases.  C. remains the same.

2. Atoms of the nonmetallic elements generally form ions by
   A. gaining electrons, forming positive ions.
   B. gaining electrons, forming negative ions.
   C. losing electrons, forming positive ions.
   D. losing electrons, forming negative ions.

3. How many valence electrons are present in an atom of bromine in the ground state?
   A. 1  B. 2  C. 3  D. 7

4. Which type of chemical bond involves the unequal sharing of electrons?
   A. Ionic  B. Polar covalent  C. Nonpolar covalent

5. A 4.00 L sample of a gas is at a pressure of 2.00 atm. If the temperature remains constant, what will be its volume at 0.500 atm of pressure?
   A. 1.00 L  B. 16.0 L  C. 0.250 L  D. 4.00 L

6. A sample of gas has a volume of 3.40 L at 10.0 °C. What will be its volume at 100.0°C, pressure remaining constant?
   A. 0.340 L  B. 4.48 L  C. 34.0 L  D. 2.58 L

7. A sample of gas has a volume of 400. mL at STP. What will be its volume at 20.0 °C and 700. torr?
   A. 466 mL  B. 343 mL  C. 60.1 mL  D. 2660 mL

8. How many moles are present in 10.0 L of nitrogen gas at STP?
   A. 2.24 moles  B. 2.80 moles  C. 0.446 moles  D. 224 moles

9. How many moles of water will be produced when 15.0 g of calcium chloride dihydrate are heated?
   A. 0.134 moles  B. 0.0510 moles  C. 0.204 moles  D. 0.102 moles

10. Which bond type is weakest?
    A. Polar covalent bond  B. Nonpolar covalent bond
    C. Ionic bond  D. Hydrogen bond

11. A solution is a
    A. homogeneous compound.  B. heterogeneous compound.
    C. homogeneous mixture.  D. heterogeneous mixture.

12. As temperature increases, the solubility of a gas in water
    A. increases.  B. decreases.  C. remains the same.
13. Which phases or states are present within the CD segment in the figure shown below?

A. solid + liquid  B. solid only  C. liquid only  D. liquid + gas

14. Which one molar solution would have the highest freezing point?
A. KCl        B. BaCl₂     C. AlCl₃    D. CH₃OH

15. What masses of KBr and water are needed to produce 300. g of a solution that is 3.00 % by mass?
A. 9.00 g of KBr and 300. g of water  B. 9.00 g of KBr and 291 g of water
C. 300. g of KBr and 9.00 g of water  D. 291 g of KBr and 9.00 g of water

16. Arrhenius defined an acid as a substance whose aqueous solution contains an excess of
A. sodium ion.        B. hydroxide ion.        C. chloride ion.        D. hydrogen ion.

17. Bronsted and Lowry defined a base as a(n)

18. Acids react with carbonates to produce the gas

19. What is the pH of a 0.034 M hydrochloric acid solution?
A. -2        B. 3.4        C. -1.5        D. 1.5

20. In a 0.125 M aqueous solution of potassium phosphate, what is the molarity of each ion?
A. 0.125 M for the potassium ion and 0.250 M for the phosphate ion.
B. 0.125 M for the potassium ion and 0.375 M for the phosphate ion.
C. 0.375 M for the potassium ion and 0.125 M for the phosphate ion.
D. 0.250 M for the potassium ion and 0.125 M for the phosphate ion.
Write out your answers to the following questions in the space provided. Write neatly and legibly. (2 points each)

21. Arrange the following bonds in order of increasing polarity.
   F-F, N-H, Ca-O, H-O, C-H

*Answer:* Lowest polarity  F-F, C-H, N-H, H-O, Ca-O  Highest polarity

22. For each of the following compounds, choose its molecular shape from the list of shapes.
   (Shapes can be used more than once.)

   **SHAPES**
   
   A.  H₂O  1.  Linear
   B.  CO₂  2.  Bent
   C.  CH₄  3.  Trigonal Planar
   D.  BF₃  4.  Trigonal Pyramidal
   E.  N₂  5.  Tetrahedral

*Answer:* A.  H₂O is bent (2); B.  CO₂ is linear (1); C.  CH₄ is tetrahedral (5); D.  BF₃ is trigonal planar (3); E. N₂ is linear (1)

23. What is the molar mass of a gas if 36.4 g of the gas occupies 100.0 L at 32.0 °C and 0.800 atm?

*Answer:* 11.4 g

   A. Write a balanced chemical equation for this reaction.

   B. What mass of ammonia is produced from the complete reaction of 20.0 L of nitrogen in this reaction?

   C. What volume of ammonia is produced from the complete reaction of 20.0 L of hydrogen in this reaction?

   Answer: A. \( \text{N}_2 + 3 \text{H}_2 \rightarrow 2 \text{NH}_3 \); B. 30.4 g; C. 13.3 L

25. A small, 0.500 mL, bubble forms at the bottom of a lake where the temperature is 2.0 °C and the pressure is 2.40 atm. What volume will the bubble occupy near the surface where the temperature is 32.0 °C and the pressure is 1.10 atm?

   Answer: 1.21 mL