

University of Kentucky Department of

Name: _____ SID: _____ Seat No.: _____ Room: _____

1.	<p>Which of the following are held together in the solid or liquid state by dispersion forces only?</p> <p style="text-align: center;">Pt, PH₃, SO₃, NaCl, O₂, CO₂, K₂O</p> <p>A. Pt, O₂ and CO₂ only C. SO₃, O₂ and CO₂ only</p> <p>B. K₂O, PH₃ and SO₃ only D. Pt, PH₃, NaCl and K₂O only</p>
2.	<p>Based on the types of forces holding these solids together, rank them in order of increasing melting point.</p> <p style="text-align: center;">Ar, KBr, C(diamond), NH₃</p> <p>A. Ar < KBr < C(diamond) < NH₃ C. NH₃ < Ar < KBr < C(diamond)</p> <p>B. Ar < NH₃ < KBr < C(diamond) D. NH₃ < Ar < C(diamond) < KBr</p>
3.	<p>Which of these substances is <i>not</i> matched with its correct type of crystalline form?</p> <p>A. NaNO₃, ionic C. SiO₂ (quartz), molecular</p> <p>B. C (graphite), covalent network D. Fe, metallic</p>
4.	<p>These binary hydrogen compounds have the following boiling points:</p> <p style="text-align: center;">CH₄ -162 °C</p> <p style="text-align: center;">SiH₄ -112 °C</p> <p style="text-align: center;">GeH₄ -88 °C</p> <p style="text-align: center;">SnH₄ -52 °C</p> <p>Which will have the greatest vapor pressure at -170 °C?</p> <p>A. CH₄ B. SiH₄ C. GeH₄ D. SnH₄</p>

10.	What is the boiling point of a 45.0% by mass aqueous solution of sugar, C ₁₂ H ₂₂ O ₁₁ ? K _b for water is 0.52 °C/m; molar mass of C ₁₂ H ₂₂ O ₁₁ is 342.3 g/mol.
	A. 98.8 °C B. 1.24 °C C. 101.2 °C D. 102.4 °C

11.	Which of these substances should be the most soluble in benzene, C ₆ H ₆ ?
	A. Water, H ₂ O C. Graphite, C B. Potassium bromide, KBr D. Carbon disulfide, CS ₂

12.	The osmotic pressure of a 0.035 M MgCl ₂ solution at 25 °C is 2.29 atm. Calculate the van-t Hoff factor, i, for MgCl ₂ in this solution.
	A. 3.00 B. 2.67 C. 2.26 D. 0.374

13.	Calculate the freezing point of a solution of 24.8 g of KCl in 200. g of water. The freezing point depression constant for water is 1.86 °C/m.
	A. 3.09 °C B. -1.55 °C C. -3.09 °C D. -6.19 °C

14.	How much urea, H ₂ NCONH ₂ , must be added to 555 g of water to give a solution with a vapor pressure 3.50 mm Hg lower than that of pure water at 30.0 °C? The vapor pressure of water at 30.0 °C is 31.8 mm Hg.
	A. 30.8 g B. 6.37 x 10 ⁻² g C. 229 g D. 555 g

15.	At 1273 °C, K _c = 2.24 x 10 ²² for the equilibrium
	$2 \text{CO}(g) + \text{O}_2(g) \rightleftharpoons 2 \text{CO}_2(g)$
	A reaction mixture initially consisting of equimolar amounts of CO, O ₂ and CO ₂ is heated to 1273 °C and equilibrium is established. Which statement is true?
	A. The equilibrium concentrations of CO and CO ₂ will be equal. B. The equilibrium concentration of CO will be much greater than that of CO ₂ . C. The equilibrium concentration of CO ₂ will be much greater than that of CO. D. The equilibrium concentration of CO will be greater than that of O ₂ .

16.	In a 10 L flask, 0.11 mol hydrogen and 0.075 mol iodine are combined and heated to 425 °C. At equilibrium, 0.14 mol of hydrogen iodide are present. What is the equilibrium constant K _c for this reaction?
	$\text{H}_2(g) + \text{I}_2(g) \rightleftharpoons 2 \text{HI}(g)$
	A. 98 B. 2.4 C. 24.5 D. 1.4 x 10 ⁴

21.	<p>The equilibrium constant, K_c, for the reaction</p> $\text{N}_2(\text{g}) + 3 \text{H}_2(\text{g}) \rightleftharpoons 2 \text{NH}_3(\text{g})$ <p>is 0.65 at 375 °C. If one initially starts with 0.35 M N_2, 0.25 M H_2 and 0.15 M NH_3 at 375 °C, which of the following statements is true when the mixture comes to equilibrium?</p>
	<p>A. No changes will occur since the initial concentrations of all species are equilibrium concentrations.</p> <p>B. NH_3 will increase in concentration; N_2 and H_2 will decrease.</p> <p>C. NH_3 and N_2 will decrease in concentration; H_2 will increase.</p> <p>D. N_2 and H_2 will increase in concentration; NH_3 will decrease.</p>

22.	<p>What is the H_3O^+ concentration of a solution whose OH^- concentration is $6.95 \times 10^{-6} \text{ M}$?</p>
	<p>A. $1.00 \times 10^{-7} \text{ M}$ B. 8.84 M C. $1.44 \times 10^{-9} \text{ M}$ D. $5.16 \times 10^{-8} \text{ M}$</p>

23.	<p>What is the pH of a $6.9 \times 10^{-4} \text{ M}$ $\text{Ba}(\text{OH})_2$ solution?</p>
	<p>A. 3.16 B. 10.84 C. 2.86 D. 11.14</p>

24.	<p>A solution is prepared by mixing 250. mL of 5.0 M HCl and 500. mL of 3.0 M HClO_4. Water is then added until the final volume is 7.50 L. What is the pH of the final solution?</p>
	<p>A. 0.44 B. 0.37 C. -0.44 D. 1.18</p>

25.	<p>Identify the species acting as a Lewis acid in this reaction, carried out in aqueous solution.</p> $\text{F}^-(\text{aq}) + \text{BF}_3(\text{g}) \text{-----} \text{BF}(\text{aq})$
	<p>A. H_2O B. $\text{F}^-(\text{aq})$ C. $\text{BF}_3(\text{g})$ D. $\text{BF}(\text{aq})$</p>