

Sample Exam 2 – Chapters 4, 5, 7

Show ALL work for FULL credit!!

- How many valence electrons are there in the molecule disilicon hexahydride, Si_2H_6 ?
a. 8 b. 14 c. 18 d. 20
- What is the correct electron domain geometry for nitrite ion, NO_2^- ?
a. linear b. bent c. tetrahedral d. trigonal planar
- What is the correct molecular shape for ClF_3 ?
a. tetrahedral b. trigonal bipyramidal c. T-shaped d. square pyramidal
- What is the correct bond angle for a molecule that is tetrahedral in electron domain geometry and bent in molecular shape?
a. $<180^\circ$ b. $<90^\circ$ c. $<120^\circ$ d. $<109.5^\circ$
- A triple bond consists of the following:
a. 3 σ bonds b. 2 σ and 1 π bonds c. 1 σ and 1 π bond d. 1 σ and 2 π bonds
- Predict the molecular shape for the molecule SF_4 .
a. square pyramidal b. trigonal planar c. see-saw d. tetrahedral
- What is the overall polarity for nitrite ion, NO_2^- ?
a. polar b. nonpolar
- How many resonance structures are possible for nitrite ion, NO_2^- ?
a. 1 b. 2 c. 3 d. 4
- What is the hybridization for the central atom in the molecule ClF_3 ?
a. sp^2 b. sp^3 c. sp^3d d. sp^3d^2
- What is the molecular geometry (shape) for a molecule that has two lone pairs and four bonded atoms around the central atom?
a. bent b. trigonal bipyramidal c. square planar d. see-saw
- What is the formal charge on the carbon atom in cyanide ion, CN^{-1} ?
a. 0 b. +1 c. -1 d. -2
- What is the correct Roman Numeral used for tin in $\text{Sn}(\text{SO}_4)_2$?
a. I b. II c. III d. IV
- What does the Greek prefix hepta- represent?
a. 4 b. 5 c. 6 d. 7
- If 0.25 moles of H_2 reacts with excess N_2 , how many moles of NH_3 are produced in the combination reaction $3 \text{H}_{2(\text{g})} + \text{N}_{2(\text{g})} \rightarrow 2 \text{NH}_{3(\text{g})}$?
a. 0.25 mol b. 0.50 mol c. 0.38 mol d. 0.17 mol

15. What is the **precipitate** in the following reaction: $\text{KCl}_{(aq)} + \text{Pb}(\text{NO}_3)_2_{(aq)} \rightarrow$
- a. KCl b. KNO_3 c. PbK d. PbCl_2
16. What is the oxidizing agent in the reaction $\text{N}_2(g) + 3 \text{H}_2(g) \rightarrow 2 \text{NH}_3(g)$
- a. H in $\text{NH}_3(g)$ b. N in $\text{NH}_3(g)$ c. $\text{H}_2(g)$ d. $\text{N}_2(g)$
17. What products are produced when $\text{LiHCO}_3(s)$ undergoes decomposition?
- a. $\text{Li}_2\text{O}(s)$ and $\text{CO}_2(g)$
 b. $\text{LiOH}(s)$ and $\text{CO}_2(g)$
 c. $\text{LiH}(aq)$ and $\text{CO}_2(g)$
 d. $\text{Li}_2\text{CO}_3(s)$, $\text{CO}_2(g)$, and $\text{H}_2\text{O}(g)$
18. Classify the following reaction: $\text{CaO}(s) + \text{CO}_2(g) \rightarrow \text{CaCO}_3(s)$
- a. combination b. combustion c. neutralization d. decomposition
19. What is the oxidation number for sulfur in the compound K_2SO_4 ?
- a. +3 b. +6 c. +7 d. +4
20. Which one of the following metals will react with $\text{Sn}(\text{NO}_3)_2(aq)$?
- a. $\text{Cu}(s)$ b. $\text{Ni}(s)$ c. $\text{Sn}(s)$ d. $\text{Pb}(s)$
21. Classify the following reaction: $2 \text{NaOH}(aq) + \text{Sr}(s) \rightarrow 2 \text{Na}(s) + \text{Sr}(\text{OH})_2(aq)$
- a. combination b. combustion c. neutralization d. single replacement
22. If a student ran a chemical reaction calculated the theoretical yield to be 3.78 g. If the percent yield is 76.4%, what mass did the student actually obtain?
- a. 2.89 g b. 4.95 g c. 20.2 g d. 0.202 g
23. Which one of the following solutions will react $\text{Ag}(s)$?
- a. $\text{Al}(\text{NO}_3)_3(aq)$ b. $\text{HNO}_3(aq)$ c. $\text{Cu}(\text{NO}_3)_2(aq)$ d. $\text{Au}(\text{NO}_3)_3$
24. What is the net ionic equation for the reaction of $\text{Na}_2\text{SO}_4(aq)$ and $\text{AgNO}_3(aq)$?
- b. $\text{Ag}^+(aq) + \text{NO}_3^-(aq) \rightarrow \text{AgNO}_3(s)$
 c. $2 \text{Na}^+(aq) + \text{SO}_4^{2-}(aq) \rightarrow \text{Na}_2\text{SO}_4(s)$
 d. $\text{Na}^+(aq) + \text{NO}_3^-(aq) \rightarrow \text{NaNO}_3(s)$
 e. $2 \text{Ag}^+(aq) + \text{SO}_4^{2-}(aq) \rightarrow \text{Ag}_2\text{SO}_4(s)$
25. Calculate the moles available to react when a graduated cylinder contains 25.0 mL of 2.50 M H_2SO_4 .
- a. 0.0625 mol b. 62.5 mol c. 100. mol d. 0.0100 mol
26. Which of the following is considered a weak acid?
- a. $\text{HCl}(aq)$ b. $\text{HI}(aq)$ c. $\text{HBr}(aq)$ d. $\text{HF}(aq)$
27. What volume of a 9.00 M KCl solution is required to make 45.0 mL of a 2.50 M KCl solution?
- a. 162 mL b. 1010 mL c. 0.500 mL d. 12.5 mL
28. What is the coefficient for oxygen in the reaction: $__ \text{C}_8\text{H}_{18}(g) + __ \text{O}_2(g) \rightarrow __ \text{CO}_2(g) + __ \text{H}_2\text{O}(g)$?
- a. 25 b. 2 c. 16 d. 18

29. Draw the correct Lewis Structure for ALL of the following molecules and answer the questions:

<p>PI₃ # valence electrons: _____</p> <p>EDG: _____ Hybridization: _____ Shape: _____ Polar? Y/N</p>	<p>ICl₄⁻ # valence electrons: _____</p> <p>EDG: _____ Hybridization: _____ Shape: _____ Polar? Y/N</p>
<p>TeF₄ # valence electrons: _____</p> <p>EDG: _____ Hybridization: _____ Shape: _____ Polar? Y/N</p>	<p>XeBr₂ # valence electrons: _____</p> <p>EDG: _____ Hybridization: _____ Shape: _____ Polar? Y/N</p>

30. Please name the following compounds (*spelling counts!*):

- a. KIO₂ _____
- b. CO₃N₂ _____
- c. K₃PO₄ _____
- d. TiS _____
- e. P₄S₆ _____
- f. IF₃ _____
- g. SrCO₃ _____

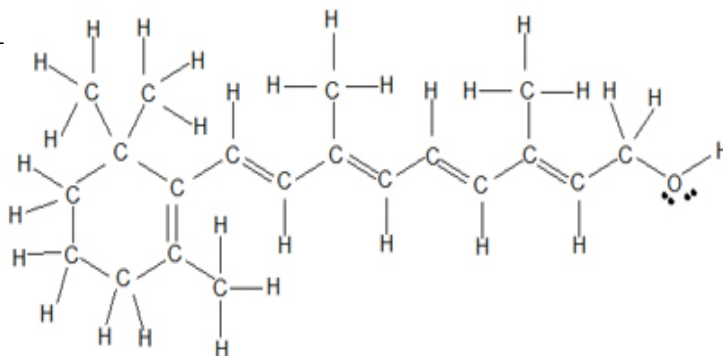
31. Please write the correct formula for the following compounds:

- a. aluminum hydroxide _____
- b. dinitrogen nonoxide _____
- c. vanadium (IV) oxide _____
- d. silver nitrate _____
- e. sodium sulfite heptahydrate _____
- f. calcium fluoride _____
- g. sodium perchlorate _____

32. Answer the following questions regarding the structure for Retinol below:

How many sigma, σ , bonds are there? _____

How many pi, π , bonds are there? _____



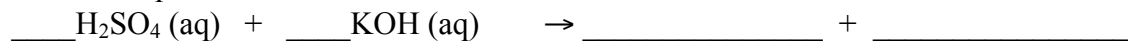
33. Draw three resonance structures for the molecule OCS (in that order) and evaluate each using formal charges.

34. Write a balanced reaction for the **decomposition** of solid manganese (II) chloride, MnCl_2 (s).

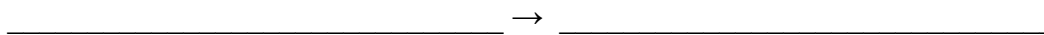
35. Calculate the molarity of a calcium nitrate solution made by dissolving 100.0 g of $\text{Ca}(\text{NO}_3)_2$ in enough water to fill a volumetric flask to the 5.00 L mark.

36. Write the molecular equation, total ionic equation, and net ionic equation for the reaction of aqueous H_2SO_4 with aqueous KOH.

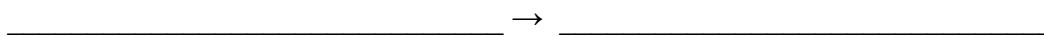
a. Molecular Equation:



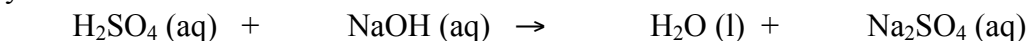
b. Total Ionic Equation:



c. Net Ionic Equation:



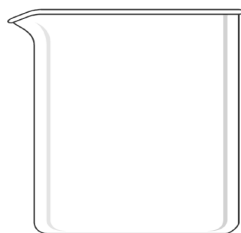
37. A student performed a titration of 29.5 mL of 1.33 M H₂SO₄ with 16.8 mL of NaOH. What is the molarity of the NaOH?



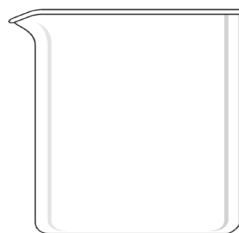
38. Classify each of the following as a nonelectrolyte, a weak electrolyte, or a strong electrolyte:

- | | | | |
|--|----------------|------------------|--------------------|
| a. Al ₂ (SO ₄) ₃ | nonelectrolyte | weak electrolyte | strong electrolyte |
| b. K ₂ CrO ₄ | nonelectrolyte | weak electrolyte | strong electrolyte |
| c. C ₆ H ₁₂ O ₆ | nonelectrolyte | weak electrolyte | strong electrolyte |
| d. Fe(OH) ₃ | nonelectrolyte | weak electrolyte | strong electrolyte |

39. Show the beaker drawings for the following compounds once they are placed in water:

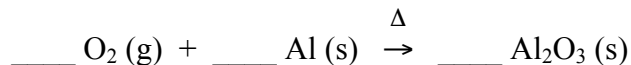


HNO₃



CaSO₄

40. What mass of Al₂O₃ (s) is produced when 18.53 grams of solid Al is combined with 10.22 L of O₂ gas at STP?



41. Identify the type of reaction and predict products for the following reactions. Be sure to balance the final equation and write in the correct physical states. If no reaction occurs write NR.

