CHM 2045, Fall 2019

Exam Packet Instructions: Do your best and don’t be anxious. Read the question, re-read the question, write down all given or valuable information, and write down what you want to find.

1. Which formula is properly named?
   (1) C\textsubscript{7}H\textsubscript{16}, septane
   (2) Mg(NO\textsubscript{3})\textsubscript{2}, magnesium(II) nitrate
   (3) Na\textsubscript{2}SO\textsubscript{3}, sodium sulfite
   (4) FeCl\textsubscript{2}, iron dichloride
   (5) NO\textsubscript{2}, mononitrogen dioxide

2. The \textsuperscript{55}Mn isotope has which Z, neutron number, and A (respectively)?
   (1) 25, 55, 30
   (2) 12, 24, 55
   (3) 25, 30, 55
   (4) 23, 81, 35
   (5) 12, 27, 11

3. A sample of a hydrocarbon produced 3.14 grams of CO\textsubscript{2} and 1.28 grams of H\textsubscript{2}O during combustion analysis. If the hydrocarbon has a molar mass of approximately 56 g/mol, what is the molecular formula?
   (1) CH\textsubscript{2}
   (2) C\textsubscript{3}H\textsubscript{6}
   (3) C\textsubscript{5}H\textsubscript{20}
   (4) C\textsubscript{4}H\textsubscript{8}
   (5) C\textsubscript{2}H\textsubscript{4}

4. Use oxidation numbers to decide whether each of the following is a redox reaction or not.
   I) MnO\textsubscript{4}-(s) + SO\textsubscript{3}\textsuperscript{2-} (aq) + H\textsuperscript{+} (g) → Mn\textsuperscript{2+} (aq) + SO\textsubscript{4}\textsuperscript{2-} (aq) + H\textsubscript{2}O (l)
   II) 4 KNO\textsubscript{3} (s) → 2 K\textsubscript{2}O(s) + 2 N\textsubscript{2}(g) + 5 O\textsubscript{2}(g)
   III) NaHSO\textsubscript{4} (aq) + NaOH (aq) → Na\textsubscript{2}SO\textsubscript{4} (aq) + H\textsubscript{2}O (l)
   (1) I and III only (2) II only (3) II and III only (4) I and II only (5) I, II, and III

5. Elemental magnesium consists of 3 isotopes: \textsuperscript{24}Mg with an accurate mass of 23.99 amu, \textsuperscript{25}Mg with an accurate mass of 24.99 amu, and \textsuperscript{26}Mg with an accurate mass of 25.99 amu. If \textsuperscript{24}Mg is 79\% of naturally occurring magnesium, what is the percent abundance of \textsuperscript{26}Mg?
   (1) 10\% (2) 11\% (3) 15\% (4) 19\% (5) 21\%

6. Which of the following acid base reactions show the acids correctly highlighted?
   (1) H\textsubscript{2}CO\textsubscript{3} (aq) + H\textsubscript{2}O(l) → H\textsubscript{3}O\textsuperscript{+}(aq) + HCO\textsubscript{3}-(aq)
   (2) H\textsubscript{2}O(l) + NH\textsubscript{3}(aq) → OH\textsuperscript{-}(aq) + NH\textsubscript{4}+(aq)
   (3) HI(aq) + NaOH(aq) → H\textsubscript{2}O (l) + Na\textsuperscript{+}(aq) + I\textsuperscript{-} (aq)
   (4) NH\textsubscript{4}+(aq) + HCO\textsubscript{3}-(aq) → H\textsubscript{2}CO\textsubscript{3}(aq) + NH\textsubscript{3}(aq)
   (5) HNO\textsubscript{3}(aq) + H\textsubscript{2}O(l) → H\textsubscript{3}O\textsuperscript{+}(aq) + NO\textsubscript{3}-(aq)
7. A 1.0 kg bottle of sodium carbonate (Na$_2$CO$_3$, 106.0 g/mol) is available to clean up 5.00 liters of spilled concentrated aqueous hydrochloric acid (9.75 M). Is this enough sodium carbonate to neutralize the acid according to the following reaction?

\[ 2 \text{HCl (aq)} + \text{Na}_2\text{CO}_3 \ (s) \rightarrow 2\text{NaCl (aq)} + \text{CO}_2 \ (g) + \text{H}_2\text{O} \ (l) \]

(1) No, there is approximately 40% too small amount of sodium carbonate needed.
(2) Yes, there is approximately 80% more than what is needed.
(3) No, there is approximately 60% too small amount of sodium carbonate needed.
(4) Yes, there is exactly enough sodium carbonate, but no excess.
(5) No, there is approximately 20% too small amount of sodium carbonate needed.

8. How many grams of precipitate will form if 0.2 kg of Na$_3$PO$_4$ (164 g/mol) is added to 2.25 liters of 0.793 M of Ni(CH$_3$COO)$_2$?

(1) 223.25 g (2) 0.223 g (3) 0.2178 g (4) 366.1 g (5) 217.7 g

9. Which of the following reactions is not classified correctly?

(1) NaOH (aq) + HCl (aq) \rightarrow \text{H}_2\text{O} + \text{NaCl} is both a Bronstead Lowry Acid Base and a precipitation (ppt) reaction.
(2) CH$_3$OH(g) + O$_2$(g) \rightarrow CO$_2$ (g) + H$_2$O(g) is a combustion and a redox reaction
(3) NH$_4^+$ (aq) + H$_2$O(l) \rightarrow NH$_3$(aq) + H$_3$O$^+$ (aq) is a Bronstead Lowry Acid Base Reaction
(4) Na(s) + Cl$_2$(g) \rightarrow NaCl is a redox and a precipitation reaction
(5) All the reactions are classified correctly

10. If 76.0 mL of 1.85 M NaOH is required to neutralize 91.00 mL of a sulfuric acid, H$_2$SO$_4$, solution, what is the molarity of the sulfuric acid?

(1) 0.193 M H$_2$SO$_4$ (2) 0.386 M H$_2$SO$_4$ (3) 0.773 M H$_2$SO$_4$ (4) 1.55 M H$_2$SO$_4$
(5) 3.10 M H$_2$SO$_4$

11. Which of the following is false?

(1) If there is no net ionic equation, no precipitation reaction occurs within an aqueous system
(2) A formula unit of copper (II) sulfate contains less ions than a formula unit of copper(I) sulfite
(3) A formula unit of sodium sulfite contains as many sodium ions as a formula unit of sodium sulfate
(4) A formula unit of sodium sulfate contains more oxygen atoms than a formula unit of sodium sulfite
(5) None of the Above are false
12. If volumes are additive and 80.0 mL of 0.40 M sodium chloride is mixed with 120 mL of a calcium chloride solution to give a new solution in which \([\text{Cl}^-]\) is 0.52 M, what is the concentration of the calcium chloride used to make the new solution?

(1) 0.60 M  (2) 0.30 M  (3) 0.072 M  (4) 0.036 M  (5) 0.52 M

13. Chlorine gas is bubbled through a solution of bromide ions, resulting in the formation of liquid bromine, as follows:

\[
\text{Cl}_2 (g) + 2 \text{Br}^- (aq) \rightarrow \text{Br}_2 (l) + 2 \text{Cl}^- (aq)
\]

During this reaction, which of the following occurs?

(1) Chlorine (\(\text{Cl}_2\)) acts as the oxidizing agent
(2) Chlorine (\(\text{Cl}_2\)) is oxidized to chloride ions
(3) Bromine (\(\text{Br}_2\)) acts as the reducing agent
(4) Bromide ion is reduced to bromine (\(\text{Br}_2\))
(5) All of the above take place

14. How many atoms of oxygen are present in 8.00 grams of calcium perchlorate?

(1) \(1.613 \times 10^{23}\)  (2) \(1.613 \times 10^{-23}\)  (3) \(8.85 \times 10^{22}\)  (4) \(8.066 \times 10^{22}\)  (5) \(1.210 \times 10^{23}\)

15. Given the reaction: \(3 \text{H}_2\text{S} + 2 \text{FeCl}_3 \rightarrow \text{Fe}_2\text{S}_3 + 6 \text{HCl}\)

We have 50.0 g of \(\text{FeCl}_3\) reacts with 52.0 g of \(\text{H}_2\text{S}\). How much of the excess reactant is left over after reaction?

(1) 15.758g  (2) 36.24g  (3) 105.98g  (4) 0.462g  (5) 52.0g

16. Phosphorus is obtained primarily from ores containing calcium phosphate. If a particular ore contains 55.1% calcium phosphate, what minimum mass of the ore must be processed to obtain 1.44 kg of phosphorus?

(1) 30.97 g  (2) 7.211 kg  (3) 310.8 g  (4) 13.09 kg  (5) 23.25 g

17. A 5.00 M solution of dye is diluted by taking 10.00 ml of it and adding enough water to make 100.0 ml solution. Then, 20.00 ml of that solution is diluted to a volume of 250.0 ml. What is the concentration of the diluted dye?

(1) 0.004 M  
(2) 0.040 M  
(3) 0.400 M  
(4) 0.020 M  
(5) 0.002 M
18. The density of fresh milk is found to be 61.4 lb per cubic foot. Converted to SI units, this translates into:
   (1) 0.9825 kg/m$^3$  (2) 983.4 kg/m$^3$  (3) 895.2 kg/m$^3$  (4) 0.8952 kg/m$^3$  (5) 985.2 kg/m$^3$

19. What is the percent yield of a reaction in which 232 g of phosphorus trichloride reacts with water to form 150 g of HCl and aqueous phosphorous acid (H$_3$PO$_3$)?
   (1) 18.8%  (2) 41.0%  (3) 59.0%  (4) 100%  (5) 81.2%

20. A chemist dilutes 35.3 ml of 6.15 M sodium chloride to make a 1.67 solution. What is the final volume of the diluted solution?
   (1) 130.0 L  
   (2) 165.3 ml  
   (3) 165.3 L  
   (4) 130.0 ml  
   (5) 94.7 ml

GOOD LUCK ON THE EXAM!!!

For any future help, visit our website @ teachingcenter.ufl.edu for information on FREE TUTORING!