Exam Review 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. The compound (X) contains 49.48 % carbon, 5.191 % hydrogen, 28.87 % nitrogen, and 16.48% oxygen by mass. Additionally, X’s molecular weight lies between the domain of Compound Y’s MW and Compound Z’s MW. If MWY = 188 g/mol and MWZ = 200 g/mol, determine the molecular formula of the compound.

   1) C₄H₅N₂O  2) C₈H₁₀N₄O₂  3) C₈H₈N₃O₃  4) C₁₀H₇N₅O₂  5) C₈H₁₀N₂O

2. Consider the following reaction: 2A + B → 3C + D

   If 3.0 mol A and 2.0 mol B react to form 4.0 mol C, what is the percent yield of this reaction?

   (1) 100%  (2) 67%  (3) 89%  (4) 50%  (5) 75%

3. In which of the following equations are the base and conjugate base (proposed bases are underlined) incorrectly labeled?

   (1) HCl + H₂O → Cl⁻ + H₃O⁺
   (2) H₂PO₄⁻ + H₂O → H₃PO₄ + OH⁻
   (3) CN⁻ + H₂O → HCN + OH⁻
   (4) CH₃COOH + H₂O → CH₃COO⁻ + H₂O⁺
   (5) HCO₃⁻ + H₂O → H₂CO₃ + OH⁻

4. If 1.951 g BaCl₂·xH₂O yields 1.864 g of anhydrous BaSO₄ (136.14 g/mol) after treatment with excess sulfuric acid, what is the value of x in the formula of BaCl₂·xH₂O? (round to the nearest whole number)

   1) one  2) two  3) three  4) four  5) five
5. Which of the following is the correct net ionic equation for the reaction of aqueous silver nitrate and aqueous potassium chloride?

1) \( \text{Ag}^+ (aq) + \text{Cl}^- (aq) \rightarrow \text{AgCl} (s) \)
2) \( \text{AgNO}_3 (aq) + \text{KCl} (aq) \rightarrow \text{KNO}_3 (aq) + \text{AgCl} (s) \)
3) \( \text{K}^+ (aq) + \text{NO}_3^- (aq) \rightarrow \text{KNO}_3 (aq) \)
4) \( 2\text{Ag}^+ (aq) + 2\text{Cl}^- (aq) \rightarrow 2\text{AgCl} (s) \)
5) \( \text{AgNO}_3 (aq) + \text{KCl} (aq) \rightarrow \text{AgCl} (s) \)

6. Determine the answer for each of the following calculations with the correct number of significant figures.

I) \( 8.78 \times 5.903 \times (7.489 - 7.02) \)
II) \( 4.562 \times 3.99870 \div (452.6755 - 452.330) \)

1) 24.31 : 52.8
2) 24 : 53
3) 24.3 : 52.79
4) 24.31 : 52.79
5) 24.3 : 52.80

7. Citric acid is a triprotic acid found in citrus fruits. A 40.00 mL solution containing an unknown concentration of citric acid is titrated with 22.62 mL of 0.2000 M NaOH solution. Calculate the molarity of the citric acid solution.

(1) 0.1131 M (2) 0.07224 M (3) 0.03770 M (4) 0.1768 M (5) 0.05655 M

8. Phosphorus is obtained primarily from ores containing calcium phosphate. If a particular ore contains 44.8% calcium phosphate, what minimum mass of the ore must be processed to obtain 8.5 kg of phosphorus?

(1) 95 kg
(2) 27 kg
(3) 64 kg
(4) 95 g
(5) 64 g
9. Which of the following pairings of name : formula is incorrect?
   
a. Calcium Nitrate : Ca(NO\(_3\))\(_2\)
   b. Copper Sulfate : CuSO\(_4\)
   c. Lead (II) Carbonate : PbCO\(_3\)
   d. Sodium Perchlorate : NaClO\(_4\)
   e. Carbon Monoxide : CO

10. Determine the simplest formula for a hydrocarbon if the complete combustion of a sample produces 5.28 g of CO\(_2\) and 2.7 g of H\(_2\)O.
   (1) CH (2) C\(_2\)H\(_3\) (3) CH\(_3\) (4) C\(_2\)H\(_5\) (5) C\(_8\)H\(_{10}\)

11. Select the true statement below regarding the following balanced reaction:
MnO\(_4^-\) (aq) + NO(g) → MnO\(_2\)(s) + NO\(_3^-\) (aq)
   (1) since a solid is formed, this is a redox reaction and a precipitation reaction
   (2) NO oxidizes MnO\(_4^-\) to MnO\(_2\)
   (3) NO is the reducing agent in the forward reaction
   (4) four electrons are transferred during the reaction as written
   (5) none of the above are true

12. What is the oxidation number of zinc in Zn(OH)\(_4\)^{2-}?
   (1) +3 (2) +4 (3) +2 (4) -3 (5) -4

13. The two naturally occurring isotopes of chlorine are \(^{35}\text{Cl}\) with a mass of 34.9689 amu and \(^{37}\text{Cl}\) with a mass of 36.9659 amu. The atomic mass of elemental chlorine on earth is found to be 35.46 amu. Calculate the percent abundance of \(^{37}\text{Cl}\).
   1) 15.3% 2) 30.5% 3) 24.4% 4) 69.5% 5) 75.6%
14. A 30.0 mL sample of only a strong base is neutralize after the addition of 12.0 mL of a 0.150 M nitric acid solution. If the unknown base concentration is 0.0300 M, which answer choice gives us correct possible identities of the unknown base?

I. Ca(OH)$_2$ II. NaOH III. LiOH IV. RbOH V. Mg(OH)$_2$

(1) I and V only (2) II and IV only (3) II and III only (4) I and III only (5) All possible

15. A certain organic compound in water is 76.0% acetophenetidin by mass and has a density of 1.099 g/mL. What mass of acetophenetidin, in grams, is contained in 4.00 L of solution?

1) 2.8*10$^3$ g  2) 3.334*10$^3$ g  3) 3.34*10$^3$ g  4) 4.4*10$^3$ g  5) 4.496*10$^3$ g

16. Arcyloitrile, C$_3$H$_3$N, is the starting material for the production of a kind of synthetic fiber) and can be made from propylene, C$_3$H$_6$, by reaction with nitric oxide, NO, as follows: 4 C$_3$H$_6$ (g) + 6 NO (g) → 4 C$_3$H$_3$N (s) + 6 H$_2$O (l) + N$_2$ (g) What mass of C$_3$H$_3$N can be made when 21.6 g of C$_3$H$_6$ react with 21.6 g of nitric oxide?

(1) 28 g  (2) 25.5 g  (3) 2.3 kg  (4) 33 kg  (5) 1.6 kg

17. Which of the following is false?

1) Fe(III)Sulfide is Fe$_3$S$_2$ in molecular form
2) HNO$_3$ is a strong acid
3) A is the atomic mass symbol
4) N$_2$O$_3$ is dinitrogen trioxide
5) The reaction H$_2$(g) + F$_2$(g) → 2HF(g) is a redox reaction

18. Sweetener saccharin (C$_7$H$_5$NO$_3$S) is sometimes dispensed in tablet form. Ten (10) tablets with a total mass of 0.5480 g were dissolved in water. They were oxidized to convert all the sulfur to sulfate ion, which was precipitated by adding an excess of barium chloride solution. The mass of barium sulfate obtained was 0.430262 g which ≈ 0.430 g BaSO$_4$. What is the average mass percent of saccharin in the tablets?

1) 69%  2) 73%  3) 55%  4) 39%  5) 44%
19. What mass of potassium chlorate is required in order to be able to supply the minimal amount of oxygen needed to completely burn 58 g of methane?

A) $\text{KClO}_3 \rightarrow \text{KCl} + \text{O}_2$  Percent Yield: 87%

B) $\text{CH}_4 + \text{O}_2 \rightarrow \text{CO}_2 + \text{H}_2\text{O}$  Percent Yield 95%

1) 3 kg
2) 102 g
3) 0.89 kg
4) 0.68 kg
5) 67.9 g

20. Use oxidation numbers to decide how many the following are redox reactions.

I) $\text{CaO (s)} + \text{CO}_2 (g) \rightarrow \text{CaCO}_3 (s)$
II) $\text{Cl}_2(\text{aq}) + 2\text{KI (aq)} \rightarrow \text{I}_2(\text{s}) + 2\text{KCl}$
III) $\text{CO}_2(g) + \text{H}_2(g) \rightarrow \text{CO(g)} + \text{H}_2\text{O (l)}$

(1) I and III only (2) II only (3) II and III only (4) I and III only (5) all are redox

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