

Spring 2023 CHM2045 Exam 1 Review Answer Key

The material covered is from chapters 1-4

1. The two most abundant isotopes of chlorine are ^{35}Cl (34.99 amu) and ^{37}Cl (36.99 amu). What are their percent abundances? (Hint: Use value from periodic table)

- a) ^{35}Cl is 37%; ^{37}Cl is 63%
- b) ^{35}Cl is 23%; ^{37}Cl is 77%
- c) ^{35}Cl is 77%; ^{37}Cl is 23%
- d) ^{35}Cl is 63%; ^{37}Cl is 37%
- e) ^{35}Cl is 50%; ^{37}Cl is 50%

2. Given the name of the compound, write its molecular formula.

- a) Vanadium (v) nitride: V_3N_5
- b) Iron (i) nitrate: FeNO_3
- c) Tin (iv) fluoride: SnF_4
- d) Copper (ii) phosphate: $\text{Cu}_3(\text{PO}_4)_2$
- e) Ammonium dichromate: $(\text{NH}_4)_2\text{Cr}_2\text{O}_7$

3. . What are the moles of each ion and the number of each atom in 78.5 g of aluminum sulfate?

- | | | |
|-----------------------------------|-------------------------------------|-----------------------------------|
| I. 0.241 mol Al^{3+} | V. 2.76×10^{23} atoms Al | IX. 1.66×10^{24} atoms O |
| II. 0.459 mol Al^{3+} | VI. 5.47×10^{24} atoms Al | X. 9.32×10^{23} atoms O |
| III. 0.987 mol SO_4^{2-} | VII. 4.14×10^{23} atoms S | |
| IV. 0.688 mol SO_4^{2-} | VIII. 6.35×10^{25} atoms S | |

- a) II, IV, V, VII, IX
- b) I, III, VI, VIII, X
- c) I, II, IV, VI, VIII, X
- d) II, III, V, VII, IX
- e) None of the above

4. You have a concentrated stock solution of HCl. The concentration is 8.2 M and there is 1.5 L of stock solution. 752 mL of stock solution are taken and diluted to 1.2 L in a volumetric flask. 65 mL of this new solution are taken and diluted to 125 mL in another volumetric flask. What is the final concentration?

- a) 2.7 M
- b) 6.2 M
- c) 8.2 M
- d) 3.4 M
- e) 4.5 M

5. Given a volume of 60 mL and a concentration of 0.925 M of hydrobromic acid, how many mols of HBr are there and what is the mass of HBr?

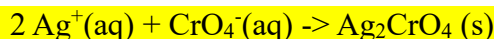
- a) 0.91 mol, 7.1 g
- b) 0.056 mol, 4.5 g
- c) 0.014 mol, 9.1 g
- d) 6.2 mol, 32.1 g
- e) 8.4 mol, 65.4 g

6. Write the balanced molecular and net ionic equations for the combination of silver nitrate and sodium chromate.

Molecular Equation:



Net Ionic Equation:



7. Given 2.68 mol of strontium phosphate, what are the mols of phosphate ion in 689 mL?

- a) 9.81 mol
- b) 4.38 mol
- c) 7.78 mol
- d) 2.43 mol
- e) 6.75 mol

8. Gypsum is a common hydrate salt. It has the general formula $\text{CaSO}_4 \cdot x\text{H}_2\text{O}$. If the molar mass of gypsum is 172.17 g/mol, what is x ?

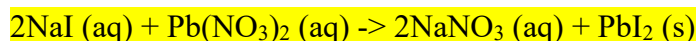
- a) 1
- b) 2
- c) 3
- d) 4
- e) 5

9. What is the mass of CO_2 if 8.2g of nonene (C_9H_{18}) and 20g of O_2 are combusted? And which is the limiting reactant?

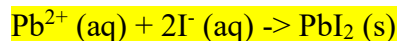
- a) Nonene, 23g
- b) O_2 , 16g
- c) Nonene, 25g
- d) O_2 , 18g
- e) O_2 , 27g

10. Write the balanced molecular and net ionic equations of NaI and Pb(NO₃)₂.

Molecular Equation:



Net Ionic Equation:



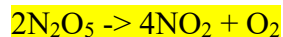
11. What is the mass of V(OH)₅ formed 624 mL of 0.389 M VCl₅ reacts with 893 mL of 0.651 M of Ca(OH)₂?

- a. 30.6g
- b. 98.2g
- c. 33.0g
- d. 74.6g
- e. 31.6g

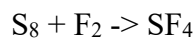
12. Using the question 11's chemical reaction, how many mL are left over of the excess reactant?

- a. 30mL
- b. 90mL
- c. 512mL
- d. 26mL
- e. 410mL

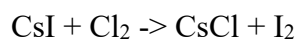
13. Balance and identify the type of reaction, oxidizing agent, and reducing agent of each equation:



Decomposition reaction; Oxidizing Agent is N₂O₅, Reducing Agent is N₂O₅



Combination reaction; Oxidizing Agent is F₂, Reducing Agent is S₈



Displacement reaction; Oxidizing Agent is Cl₂, Reducing Agent is CsI

14. Given the reaction $\text{Fe}_3\text{O}_4 + \text{H}_2 \rightarrow \text{Fe} + \text{H}_2\text{O}$, if 0.250g H_2 makes 1.49 g of H_2O , what is the percent yield?

- a. 52.3%
- b. 66.7%
- c. 95.2%
- d. 12.4%
- e. 75.3%

15. Given 7.13×10^{19} Ca atoms, what is the mass of calcium in grams?

- a. 5.23×10^{-3}
- b. 6.35×10^{-3}
- c. 4.74×10^{-3}
- d. 9.24×10^{-3}
- e. 4.93×10^{-3}

16. Given 1 mol, what is the mass percent of each element in $\text{C}_6\text{H}_{12}\text{O}_6$?

- | | | |
|-----------|-------------|-------------|
| I. 60% C | III. 6.7% H | V. 31.6 % O |
| II. 40% C | IV. 8.4% H | VI. 53.3% O |
- a. I, IV, VI
 - b. II, IV, VI
 - c. I, IV, V
 - d. II, III, VI
 - e. II, IV, V

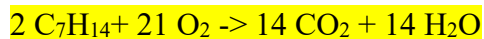
17. What volume of 0.6143 M of strontium hydroxide would neutralize 72.59 mL of a 0.8291 M solution of hydrochloric acid?

- a. 62.43mL
- b. 48.99mL
- c. 75.12mL
- d. 36.25mL
- e. 95.13mL

18. An unknown metal M reacts with sulfur to make M_2S_3 . If 1.62g of M reacts with 2.88g of sulfur, what is M and the name of M_2S_3 ?

- a. V; vanadium (iii) sulfide
- b. Fe; iron (iii) sulfide
- c. Au; gold (iii) sulfide
- d. Al; aluminum sulfide
- e. Cr; chromium (iii) sulfide

19. Balance the equation and identify the oxidation numbers, oxidizing agent, and reducing agent for the combustion of C_7H_{14} .



In C_7H_{14} , C=-2 H=+1; In O_2 , O=0; In CO_2 , C=+4, O=-2; In H_2O , H=+1, O=-2

Oxidizing Agent: O_2

Reducing Agent: C_7H_{14}

20. What is the empirical formula of a compound that is 40% C, 6.71% H, and 53.3% O? What is the molecular formula given that the molar mass is 240.24 g/mol?

- a. CH_2O ; $C_9H_{18}O_9$
- b. C_2HO ; $C_{16}H_8O_8$
- c. CH_2O ; $C_8H_{16}O_8$
- d. CHO_2 ; $C_9H_9O_{18}$
- e. CH_2O ; $C_6H_{12}O_6$