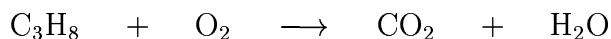


INSTRUCTIONS:

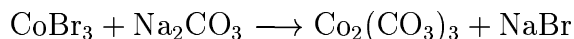
1. Fill in your social security number carefully.
2. It will be to your advantage to answer all questions.
3. Only one answer per question is allowed. Select the best answer from choices given.
4. Use a #2 soft lead pencil.
5. Erasures must be complete.
6. Marks must blacken the entire space in the circle.
7. Answer sheets must not be torn or have holes.
8. This is a 100 point exam.
9. THIS EXAM HAS 29 QUESTIONS. PLEASE MAKE SURE YOUR EXAM IS COMPLETE.
10. Answer number 1 - 29 on your answer sheet.

1. What is the percent composition, by mass, of C in CHCl_3 if it consists of 0.84 % H and 89.1 % Cl?
- A. 20 %
 - B. 0.84 %
 - C. 89.1 %
 - D. 10.1 %
2. What is the percent composition, by mass, of U in UF_6 ?
- A. 352 %
 - B. 92.6 %
 - C. 67.6 %
 - D. 32.4 %
 - E. 5.40 %
3. The empirical formula of a compound is determined to be $\text{C}_2\text{H}_3\text{Cl}_3$. If the molar mass of the compound is 133.4 g/mol, what is the molecular formula of the compound?
- A. $\text{C}_2\text{H}_3\text{Cl}_3$
 - B. $\text{C}_4\text{H}_6\text{Cl}_6$
 - C. $\text{C}_5\text{H}_5\text{Cl}_6$
 - D. CHCl
4. The percentage composition of an unknown compound is 56.6% K; 8.7% C; and 34.7% O. What is the empirical formula of this compound?
- A. KCO
 - B. KCO_2
 - C. $\text{K}_2\text{C}_2\text{O}_3$
 - D. K_2CO_3
5. When the following chemical equation is balanced, what is the correct coefficient for O_2 ?



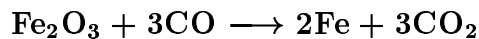
- A. 1
- B. 2
- C. 3
- D. 4
- E. 5
- F. 10

6. The correct coefficients for the unbalanced equation below are (in order)



- A. 2,3,1,6
- B. 1,3,1,6
- C. 2,1,1,2
- D. 1,1,1,3

The next three (3) questions refer to the following balanced chemical equation



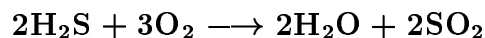
7. How many moles of CO_2 can be formed from 1.5 moles of Fe_2O_3 and sufficient CO ?
- A. 0.5 mol
 - B. 1.5 mol
 - C. 3.0 mol
 - D. 4.5 mol
8. How many moles of Fe can be formed from 3.6 moles CO and sufficient Fe_2O_3 ?
- A. 3.6 mol
 - B. 2.4 mol
 - C. 1.2 mol
 - D. 7.2 mol
9. How many grams of Fe_2O_3 are required to completely react with 75.0 g of CO ?
- A. 428 g
 - B. 179 g
 - C. 143 g
 - D. 25.0 g
 - E. 2.68 g
 - F. 0.893 g
10. In a chemical reaction, the reactant that is completely depleted (used up) when the reaction is completed is known as the:
- A. Limiting reagent
 - B. Excess reagent
 - C. Oxidizing agent
 - D. Reducing agent

11. For the following reaction, how many grams of Cl_2 will be produced if 1.97 mol of HCl is reacted with 0.45 mol of MnO_2 ? (Hint: first determine the limiting reagent)



- A. 16.0 g
- B. 17.5 g
- C. 31.9 g
- D. 34.9 g
- E. 63.8 g
- F. 69.8 g

The next two (2) questions refer to the following balanced chemical equation



12. When 2.20 moles of H_2S react with 4.00 moles of O_2 , which species is the limiting reactant?
- A. H_2S
 - B. O_2
 - C. H_2O
 - D. SO_2
13. When 2.20 moles of H_2S react completely with 4.00 moles of O_2 , how many moles of SO_2 are produced?
- A. 1.47 mol
 - B. 2.20 mol
 - C. 2.67 mol
 - D. 4.00 mol
 - E. 6.60 mol
14. Which one of the following compounds is a weak electrolyte?
- A. NaCl
 - B. H_2SO_4
 - C. H_2O
 - D. NH_4NO_3
 - E. KOH

15. Which one of the following compounds is insoluble in water?
- A. AgNO_3
 - B. BaSO_4
 - C. NaH_2PO_4
 - D. $(\text{NH}_4)_2\text{CO}_3$
 - E. KCl
16. Which one of the following acids is a weak acid?
- A. HCl
 - B. HClO_4
 - C. HNO_3
 - D. HBr
 - E. CH_3COOH
17. Which one of the following species in aqueous solution can act both as a Brønsted acid and a Brønsted base?
- A. H_2CO_3
 - B. NaHCO_3
 - C. Na_2CO_3
 - D. NaOH
 - E. HI
18. Which of the following is the correct net ionic equation for the reaction that occurs when solutions of $\text{Pb}(\text{ClO}_4)_2(\text{aq})$ and $\text{K}_2\text{SO}_4(\text{aq})$ are mixed?
- A. $\text{ClO}_4^-(\text{aq}) + \text{K}^+(\text{aq}) \rightarrow \text{KClO}_4(\text{s})$
 - B. $\text{Pb}(\text{ClO}_4)_2(\text{aq}) + \text{K}_2\text{SO}_4(\text{aq}) \rightarrow \text{PbSO}_4(\text{s}) + 2\text{KClO}_4(\text{aq})$
 - C. $\text{Pb}^{2+}(\text{aq}) + (\text{ClO}_4)_2^{2-}(\text{aq}) + \text{K}_2^{2+}(\text{aq}) + \text{SO}_4^{2-}(\text{aq}) \rightarrow \text{PbSO}_4(\text{s}) + 2\text{K}^+(\text{aq}) + 2\text{ClO}_4^-(\text{aq})$
 - D. $2\text{Pb}^{2+}(\text{aq}) + \text{SO}_4^{2-}(\text{aq}) \rightarrow \text{Pb}_2\text{SO}_4(\text{s})$
 - E. $\text{Pb}^{2+}(\text{aq}) + \text{SO}_4^{2-}(\text{aq}) \rightarrow \text{PbSO}_4(\text{s})$
19. Which one of the following reactions is not an acid-base neutralization reaction?
- A. $\text{HCl}(\text{aq}) + \text{NaOH}(\text{aq}) \rightarrow \text{NaCl}(\text{aq}) + \text{H}_2\text{O}(\text{l})$
 - B. $\text{H}_2\text{SO}_4(\text{aq}) + 2\text{NH}_3(\text{aq}) \rightarrow (\text{NH}_4)_2\text{SO}_4(\text{aq})$
 - C. $\text{H}_2\text{SO}_3(\text{aq}) + \text{Ba}(\text{OH})_2(\text{aq}) \rightarrow \text{BaSO}_3(\text{s}) + 2\text{H}_2\text{O}(\text{l})$
 - D. $\text{Na}_2\text{SO}_3(\text{aq}) + \text{Ba}(\text{OH})_2(\text{aq}) \rightarrow \text{BaSO}_3(\text{s}) + 2\text{NaOH}(\text{aq})$
 - E. $2\text{HNO}_3(\text{aq}) + \text{Mg}(\text{OH})_2(\text{s}) \rightarrow \text{Mg}(\text{NO}_3)_2(\text{aq}) + 2\text{H}_2\text{O}(\text{l})$

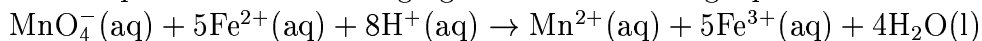
20. Which one of the following reactions is not a redox (oxidation-reduction) reaction?

- A. $2\text{HCl}(\text{aq}) + \text{Zn}(\text{s}) \rightarrow \text{ZnCl}_2(\text{aq}) + \text{H}_2(\text{g})$
- B. $2\text{HCl}(\text{aq}) + \text{CaCO}_3(\text{s}) \rightarrow \text{CaCl}_2(\text{aq}) + \text{H}_2\text{O}(\text{l}) + \text{CO}_2(\text{g})$
- C. $2\text{HCl}(\text{g}) + \text{F}_2(\text{g}) \rightarrow 2\text{HF}(\text{g}) + \text{Cl}_2(\text{g})$
- D. $\text{H}_2(\text{g}) + \text{Cl}_2(\text{g}) \rightarrow 2\text{HCl}(\text{g})$
- E. $2\text{KClO}_3(\text{s}) \rightarrow 2\text{KCl}(\text{s}) + 3\text{O}_2(\text{g})$

21. The oxidation number of Cr in $\text{CrO}_2\text{Cl}_2(\text{l})$ is:

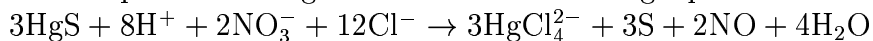
- A. -2
- B. +2
- C. -4
- D. +4
- E. -6
- F. +6

22. Which species is the reducing agent in the following equation?



- A. MnO_4^-
- B. Fe^{2+}
- C. H^+
- D. Mn^{2+}
- E. Fe^{3+}
- F. H_2O

23. Which species is being reduced in the following equation?



- A. HgS
- B. H^+
- C. NO_3^-
- D. Cl^-
- E. HgCl_4^{2-}
- F. S
- G. NO
- H. H_2O

24. The complete redox reaction $\text{Cl}_2 + \text{SO}_2 + 2\text{H}_2\text{O} \rightarrow 2\text{Cl}^- + \text{SO}_4^{2-} + 4\text{H}^+$ can be separated into two half-reactions: oxidation and reduction. What is the number of electrons transferred in its oxidation half-reaction?
- A. 0
 - B. 1
 - C. 2
 - D. 3
 - E. 4
 - F. 5
25. What is the molarity of a solution that contains 0.0150 mole of solute and 12.0 mL of solution?
- A. 1.25 M
 - B. 1.80×10^2 M
 - C. 0.125 M
 - D. 1.80 M
 - E. 1.25×10^{-3} M
 - F. 0.180 M
26. What is the molarity of an aqueous solution containing 20.0 g of NaOH in 0.250 L of solution?
- A. 0.50 M
 - B. 0.0125 M
 - C. 80.0 M
 - D. 5.00 M
 - E. 2.00 M
27. What volume of a 6.0 M H_2SO_4 solution would you need in order to prepare 200 mL of a 1.5 M H_2SO_4 solution?
- A. 1800 mL
 - B. 1200 mL
 - C. 800 mL
 - D. 133 mL
 - E. 50 mL
 - F. 33 mL

28. Acetic acid (CH_3COOH) is an important ingredient in vinegar. A 50.0 mL sample of a commercial vinegar was completely neutralized by titration with 16.4 mL of a 0.350 M NaOH solution. The concentration of acetic acid in the vinegar is:
- A. 0.115 M
 - B. 0.134 M
 - C. 0.227 M
 - D. 0.350 M
 - E. 1.07 M
29. In an acid/base titration, the point at which the acid has completely reacted with or been neutralized by the base is called the
- A. standard solution
 - B. KHP point
 - C. conjugate base point
 - D. equivalence point
 - E. indicator