1. [7 points] What is the correct name for ZnF₂?
   - (a) zinc fluorine
   - (b) zinc (II) fluoride
   - (c) zinc fluoride
   - (d) fluoride zinc
   - (e) none of the above

2. [7 points] What is the correct name for P₂O₅?
   - (a) phosphorous oxide
   - (b) phosphorous (V) oxide
   - (c) diphosphorous pentoxide
   - (d) pentoxide diphosphorous
   - (e) potassium oxide

3. [7 points] How many significant figures should there be in the answer to the following problem?
   \[(29.0025 + 0.2)(6.134 - 6.101)/5.196 \times 10^{-2}\]
   - (a) 1
   - (b) 2
   - (c) 3
   - (d) 4
   - (e) none of these

4. [7 points] Liquid mercury has a density of 13.6 g/cm³. How many pints of mercury would you need to drink to consume your body weight in mercury, assuming your weight was 145 lbs? (Please don’t try this at home). You may need the following conversion factors \(2.2046 \text{ lbs} = 1 \text{ kg}, 1 \text{ cm}^3 = 1 \text{ mL}, 473.18 \text{ cm}^3 = 1 \text{ pint}\).
   - (a) 10.2 pints
   - (b) 9.80 \(10^{-2}\) pints
   - (c) 11.3 pints
   - (d) 22.5 pints
   - (e) none of the above

5. [7 points] Which of the following is not an example of a solution.
   - (a) pure water
   - (b) a ruby crystal
   - (c) vodka
   - (d) air
   - (e) all of the above
6. [7 points] What is the proper symbol for an atom/ion with 22 protons, 27 neutrons and 18 electrons?

- (a) $^{40}\text{Ti}$
- (b) $^{49}\text{Ti}$
- (c) $^{49}\text{Co}^{4+}$
- (d) $^{49}\text{Ti}^{4+}$
- (e) $^{45}\text{Co}^{4-}$

7. [7 points] What is the formula of the compound formed between aluminum and oxygen ions?

- (a) $\text{Al}_3\text{O}_2$
- (b) $\text{AlO}$
- (c) $\text{AlO}_2$
- (d) $\text{Al}_2\text{O}$
- (e) $\text{Al}_2\text{O}_3$

8. [7 points] What is the empirical formula of a compound which is 75.96% ruthenium and 24.04% oxygen by mass?

- (a) $\text{Ru}_3\text{O}_4$
- (b) $\text{Ru}_3\text{O}$
- (c) $\text{RuO}_2$
- (d) $\text{Ru}_2\text{O}_3$
- (e) None of these

9. [7 points] Which of the following compounds is an example of metallic substance?

- (a) $\text{SnO}_2$
- (b) $\text{HClO}_4$
- (c) $\text{Au}_3\text{Cu}$
- (d) $\text{CaCO}_3$
- (e) $\text{N}_2$

10. [7 points] Indicate which set of coefficients properly balances the following equation:

$$a\text{CH}_3\text{NH}_2(g) + b\text{O}_2(g) \rightarrow c\text{CO}_2(g) + d\text{H}_2\text{O}(g) + e\text{N}_2(g)$$

- (a) $a = 1$, $b = 2$, $c = 1$, $d = 2$, $e = 1$
- (b) $a = 2$, $b = 4$, $c = 2$, $d = 5$, $e = 1$
- (c) $a = 2$, $b = 5$, $c = 2$, $d = 5$, $e = 2$
- (d) $a = 4$, $b = 9$, $c = 4$, $d = 10$, $e = 2$
- (e) none of the above
11. [7 points] Which of the following are extensive properties?

- (a) mass
- (b) color
- (c) density
- (d) volume
- (e) both (a) and (d)

When hydrogen sulfide (MW = 34.08 g/mol) gas is bubbled into a solution of sodium hydroxide (40.00 g/mol), their reaction forms sodium sulfide (78.05 g/mol) and water (18.02 g/mol) according to the following reaction.

\[ a \text{H}_2\text{S}(g) + b \text{NaOH}(aq) \rightarrow c \text{Na}_2\text{S}(aq) + d \text{H}_2\text{O}(l) \]

Use this reaction to answer questions 12-15.

12. [7 pts] Which set of coefficients properly balances the equation?

- (a) \(a = 1, b = 2, c = 1, d = 1\)
- (b) \(a = 1, b = 1, c = 1, d = 2\)
- (c) \(a = 1, b = 2, c = 1, d = 2\)
- (d) \(a = 1, b = 1, c = 1, d = 1\)
- (e) none of the above

13. [7 pts] What is the theoretical yield of sodium sulfide, if 1.50 g of hydrogen sulfide is reacted with a solution containing 1.65 g of sodium hydroxide, assuming the limiting reagent is completely consumed?

- (a) 3.43 g
- (b) 1.61 g
- (c) 1.50 g
- (d) 3.22 g
- (e) None of these

14. [7 points] What is the limiting reactant?

- (a) \(\text{H}_2\text{S}\)
- (b) \(\text{Na}_2\text{S}\)
- (c) \(\text{NaOH}\)
- (d) \(\text{H}_2\text{O}\)

15. [7 points] If the actual yield of sodium sulfide is determined to be 1.00 g, what is the percent yield?

- (a) 161 %
16. [7 points] What is the molarity of a 2 L solution containing 50 g of calcium bromide (MW = 199.88 g/mol)?

(a) 0.13 M  
(b) 0.21 M  
(c) 0.25 M  
(d) 0.42 M  
(e) 25 M

17. [7 points] Which of the following salts are soluble?

(a) NH₄Cl  
(b) AgCl  
(c) ZnS  
(d) Both (a) and (b)  
(e) All of the above compounds are soluble

18. [7 points] Which of the following compounds is a not a strong electrolyte?

(a) HClO₄  
(b) Ca(NO₃)₂  
(c) H₂SO₄  
(d) C₂H₅OH  
(e) All of the above are strong electrolytes

19. [7 points] What volume of 12 M HCl solution is needed to neutralize 120 mL of 0.5 M NaOH solution?

(a) 120 mL  
(b) 50 mL  
(c) 500 mL  
(d) 12 mL  
(e) 5 mL

20. [7 points] Identify the pair of atoms/ions which have the same number of electrons.

(a) ⁴⁰Ca and ³²S  
(b) ⁴⁰Ca²⁺ and ³²S²⁻  
(c) ³⁴S and ³²S²⁻  
(d) ⁴⁰Ca²⁺ and ⁴⁴Ca
21. [7 points] Given the following net ionic equation identify the species which is oxidized.

\[ 2 \text{Ag}^+(\text{aq}) + \text{Cu(s)} \rightarrow 2 \text{Ag(s)} + \text{Cu}^{2+}(\text{aq}) \]

- (a) \text{Ag}^+
- (b) \text{Cu}
- (c) \text{Ag}
- (d) \text{Cu}^{2+}
- (e) Water

22. [7 points] If solutions of calcium iodide and ammonium chloride are mixed together in a metathesis reaction, what is the empirical formula for the precipitate which forms?

- (a) \text{CaCl}_2
- (b) \text{CaCl}
- (c) \text{NH}_4\text{Cl}
- (d) No precipitate forms
- (e) A mixture of \text{NH}_4\text{Cl} and \text{CaCl}_2 forms

23. [7 points] What is the mass of a sample of rhodium (Rh) containing \(6.02 \times 10^{25}\) atoms?

- (a) 10.3 kg
- (b) 100. g
- (c) 103 g
- (d) \(6.20 \times 10^{27}\) g
- (e) None of the above.

24. [7 points] Which of the following reactions represents a combination reaction?

- (a) \(2\text{C}_2\text{H}_6(\text{g}) + 7\text{O}_2(\text{g}) \rightarrow 4\text{CO}_2(\text{g}) + 6\text{H}_2\text{O}(\text{l})\)
- (b) \(\text{NaHCO}_3(\text{aq}) + \text{HCl}(\text{aq}) \rightarrow \text{CO}_2(\text{g}) + \text{H}_2\text{O}(\text{l}) + \text{NaCl}(\text{aq})\)
- (c) \(4\text{Fe}(\text{s}) + 3\text{O}_2(\text{g}) \rightarrow 2\text{Fe}_2\text{O}_3(\text{s})\)
- (d) \(\text{NiO}(\text{s}) + 2\text{HClO}_4(\text{aq}) \rightarrow \text{Ni(ClO}_4)_2(\text{aq}) + \text{H}_2\text{O}(\text{l})\)
- (e) \(2\text{H}_2\text{O}(\text{l}) \rightarrow 2\text{H}_2(\text{g}) + \text{O}_2(\text{g})\)

25. [7 points] What is the molecular weight of benzene, which has a molecular formula of \(\text{C}_6\text{H}_6\)?

- (a) 13.02 amu
- (b) 81.04 amu
- (c) 72.06 amu
- (d) 78.11 amu
• (e) None of the above