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1. (4). What is the formula of the sulfide of lithium?
2. (4). How many neutrons are present in the nucleus of chlorine-35?
3. (5). What is the pH of 0.0010 M NaOH?
4. (5). Hydrogen chloride, a gas, dissolves in water with the evolution of a considerable amount of heat. Write a chemical equation that explains this observation.
5. (5). Provide the missing product in the following nuclear reaction:
$${}_{94}\text{Pu}^{238} \rightarrow {}_2\text{He}^4 + ?$$
6. (10). Sodium amide, NaNH_2 , reacts with water in a Brønsted acid-base reaction as follows:
$$\text{NaNH}_2(\text{s}) + \text{H}_2\text{O}(\text{l}) \rightarrow \text{NH}_3(\text{aq}) + \text{NaOH}(\text{aq})$$
 - a. Write the net ionic equation for this reaction.
 - b. Which is the stronger base, ____sodium amide or ____sodium hydroxide?
7. (4). What is the oxidation number of chlorine in NaOCl?

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8. (5). The half-life of C-14 is about 6000 years. After 18,000 years, what percentage of the original amount of the isotope would remain?

9. (4). Although helium is a gas under normal conditions, it becomes a liquid at about 4 K. The principal force of attraction holding atoms together in its liquid phase is:

- a. ___ Ion-ion
- b. ___ Dipole-dipole
- c. ___ London dispersion (induced dipole-induced dipole)
- d. ___ Hydrogen bonding

10. (4). One of the following combinations would likely form a homogeneous mixture. Check it.

- a. ___ gasoline and water
- b. ___ glucose and water
- c. ___ olive oil and vinegar
- d. ___ sodium chloride and hexane (C₆H₁₄)

11. (5). Balance the following equation:

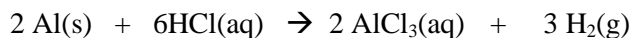


12. (5). Identify the element that has the same electronic configuration as Se²⁻.

13. (5). Check the one reaction below that does not go to completion (99%). (Note: equations are not necessarily balanced):

- a. ___ Na₂CO₃(aq) + HCl(aq) → NaCl(aq) + CO₂(g) + H₂O(l)
- b. ___ Na₂SO₄(aq) + KNO₃(aq) → NaNO₃(aq) + K₂SO₄(aq)
- c. ___ NaCl(aq) + AgNO₃(aq) → AgCl(s) + NaNO₃(aq)
- d. ___ NaOAc(aq) + HCl(aq) → NaCl(aq) + HOAc(aq)

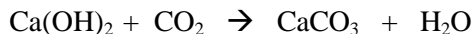
14. (5). Consider the following balanced equation:



If 54.0 g of aluminum reacts with an excess of HCl, what volume of hydrogen will be produced at STP?

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15. (5). Which is the limiting reagent in the reaction of 50.0 g Ca(OH)_2 with 50.0 g CO_2 :



16. (12). Give a specific example of each of the following:

- The proper name of manganese dioxide, MnO_2
- An isotope of carbon-14
- The metal whose electronic configuration is $\text{Ar}4s^2 3d^5$
- The conjugate acid of HPO_4^{2-}

17. (6). Boron trifluoride (BF_3) does not obey the octet rule and has dipole moment of zero. Draw the Lewis structure showing all valence electrons, predict its geometric shape and specify the F-B-F bond angle. (B is the central atom).

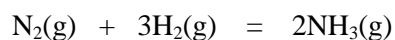
18. (5). One liter of steam ($\text{H}_2\text{O(g)}$) at 120 deg C and 1.00 atm pressure is heated to 240 deg C at constant volume. What is the final pressure of the steam?

19. (4). In osmosis, the flow of water molecules across a semipermeable membrane is from

____ more concentrated solution to less concentrated;

____ less concentrated solution to more concentrated.

20. (5). Write the equilibrium constant expression, K, for the following reaction:



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21. (5). What is the pH of an acetic acid (0.100 M) – sodium acetate (0.200 M) buffer solution? The pKa of acetic acid is 4.75.
22. (5). Amanda von Weisenheimer obtained the following data using the ideal gas law: weight of unknown gas = 0.121 g; number of moles of unknown gas = 0.00168 moles. What is the molecular weight of Amanda's unknown gas?
23. (6). Consider the bond dissociation reaction, $\text{H}_2(\text{g}) \rightarrow 2 \text{H}(\text{g})$.
- Is the reaction ___exothermic or ___endothermic?
 - Is ΔS ___positive or ___negative?
24. (5). What is the molarity of a solution made up by dissolving 24.0 g Na_2SO_4 in water and diluting to a final volume of 500 mL?

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Useful information;

Universal gas law constant, R: 62.4 L-mmHg/mol-K; 0.0821 L-atm/mol-K.

$\text{pH} + \text{pOH} = 14$; $\text{pK}_a + \text{pK}_b = 14$; $\text{pK}_w = 14$.

Henderson-Hasselbalch eqn: $\text{pH} = \text{pK}_a + \log\{[\text{base}]/[\text{acid}]\}$

Solubility rules: All Group IA metals and NH_4^+ salts are soluble; all halide salts are soluble except for silver and lead halides; all nitrates and acetates are soluble; all sulfates are soluble except for barium and lead sulfates; most others including hydroxides and sulfides are insoluble if not falling into one of the groups referenced above.

SCORING

1. (4)_____	17. (6)_____	TOTAL POINTS _____
2. (4)_____	18. (5)_____	CLASS MEDIAN _____
3. (5)_____	19. (4)_____	YOUR ADJUSTED SCORE (%) _____
4. (5)_____	20. (5)_____	
5. (5)_____	21. (5)_____	YOUR FINAL GRADE _____
6. (10)_____	22. (5)_____	
7. (4)_____	23. (6)_____	
8. (5)_____	24. (5)_____	
9. (4)_____		
10. (4)_____		
11. (5)_____		
12. (5)_____		
13. (5)_____		
14. (5)_____		
15. (5)_____		
16. (12)_____		