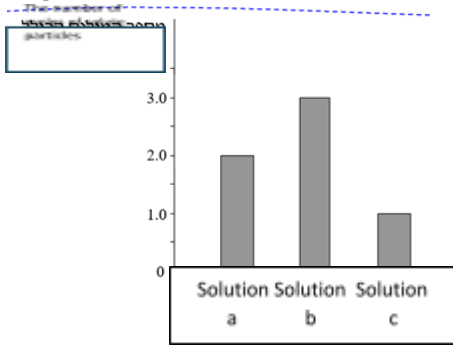


Appendix B - Stoichiometry- Questions for Grouper

Question Number	The Question	Multiple Choice
1	Doctors recommend limiting the intake of table salt, $\text{NaCl}_{(s)}$, and suggest using a product that contains not only $\text{NaCl}_{(s)}$ but also potassium chloride, $\text{KCl}_{(s)}$. A particular product contains 100 grams of a mixture consisting of 49 grams of $\text{NaCl}_{(s)}$, 49 grams of $\text{KCl}_{(s)}$, and various additives. Which of the following statements is correct?	1) 100 grams of the product contain approximately 24.5 grams of sodium ions, Na^+, and approximately 24.5 grams of potassium ions, K^+. 2) 100 grams of the product contain approximately 19 grams of sodium ions, Na^+, and approximately 26 grams of potassium ions, K^+. 3) 100 grams of the product contain approximately 49 grams of chloride ions, Cl^-, equivalent to iodine chloride. 4) 100 grams of the product contain approximately 98 grams of chloride ions, Cl^-.
2	For each of the three vessels, put 1 mol of material, and add water until a solution with a volume of 1 liter was obtained. The diagram bellow shows the total number of dissolved particles in each of the three solutions a, b, and c: In which of the rows 1-4 are the substances dissolved in solutions a, b, and c shown according to the diagram? 	c b a 1. CH_3OH, Na_2SO_4, NaNO_3 2. NaNO_3, Na_2SO_4, CH_3OH 3. Na_2SO_4, CH_3OH, NaNO_3 4. CH_3OH, NaNO_3, Na_2SO_4
3	What is the approximate mass of KCl that should be consumed every day, considering the recommended daily intake of 4.7 grams of potassium ions?	1. 7.5 gr 2. 9.02gr 3. 39.0 gr 4. 74.5 gr

4	To 1 liter of a solution of barium bromide, $\text{BaBr}_{2(\text{aq})}$, at a concentration of 0.1 M, add 0.1 mol of sodium bromide, $\text{NaBr}_{(\text{s})}$. Which of graphs 1-4 correctly describes the change in the concentrations of positive and negative ions in the solution over time?	
5	While resting, the human body takes 2.6 grams of oxygen gas, $\text{O}_{2(\text{g})}$, from the lungs per minute. What number of oxygen atoms the human body absorbs per minute? 1 mol of particles has $6.02 \cdot 10^{23}$ particles.	The correct answer is 4 $\frac{6.02 \cdot 10^{23}}{0.081}$ $\frac{6.02 \cdot 10^{23}}{0.162}$ $6.02 \cdot 10^{23} \cdot 0.081$ $6.02 \cdot 10^{23} \cdot 0.162$
6	Mix 1 liter of a sodium hydroxide solution, $\text{NaOH}_{(\text{aq})}$, with a concentration of 0.2 M, with 1 liter of an aqueous solution containing 0.2 moles of ethanol, $\text{CH}_3\text{CH}_2\text{OH}_{(\text{aq})}$. What is the concentration of $\text{OH}^{-}_{(\text{aq})}$ ions in the solution?	0.1M 0.2M 0.3M 0.4M
7	Mix 400 ml of a $\text{KCl}_{(\text{aq})}$ solution with a concentration of 0.4 M with 400 ml of a $\text{MgCl}_{2(\text{aq})}$ solution with a concentration of 0.8 M. Which statement correctly describes the concentration of $\text{Cl}^{-}_{(\text{aq})}$ ions in the resulting solution?	0.6 M solution will become less concentrated when the volume of the solution is doubled, as the concentration of $\text{Cl}^{-}_{(\text{aq})}$ ions are halved. - The value of 0.8M is obtained because the solution contains 0.8 moles of $\text{Cl}^{-}_{(\text{aq})}$ ions. 1M - The resulting solution has 0.8 moles of $\text{Cl}^{-}_{(\text{aq})}$ ions. 1M, because the volume of the solution has increased by two and the total number of moles of $\text{Cl}^{-}_{(\text{aq})}$ ions is 2 mol.
8	Prepare in the laboratory a solution by dissolving 6.05 grams of iron nitrate, $\text{Fe}(\text{NO}_3)_3_{(\text{s})}$, in 0.5 liter water. the molar mass of $\text{Fe}(\text{NO}_3)_3_{(\text{s})}$ is 242 g/mol. What is the molar concentration of $\text{NO}_3^{-}_{(\text{aq})}$ ions in the solution?	0.025 M 0.05 M 0.075 M 0.15 M
9	In each of the two vessels, A and B, there is 100 ml of water. A solid is placed in each container. In vessel A, the following reaction occurred:	- Equal masses of solid were placed in each of the two vessels. - At the end of the reactions, the volume of gas in vessel A was greater than the volume of gas in vessel B.

	$\text{Rb}_{(s)} + \text{H}_2\text{O}_{(l)} \rightarrow \text{Rb}^+_{(aq)} + \text{OH}^-_{(aq)} + \frac{1}{2} \text{H}_{2(g)}$ In vessel B, the following reaction occurred: $\text{RbH}_{(s)} + \text{H}_2\text{O}_{(l)} \rightarrow \text{Rb}^+_{(aq)} + \text{OH}^-_{(aq)} + \text{H}_{2(g)}$ The reactions in both vessels took place at the same temperature and pressure. During each reaction, 0.25 moles of gas were produced. Which of the following statements is correct?	3) The same number of solid moles reacted in each of the two vessels. 4) At the end of the reactions, the number of moles of $\text{Rb}^+_{(aq)}$ ions in vessel A was greater than the number of moles of $\text{Rb}^+_{(aq)}$ ions in vessel B.
10	In both laboratory and industrial settings, bromine, $\text{Br}_{2(l)}$, is produced according to the following reaction: $2\text{Br}^-_{(aq)} + \text{Cl}_{2(g)} \rightarrow 2\text{Cl}^-_{(aq)} + \text{Br}_{2(l)}$ 200 ml of an aqueous solution containing bromide ions was mixed with 500 ml of chlorine gas, $\text{Cl}_{2(g)}$. The materials reacted completely. Under the reaction conditions, the molar volume of a gas was 25 liters per mole. What is the concentration of ions at the end of the reaction?	1) 0.2 M 2) 0.1 M 3) 0.02 M 4) 0.0285 M
11	60 mL of ammonia gas, $\text{NH}_{3(g)}$, reacted completely with 60 mL of oxygen gas, $\text{O}_{2(g)}$. The reaction produced 90 mL of water vapor, $\text{H}_2\text{O}_{(g)}$, and 30 mL of an additional gas. All volumes were measured under the same conditions of temperature and pressure. What is the additional gas produced in the reaction?	1) $\text{N}_{2(g)}$ 2) $\text{N}_2\text{O}_{(g)}$ 3) $\text{NO}_{(g)}$ 4) $\text{NO}_{2(g)}$
12	Solid ammonium carbonate ($(\text{NH}_4)_2\text{CO}_{3(s)}$) decomposes upon heating according to the following reaction: $(\text{NH}_4)_2\text{CO}_{3(s)} \rightarrow 2\text{NH}_{3(g)} + \text{CO}_{2(g)} + \text{H}_2\text{O}_{(g)}$ A sample of ammonium carbonate was heated. The volume of the gases produced was measured under the same temperature and pressure conditions.	1) The number of $\text{NH}_{3(g)}$ molecules is equal to the number of $\text{H}_2\text{O}_{(g)}$ molecules. 2) The volume of $\text{NH}_{3(g)}$ is twice the volume of $\text{CO}_{2(g)}$. 3) The volume of $\text{H}_2\text{O}_{(g)}$ is equal to the volume of $(\text{NH}_4)_2\text{CO}_{3(s)}$. 4) The mass of $\text{H}_2\text{O}_{(g)}$ is equal to the mass of $\text{CO}_{2(g)}$.

	Which of the following statements correctly describes the products obtained in this reaction?	
13	There are two vessels, A and B, each with a volume of 1 liter. Vessel A is filled with methane gas, $\text{CH}_4(\text{g})$. Vessel B is filled with oxygen gas, $\text{O}_2(\text{g})$. The temperature and pressure in both vessels are equal. What is the correct statement?	1) The mass of the gas in vessel A is twice the mass of the gas in vessel B. 2) The mass of the gas in vessel A is equal to that in vessel B. 3) The number of gas molecules in vessel B is twice the number of gas molecules in vessel A. 4) The number of moles of gas in vessel A is equal to the number of moles of gas in vessel B.