Unit 10: Solutions

Pre-AP Chemistry Free Response Review #2

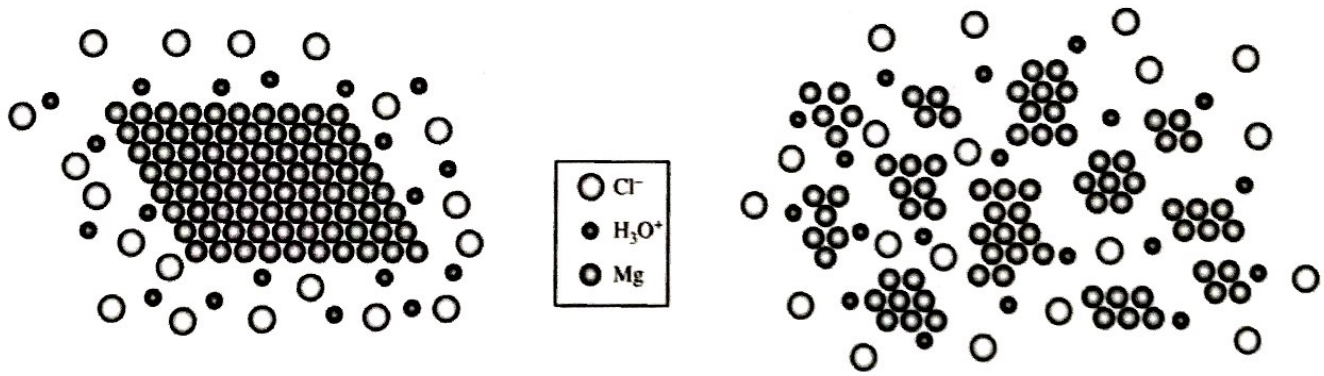
Directions: The suggested time is about 15 minutes for answering the constructed response section of the chemistry test. The parts within a question may not have equal weight. For calculations, show all your work in the spaces provided after each part. Pay particular attention to the proper use of units. Be sure your final answer is rounded to the correct number of significant figures. Make sure your work is legible. Illegible work will receive a grade of zero.

Question 1 [10 POINTS]

Two samples of solid magnesium were added to aqueous hydrochloric acid, HCl, in two separate containers., leading to the following reaction.

$$Mg(s) + 2\ HCl(aq) \rightarrow MgCl_2(aq) + H_2(g)$$

In both trials, 0.35 moles of Mg(s) and 500. mL of ~~1.2 M~~ 1.20 HCl(aq) were used: HCl was the limiting reagent. A particulate representation of the reaction occurring in the two separate containers is shown below (for simplicity, water molecules are not included).



Container A **Container B**

A. In which container will the reaction proceed faster, and why? **[1 POINT]**

Container B, b/c there's a greater surface area of $Mg_{(s)}$, so the $HCl_{(aq)}$ can react w/ Mg more quickly.

B. Using the starting quantities provided above, determine how many moles of HCl reacted. **[1 POINT]**

$mol_{HCl} = 1.2\ M \times 0.500\ L = \boxed{0.60\ mol\ HCl}$

C. What is the mass of excess reactant leftover after the reaction is complete? **[2 POINTS]**

$Mg + 2HCl \rightarrow MgCl_2 + H_2$

0.35	0.60		
-0.30	-0.60		
0.05	∅		

$0.05 \text{ mol Mg} \times \frac{24.30 \text{ g Mg}}{1 \text{ mol Mg}} = 1.1215$

$= \boxed{1 \text{ g Mg}}$ only 1 s.f.! :(

D. How many moles of $MgCl_2(aq)$ are produced in the reaction? **[1 POINT]**

$0.60 \text{ mol HCl} \times \frac{1 \text{ mol } MgCl_2}{2 \text{ mol HCl}} = \boxed{0.30 \text{ mol } MgCl_2}$

E. What is the molarity of $MgCl_2(aq)$ after the reaction is complete? **[1 POINT]**

$M = \frac{0.30 \text{ mol}}{0.500 \text{ L}} = \boxed{0.60 \text{ M } MgCl_2}$

F. When the reaction is complete, will the solution conduct electricity? Justify your answer. **[2 POINTS]**

Yes! $MgCl_2$ is an ionic compound that is soluble in H_2O (1 pt),

So it will dissociate to produce charged particles that can carry an electric current. } 1 pt

G. If exactly 3.00 moles of $MgCl_2$ dissolves in water, how many moles of total ions will form? **[1 POINT]**

$MgCl_2 \rightarrow Mg^{2+} + 2Cl^-$] 3 ions

$3.00 \text{ mol} \times 3 = \boxed{9.00 \text{ mol of ions}}$