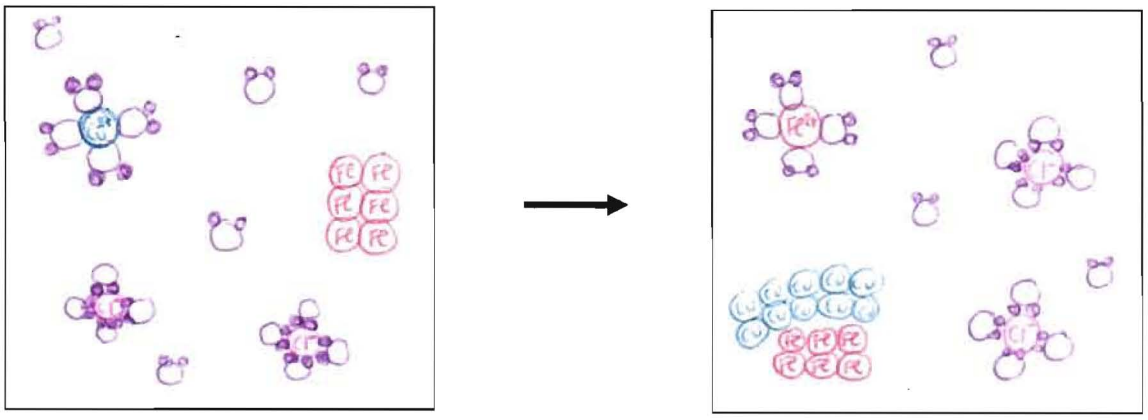
Name Plotnik, Shivtey Date _____ Pd ___

Representing Reactions Worksheet

1. When an iron nail is placed in an aqueous solution of copper (II) chloride an orange solid appears around the nail, there is a change in color from blue to green and the nails lose mass.

a) In the spaces below do a before and after drawing at the particle level of the reaction

Before $CuCl_2 + Fe$ **After**



b) Explain in your own words how the reaction took place and how your representation accounts for the visual observations described above. Make sure to mention the role of each atom participating in the reaction

Before the reaction takes place we have a blue liquid ($CuCl_2$) where Cu has a charge of 2+ and chloride has a charge of 1-. We also have an iron nail (Fe) with a neutral charge. The $CuCl_2$ is aqueous which explains that since this is an ionic compound, the water molecules separate the Cu ions and the Cl ions. During the reaction the Cu^{2+} gains 2 electrons (becomes reduced) from the neutral Fe, which makes some Fe ions a 2+ charge. This charged Fe^{2+} ions now are aqeous. The Cu^{2+} which became neutral (ammad) a solid around the remaining nail. The Cl^- are spectator, meaning they dun combulr to the reaction

c) How would the amount of orange solid change if more iron nails were initially placed in the copper (II) chloride solution?

The amount of orange solid would not change if more iron nails were added because you utilize both iron and the $CuCl_2$ solution to make the solid. If you don't increase the amount of $CuCl_2$, the amount of copper produced would not change.

d) During our class discussion it was concluded that the either iron (II) or iron (III) could be a product of the reaction. Use your data from the experiment to quantitatively determine which of the two ions was present after the reaction

Mass nails before: 5.35g
Mass of nail after: 3.206g
Mass of copper: 2.46
Lowered: 2.144g

$2.46\,g \times \frac{1\,mol}{63.546\,g} = 0.0387$

$2.144\,g \times \frac{1\,mol}{55.845\,g} = 0.0384$

1:1 an

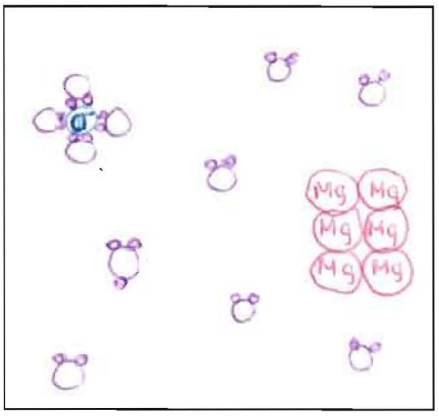
e) Write the chemical equation which represents the reaction discussed above

$Fe_{(s)} + CuCl_{2\,(aq)} \longrightarrow Cu_{(s)} + FeCl_{2\,(aq)}$

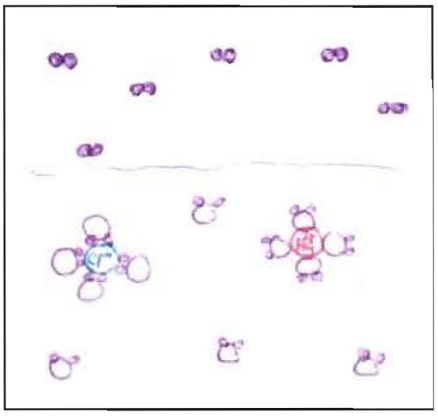
2. When a piece of magnesium metal is dropped in an aqueous solution of hydrochloric acid, bubbles form around the magnesium metal and the metal disappears from view.

a) In the spaces below do a before and after drawing at the particle level of the reaction

Before



After



b) Explain how the reaction took place and how your representation accounts for the visual observations listed above. Address the role of all species involved in the reaction.

Before the reaction we have a neutral Mg metal and a solution (aqueous) composed of H^+ ions and Cl^- ions. Since this is ionic the water molecules separate the H^+ ions and Cl^- ions. During the reaction we observed bubbles forming around the Mg metal, which was a redox reaction where 2 H^+ ions become reduced and take electrons from the neutral Mg atoms which makes them charged ions with a 2+ charge. Therefore, the H atoms escape the solution in pairs, which is a gas. The charged Mg^{2+} ions are now soluble in the aqueous solution the Cl^- ions are spectators, which do not contribute to the reaction.

c) Write the chemical equation which represents the reaction discussed above

$$Mg_{(s)} + HCl_{(aq)} \longrightarrow MgCl_{2\,(aq)} + H_2$$

d) How does this reaction compare to the reaction between the iron nail and the $CuCl_{2\,(aq)}$?

This reaction is the same reaction as the previous since it is also a redox reaction where the solid metal loses electrons (oxidized) and transfers them to other atoms which become reduced this causes new substances to form

e) If a piece of copper metal is placed in the solution of HCl no change is observed but if an iron nail is placed in the same solution bubbles will be observed. Explain these observations.

These observations show that hydrogen is able to take electrons from iron because it has a stronger pull, but it is not strong enough to take electrons from copper.