TEACHER PREPARATION GUIDE.

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Net Ionic Equations Lab

Chemistry | TEACHER GUIDE

Recipes, station setup, and waste handling for the watch glass station lab.

Solution Recipes

Use **distilled or deionized water** for every solution. Tap water contains chloride ions, which make silver nitrate and lead (II) nitrate cloudy. For each solution, dissolve the solid in about 60% of the final volume of water, then add water to the final volume and mix.

Solution	Solid to use	Molar mass (g/mol)	Mass for 100 mL	Mass for 250 mL
0.1 M copper (II) sulfate	$CuSO_4 \cdot 5H_2O$ (pentahydrate)	249.68	2.50 g	6.24 g
0.1 M lead (II) nitrate	$Pb(NO_3)_2$	331.21	3.31 g	8.28 g
0.1 M potassium iodide	KI	166.00	1.66 g	4.15 g
0.1 M silver nitrate	$AgNO_3$	169.87	1.70 g	4.25 g
1 M sodium hydroxide	NaOH pellets	40.00	4.00 g	10.00 g
1 M sodium chloride	NaCl	58.44	5.84 g	14.61 g
1 M hydrochloric acid	Concentrated HCl (12 M)	n/a	8.3 mL	20.8 mL
Zinc	Granular or mossy zinc	n/a	One 0.5 cm piece per group	
Magnesium	Magnesium ribbon	n/a	One 1 cm piece per group	

How much to make: each reaction uses only a few drops. 250 mL of each solution fills every station bottle for the day with plenty left for refills. Check that your copper (II) sulfate is the pentahydrate, since the mass changes with the number of waters.

Mixing Notes

- **Safety:** wear goggles, gloves, and an apron while preparing solutions, and work near a sink and eyewash.
- **Sodium hydroxide:** dissolving it releases a lot of heat. Add the pellets a few at a time to cold distilled water while stirring. Let it cool before you dilute to the final volume. Store it in a plastic bottle with a tight cap, since it attacks glass stoppers and absorbs CO_2 from the air.
- **Silver nitrate:** store in an amber or dark bottle. Light slowly turns it gray. It stains skin black.
- **Lead (II) nitrate:** weigh it carefully to avoid dust. Wash your hands and clean the balance right away.
- **Hydrochloric acid:** work in a fume hood. Always add the acid to about 60% of the final volume of water, never water to acid, then dilute to the final volume.
- **Potassium iodide:** store in a dark bottle. It slowly turns yellow as it sits, so make it within a week or two of the lab.
- **Magnesium ribbon:** cut it into 1 cm pieces. If the ribbon is dull or dark, rub it with steel wool first so the reaction starts right away.
- **Labels:** every bottle gets the name, formula, concentration, main hazard, and date.

Station Setup

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The student handout calls the two solutions at each station "A" and "B". The plan below uses 7 stations, one reaction each, so groups can rotate in the same order as the data table. Each bottle needs its own pipette.

Station	Solution A	Solution B
1	1 M sodium chloride	0.1 M copper (II) sulfate
2	0.1 M lead (II) nitrate	0.1 M potassium iodide
3	0.1 M silver nitrate	1 M sodium chloride
4	0.1 M copper (II) sulfate	1 M sodium hydroxide
5	Zinc pieces (small cup)	0.1 M copper (II) sulfate
6	0.1 M lead (II) nitrate	1 M sodium chloride
7	Magnesium ribbon pieces (small cup)	1 M hydrochloric acid

Bottles Needed

Solution	Bottles	Stations
Copper (II) sulfate	3	1, 4, 5
Sodium chloride	3	1, 3, 6
Lead (II) nitrate	2	2, 6
Potassium iodide	1	2
Silver nitrate	1	3
Sodium hydroxide	1	4
Hydrochloric acid	1	7

That is 12 labeled dropper bottles (or small bottles with a pipette each), plus a cup of zinc pieces at station 5 and a cup of magnesium pieces at station 7.

Supplies per Station

- 1 watch glass, a sheet of white paper, and a sheet of black paper
- The two labeled solutions from the table, each with its own pipette
- 1 wash bottle of distilled water
- 1 beaker (250 mL) labeled WASTE
- Paper towels. Goggles and gloves for every student.

Waste and Cleanup

- Station waste contains lead, silver, and copper, plus a small amount of acid. Combine it in one labeled heavy metal waste container. Do not pour any of it down the drain.
- The zinc pieces from station 5 are coated with copper. Collect them as solid heavy metal waste. Let any magnesium finish reacting before you seal a waste container, since it keeps making hydrogen gas in acid.
- Dispose of all waste through your district's chemical waste procedure. Wipe stations with a damp paper towel and put the towels in the solid waste.

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