TIE-DYE T-SHIRT LAB **Name: _____ Per: ___**

PROCEDURE: Twelve steps to a perfect tie-dye!

Day 1:

1. Pick out the size shirt you want. Use a permanent marker to write your name **on the tag**.

2. Soak your T-shirt in the large basin of sodium carbonate solution for at least 15-20 minutes. This solution removes "sizing" or fabric fillers and therefore helps open up the bonding sites on the cotton molecules (cellulose polymer chains) to give the dye molecules a place to bond covalently. Such a substance is called a "mordant," and many fabrics have to be soaked in mordants before they can be dyed.

3. While the T-shirt is soaking, practice designs and color mixings on damp paper towels.
Wet the paper towels with tap water then wring them out completely, carefully open them up and try different folding and dye application patterns.
There will only be five colors available: blue, yellow, red, viridian (aquamarine) and fuchsia (dark pink). If you want a green or orange, etc, you will need to mix them yourself. To do this, squeeze 6 drops of yellow and 4 drops of fuchsia (for example) into a small test tube. Then just pour out a few drops of this mixture onto a spread out moistened paper towel. If this isn't quite the orange you wanted, rinse out the test tube and try 7 drops of yellow and 3 drops of fuchsia. It's best to try to keep the total drops at 10. When you find a mixture you like, right down the proportions.

4. Take the T-shirts out of the mordant solution and run them through the wringer. Watch your fingers. There's nothing worse than a painful case of "wringer finger!" Place the wrung-out T-shirts on a coat hanger and hang them up to dry overnight in the lab room.

Day 2:

5. Working with a friend, with your desks scooted together, fold and wrap your T-shirt in any of a number of ways discussed (spirals are easy and always turn out great). Use rubber bands to hold them together.

6. Take the wrapped shirt into the lab, place a single newspaper sheet folded in quarters on a plastic tray and begin dyeing. First, though, figure out how much dye you will need and what colors you want to use. You and your partner will have four squirt bottles to use between the two of you.

shirt size	Short Sleeve		Long Sleeve	
	Volume (mL) for 90% coverage	Volume (mL) for 100% coverage	Volume (mL) for 90% coverage	Volume (mL) for 100% coverage
XS	260	290	360	400
S	280	310	390	430
M	300	330	420	470
L	320	370	470	520
XL	380	420	530	590
XXL	420	480	610	680

That means an XXL short sleeve shirt will need 480 mL of total dye. So if you want the shirt to be half red and half orange (that is 7 parts yellow and 3 parts fuchsia), you will put about 240 mL ($^1/_2$ of 480) of red in one squirt bottle, and 240 x 70% = 168 mL of yellow and 240 x 30% = 72 mL of fuchsia in the second squirt bottle. (You can eyeball this or use graduated cylinders.)

7. VERY IMPORTANT: Make as little mess as possible, and clean up after yourself as you go. Get the dye bottles you want from the center lab table. Then gently squeeze the dye out onto the shirt making slow sweeping movements to allow the dye to spread evenly. Also, be aware that mixing will occur where the dyes come in contact with each other. Or, you can premix two or more colors in one of the empty bottles, but please do not make up more than you need, and rinse out the bottle when you are finished with it. Using complimentary colors (purple & yellow, blue & orange, red & green) near each other usually produces a brownish black color. The dyes being used in this lab are known as "fiber-active" dyes; that means they actually form covalent bonds with the cotton molecules, and are therefore essentially impossible to wash out. (By the way, bleach does not really wash out the molecules, it just breaks them up so they no longer show the colors they normally do. Bleach also breaks up the cotton fibers and if overused will eventually lead to holes in the shirt!)

8. Take a fresh piece of newspaper (just one sheet) and fold it down so it is the same size as your shirt. Place this on the foam board for your class, then transfer the T-shirt onto this folded up newspaper. It will stay there for at least 24 hours. This gives the dye time to bond to the fabric, and as the water evaporates, it concentrates the dye to give richer colors.

9. When both you and your partner are done, thoroughly clean up your lab station, rinse out the bottles and tops, throw away the old newspaper sheet, use a cheap paper towel to wipe up your tray (and the lab area) and place a fresh **single sheet** of newspaper in the tray for the next person. Then wash your hands well.

Day 3:

10. The next day, at the end of class, place your T-shirt in a grocery bag and take it home. (Hint: Be careful not to let it stain things such as upholstered car seats as one careless student did a few years ago!) When you're ready, remove the rubber bands, open the shirt up (say "Ooooo" or "Ahhhhh") and place it in a large bucket of water. Rinse it a few times, wring it out, then continue to rinse it with fresh, clean water until the rinse water comes out dilute enough so that you can see your hand through about 5-6 cm (2 in) of the water. You may want to wear gloves while doing this. This rinse water is safe to dump on the grass.

11. Wring out the T-shirt one final time, then wash it in the washing machine by itself (small load setting to conserve water) in hot water using dish detergent (about 1 teaspoon!) such as Dawn or Joy (not laundry detergent). Dry it (by machine on **hot** setting). Note: Some dryers have trouble drying just one item, so if you have a bunch of rags or clothes that you don't care about, throw them in there too. The first few times you wash it, you may want to wash it by itself, but after that, the shirt can be washed with other darks in cold water.

12. To receive credit for this lab, **wear your T-shirts to school on _____ . Bring $12 for short sleeve or $15 for long sleeve, (checks made out to KHS). Or if you're not keeping it, turn it in immediately after the class picture.**