DIY Photometer Sampling Procedure

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1) Measure the temperature and salinity of your sample. Put these into the .ino file under measured variables and upload it to the Arduino Nano.

```
// Measured variables
float S = 32.000;      // Salinity
float T = 11.000;      // Temp in C
```

2) Put your sample in a 10 ml vial. Put it in the photometer and press the "blank" button. This will "zero" the photometer. The screen will show the absorbances for each color of LED.

3) Add five drops of m-Cresol Purple sodium salt, 0.04% w/v aq. soln. (mCP) dye into the sample. Invert it at least twice so the dye is evenly mixed in the sample.

4) Put the vial in the photometer and press the "sample" button. The screen will briefly show the absorbances for each LED and then will show you the calculated pH.

Other information:

Left to right: 0 drops, 3 drops, 5 drops, 10 drops mCP. More dye gives a more consistent result than less dye.

The photometer should be consistent to +/- 0.01 pH between roughly 7-8.5. This does not mean it is accurate. If you have another pH reader that has accuracy around or greater than +/- 0.01, then you can calibrate the photometer using a linear relationship.

Here is the code that will be edited. There should be close to a linear function between the pH readings of the DIY photometer and a more expensive pH meter. You can calculate m*x + b and insert m as `c1` and b as `c2` near the top of the .ino file. Change the `1` and `0` to whatever you calculate.

```
// correction variables... for corr = c1*abs + c2
float c1 = 1;
float c2 = 0;
```

The relevant line is in the pH calculation is `double corr = c1 * A1A2 + c2;` from this function:

```
// Kirt Onthank's pH function
double Calc_pH(float b1, float g1, float r1, float b2, float g2, float r2) {
    double K = T + 273.15;
    double pK2 = (1245.69/K) + 3.8275 + 0.00211 * (35 - S);
    double A1A2 = (g1 - g2 - (r1 - r2))/(b1 - b2 - (r1 - r2));
    double corr = c1 * A1A2 + c2;
    double PH = pK2 + log10((corr - 0.00691)/(2.222 - corr * 0.1331));
    return(PH);
}
```