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Evaluation of Five Conductivity Meters

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INTRODUCTION

Prices of conductivity meters vary widely. Here we report the response time, stability, and linearity of five meters.

MATERIALS AND METHODS

Manufacturer	Model	Approximate Cost
Hanna	HI 98188	\$900
YSI	Pro 30	\$800
Hanna	HI 8733	\$400
Hanna	ECTestr 11+	\$100
Various	Blue Pen	\$20



Figure 1

Calibration Procedure. Conductivity standards were made according to the *Standard Methods for the Examination of Water and Wastewater* page 2-45. KCl (7.46 grams) was dissolved in 1 liter of deionized water to make a 12890 $\mu\text{S cm}^{-1}$ standard. 100 mL of the standard was added to 900 ml of deionized water to make a 1412 $\mu\text{S cm}^{-1}$ standard (conductivity is not linear with concentration.) 10 mL of the 12890 $\mu\text{S cm}^{-1}$ standard was added to 990 ml of deionized water to make a 146.9 $\mu\text{S cm}^{-1}$ standard. Tap water is about 400 $\mu\text{S cm}^{-1}$ and sea water is about 50000 $\mu\text{S cm}^{-1}$ (50 mS cm^{-1}). The most conductive standard tested was the conductivity equivalent of 25% sea water.

For each meter with each standard solution the probe was rinsed with deionized water prior to insertion into the solution. After insertion the probe was gently stirred in the solution until the display stabilized.

Response Time.

Manufacturer	Model	Approximate Response Time
Hanna	HI 98188	3 minutes
YSI	Pro 30	1 minute
Hanna	HI 8733	1 minute
Hanna	ECTestr 11+	2 minutes
Various	Blue Pen	10 seconds

Stability. Each meter was calibrated one month before the evaluation. Hanna HI 98188, YSI Pro 30, and Blue Pen did not significantly drift from their calibration. However, Hanna HI 8733 and Hanna ECTestr 11+ drifted by about 40%. The reason for this drift is unknown.

RESULTS

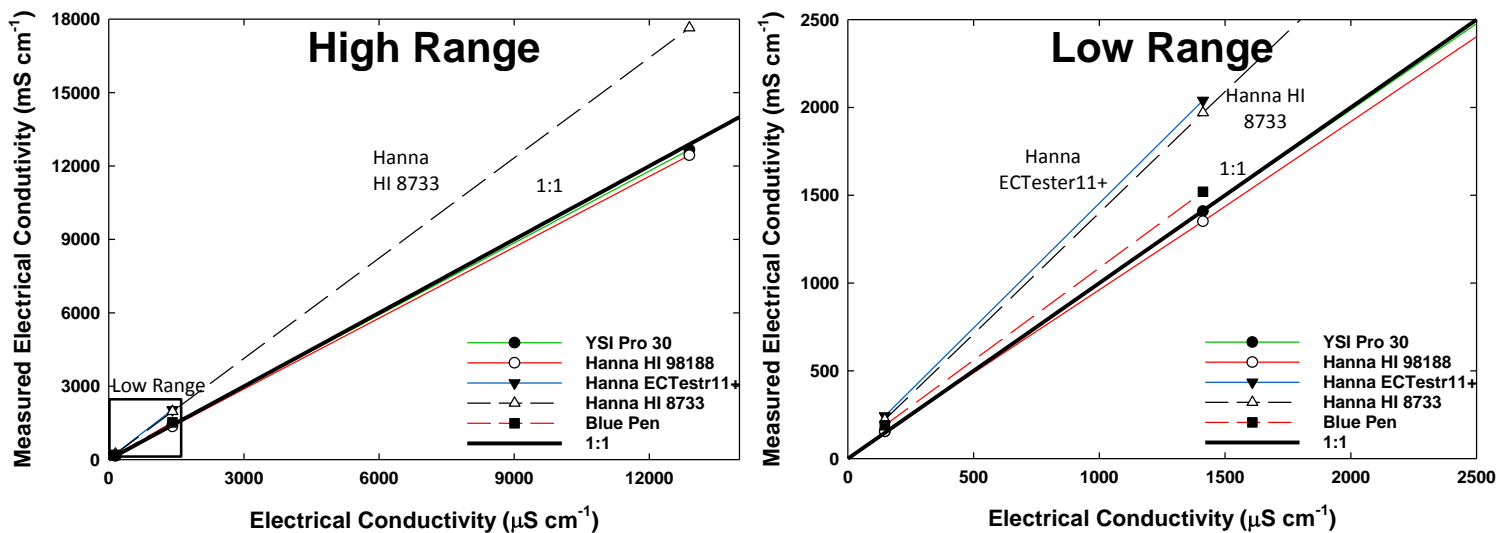


Figure 3

CONCLUSIONS

The Hanna HI 98188 and the YSI Pro 30 are the two most expensive meters and they were the most stable. They were within 5% of the actual conductivity.

The Blue Pen was consistently closer to the actual conductivity than the other two Hanna meters and at only \$20 it is a cost effective meter.

USEFUL CONVERSIONS AMONG ELECTRICAL CONDUCTIVITY UNITS

Common Salt Solutions	----- per cm -----			----- per m -----		
	mS* cm ⁻¹	mmho** cm ⁻¹	μS cm ⁻¹	S m ⁻¹	dS m ⁻¹	mS m ⁻¹
Tap Water	0.35	0.35	350	0.035	0.35	35
Optimal Nutrient Solution	1.0	1.0	1000	0.1	1.0	100

*S = Siemen, the SI unit for electrical conductance.

**mho = ohm spelled backward, an older unit of electrical conductance.

**mmho = millimho = 1 x 10⁻³ mhos