Chapter 5

24

a. dilution of unknown $= \frac{95}{100} = 0.95$

new concentration = 0.95 (original concentration)

or $\boxed{[Cu^{2+}]_f = 0.950[Cu^{2+}]_i}$

b. $[S]_f = \frac{1}{100}[S]_i = \frac{1}{100}(100.0\,ppm) = \boxed{1.00\,ppm}$

c.
$$\frac{[Cu^{2+}]_i}{1.00ppm + 0.950[Cu^{2+}]_i} = \frac{0.262}{0.500}$$

$$0.500[Cu^{2+}] = 0.262_{ppm} + 0.249[Cu^{2+}]_i$$

$$0.251[Cu^{2+}]_i = 0.262\,ppm$$

$$[Cu^{2+}]_i = \boxed{1.04\,ppm}$$

26a

The x-intercept represents the amount of analyte in the sample beyond the added standard in units as expressed by the x-axis

for tap water x intercept = 6.0 mL

$$6.0\,mL\left|\frac{0.152\,ng}{1\,mL}\right| = \frac{0.912\,ng\,Eu(III)}{10.00\,mL}$$

amount of sample in solution

$$= \boxed{0.0912\,ng/mL}$$

for pond water x-intercept = 14.6 mL

$$14.6\,mL\left|\frac{15.2\,ng}{1\,mL}\right| = \frac{221.9\,ng}{10.00\,mL} = \boxed{22.2\,ng/mL}$$

29 Standard addition should be used when the sample matrix (anything other than the analyte that is in the sample) interferes with the instrument response and the matrix cannot be reproduced for calibration standards.

An internal standard should be used when sample losses may occur during sample processing or analysis or if the volume of sample being analyzed cannot be controlled.

30
$$\frac{3473}{10222} = F\left(\frac{3.47}{1.72}\right) \rightarrow F = \boxed{0.168}$$

b.
$$\frac{1\,mL}{10\,mL}(8.47\,mM) = \boxed{0.847\,mM}$$

c.
$$\frac{5428}{4431} = (0.168)\frac{x}{0.847} \rightarrow x = \boxed{6.17\,mM}$$

d.
$$6.17\left(\frac{10.00\,mL}{5.00\,mL}\right) = \boxed{12.4\,mM}$$

31
$$\frac{10.1}{15.3} = F\left(\frac{0.800}{0.500}\right) \rightarrow F = 0.413$$

$$10.2\,\mu L \left| \frac{1.484\,mg}{\mu L} \right| \frac{1\,mmol}{119.39\,mg} \right| = \frac{0.127\,mmol}{0.100\,L} = 1.27\,mM$$

$$\frac{0.1(x)}{1.27}(0.413) = \frac{8.7}{29.4} \longrightarrow x = \boxed{9.10\,mM}$$