More Ch 5 Homework
Skoog, 5th ed.

5-1 Frequency dependent: flicker and environmental noise.
Frequency independent: thermal and shot noise.

5-2 (a) Thermal noise.

(b) Certain types of environmental noise.

(c) Thermal and shot noise.

5-3 10^4 to 10^5 and 10^6 to 10^7 Hz. Environmental noise is at a minimum in these regions (see Figure 5-3).

5-4 At the high impedance of a glass electrode, shielding is vital to prevent currents induced from power lines from being amplified and disturbing the output.

5-5 (a) High-pass filters are used in order to remove low frequency flicker noise from high frequency analytical signals.

(b) Low-pass filters are used to remove high frequency noise from dc analytical signals.

5-6 We estimate the maximum and the minimum in the recorded signal (0.9×10^{-15} μA) to be 1.5×10^{-15} and 0.4×10^{-15} μA. The standard deviation of the signal is estimated to be one fifth of the difference (page 100) or 0.22×10^{-15} μA. Thus,

$$S/N = \frac{0.9 \times 10^{-15}\ \mu A}{0.22 \times 10^{-15}\ \mu A} = \underline{\underline{4}}$$

5-7 (a) The mean for the data is $\bar{x} = 1.003$.

The standard deviation is $s = 2.80 \times 10^{-3}$ (Equation a1-9, page A-6).

$$S/N = 1.003/2.80 \times 10^{-3} = \underline{\underline{\underline{358}}}$$

(b) $$\frac{S}{N} = \frac{S_n}{N_n}\sqrt{n} \qquad \text{(Equation 5 – 11)}$$

For the nine measurements

$$358 = \frac{S_n}{N_n}\sqrt{9}$$

5-10 $$\frac{S}{N} = \sqrt{1}\frac{s_x}{N_x} = \underline{\underline{4.3}}$$

$$\frac{S}{N} = \sqrt{n}\frac{S_x}{N_x} = \underline{\underline{43}}$$

Dividing the second equation by the first gives

$$\frac{\sqrt{n}}{\sqrt{1}} = \frac{43}{4.3} = \underline{\underline{10}}$$

$$n = 10^2 = \underline{\underline{100}}$$