(16) $A = \varepsilon b c$

a. $c = \frac{A}{\varepsilon b} = \frac{0.427}{(6130\ M^{-1}cm^{-1})(1.000\ cm)} = \boxed{6.97\times10^{-5}\ M}$

b. $\frac{6.97\times10^{-5}\ M}{(1/10)} = \boxed{6.97\times10^{-4}\ M}$

c. $5.00\ mL \left| \frac{6.97\times10^{-4}\ mol}{1000\ mL} \right| \frac{292.16\ g}{1\ mol} \left| \frac{1000\ mg}{1\ g} \right| = \boxed{1.02\ mg}$

(18) $A = \varepsilon b c$

a. $\varepsilon = \frac{A}{bc} = \frac{(0.267 - 0.019)}{(1.00\ cm)(3.15\times10^{-6}\ M)} = \boxed{78730\ M^{-1}cm^{-1}}$

b. $c = \frac{A}{\varepsilon b} = \frac{(0.175 - 0.019)}{(78730\ M^{-1}cm^{-1})(1.00\ cm)} = \boxed{1.98\times10^{-6}\ M}$

(19) a. Absorbance due to known amount of NO_2^-
$= 0.967 - 0.622 = 0.345$

concentration of known $NO_2^- = 7.50\times10^{-3}\ M\ (10.0\times10^{-6}\ L)$
$= \frac{7.5\times10^{-8}\ mol}{0.054\ L} = 1.39\times10^{-6}\ M$

$\varepsilon = \frac{A}{bc} = \frac{0.345}{(5.00\ cm)(1.39\times10^{-6}\ M)}$

$= \boxed{49680\ M^{-1}cm^{-1}}$

b. $\frac{7.50\times10^{-8}\ mol}{x\ mol} = \frac{0.345}{0.469} \Rightarrow x = 1.02\times10^{-7}\ mol\ NO_2^-$

$1.02\times10^{-7}\ mol\ NO_2^- \left| \frac{46\ g}{1\ mol} \right| \frac{10^6\ \mu g}{1\ g} = \boxed{4.69\ \mu g\ NO_2^-}$

24 Fluorescence is emission of a photon with an electronic transition from an excited singlet state to the ground singlet state. The lifetime of the excited singlet state is very short. Phosphorescence is emmision of a photon with an electronic transition from a triplet state to a singlet state. The lifetime of the excited triplet state is relatively long.

25 Luminescence results after a molecule absorbs light. Chemiluminescence results from the product of a chemical reaction that is in the excited state.

28 For an excitation spectrum the λ of the spectrometer's light source is varied and light of a specific emission λ is monitored. For an emission spectrum, the excitation λ is held constant and the measured emission λ is varied. The excitation spectrum resembles an absorption spectrum because emission is proportional to absorption.