A sample of cyclobutane, C_4H_8, contains 0.104 mole of the compound. What is the mass of the sample, in grams?

First, we need the molar mass of cyclobutane

$$4\left(12.011\ g\cdot mol^{-1}\right)+8\left(1.0079\ g\cdot mol^{-1}\right)=56.107\ g\cdot mol^{-1}$$

Next, we use molar mass to convert moles to mass

$$\left(56.107\ g\cdot mol^{-1}\right)\left(0.104 mol\right)=5.835 g$$

What is the mass percent composition of each element in hydrogen sulfite, H_2SO_3?

Where to begin? Mass percent: need to know the mass of each element and the whole

Assume 1 mole of the compound. Calculate the mass of the compound and of the stoichiometric number of moles of each element.

Molar Mass of H_2SO_3

$$\left[2(1.0097)+1(32.066)+3(15.9994)\right] g\cdot mol^{-1} = 82.084\, g\cdot mol^{-1}$$

Masses in 1 mole		Mass Percent
H_2SO_3	$(1\ mol)\left(82.084\, g\cdot mol^{-1}\right) = 82.084\, g$	
H	$(2\ mol)\left(1.0097 g\cdot mol^{-1}\right) = 2.019 g$	$\left({}^{2.019}/_{82.084}\right)100\% = 2.46\%$
S	$(1\ mol)\left(32.066 g\cdot mol^{-1}\right) = 32.066 g$	$\left({}^{32.066}/_{82.084}\right)100\% = 39.1\%$
O	$(3\ mol)\left(15.9994 g\cdot mol^{-1}\right) = 47.998 g$	$\left({}^{47.998}/_{82.084}\right)100\% = 58.5\%$

The energy required to break the C-C bond in graphite is 500 kJ mol^{-1}. What is the longest wavelength of light capable of breaking a C-C bond?

$$\Delta E = h\nu = \frac{hc}{\lambda} = 500\ kJ \cdot mol^{-1}$$

$$\lambda = \frac{hc}{500\ kJ \cdot mol^{-1}}$$

$$6.02x10^{23}\ 'things' = 1mol$$

$$\lambda = \frac{\left(6.626x10^{-34} J \cdot s\right)\left(3.0x10^{8} m \cdot s^{-1}\right)}{500\ kJ \cdot mol^{-1}} \frac{kJ}{10^{3} J} \frac{6.02x10^{23}}{mol}$$

$$\lambda = 2.4x10^{-7} m\ \frac{10^{9} nm}{m} = 239\ nm$$