



# Chemistry in Context



## Exam 1

Short answer: answer the following questions with a word, sentence, equation or number.

$$c = 3.0 \times 10^8 \text{ m/sec}$$

$$h = 6.63 \times 10^{-34} \text{ J sec}$$

$$E = \frac{h \cdot c}{\lambda} = h \cdot \nu$$

1. Explain:

a. The observation that clear winter nights tend to be colder than cloudy ones.

b. How this relates to the greenhouse effect.

2.

a. Draw the Lewis dot structure of  $\text{NO}_2$

b. Would you expect  $\text{NO}_2$  to be a greenhouse gas?

3.

a. Express the 0.9% of air which is argon in ppm.

\_\_\_\_\_

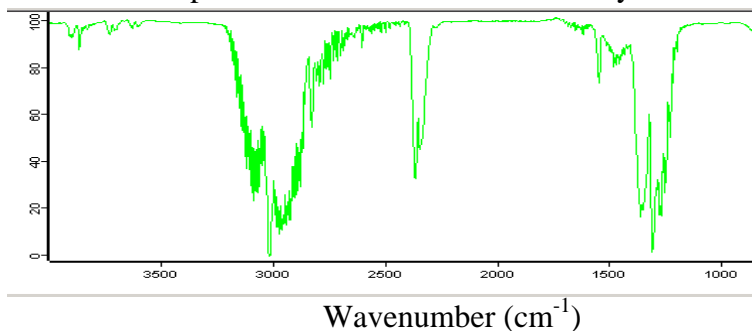
b. In the cigarette lab, you found 0.30 mg of particles on the “smokers” filter and 0.05 mg on the “second-hand” smoke filter. What percentage of the smoke particles were on the “second-hand” filter?

\_\_\_\_\_

- c. If you release 700 moles of CO<sub>2</sub> driving your Hummer 8 miles, how many grams of carbon did you release?

\_\_\_\_\_ grams

4. Below is a spectrum we recorded in laboratory.



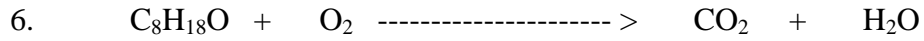
- a. What type of spectrum is this?
- b. Give the rough position of each position of maximum absorbance in the correct units.
- c. What is the energy (J) associated with the greatest absorbance in this spectrum?

\_\_\_\_\_ J

- 5.
- a. Calculate the energy of a 242 nm photon of light. Light of this wavelength has sufficient energy to break an O-O bond to produce oxygen radical.

b. If it requires a photon of 320 nm to break one of the bonds in ozone, what can be said about the relative strength of these bonds?

c. Draw the Lewis dot structure of ozone and oxygen and rationalize the relative bond strength.



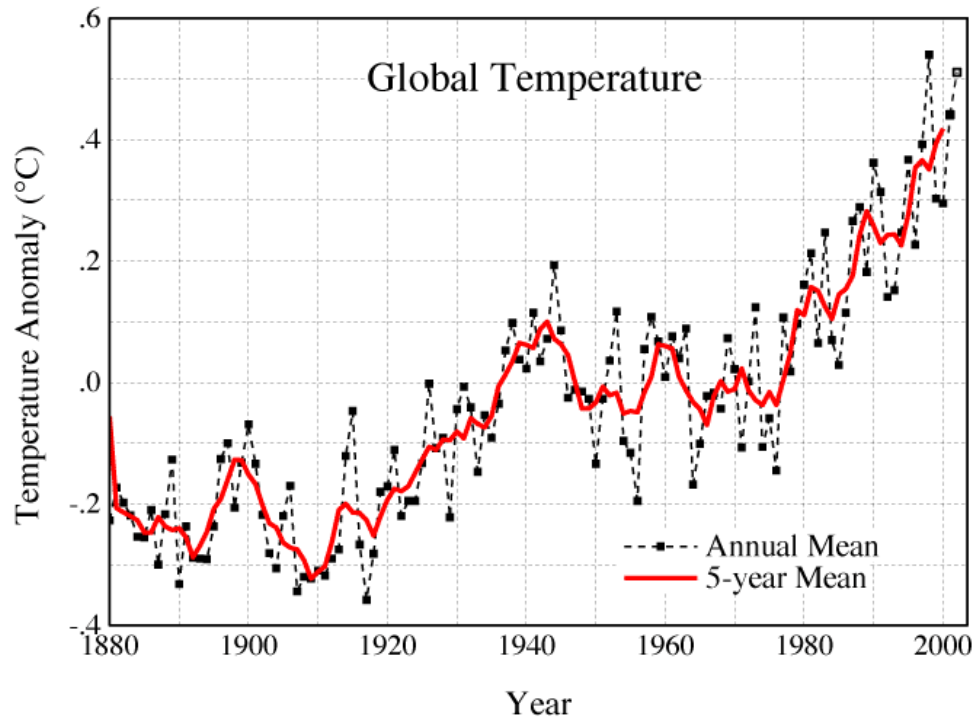
a. Balance this equation for octanol being combusted in the presence of oxygen.

b. If you burn 100g of  $C_8H_{18}O$ , how many g of  $CO_2$  are formed?

\_\_\_\_\_ gram  
c. How many moles is this?

\_\_\_\_\_ moles

7. What is climate forcing? Name two positive and negative climate forcings.

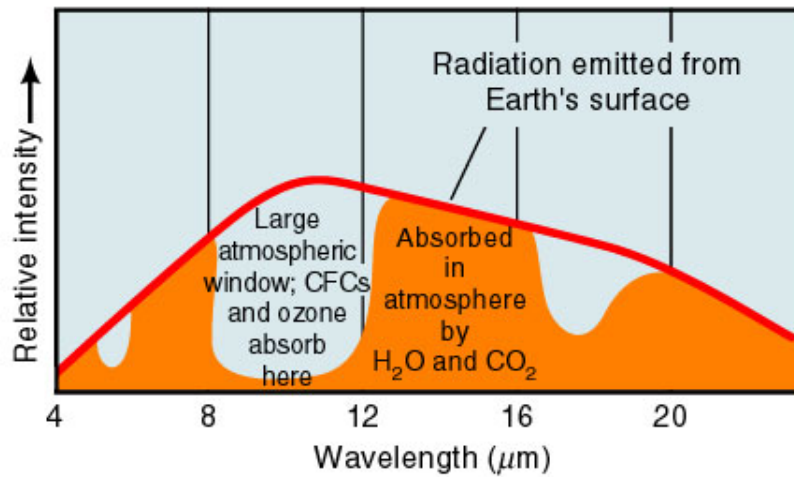


8.

- a. Given the above global temperature trends, how much might you expect temperature to increase by the year 2050? Explain your reasoning.

\_\_\_\_\_ degree C

- b. From 1940-1970, there was no increase in global temperature. Explain how this could have happened given that CO<sub>2</sub> levels were rising during this time period. It may be helpful to think about climate forcing.



9.
  - a. What region of the light spectrum is the above figure referring to?
  
  - b. At what wavelength does most radiation exit the earth's atmosphere?  
 \_\_\_\_\_
  - c. Would more of the sun's radiation be at longer or shorter wavelengths than 4 – 20 microns ( $10^{-6}\text{m}$ )?  
 \_\_\_\_\_
  
10.
  - a. What is the difference between  $\text{PM}_{10}$  and  $\text{PM}_{2.5}$ ?
  
  - b. What are three major sources of these pollutants?
  
  - c. Which one has the most detrimental health effects? Why?