

Honors 203/Chemistry 110
Homework 4/5 (20 pts)

Due Thursday, March 17th.

Spring 2011

1. **CIC 3.21** Silver has an atomic number of 47.
 - (a) What is the number of protons, neutrons, and electrons in a neutral atom of the most common isotope, Ag-107?
 - (b) How do the numbers of protons, neutrons, and electrons in a neutral atom of Ag-109 compare with those of Ag-107?
2. **CIC 3.22.** Silver has only two naturally occurring isotopes: Ag-107 and Ag-109. Why isn't the atomic mass of silver given on the periodic table just the average, 108?
3. Thallium has two naturally occurring isotopes, Tl-203 and Tl-205. Tl-203 has a mass of 202.97 amu and makes up 29.52% of naturally occurring thallium. Tl-205 has a mass of 204.97 amu and makes up the other 70.48%. What is thallium's average atomic mass?
4. **CIC 3.24** Calculate the molar mass of these molecules. Each plays a role in atmospheric chemistry.
 - (a) H₂O
 - (b) CCl₂F₂ (Freon-12)
 - (c) N₂O
5. How many moles of CH₃Cl are there in 75.0 g?

6. How many moles of N_2O are there in 125.3 g?

7. How many moles of glucose, $\text{C}_6\text{H}_{12}\text{O}_6$ are there in 210.2 g?

8. Calculate the number of grams in 0.178 moles of Ag_2S

9. Calculate the number of grams in 1.46 moles of CH_4

10. Calculate the number of grams in 0.50 moles of C_8H_{18}

11. **CIC 3.25**
 - (a) Calculate the mass percent of chlorine in CCl_3F (Freon-11).

 - (b) Calculate the mass percent of chlorine in CCl_2F_2 (Freon-12).

 - (c) What is the maximum mass of chlorine that could be released in the stratosphere by 100 g of each compound?

 - (d) How many molecules of chlorine correspond to the masses calculated in part c?

12. **CIC 3.2** The surface temperatures of both Venus and Earth are warmer than would be expected on the basis of their respective distances from the Sun. Explain.

13. **CIC 3.5** Describe the difference between climate and weather.
14. The text states that a UV photon can break chemical bonds, but that an IR photon can cause only vibration in the bonds. Assuming a wavelength of 320 nm for the UV photon and a wavelength of 5000 nm for the IR photon, how do the energies of these compare?
15. **CIC 3.16** If a carbon dioxide molecule interacts with certain photons in the IR region, the molecule vibrates. For CO₂, the major wavelengths and their corresponding wavenumbers of absorption occur at 4.26 μm (2350 cm⁻¹) and 15.00 μm (667 cm⁻¹).
- What is the energy corresponding to each of these IR photons?
 - What happens to the energy in the vibrating CO₂ species?
16. **CIC 3.7** Hexane, C₆H₁₄, and octane, C₈H₁₈, will burn with oxygen gas, O₂. The products of complete combustion are H₂O and CO₂
- Write a balanced equation for the complete combustion of hexane.
 - Repeat for octane.
 - Compare the number of moles of CO₂ produced when 1 mol of each hydrocarbon burns.
17. **CIC 3.7** Consider Figure 3.9.
- How does the present concentration of CO₂ in the atmosphere compare with its concentration 20,000 years ago? With its concentration 120,000 years ago?

- (b) How does the present temperature of the atmosphere compare with the 1950-1980 mean temperature? With the temperature 20,000 years ago? How does each of these values compare with the average temperature 120,000 years ago?
- (c) Do your answers to parts a and b indicate causation, correlation, or no relation? Explain.
18. **CIC 3.8** Understanding Earth's energy balance is essential to understanding the issue of global warming. For example, the solar energy striking Earth's surface averages 168 watts per square meter (W/m^2), but the energy leaving Earth's surface averages $390 \text{ W}/\text{m}^2$. Why isn't Earth cooling rapidly?
19. **CIC 3.18** Explain how each of these relates to global climate change.
- (a) volcanic eruptions
 - (b) CFCs in the troposphere
 - (c) CFCs in the stratosphere
20. **CIC 3.54** Data taken over time reveal an increase in CO_2 in the atmosphere. The large increase in the combustion of hydrocarbons since the Industrial Revolution is often cited as a reason for the increasing levels of CO_2 . However, an increase in water vapor has not been observed during the same period. Remembering the general equation for the combustion of a hydrocarbon, does the difference in these two trends disprove any connection between human activities and global warming? Explain your reasoning.