

Chem / Envsty L111:
Spring 2007
Quiz 4

Name _____

1. Scientists believe they know the average global temperature over the last 160,000 years. Which property of the ice core samples from Antarctica provides this information?

- a. their thickness
- b. their carbon dioxide concentration

c. their $^1\text{H}/^2\text{H}$ ratio

d. their temperature

The rate at which isotopes are exchanged depends on temperature. **4/23 correct**

2. Which atmospheric component does not contribute to global warming?

a. H_2O

b. CO_2

c. N_2

d. O_3

All of the others have vibrations which distort the electron density. **19/23**

3. What is the effect of infrared energy on matter?

- a. It excites bonding electrons.
- b. It increases molecular rotation.
- c. It breaks chemical bonds.

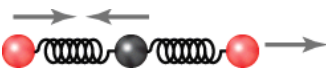
d. It increases the vibration of chemical bonds.

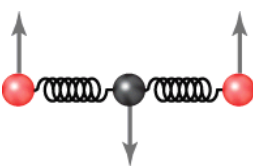
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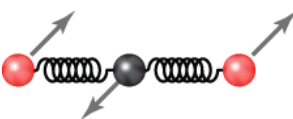
4. Which vibrational mode for carbon dioxide is **not** expected to contribute to the greenhouse effect?

a. 

This vibration is perfectly symmetric and doesn't affect the relative distribution of electrons. **17/23**

b. 

c. 

d. 

5. Argon, which comprises almost 1% of the atmosphere, is approximately 27 times more abundant than CO₂, but doesn't contribute to global warming. Which explanation accounts for this fact?

- a. Single atoms do not vibrate. They have no bonds. 21/23
- b. Argon's vibrational energy is not excited by infrared radiation.
- c. The mass of argon does not allow it to reach sufficiently high in the atmosphere to interact with the earth's radiant energy.
- d. Argon is transparent to UV radiation.

6. Although greenhouse gases likely account for the problem of global warming, they are also responsible for making earth habitable. What would be the temperature on earth in the absence of the effects of carbon dioxide and water?

- a. 450 °C
- b. 15 °C
- c. -18 °C 14/23
- d. -270 °C

7. Water has a strong infrared absorbance at 1500 cm⁻¹. Convert this frequency to wavelength.

- a. $1.50 \times 10^7 \mu\text{m}$
- b. 6.66 μm 4/23
- c. 2.98 μm
- d. 0.15 μm

8. Determine the shape or geometry of PH₃. (Hint: Use the Periodic Table to arrive at the electron configuration for phosphorous.)

- a. tetrahedral
- b. trigonal pyramidal This is just like :NH₃ – and thus, pyramidal. 13/23
- c. bent
- d. trigonal planar

9. Predict the geometry of nitrous oxide, N₂O (atomic order N–N–O).

- a. linear The best Lewis structure is :N≡N–O::: - a linear arrangement 7/23
- b. bent
- c. trigonal pyramidal
- d. trigonal planar

10. Which process plays the most important role in the greenhouse effect?

- a. Energy from the sun is reflected back into the atmosphere.
- b. Energy from the sun is absorbed by the earth.
- c. Energy from the sun is absorbed by the atmosphere.
- d. Energy radiated by the earth is absorbed by the atmosphere. 13/23