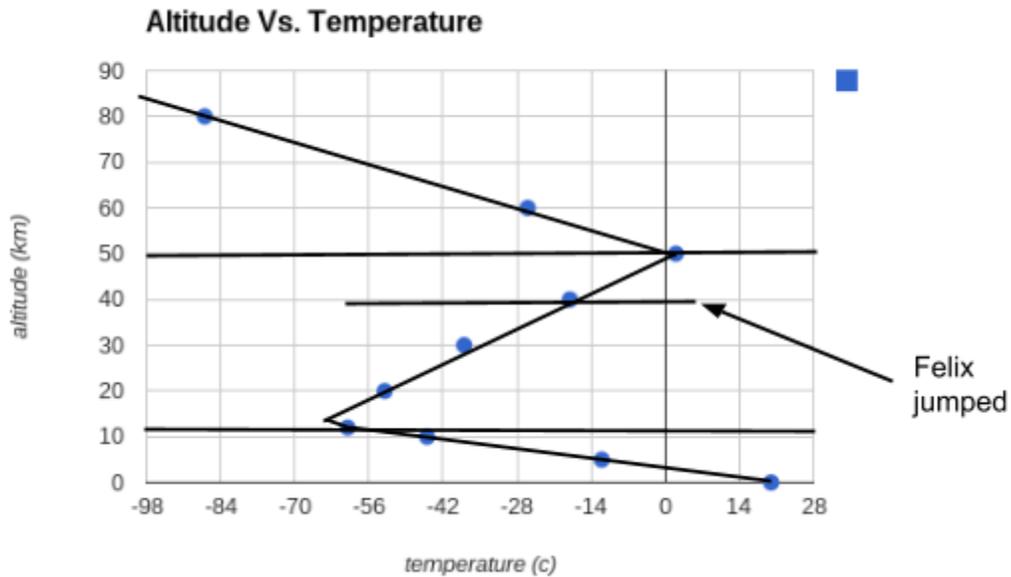


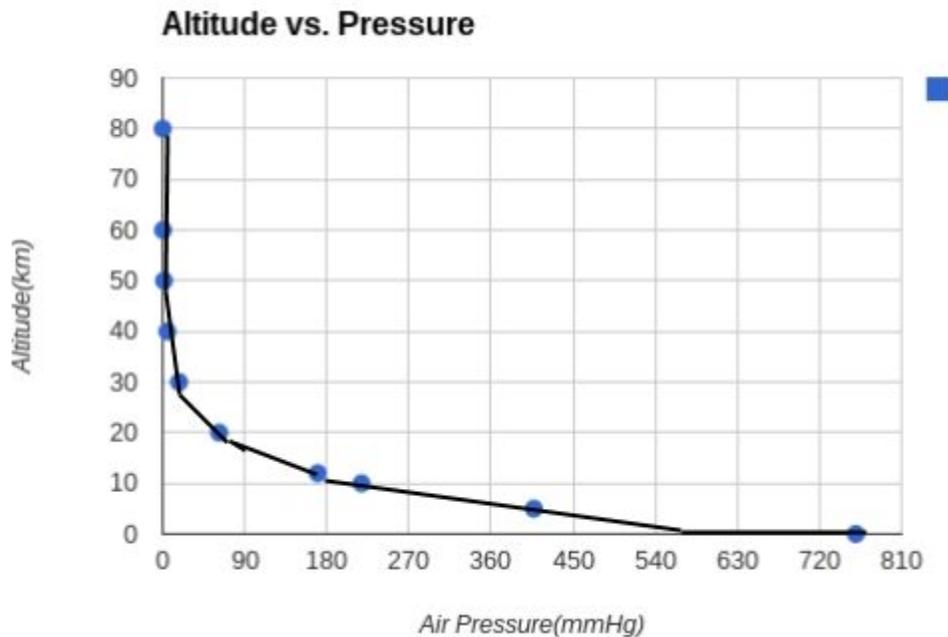
Structure of the Atmosphere

Use the graph below to answer the following questions:



1. Label each layer of the atmosphere in the graph above.
2. What was the temperature outside of the hot air balloon when Felix jumped?
3. What is the highest altitude that will get to a temperature of 0 deg C?
 What is the lowest altitude that will get to a temperature of 0 deg C?
4. What is the most abundant gas in the atmosphere?
5. What are the three most abundant gases in the atmosphere? Rank them and provide the percent of each.
6. What is the name layer of the atmosphere that
 - a. you live in? _____
 - b. planes fly in? _____
 - c. felix jumped from? _____

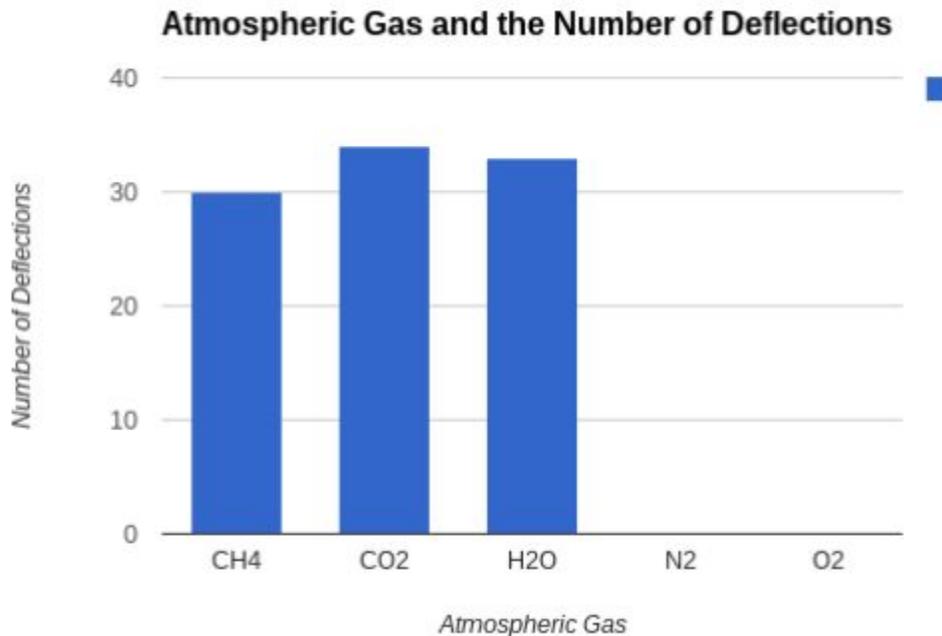
7. What is the difference in the temperature of the atmosphere when you compare where Felix jumped to the surface of the Earth? (These types of calculation questions will be worth two points!)
8. What happens to the temperature of the atmosphere when you descend from 10 km flying across the country in a plane and land at ground level?



9. Write a sentence that describes the relationship between air pressure and the altitude above the Earth?
10. If Felix did not wear a spacesuit, what would have happened to him when he stepped outside of the capsule to jump?
11. At the surface of the Earth standard air pressure is 760 mm of Hg. What percent of the atmospheric pressure is surrounding you when you fly in an airplane at an altitude of 20 km?
12. Planes fly at around 10 km above the Earth. What was the approximate pressure around a plane?

Changes in the Earth's Atmosphere

Use the graph below to answer the following questions:

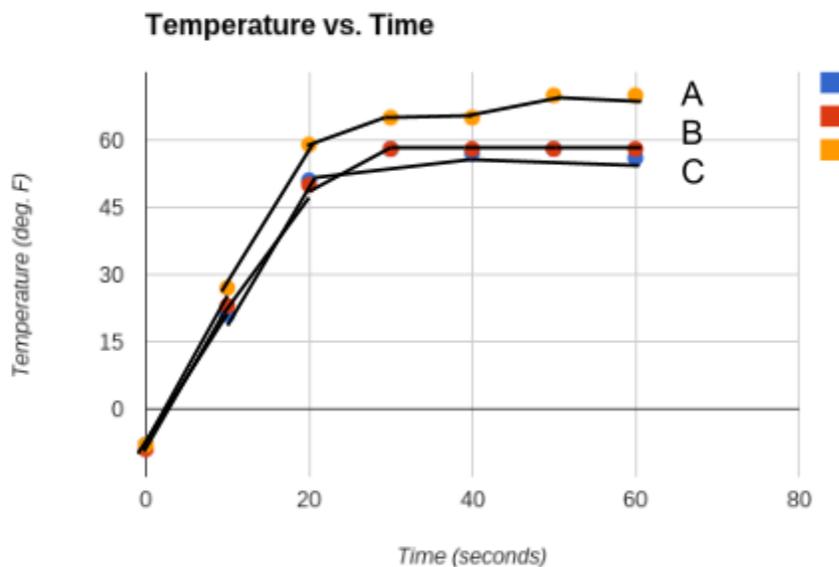


13. Based on the graph, rank the gasses from the gas that traps the least infrared radiation, to the gas that traps the most infrared radiation.
14. Which of the greenhouse gases tested above are produced when hydrocarbons like coal, gasoline and natural gas are burned?

Which greenhouse gas leaks from the ground from storage zones used to hold fuel used to heat our homes?
15. How many total photons were deflected by the water (H₂O) and carbon dioxide (CO₂)?

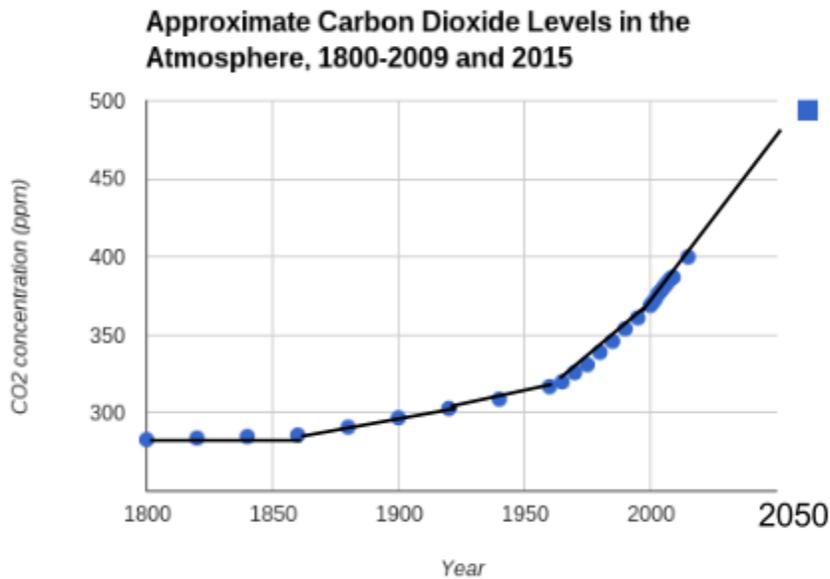
Use the graph below to answer the following questions:

Settings	Run #1	Run #2	Run #3
Atmosphere Year	1750	Today	Lots
Temperature units	Fahrenheit	Fahrenheit	Fahrenheit
Run Speed	Fast	Fast	Fast
Greenhouse Gas Composition	H ₂ O 70% rel. humidity CO ₂ 280ppm CH ₄ 0.730ppm N ₂ O 0.270ppm	H ₂ O 70% rel. humidity CO ₂ 388ppm CH ₄ 1.843ppm N ₂ O 0.317ppm	"Lots"



16. Which set of data would show the temperature of the Earth's atmosphere if the amount of greenhouse gases in the atmosphere was a lot lower than today's levels?
17. Based on the data table, how much has the methane increased "today" compared to the methane level in 1750?
18. Based on the graph above, what was the approximate stable temperature of the Earth's atmosphere in the past before we began burning fossil fuels?
19. What was the approximate temperature of the Earth's atmosphere 40 seconds into running the simulation during trial B?

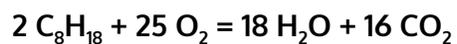
Use the data table and graph of the Carbon Dioxide levels from Mauna Loa to answer the following questions.



20. What was the level of carbon dioxide in the atmosphere in 1890 before people during the industrial revolution began burning gasoline in cars?
21. How much did the level of carbon dioxide in the atmosphere increase between 1800 and 2015?
22. In 2015 the carbon dioxide level in the atmosphere hit 400 ppm. How much CO₂ has been added to the atmosphere since you were born?
23. Make each statement below into a true statement by circling the correct word.
 - a. The amount of carbon dioxide added to the atmosphere in the last 15 years is more/less than between 1980 and 1995.
 - b. The amount of carbon dioxide added to the atmosphere in the last 15 years is more/less than between 1900 and 1950.
 - c. The amount of carbon dioxide added to the atmosphere in the last 15 years is the more/less/the same as the 15 years between 1800 and 1900.

24. Rank the types of electromagnetic radiation from the one with the least energy, to the one with the most energy.

25. The chemical equation for burning gasoline is below. Why does burning fossil fuels like gasoline and coal contribute to global warming?



26. Which of the following gases do not absorb and deflect photons of infrared radiation in the atmosphere?

N_2

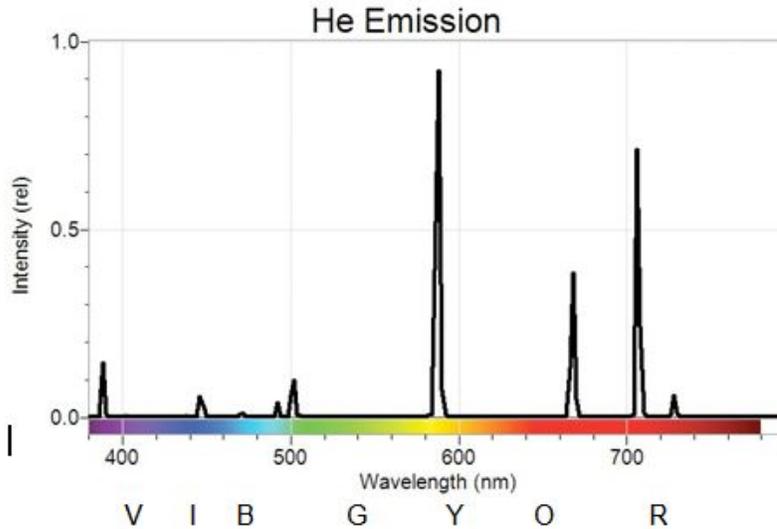
O_2

CO_2

CH_4

H_2O

Use the graph below to answer the following questions:



$$\text{Energy} = \frac{M}{\lambda}$$

E= the energy carried by the wave in calories

M is Mckittrick's constant = $4.76 \times 10^{-17} \text{ nm} \cdot \text{calories}$

λ is the wavelength in nanometers measured on your graph

27. Which color photons of light on the spectrum above would have the lowest energy?
28. Estimate the wavelength of the photons of light making the peak between the blue and green zones.
29. The photons captured by the spectrovis were generated by exciting the atoms of the different chemicals with energy. Which subatomic particle gets pushed up to higher energy levels, then falls emitting photons of light during the experiments?
30. (2 points) Calculate the energy of the most intense peak of photons in the orange zone of the spectrum.
31. (2 points) Calculate the energy in a photon of infrared light that has a wavelength of $2.0 \times 10^6 \text{ nm}$.