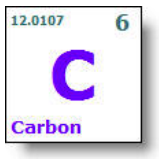
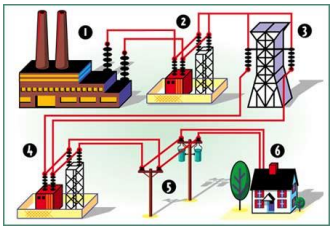
Name: _____

Period:_____



Calculating your Carbon Footprint



Background:

Currently the world's demands for natural resources, particularly petroleum-based products are at record high levels. In July 2008 the price for a barrel of crude oil hit a new all time record of 146 $ a barrel sending gasoline prices well into 4 dollars a gallon range. Current price for barrel of crude oil is: _____. Since the record setting price a decade ago Americans are demanding ever more fuel efficient vehicle which are better on pocket book as well as the environment.

Useful Information:

1. 1 gal gasoline = 6.0 lbs
2. 1 lbs = 453.59 gram
3. 1 barrel oil = 42 gal
4. United State Environmental Protection Agency
    a. www.fueleconomy.gov

The term "carbon foot print" is becoming trendy way to access your affect on the environment. As we live out our daily lives we are constantly using and producing carbon. The carbon we produce on a daily bases comes from many sources besides the CO_2 produced from the driving cars. Some of the overlooked sources of CO_2 include, turning on lights, boiling water, and eating ice cream to name of few.

The internal combustion engine powers most cars and trucks, which most commonly run a regular unleaded gasoline. A cars power is produced when gasoline is sprayed through injectors located at the top of each of the cylinder. The injectors spray a fine mist of gasoline which is then ignited using spark plugs creating an explosion within the cylinder which forces a piston down which provides power to the wheels.

As we travel to and from school in our cars a combustion reaction is taking place under the hood. Gasoline (C_8H_{18}) reacts with O_2 gas to produce carbon dioxide and water. Based on the law of the conservation of mass the mass of the reactants must be equal to the mass of the products in all chemical reactions. The combustion reaction, which takes place in your car produces a specific amount of water and carbon dioxide for every gallon of gas, you burn which can be determined using stoichiometry. ***Your task is to determine how much CO_2 you produce traveling back and forth to school, work, store, friends, or cabin.***

Day 1:

1. Using the webpage listed above find the average mile per gallon (MPG) for you car. If you don't have a car use the website and your parents car and use the average MPG for that vehicle.
    a. Instructions
        i. Go to www.fueleconomy.gov
        ii. On the left side of the page click Find a car > Find a car
        iii. Use the page to look up the MPG information for your car.
            Make:_____
            Model:_____
            Year:_____
            Gas tank size (gal):_____ (see auto makers website or Google it)
        iv. The average MPG rating will be the combined number located in red.
            Combined MPG of your car: _____
            City MPG of you car:_____
            Highway MPG of your car:_____
        v. What is your cars Greenhouse gas rating? _____
        vi. How many barrels of oil does your car use in 1 year? _____
            1. How many gallons is that? _____
    2. Using google maps to determine the number of mile you live from your locationl.
    Distance to: school Work Cabin store : _____ mile
3. Determine the size of the gas tank of your car. (see auto makers website or Google it)
    Gas tank size (gal):_____
    Mass (g) of a full tank of gas:_____

Day 2: (Depending on where you are driving to and from use city or highway MPG)

4. Calculate how many gallons of gas your car uses to get to and from _____ in one day?

5. Determine the mass of gasoline your car combusts to get to and from school in one day. (you will need to use the avg. mpg of your car as well as the ratios given in the background section)

6. Determine and balance the chemical equation for the combustion of gasoline.

7. Convert the mass of gasoline consumed by your car in one day (to and from_____) into moles of gasoline. ***Must find the molar mass of gasoline***

8. Using the answers from questions 5 and 6 calculate the mass (pounds and grams) of CO_2 produced from drive too and from school in one day. **Hint:** the calculation is mass-mass

9. Determine the mass (pounds and grams) of CO_2 produced form driving too and from _____ in one week.

10. Determine the mass (pounds and grams) of CO_2 produced from driving too and from school in one school year.

11. Determine the mass of CO_2 produced from burning 1 tank of gasoline. (assume the MPG is based on your cars combined MPG)

12. If you were to burn 42 gallons of gasoline how many moles of CO_2 would be produced?

13. How do you think the EPA website calculated the carbon footprint?

Challenge Questions:

In chemistry gasses are often measured based on volume (liters) instead grams. As a result chemists can relate liters of a gas to moles of a gas based on a constant. 1 mole of any gas at STP (standard temperature and pressure) will occupy 22.4 liters. How many liters of CO_2 are produced in one day driving too and from school?

Determine the mass of CO_2 produced based on the EPA's estimates for how many barrels of oil your car will use in one year?