Sample of a Student's Notebook for

Science and Sustainability, Revised Edition

Activity 31

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Issue-Oriented Science

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Activity 31.1 Fueling Trade offs

~~Page~~ Date 5/14

Prediction – kerosene will be better because they sell it in stores

Procedure

1. Fill soda can with exactly 100ml of H_2O
2. Stick thermometer in can and take temp of H_2O
3. Put Kerosene burner under can holder and light. Top with the matches
4. Time it for 5 minutes then take temp
5. Do 1-4 again but use ~~ethanol~~ burner

WE FORGOT THIS

Weigh the burner here and here

Data Table

Burner	start Mass	start Temp	end Temp	end Mass
Kerosene	251.1g	25.2°C	72.8	250.1
Ethanol	221.6	24.8	57.0	220.5

GOOD JOB!

Temp. →

Kerosene: 72.8 − 25.2 = 47.6°

Ethanol: 57.0 − 24.8 = 32.2°

Mass →

~~25~~ 251.1 − 250.1 = 1.0 g

221.6 − 220.5 = 1.1 g

Page 5/15

31.1 Group Analysis

1. Errors ..... weighings and temperature mistakes
flames different sizes
measuring water not the same
burners not in exact same spot
timing could be different

2. We don't all agree but I think energy per volume is useful because you fill up your tank in gallons and that is volume and mpg is important to know so you don't run out of gas.

Individual Analysis

3. Since we got a pretty big difference between temperature change using kerosene I would use pure gasoline unless it costs a lot more than ethanol gasoline

4. I would want to know the price of each one and the mpg of each one and also the pollution of each one

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31.2 Fuels for the Future

1. Cheap to buy
   Easy to get wherever you need it
   High mpg
   low pollution
   lots of it for future

I think that either biomass or hydrogen are the best because the others don't seem like they would work very well in a car

2. For electricity you would want pretty much the same as for the car list I made except mpg isn't important. I also think we use lots more electricity so you need a way to produce a lot all the time. Nuclear seems good except that its bad for the environment. All the others seem like they aren't big enough or useful enough for some places if you don't have lots of sun or wind or big rivers to dam up.

3. The trade-offs with nuclear are that you get a lot of energy from a little amount of fuel but the fuel is dangerous and so is the reactor if it melts down. Also the wastes stay radioactive for a very long time and are hard to get rid of safely. Nuclear plants don't make any air pollution like fossil fuels do and should last a lot longer into the

Page

future. Another bad thing about nuclear is that terrorists can steal the uranium to make bombs or they might try to blow up the reactor.

4. I think that solar is the most sustainable because it doesn't mess up the environment as much as the others do and it can be used pretty much everywhere except maybe at the north and south poles in winter. The wind and the water can't be used everywhere and not geothermal either. Biomass and hydrogen still mean that fuel gets burned and that is not great. Solar is not used because it is still expensive and isn't good when the sun is not shining a lot.

31.3 Combustion 5/19

Purpose: Model the chemical changes that occur when a hydrocarbon molecule reacts with oxygen and relate these changes to the energy released during combustion

Procedure

1) $CH_4 + 2O_2 \rightarrow \_\_ CO_2 + \underline{2}\, H_2O$ + energy

2) Done

3) $3O_2$ used and $2CO_2$ and $3H_2O$ made

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Page

4) $C_2H_5OH + 3O_2 \rightarrow 2CO_2 + 3H_2O$

5) a. benzene (C_6H_6)

$7\frac{1}{2}$ O_2 used and 6 CO_2 and $3H_2O$ made

$C_6H_6 + 7\frac{1}{2}O_2 \rightarrow 6CO_2 + 3H_2O$

b. hexane (C_6H_{14})

$9\frac{1}{2}$ O_2 used and 6 CO_2 and 7 H_2O made

$C_6H_{14} + 9\frac{1}{2}O_2 \rightarrow 6CO_2 + 7H_2O$

Group Analysis

1) ~~$2CH_4 + 2O_2 \rightarrow CO + CO_2 + 4H_2O$~~

$3CH_4 + 5O_2 \rightarrow 2CO + CO_2 + 6H_2O$