Thermochemical equations – combustion reactions stoichiometry – determining ΔH and naming organic molecules.
Revision 1

1) a) Write a balanced chemical equation for the complete combustion of butane(C_4H_{10}).

$C_4H_8(g) + 6O_2 \rightarrow 4CO_2(g) + 4H_2O(g)$

b) Calculate the ΔH for the reaction represented by the equation above if 0.580 grams of pure butane generated 28.9 kJ of heat energy.

Step 1 find the mol of butane
=> 0.580 / 58.12 = 0.0100
Step 2 Calculate the energy per mol of butane
=> 28.9 / 0.0100 = 2890 kJ
ΔH = -2890 kJ/mol

c) Calculate the mass of carbon dioxide produced if an unknown mass of butane delivered 3100 kJ of energy.
Step 1 find the mol of CO_2 produced if 3100 kJ of energy is released
=> 4/2890 = x / 3100
=> (4/2890) X 3100 = 4.29
Step 2 calculate the mass of CO_2
=> 4.29 X 44.0 = 189 grams

2) Propane gas undergoes incomplete combustion in a limited amount of oxygen gas to produce gaseous products.
a) Write a balanced chemical equation for the combustion reaction.
$2C_3H_8(g) + 7O_2(g) \rightarrow 6CO(g) + 8H_2O(g)$

b) If 120.0 g of pure propane generated 6.05 X 10^3 kJ of heat energy, find the ΔH for the equation for the combustion reaction above.

Step 1 Find the mol of propane
=> 120.0 / 44.1 = 2.72
Step 2 Find the energy released per mol of propane
=> 6050 kJ / 2.72 = 2224 kJ/mol
=> ΔH = -4448 kJ/mol

c) What mass of water is produced from the reaction represented by the equation above if 6.60 kJ of energy is produced?

=> 8mol/4448 kJ = n_{water}/6.60kJ
=> 0.0119 mol
=> 0.214 grams

3) Name the following compounds and draw their structural formula.

a) $CH_3CH_2CH_2NH_2$

propan-1-amine

b) $CH_3CH_2CH_2CHOHCOOH$

2-hydroxypentanoic acid

c) $CHCl_2CH_2CHCHCH_3$

5,5-dichloropent-2-ene

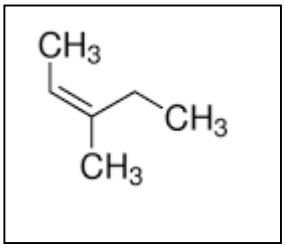
d) $CH_3CHOHCH_2NH_2$

1-aminopentan-2-ol

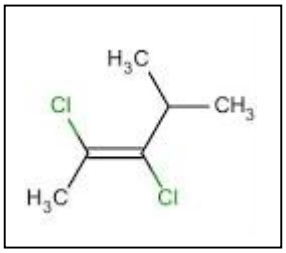
e) $CH_3CHCHCH_2NH_2$

prop-2-en-1-amine

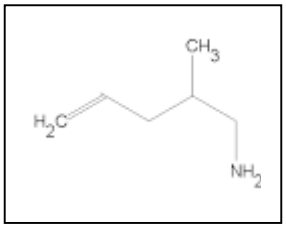
Name the following molecules

f) 

cis-3-methylpent-2-ene

g) 

trans-2,3-dichloro-4-methylpent-2-ene

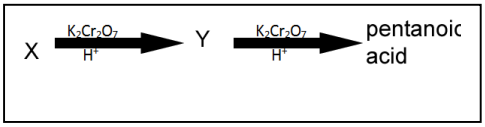
h) 

2-methylpent-4-en-1-amine

4) Identify compound X and Y

Pentanol = X

Pentanal =Y



5) Draw a fully labelled electroplating cell to coat an iron spoon with copper.

a) Label the, anode, cathode, polarity of electrode, electrolyte and direction of positive ion flow.

b) Write the half equations for the reactions occurring at each electrode.

Anode = Cu(s) → Cu^{2+}(aq) + 2e

Cathode = Cu^{2+}(aq) + 2e → Cu(s)

c) If a current of 1.12A was delivered over 2.51 hours calculate the mass of copper deposited on the spoon.

Step 1 calculate the mol of electrons used.

=> Charge = It = 1.12 X 60 X 60 X 2.51 =10120 C

=> 10120 / 96500 = 0.105 mol

Step 2 calculate the mol of copper deposited.

=> 0.105 / 2 = 0.0524

Step 3 calculate the mass of copper

=> 0.0524 X 63.5 = 3.33 grams