Year 12 Chemistry **UCR Assignment 2** NAME________________

1. Discuss the advantages and disadvantages of using biofuels for heat energy, compared with use as feedstock. /2

2. List the products of incomplete combustion and hence describe undesirable consequences brought about by incomplete combustion. /4

3. Write balanced equations for the complete combustion of the following:
   (a) heptane, C_7H_{16} /2
   (b) ethane, C_2H_6 /2
   (c) glucose, $C_6H_{12}O_6$ /2
   (d) methanol, CH_3OH /2
   (e) propanol, C_3H_7OH /2

4. Write thermochemical equations to correspond to the following enthalpy reactions:
   (a) the enthalpy of combustion of propane gas (C_3H_8), releasing 2220 kJ mol^{-1}. /3
   (b) the enthalpy of combustion butane gas (C_4H_{10}), releasing 2886 kJ mol^{-1}. /3
   (c) the enthalpy of solution of ammonium nitrate, absorbing 25 kJ mol^{-1}. /3
   (d) the neutralization of sodium hydroxide solution with nitric acid solution, releasing 57.1 kJ mol^{-1}. /3

5. Calculate the heat energy released when the following quantities of methane are completely burnt in oxygen (the enthalpy of combustion of methane is 890 kJ mol^{-1}):
   (a) one mole /1
   (b) one gram /2
   (c) one tonne. /1

6. A candle containing 151.2 g of stearic acid was burnt and used to warm 500.0 g of water, which was initially at 22.6°C. When the burning was stopped the remaining stearic acid weighed 149.6 g and the temperature of the water was 33.5°C.
   (Specific heat of water = 4.18 J g^{-1} K^{-1})
   (a) Calculate the heat needed to warm the water from 22.6°C to 33.5°C. /2
   (b) Calculate the heat produced by the combustion of 1.0 mole of stearic acid. (M = 284 g mol^{-1}) /3

7. The enthalpy of combustion of methane (natural gas) is as follows:

   $CH_{4(g)} + 2O_{2(g)} \rightarrow CO_{2(g)} + 2H_2O_{(g)}$ $\Delta H = -890$ kJ mol^{-1}

   (a) Calculate the heat released when 1.00×10^3 kg of methane is burned. /3
   (b) Calculate the volume of water that could be heated from 20.0°C to 70.0°C using the heat from the combustion of 1.00×10^3 kg tonne of methane, given the specific heat capacity of water = 4.18 J g^{-1} K^{-1} /2

TOTAL /42