FORM 4 CHEMISTRY

KAGONDO SECONDARY SCHOOL

TERM 1 CAT 2015

1. a) Define the standard enthalpy of formation of a substance (1mk)

b) Use the thermo chemical equation below to answer the questions that follow

1. C_2H_6 (g) + 7/2 O_2 (g) → 2CO_2 (g) + 3H_2o (g) $\Delta H_1 = -1560$ kJmol^{-1}

2. C (graphite) + O_2 (g) → CO_2 (g) $\Delta H_2 = -394$ kJmol^{-1}

3. H_2 (g) + ½ O_2 → H_2O (g) $\Delta H_3 = -286$ kJmol^{-1}

i) Name two types of heat changes represented by ΔH_3 (2mks)

ii) Draw an energy level diagram for the reaction represented by equation 1 (2mks)

iii) Calculate the standard enthalpy of formation of ethane (2mks)

iv) When a sample of ethane was burnt, the heat produced raised the temperature of 500g of water by 21.5k (specific heat capacity of water 4.2 Jg^{-1}K^{-1})

Calculate

I) Heat change for the reaction (2mks)

II) Mass of ethane that was burnt (Relative formula mass of ethane = 30) (1mk)

2. 50cm^{3}of 2M sodium hydroxide solution were each placed in an insulate beaker. 20 cm^3 of hydrochloric acid was added and the heat change in each case was calculated. The experiment was repeated at other set of volume of hydrochloric acid. The result was recorded as in table below.

Volume of NaOH (cm^3)	50	50	50	50	50	50	50
Volume of HCl (cm^3)	20	40	60	80	100	120	140
Heat change evolved (kJ)	1.1	2.2	3.4	4.5	5.6	5.6	5.6

a) Plot a graph of heat change (y-axis) against the volume of hydrochloric acid (3mks)

b) From the graph, determine the volume of hydrochloric acid required to completely neutralize 50 cm^3 of 2m sodium hydroxide (1mk)

c) What is the concentration in moles per liter of hydrochloric acid (2mks)

d)Calculate the molar heat of neutralization for the reaction (3mks)

e)Sketch an energy level diagram for this reaction (2mks)

3.The reaction between bromine and methanoic acid at 30^{o}C proceeds according to the information given below.

Br_2 (aq) + HCOOH (aq) → $2Br^-$ (aq) + $2H^+$ (aq) + CO_2 (g)

Concentration of Br_2 (aq) ($Moldm^{-3}$)	Time (minutes)
10.0×10^{-3}	0
8.1×10^{-3}	1
6.6×10^{-3}	2
4.4×10^{-3}	4
3.0×10^{-3}	6
2.0×10^{-3}	8
1.3×10^{-3}	10

a)On a grid provided plot a graph of concentration of bromine (vertical axis)against time (3mks)

b)From the graph determine:

i)The concentration of bromine at the end of 3 minutes (1mk)

ii)The rate of the reaction at time 't' where t=1 ½ minutes (2mks)

c)Explain how the concentration of bromine affects the rate of the reaction (2mks)

d) On the same axes, sketch the curve that would be obtained if the reaction was carried out at 20^{o}C and label the curve II.Give a reason for your answer (2mks)