

2. i) Write and **balance** an equation for the complete combustion for **1 mole** of ethyne. 🛆Hf ethyne = +227 kJ/mol

ii) Determine the enthalpy (🛆H) from standard heats of formation for the burning of 1 mole of ethyne. Assume all other reactants and products are in gas form.

3. Using Hess’s Law calculate 🛆H for the reaction

**4 NH3 (g) + 5 O2 (g) → 4 NO (g) + 6 H2O (g)** given the equations below.

N2 (g) + O2 (g) → 2 NO (g) 🛆H = -180.5 kJ

N2 (g) + 3 H2 (g) → 2 NH3 (g) 🛆H = -91.8 kJ

2 H2 (g) + O2 (g) → 2 H2O (g) 🛆H = -483.6 kJ

4. The first antiseptic to be used in surgical operating rooms was phenol C6H5OH, a weak acid and a potent bactericide. A 0.550mol/L solution of phenol in was water was found to have a pH of 5.07. Calculate the Ka.

5. The experimental observations found below are obtained for the reaction: **2A + B + 2C 🡪 3X.**

* 1. Write a general rate law for the above reaction and solve the exponent values [3]
	2. Calculate the value for the **rate constant** ‘k’ with proper units [2]
	3. Calculate the rate of production of X when [A] = [B] = [C] = 0.4 mol/L [1]
	4. When the concentration of [A] is doubled what happens to the rate of production of X? [1]

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Trial | Initial [A] (mol/L) | Initial [B] (mol/L) | Initial [C] (mol/L) | Rate of production of X (mol/(L\*s)) |
| 1 | 0.1 | 0.1 | 0.1 | 3.0x10-4 |
| 2 | 0.2 | 0.1 | 0.1 | 1.2x10-3 |
| 3 | 0.1 | 0.3 | 0.1 | 3.0x10-4 |
| 4 | 0.2 | 0.1 | 0.2 | 2.4 x10-3 |

[3] 6. Write the structural formulas to represent the following compounds:

 a) 3-amino-5-bromo-2,2-diethylheptane

 b) 3-ethyl-2-methylhexanoic acid

 c) 1-chloro-3-methyl-1,4-pentadiene

[4] 7. Write the **structural formula for the primary product** formed in each of the following reactions. Don’t forget **catalysts** involved.{*note: it is not necessary to write formulas for the reactants*}

1. propane and chlorine (assume reaction is with only one molecule of Cl2)
2. addition of 1-propene using hydrogen chloride
3. hydration of 1-pentene
4. esterification of propanol and butanoic acid

[2] 8. Draw the **Energy Level Diagram** for **Strontium**, placing electrons in the proper orbital with the correct spin.

[4] 9. i) Explain VSEPR theory

ii) Draw the resonance structure for the formate ion CHO2 -1.

iii) what is the shape around the central atom

10.



11.

