Enthalpy

What are the thermodynamic standard conditions?

- 298K, 1 atm pressure, concentration of 1mol per dm3

What is enthalpy change?

- The heat change measured at a constant pressure and temperature.

Define standard enthalpy of formation:

- The enthalpy change when a single mole of compund is formed from its elements under standard conditions of 298K and 1atm pressure with all the reactants in their standard states.

Why is enthalpy change for exothermic reactions negative?

- Because energy has been released to the surroundings. The products therefore have a lower enthalpy than the reactants and the final enthalpy is less than the initial enthalpy.

Classify as endothermic or exothermic:

- NaOH dissolves in water & temp. of solution rises - Exothermic
- Ammonium Chloride dissolves in water and temp. of surroundings drop - Endothermic
- H and O combine explosively into water - Exothermic
- Liquid water condenses into ice at 0 C - Exothermic
- Liquid Nitrogen boils spontaneously at room temp.- Endothermic

Why is standard enthalpy changes of combustion always negative?

- Because heat is always evolved, the reaction is exothermic and therefore heat is lost to the surroundings. The energy required to break bonds is always less than the energy released when bonds are formed.

Organic chemistry

Electrophile

- A species which seeks out negative centres. Can accept a lone pair of electrons.

Nucleophile

- A species which seeks out positive centres. Has a lone pair of electrons which can be used to form a dative covalent bond.

Radical

- A species with an unpaired electron. Are highly reactive. Formed by homolytic fission.

Making Alcohol from Alkenes

Condensation Reaction

- Reagents: concentrated H_2SO_4 catalyst
- Conditions: Room Temperature, then add water and warm under reflux

Oxidation Reaction

- Reagents: Alkaline Potassium Manganate(VII) solution
- Conditions: Room Temp.
- Other notes: The manganate(VII) reduces to manganate(VI) and goes from purple to green.

Oxidation Reaction 2

- Reagents: O_2, silver catalyst
- Conditions: 250^0C

Hydration Reaction

- Reagents: steam, H_3PO_4 catalyst
- Conditions: 300^0C, 60 atm pressure

Why is benzene stable

- The p orbitals on each carbon atom in benzene overlap
- There is delocalisation of electrons in the ring (not 3 localised C==C double bonds)
- This makes benzene more thermodynamically stable than predicted
- It therefore undergoes substitution reactions rather than addition reactions because addition reaction break the delocalisation in the ring. e.g The nitration of benzene results in a loss of H+ which is replaced by NO_2^+

Test for Organic compounds

Test for a carbonyl

- Reagents: 2,4-dinitrophenylhydrazine (2,4-DNPH)
- Observation with a positive test: Orange preciptate when added to a carbonyl

Test for an aldehyde

- Reagents: Fehlings solution 1 and 2
- Observation with a positive test: Red precipitate when reagents are warmed with an aldehyde

Test for an aldehyde

- Reagents: Tollen's reagent ($NaOH_{(aq)}$ + $AgNO_{3(aq)}$ + dilute ammonia solution)
- Observation with a positive test: Silver mirror with an aldehyde

Test for an alcohol

- Reagents: PCl_5 in dry conditions
- Observation with a positive test: Steamy fumes of HCl gas which turns damp blue litmus paper red

Test for a carboxylic acid

- Reagents: $NaHCO_{3(aq)}$
- Observation with a positive test: CO_2 gas which turns lime water milky

Test for an alcohol

- Reagents: Na
- Observation with a positive test: H_2 gas