### 1.1 Rate of reaction

05 June 2015 10:28

Rate of reaction = change in concentration (of reactants and products) with unit time.



- Concentration of the reactants decrease
- Concentration of the products increase

rate = l	$K[A]^m[B]^n \qquad [A] = mol \ a$	$rate = mol  dm^{-3}  s^{-1}$	
			<b>k</b>
Order	Effect		un
0	doesn't affect the rate of react	on	
1	rate of reaction goes up 2 time	s Notest	
2	rate of reaction goes up 4 time	M + 47	
Overall	total of orders		
۲	previe pa	ige -	
		-	

### 3.5 Choice of Indicators

### **Indicators needs**

- Sharp colour, pH change rather than at the end point
- Endpoint of the titration = the equivalence point
- Distinct colour change
- © Colourless to pink (phenolphthalein)
- <sup>⊗</sup> Red to yellow (methyl orange)

### Half- neutralisation point

• Halfway between zero and the equivalence point



# 4.1 Naming organic compounds

23 September 2015 19:02

Number of halogen atoms or branched	Prefix	Number of carbons	Prefix
chains		1	Meth
2	Di	3	Eth
3	Tri	3	Prop
4	Tetra	4	But
5	Penta	5	Pent
6	Hexa	6	Hex
7	Hepta		

Family	Formula	Suffix	Prefix	Example	Symbol
Alkanes	$RCH = CH_2$	-ene		Prop <mark>ene</mark>	
Alkynes	$RC \equiv CH$	-yne		Prop <mark>yne</mark>	
Halo alkanes	R - X (x is F,Cl,Br,I)		Halo- (fluoro-,chloro-, bromo,iodo-)	Chloromethane	CH <sub>3</sub> Cl
Carboxylic acids	RCOOH	-oic acid		Ethanoic acid	C¥₃COOH
Anhydrides	RCOOCOR'	-oic anhydride		hthe loic enhydride	
Easters	RCOOR	-oate*	ates?	Propyl ethan <mark>oate</mark>	CH <sub>3</sub> COOC <sub>3</sub> H <sub>7</sub>
Acyl chlorides	RCOCL	-oyl.cblorida		E han oyl chloride	CH <sub>3</sub> COCL
Amides	RCONH <sub>2</sub>	Oamide	2014	Ethan amide	$CH_3CONH_2$
Nitriles	ve≡n	-nit 🕡	6	Ethan <mark>e nitrile</mark>	$CH_3C \equiv N$
udel yoes	RCHO	39		Ethan <mark>al</mark>	CH <sub>3</sub> CHO
Ketones	RCOR'	-one		Propan <mark>one</mark>	$CH_3COCH_3$
Alcohols	ROH	-0	Hydroxy-	Ethan <mark>ol</mark>	$C_2H_5OH$
Amines	RNH <sub>2</sub>	-amine	Amino-	Ethylamine	$CH_3CH_2NH_2$
Arenes	$C_6H_5R$			Methylbenzene	

## 5.1 Carbonyl group compounds

28 September 2015 17:16

	General formula	Suffix	Reduced
Aldehyde	RCHO	-al	Primary alcohol
Ketone	RCOR'	-one	Secondary alcohol

### Physical properties of carbonyl compounds

- Strongly polar  $C^{\delta+} = O^{\delta-}$  (dipole dipole frorces between molecules)
- Higher Bp compared to alkanes of the same RMM
- Not as high Bp as alcohols with hydrogen bonding

Name	Formula	M,	<i>Т<sub>ь</sub></i> / К
butane	CH <sub>3</sub> CH <sub>2</sub> CH <sub>2</sub> CH <sub>3</sub>	60	273
propanone	CH <sub>3</sub> COCH <sub>3</sub>	58	359
propan-1-ol	CH,CH,CH,OH	60	370

### Solubility in water

**Nucleophilic addition** 

- Short chain ketones and aldehydes are soluble in water
- As the chain increases, the less it will dissolve

### Reactivity of the carbonyl group

# Is open to nucelophilic reagents to attack Nucleophilic addition is possible due to the double boost attack 2 Reactions of the 5.2 Reactions of the Dranbonyl grou Undergo nucleophilic

Nucleophile can attack

from either side

Equally as likely to form a racemic mixture

C=O is planner



Same reaction for aldehydes and ketones

Balanced equation for an aldehyde is



**Oxidation reactions** 

### Biodiesel



## 7.1 introduction

08 October 2015 12:57

Amines = derivatives of ammonia where 1 or more hydrogen atoms have been replaced with alkyl or aryl groups



Amines are useful for synthesis (making new compounds)

### Properties of primary amines



- Nitrogener has electronegative than a vgen
  anines hydrogen bonds all not cas strong as alcohols
- Short chain are gasses at room temperature

### Reactivity

- Lone pair of electrons
- Gain an H+ ion (base)
- Electron deficient carbon atom nucleophile

### Solubility

- Primary amines soluble up to C<sub>4</sub>
- Form hydrogen bonds in less polar substances
- · Phenylamine is not very soluble due to the benzene ring

### 11.5/6 proton nmr

20 October 2015 17:16

- <sup>1</sup>H is being examined
- Hydrogen atoms from different functional groups fell the magnetic field differently
- Relative area under each peak tells you the relative number of hydrogen atoms

#### **Integration trace**

### Shows the ratio more clearly



### Spin-spin coupling/ spin-spin splitting

- Magnetic field is felt by any hydrogens on neighbouring carbon atoms plus one
- If the two CH<sub>3</sub> groups are not on neighbouring carbon atoms n coupling lotes

#### n + 1 rule

• N hydrogen's on a neigh to *n+1* smaller peaks



#### solvents used

Tetrachloromethane  $CCl_4$  does not contin any hydrogen atoms