Chemistry Table of contents

References to an activity, exercise or other type of question are from: Hogendoorn B, et ak (2009). Chemistry 3&4. Australia: Pearson Heinemann
What's found in here are our own solutions along with notes on chemistry.

4. Carbon Chemistry

1. **Nomenclature**

* Prefix – No. of carbon atoms in the main chain

- meth - 1	- pent - 5	- oct – 8
- eth - 2	- hex - 6	- Non – 9
- prop - 3	- hept - 7	- Dec – 10
- but - 4		

* Homologous series

(compounds which have similar structures and chemical properties and the same general formula. Each member of a homologous series differs by a — CH_2— group from the previous member).

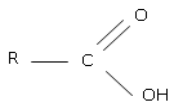
- Alkanes: $CH_3 - CH_2 - \dots - CH_3$ saturated hydrocarbons single bonds only. (C_nH_{2n+2})
- Alkeness: $CH_2 = CH - CH_2 - CH_2 \dots CH_3$ unsaturated contains 1 double bond (C_nH_{2n})
- Alkyness: $CH \equiv C - CH_2 \dots CH_3$ unsaturated contains 1 triple bond (C_nH_{2n-2})

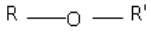
* Functional group

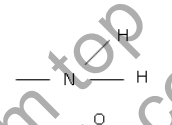
— CL: chloro

— Br: Bromo

: Carboxy

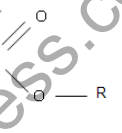


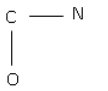
ether: 



:amino

:ester

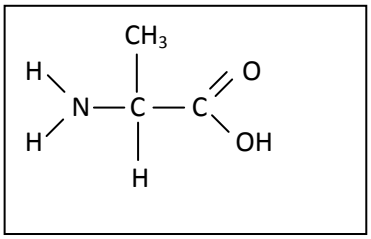




:amide

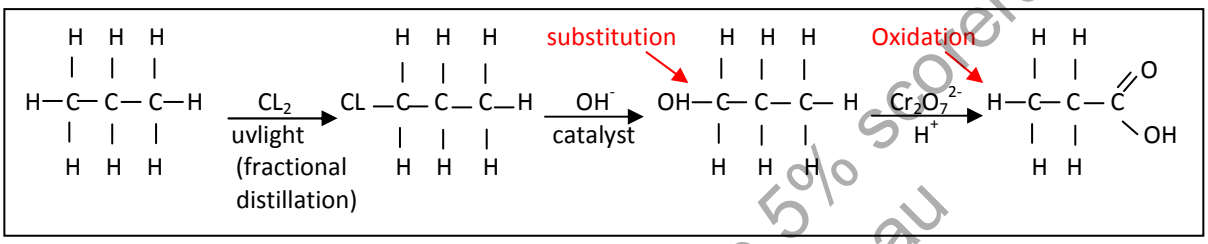
* Amines: -Organic compounds that contain —NH_2 group: (RNH_2).
-smaller amines are more soluble
-larger amines (size of alkyl group ↑): less soluble
-name: amino-alkane (e.g amino ethane C_2H_5 NH_2)

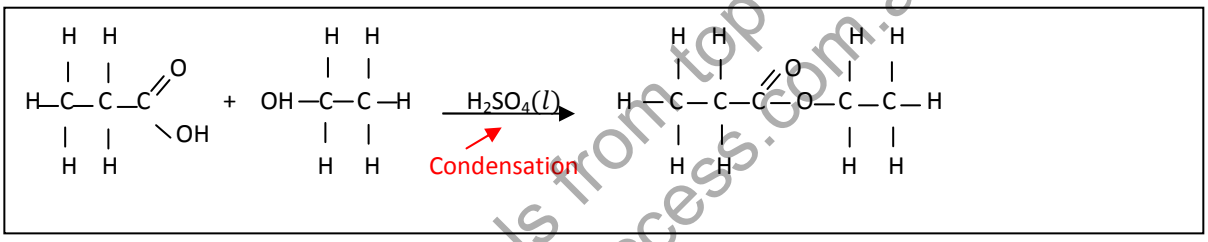
* Amino acids:



(systematic name
2amino-propanoic acid)

2. **Reaction Path ways**

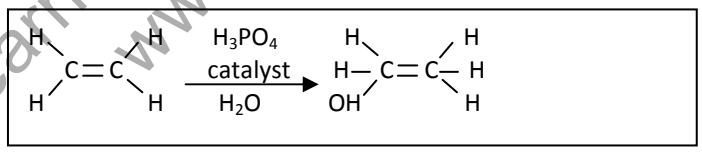




Notice: (1) Adding HCL to an alkene larger than ethene will result in the formation of secondary halo alkene. (2 chloro propane)

(2) Oxidation of secondary alcohol results in the formation of tertiary alkanols , which is not oxidized.
Disadvantages: Carboxylic acid can't be formed when 2nd alcohol is oxidized.

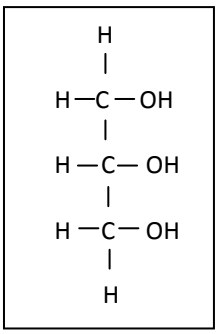
(3) Name of ester: ethyl propanoate (e.g above)



Biomolecules:

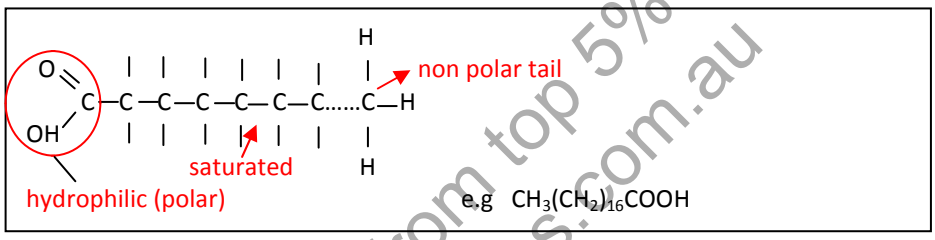
* Fats

Components (1) glycerol (1,2,3 – tripropanol) → trialcohol



(2) fatty acid

- carboxylic acid
- long acid C_{16} - C_{19}



(3) glycerol + 3 fatty acids → fat + $3H_2O$

(ester link) (triglyceride)

* Carbohydrates — monosaccharides: glucose, fructose, galactose
disaccharides: maltose, lactose, sucrose
polysaccharides: starch, glycogen
cellulose

- storage ole in plant
- structure in plant
- human (roughage)

Difficult question

(1) Distinguish between:

* Butan-1-ol and butanoic acid. (Add salt, give off CO_2)

→Add Na_2CO_3:

-butanol doesn't react

- $C_3H_7COOH + Na_2CO_3 \rightarrow C_3H_7COONa + H_2O + CO_2\uparrow$ (bubbles)

* Butan-1-ol and but-1-ene. (add Br_2)

→Add Bromine water (yellow water)

- $C_4H_8 + Br_2 \rightarrow C_4H_8Br_2$ (yellow colour faded)
- butan-1-ol doesn't react.

* Butan-1-ol and methylpropan-2-ol. (tertiary alkanol not oxidised)

- Add H_2SO_4 acid (concentrated), butan-1-ol reacts to produce butanoic acid.
- Add Na_2CO_3 , butanoic acid reacts to produce $CO_2\uparrow$

(2) $C_5H_{11}COOH \rightarrow hexanoic\ acid$

↳ not pentanoic acid

saturated molecules do NOT react with Cl_2 or Br_2

5. SPECTROMETRY

CHROMATOGRAPHY

1. **Definition**

-Chromatography: a technique that is used to separate the substances present in a mixture.

-Stationary phase: a solid used in chromatography – the component of a mixture undergo adsorption to this phase.

-Mobile Phase: the phase that moves over the stationary phase in chromatography.

-Adsorption: the attraction of one substance to the surface of another.

-Desorption: the breaking of bonds between a substance and the surface to which the substance is adsorbed.

-Retention time : the time taken for a component to pass through a chromatography column. (R_t)

-Eluent: a liquid used as the mobile phase in chromatography.

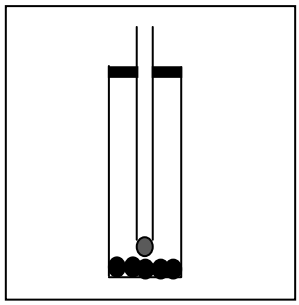
-Carrier gas: the gas used as the mobile phase in gas chromatography.

-R_f value = $\frac{distance\ moved\ from\ origin\ by\ component}{distance\ moved\ from\ origin\ by\ solvent}$

-solvent Front: the point reached by the mobile phase as it moves along the stationary phase in thin-layer chromatography.

-Chromatogram: is the pattern of bands or spots formed on the plate in thin-layer chromatography.

11. Energy from chemical reaction

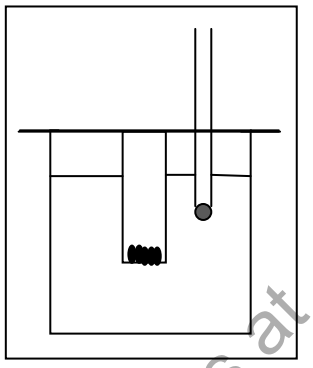


problem:

- test tube absorbs heat

-measure Δt of water

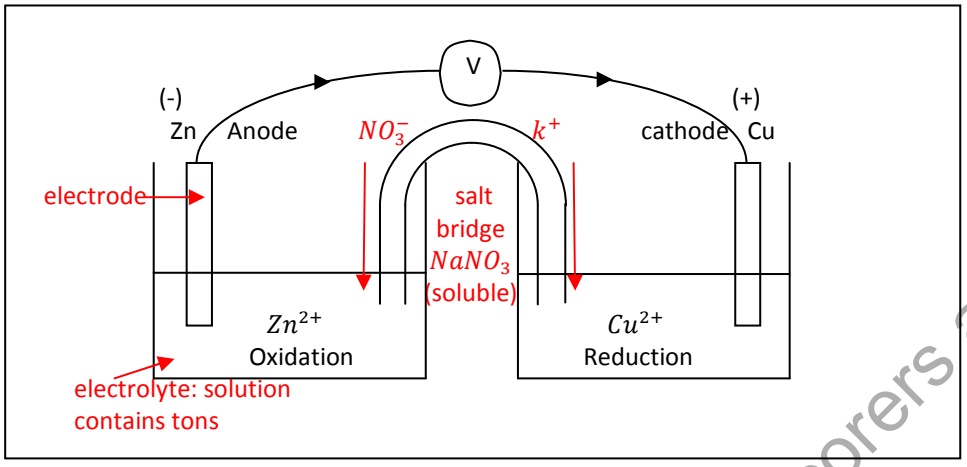
-assume all heat is absorbed by water



- The use of calibration: to measure how much energy is required to change the temperature of the system.
- Do not mention about heat absorption of vessel as the calibration factor already includes it. The lower value calculated may due to the leak of gas fuel used or the incomplete reaction.
  - calibration factor $= \frac{Energy}{\Delta\,(°C)}$

The energy can be added by means other than electricity. A chemical reaction with a known ΔH can be used instead of electricity.

12. Galvanic cells



- $m(Zn) \downarrow$ because $Zn_{(s)} \rightarrow Zn^{2+} + 2e^-$
  loses 2 electrons
- $m(Cu) \uparrow$ because $Cu^{2+} + 2e^- \rightarrow Cu_{(s)}$
  gets more copper
- $[Cu^{2+}] \downarrow$ (but K^+ ions increase the charge)
- $[Zn^{2+}] \uparrow$ (but NO_3^- ions decrease the charge)
  →salt bridge helps to balance the system

- Salt bridge: -provides positive ions for the lack of positive ions in the cathode.
  -provides negative ions for the internal electric current towards the anode, partially reduce the excess of positive charge in anode.