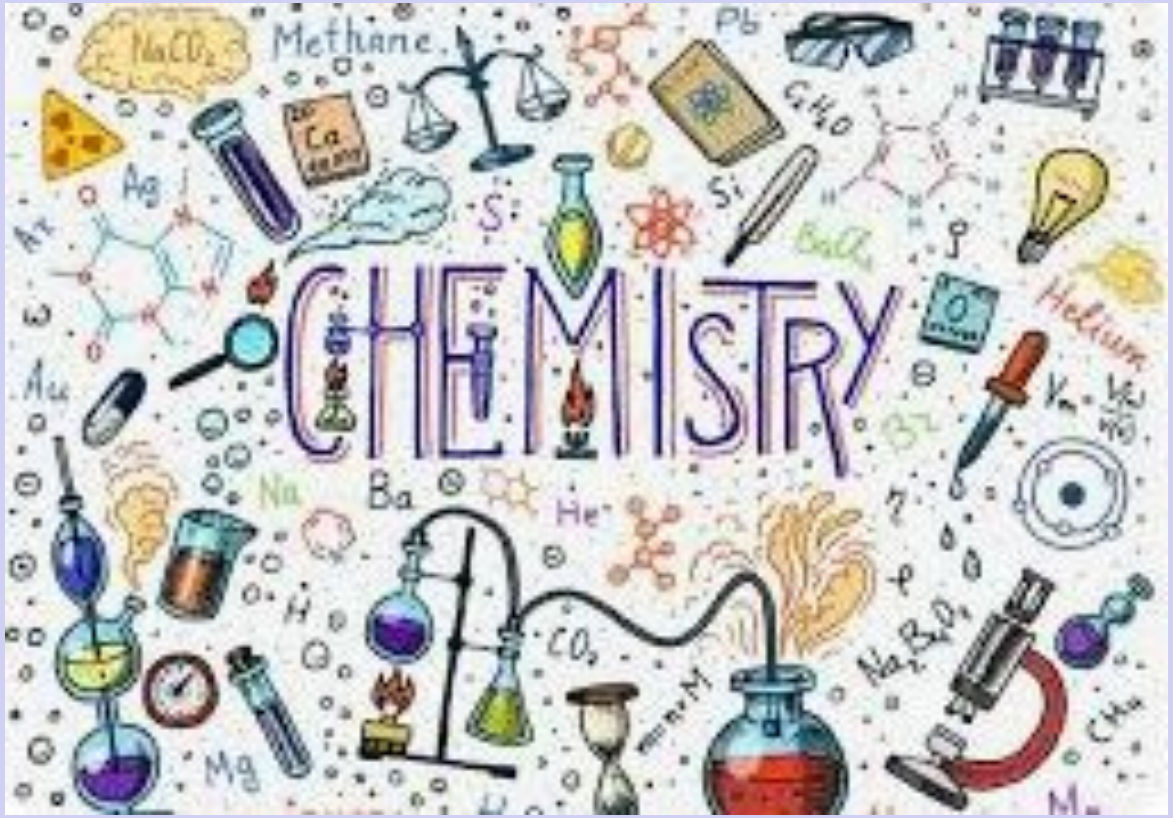
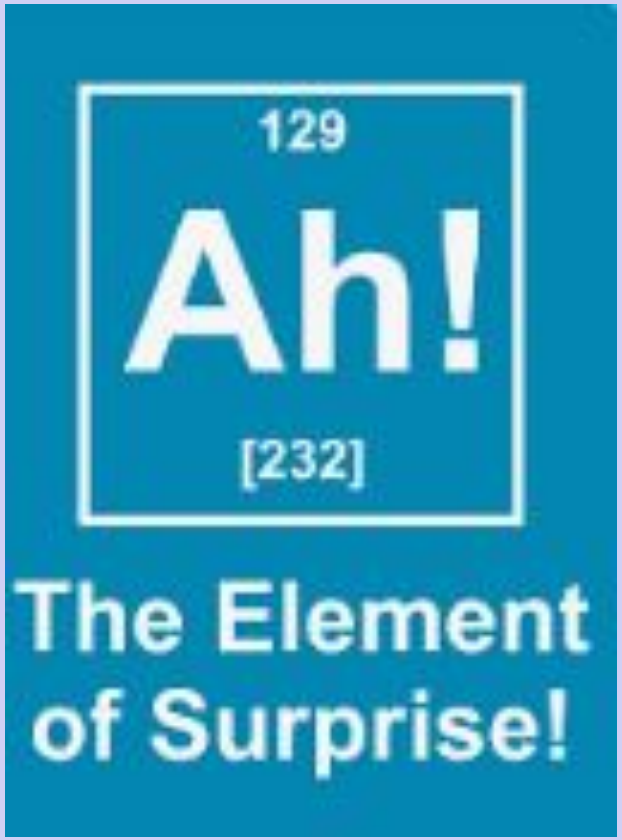
Welcome to A-Level Chemistry

- Mrs Laxton & Miss Thring





Introduction

- A-Level Chemistry is an excellent subject to study for may reasons
- Interesting, diverse and is evident in everyday life
- Develops a wide range of skills
  - Analysis and problem solving
  - Time management and organisation
  - Written and oral communication
  - Monitoring/maintaining records and data
  - Team work and independent thinking
  - Research and presentation
- Open doors to a variety of careers/courses
  - 'facilitating subject'
  - Needed for Medicine and Veterinary courses

Introduction continued

- But:
- Chemistry is a demanding A-Level

(often ranked in the top 5 subjects for A-level)

- GCSE Chemistry to A-level, will be one of the biggest leaps in your educational life.

OCR Course structure and exams

Content Overview	Assessment Overview	
Content is split into six teaching modules: • Module 1 – Development of practical skills in chemistry • Module 2 – Foundations in chemistry • Module 3 – Periodic table and energy • Module 4 – Core organic chemistry • Module 5 – Physical chemistry and transition elements • Module 6 – Organic chemistry and analysis Component 01 assesses content from modules 1, 2, 3 and 5. Component 02 assesses content from modules 1, 2, 4 and 6. Component 03 assesses content from all modules (1 to 6).	Periodic table, elements and physical chemistry (01) 100 marks 2 hours 15 minutes written paper	**37%** of total A level
	Synthesis and analytical techniques (02) 100 marks 2 hours 15 minutes written paper	**37%** of total A level
	Unified chemistry (03) 70 marks 1 hour 30 minutes written paper	**26%** of total A level
	Practical Endorsement in chemistry (04) (non exam assessment)	Reported separately (see Section 5)

A Level Chemistry Journey

Inorganic

Organic

Final Exams

Module 5 physical chemistry and transition elements

- Redox and electrode potentials
- Transition elements
- Entropy and entropy
- Buffers and neutralisation
- Acids, bases and pH
- Equilibrium
- Reaction Rates and Equilibrium
- Rates of reactions
- Enthalpy

Module 6 Organic chemistry and analysis

- Chromatography and spectroscopy
- Organic synthesis
- Amines, amino acids and polymers
- Aromatic chemistry
- Carbonyls and carboxylic acids
- Spectroscopy
- Organic synthesis
- Haloalkanes
- Alcohols

Module 3 Periodic table and energy

- Reactivity Trends
- Periodicity

Module 4 Core organic chemistry and analysis

- Basic concepts of organic chemistry
- Alkanes
- Alkenes

Module 2 Foundations in chemistry

- Atoms, ions and compounds
- Amount of substance
- Acids and redox
- Electrons and bonding
- Shapes of molecules and intermolecular forces

Y13

Y13

Y12

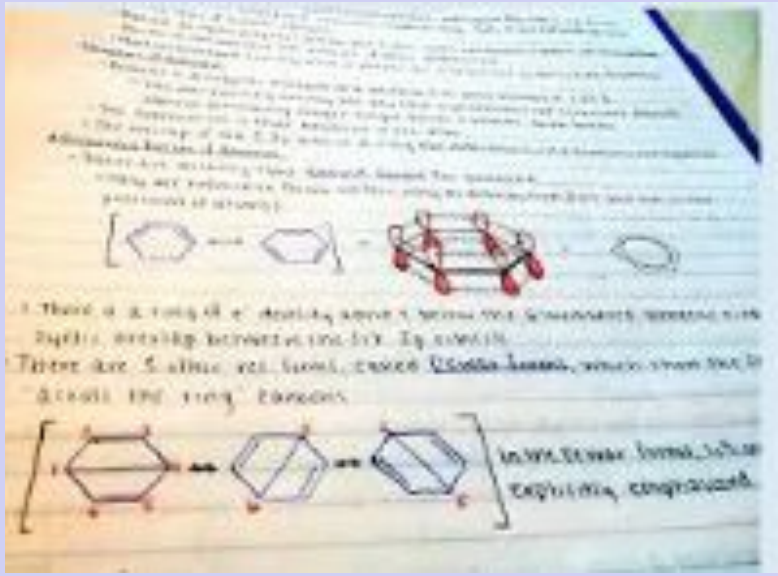
OCR

Assessed Practical's (PAG)

- These test our practical skills on a number of key experiments
- Lab books to record work
- Develop skills and techniques
- Runs throughout the course
- 12 key practical's (at least)
- Smaller groups with more hands on experience
- Additional Chemistry technician support
- You will need to own (borrow) a lab coat

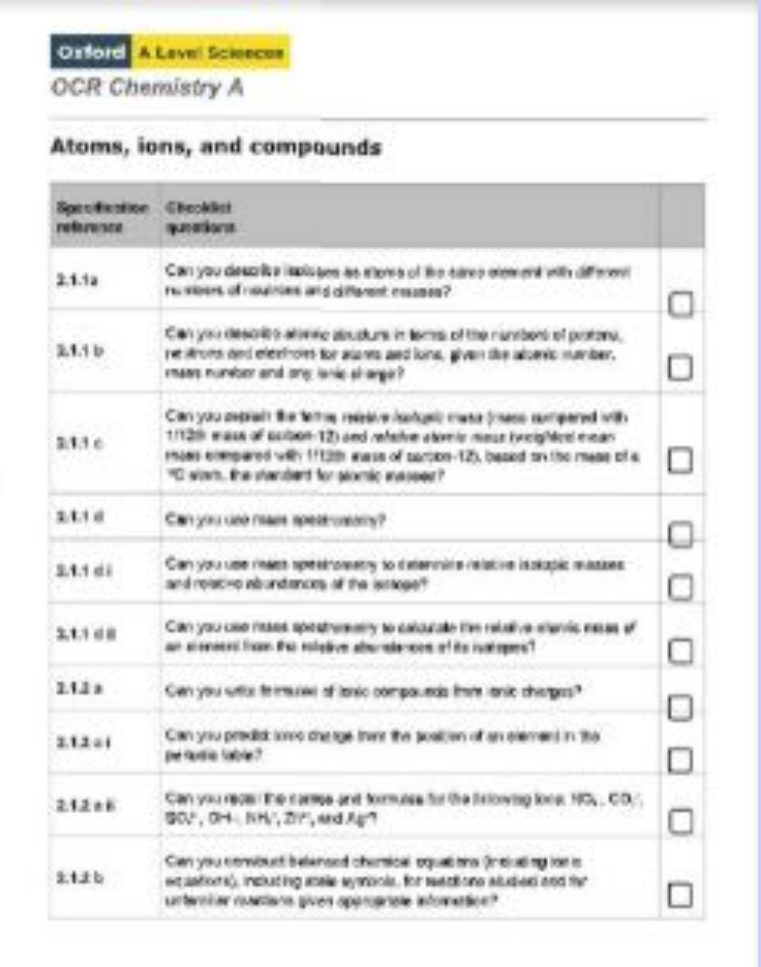
Expectations

- Attendance needs to be good
  - catching up on missed work is essential
- Attentive and focussed in lessons- asking if you are unsure
- Organised
  - Folder and notes (with dividers)
  - Dates, subject, teacher
  - Clear and tidy
  - Filed
- Punctuality
- Homework (Essential practice)



Assessment

- Regular homework
  - Essential practise to ID strengths and weakness
- Outline and Progress Sheets (OAP)
  - Key ideas and concepts
  - RAG rated to track learning
- End of Topic and Mid topic tests
  - Past questions
  - Feedback given on weaknesses



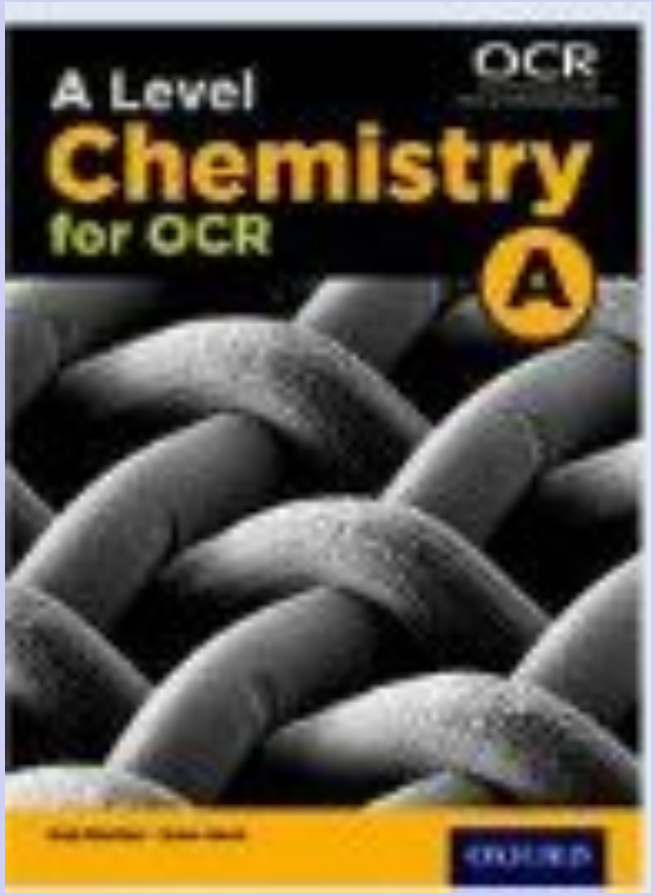
Oxford A Level Sciences

OCR Chemistry A

Atoms, ions, and compounds

Specification reference	Checklist questions	
2.1.1 a	Can you describe isotopes as atoms of the same element with different numbers of neutrons and different masses?	☐
2.1.1 b	Can you describe atomic structure in terms of the numbers of protons, neutrons and electrons for atoms and ions, given the atomic number, mass number and any ionic charge?	☐
2.1.1 c	Can you explain the terms relative isotopic mass (mass compared with 1/12th mass of carbon-12) and relative atomic mass (weighted mean mass compared with 1/12th mass of carbon-12), based on the mass of a ^{12}C atom, the standard for atomic masses?	☐
2.1.1 d	Can you use mass spectrometry?	☐
2.1.1 d i	Can you use mass spectrometry to determine relative isotopic masses and relative abundances of the isotopes?	☐
2.1.1 d ii	Can you use mass spectrometry to calculate the relative atomic mass of an element from the relative abundances of its isotopes?	☐
2.1.2 a	Can you write formulae of ionic compounds from ionic charges?	☐
2.1.2 a i	Can you predict ionic charge from the position of an element in the periodic table?	☐
2.1.2 a ii	Can you recall the names and formulae for the following ions: NO_3^-, CO_3^{2-}, SO_4^{2-}, OH^-, NH_4^+, Zn^{2+}, and Ag^+?	☐
2.1.2 b	Can you construct balanced chemical equations (including ionic equations), including state symbols, for reactions studied and for unfamiliar reactions given appropriate information?	☐

Resources



- Textbook Oxford
- Kerboodle online book and resources to support learning
- Revision Guide
- Chemguide (www.chemguide.co.uk)
- A-Level Notes (http://www.a-levelnotes.co.uk/ocr-chemistry-notes-new-spec.html)
- Knock Hardy

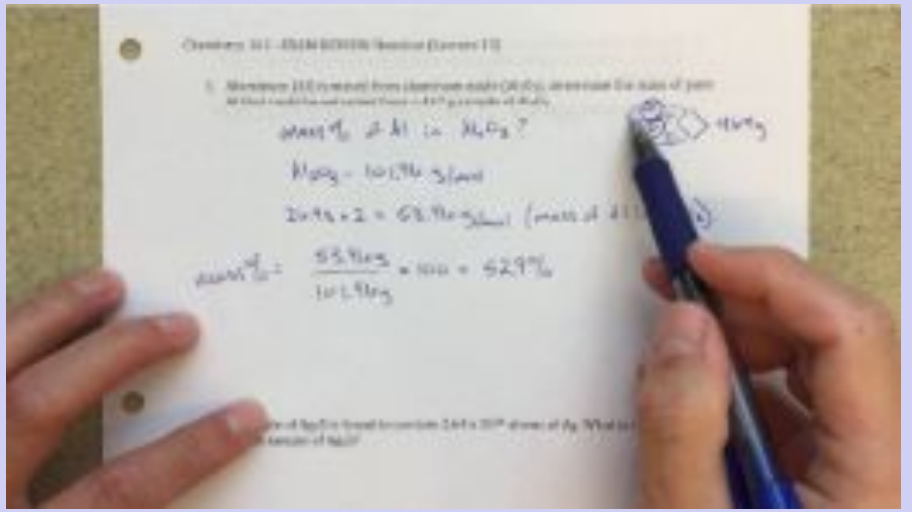
Support

- Be prepared to ask questions (in and out of lessons)
- You can always email if you have an issue or problem
- Work on problems together
- Technician support during course
- Two teachers

Tips for success

- No substitute for hard work and commitment
  - Consistency is the key – not a last dash cramming session
  - Both years are important
- Read around the subject
  - Read the next section of the text book to get ahead
  - Read the support guides on kerboodle before each chapter
  - After the lesson file your work, and re-read it (do you understand what it says)
- Questions – make a note of any you have

Tips for success



- Practise, practise, practise!
  - Exam questions
  - Study the mark-schemes
- Get comfortable with Maths
  - Ask for help if you are struggling

- GCSE – Learn the material A-Level- understand and learn

Tips for Success

- Do not give up and persevere
- You will not get every topic first time

Why does wine go off?

Taster Lesson

Taster Lesson

30/06/2024

Why does wine go off?

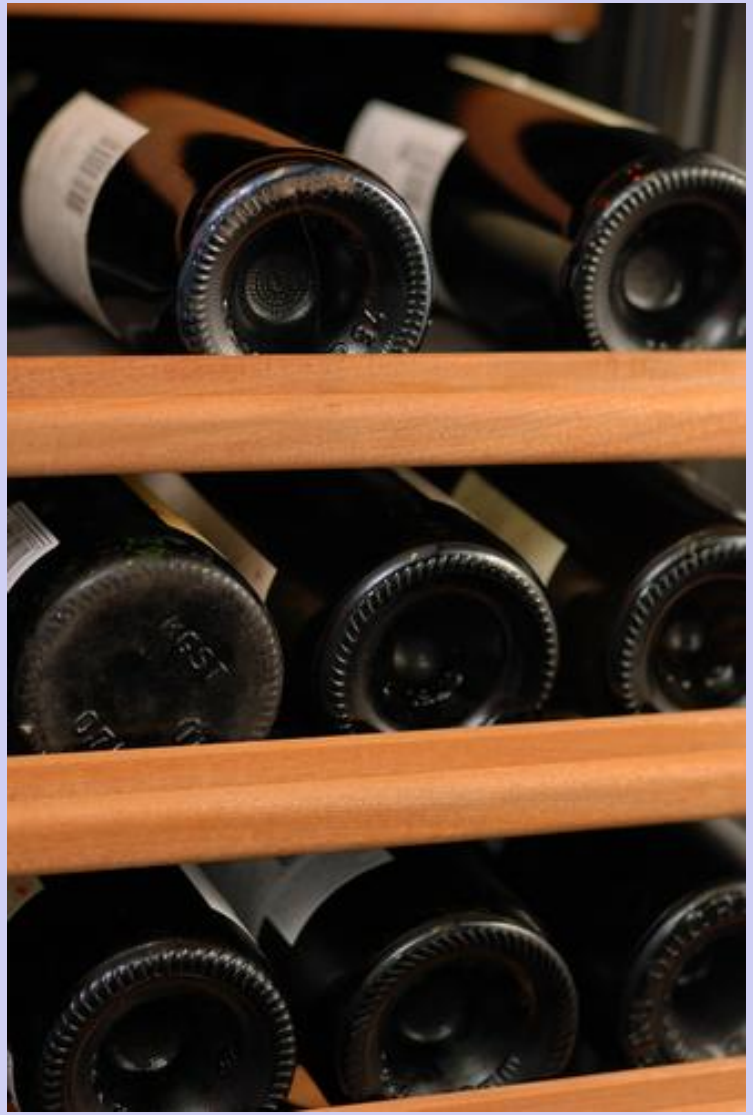
Must	• Give examples of different organic compounds
Should	• identify which organic compounds are oxidised by acidified potassium dichromate
Could	• explain why does wine goes off • explain how breathalysers work.


Irish Luck
Ample food and Sturdy Drink
in heaven
for the Devil knows
KOKOMO
CRIED

Making wine and cider

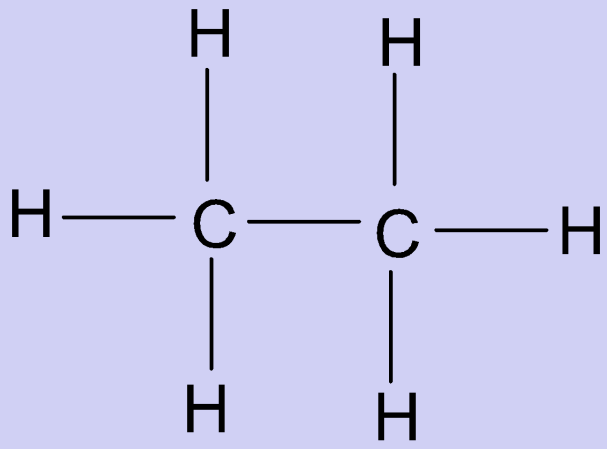
Alcohol has been produced by fermentation of sugars for thousands of years.

Sugar from fruit or grains such as wheat and barley is mixed with yeast and water, which produces ethanol and other compounds.



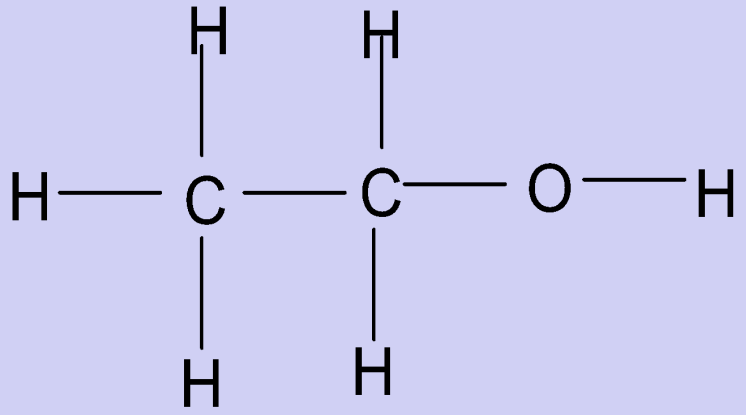
Alkanes

- Only carbon and hydrogen
- All single bonds



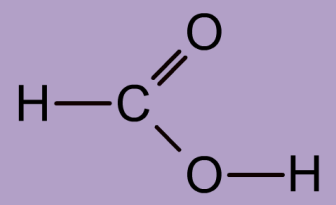
Alcohols

- Only one oxygen
- Has an OH group

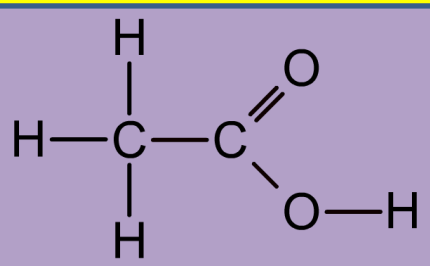


Homologous Series

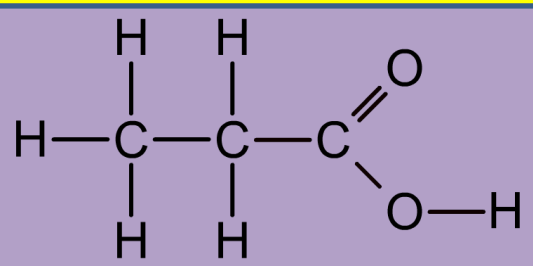
A homologous series is a group of molecules with the same functional group but a different number of $-CH_2$ groups. (LEARN THIS)



methanoic acid
($HCOOH$)



ethanoic acid
(CH_3COOH)



propanoic acid
(CH_3CH_2COOH)

Functional groups determine the pattern of reactivity of a homologous series, whereas the carbon chain length determines physical properties such as melting/boiling points.

What are alcohols?

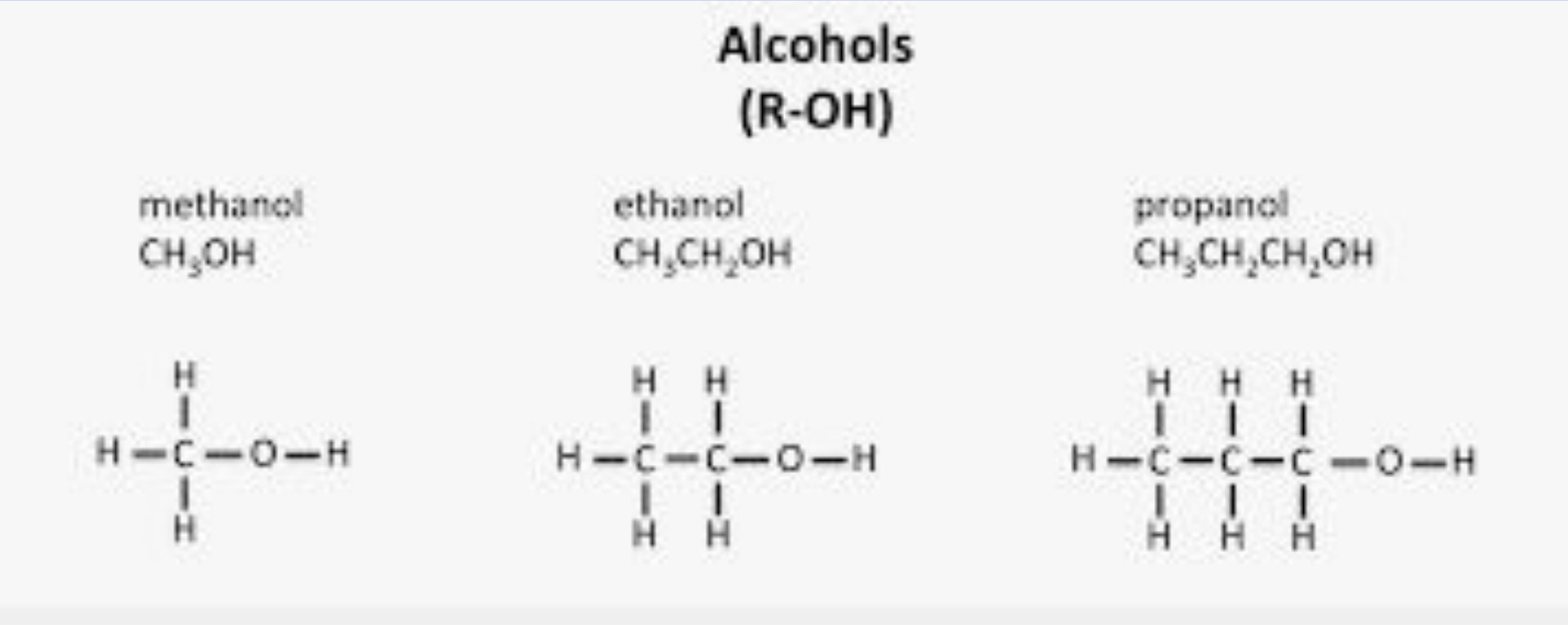
Alcohols are a **homologous series** of organic compounds with the general formula $C_nH_{2n+1}OH$ and names ending *–ol*.

The functional group in alcohols is the **hydroxyl group**: –OH.

Which is responsible for the typical chemical reactions.

No. of carbon atoms	Molecular formula	Name
1	CH_3OH	methanol
2	C_2H_5OH	ethanol
3	C_3H_7OH	propanol
4	C_4H_9OH	butanol
5	$C_5H_{11}OH$	pentanol
6	$C_6H_{13}OH$	hexanol

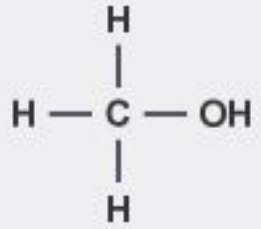
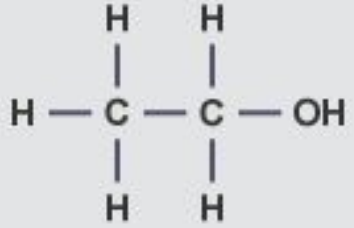
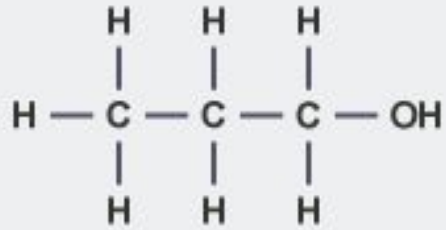
Task 1: Make the first 3 alcohols



Molecular Formulae

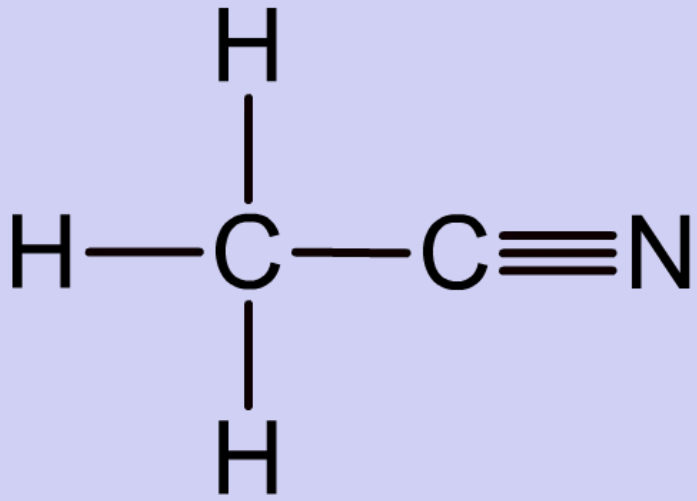
- The molecular formula shows the number of each type of atom present in one molecule.

- Can you write the molecular formula for the first 3 alcohols?

Methanol	CH_3OH	
Ethanol	C_2H_5OH	
Propan-1-ol	C_3H_7OH	

Displayed Formula

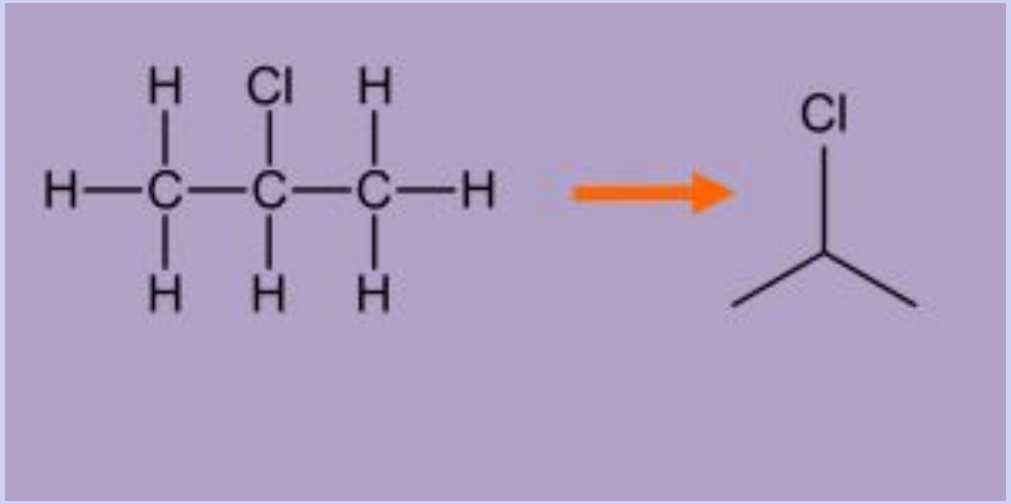
- Shows the arrangement of atoms in a molecule, as well as all the bonds

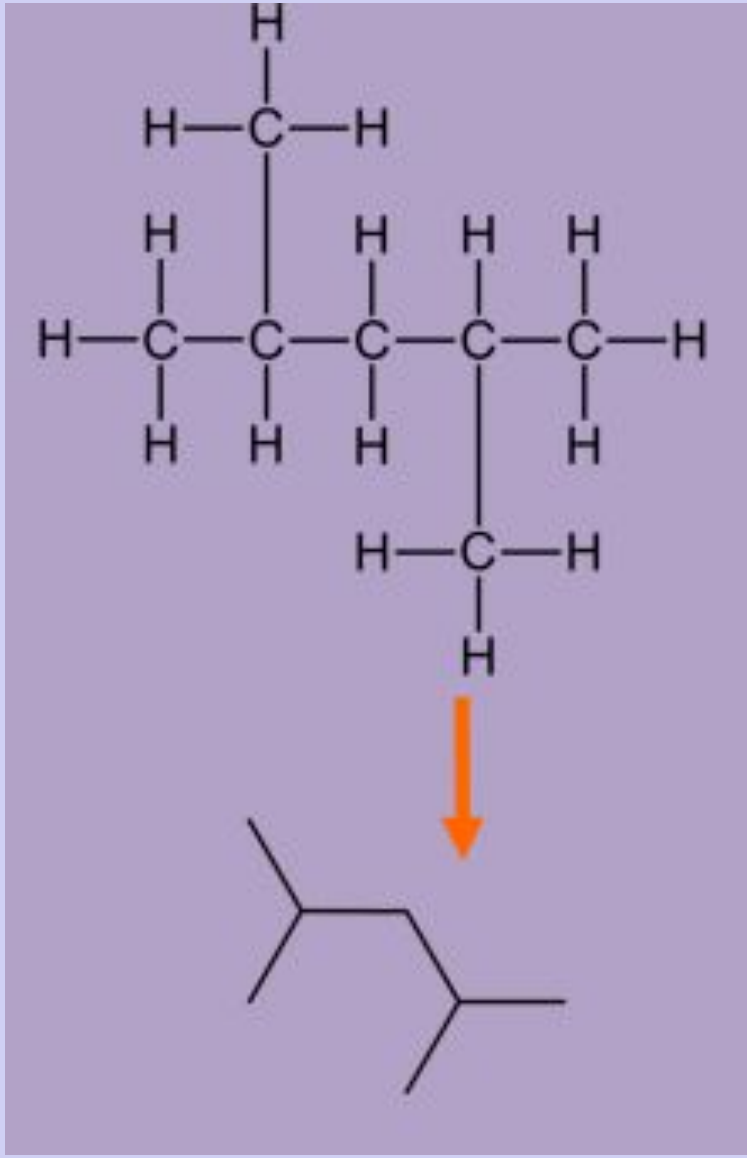


- Draw the displayed formula for the first three alcohols

Skeletal formula

- Shows the bonds between carbon atoms, with H atoms omitted, other atoms are shown
- Draw the skeletal formula for your 3 alcohols

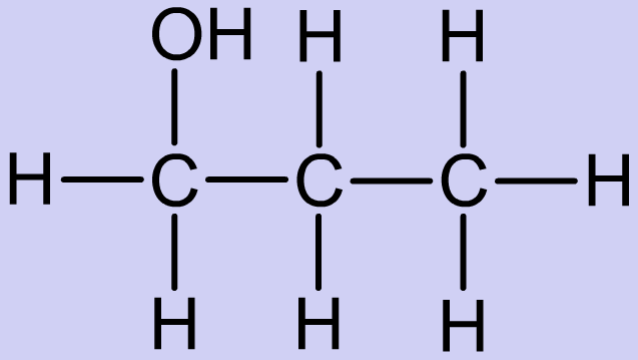




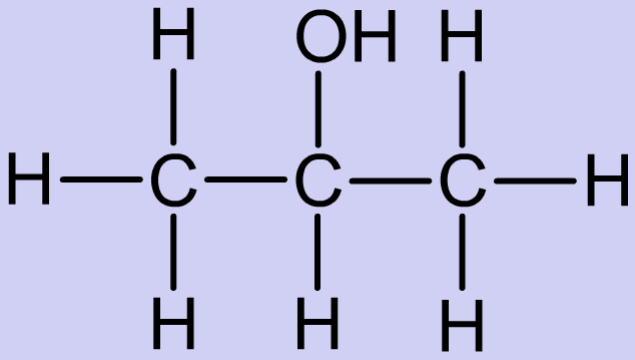
Naming alcohols

Alcohols with three or more carbon atoms display **positional isomerism**.

The number of the carbon to which the hydroxyl groups is attached is written before the *–ol*.



propan-1-ol



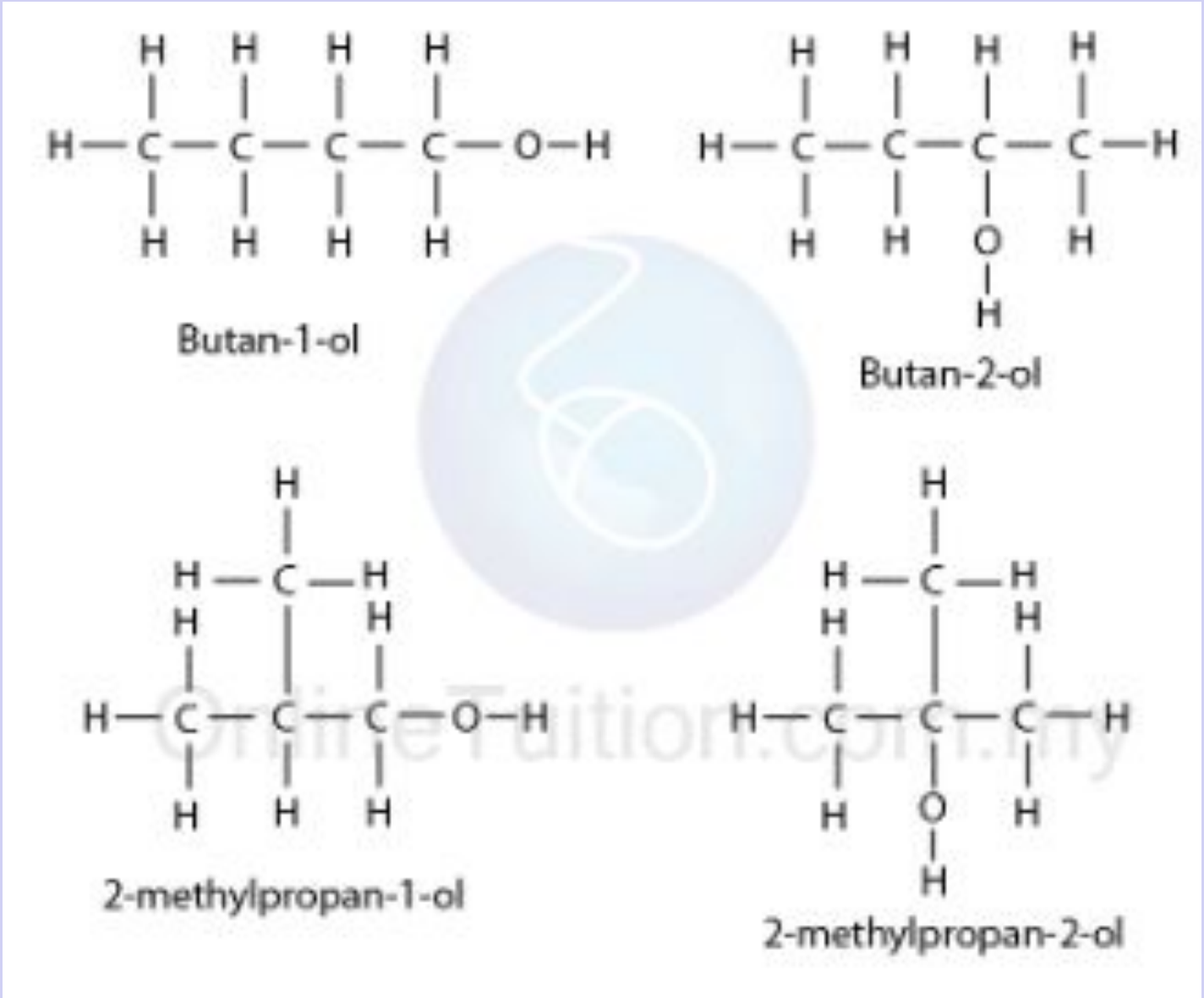
propan-2-ol

Activity: Molymods

- How many isomers can you make of Butanol?

Activity: Molymods

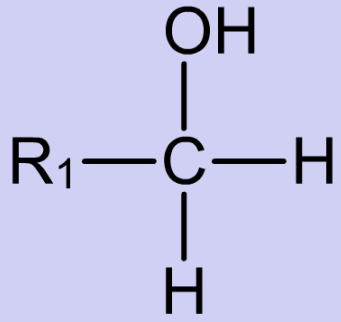
- How many isomers can you make of Butanol?



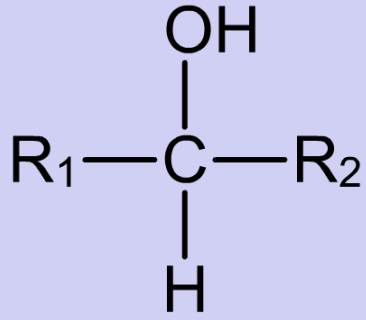
Primary, secondary and tertiary

A chain of carbon atoms can be represented by R when drawing the structure. This is referred to as an **R group**.

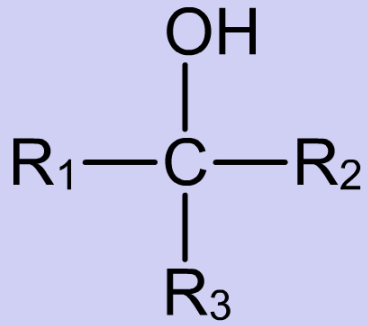
- **Primary (1°) alcohols** have one R group attached to the carbon to which the OH group is attached.



- **Secondary (2°) alcohols** have two R groups attached to the carbon to which the OH group is attached.



- **Tertiary (3°) alcohols** have three R groups attached to the carbon to which the OH group is attached.



Testing drivers for ethanol

Roadside breathalyser

Primary alcohols

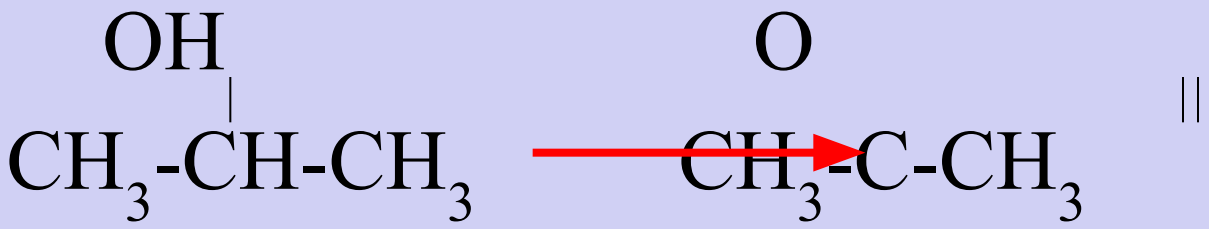
ethanol → ethanal

CH_3-CH_2-OH → CH_3-CHO

Primary alcohols are oxidised to aldehydes

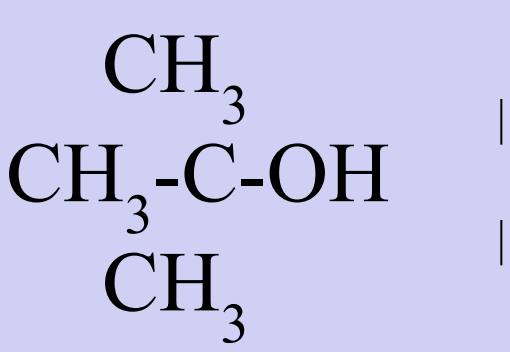
Secondary alcohols

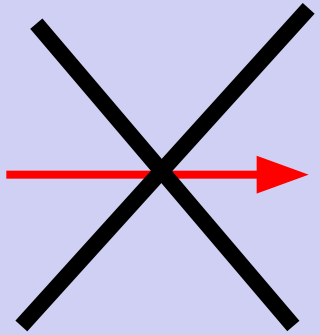
propan-2-ol → propanone



Secondary alcohols are oxidised to ketones

Tertiary alcohols





No reaction

Tertiary alcohols are not oxidised, no spare hydrogen on the carbon containing the hydroxy group

Road side breathalysers

Original breathalyser
is based on the oxidisation of ethanol to ethanal and ethanoic acid by potassium dichromate.

Amount of colour change tells the amount of alcohol

orange green

‘Alcolmeter’ is based on an electrochemical cell

Two reactions occur at electrodes

1. Oxygen is reduced to water
2. Ethanol is oxidised to ethanoic acid

Instrument is calibrated with different concentrations of ethanol in air

green amber red

Activity: MD1.1



- Alcohols can be oxidised by using acidified potassium dichromate

$$Cr_2O_7^{2-}{}_{(aq)} + 14H^+{}_{(aq)} + 6e^- \rightarrow 2Cr^{3+}{}_{(aq)} + 7H_2O$$

orange → green

Chemical	Result
Propan-1-ol	
Propan-2-ol	
2-methyl-propan-ol	

Summary

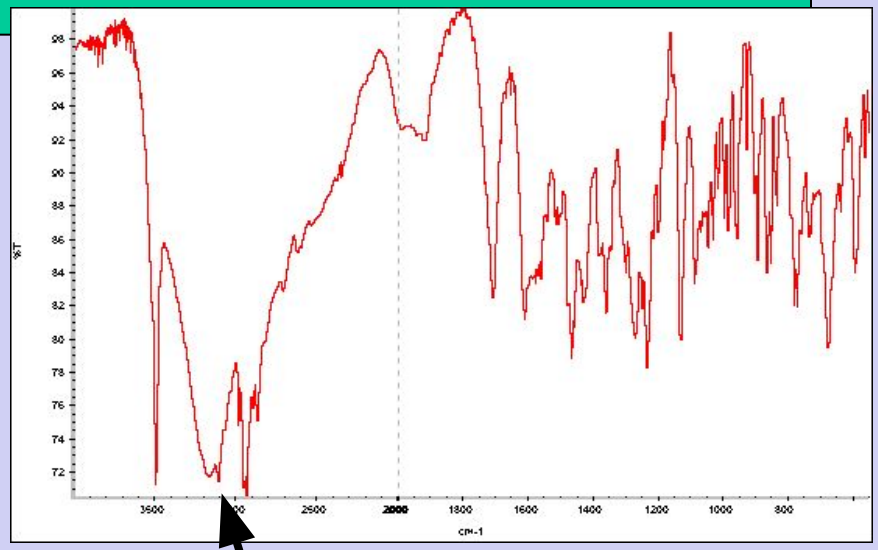
1º alcohol —(oxidises)→ aldehyde —(oxidises)→ carboxylic acid

2º alcohol —(oxidises)→ ketone —✗→ no reaction

3º alcohol —✗→ no reaction

Dichromate reduces 1º , 2º alcohols and aldehydes

At the police station

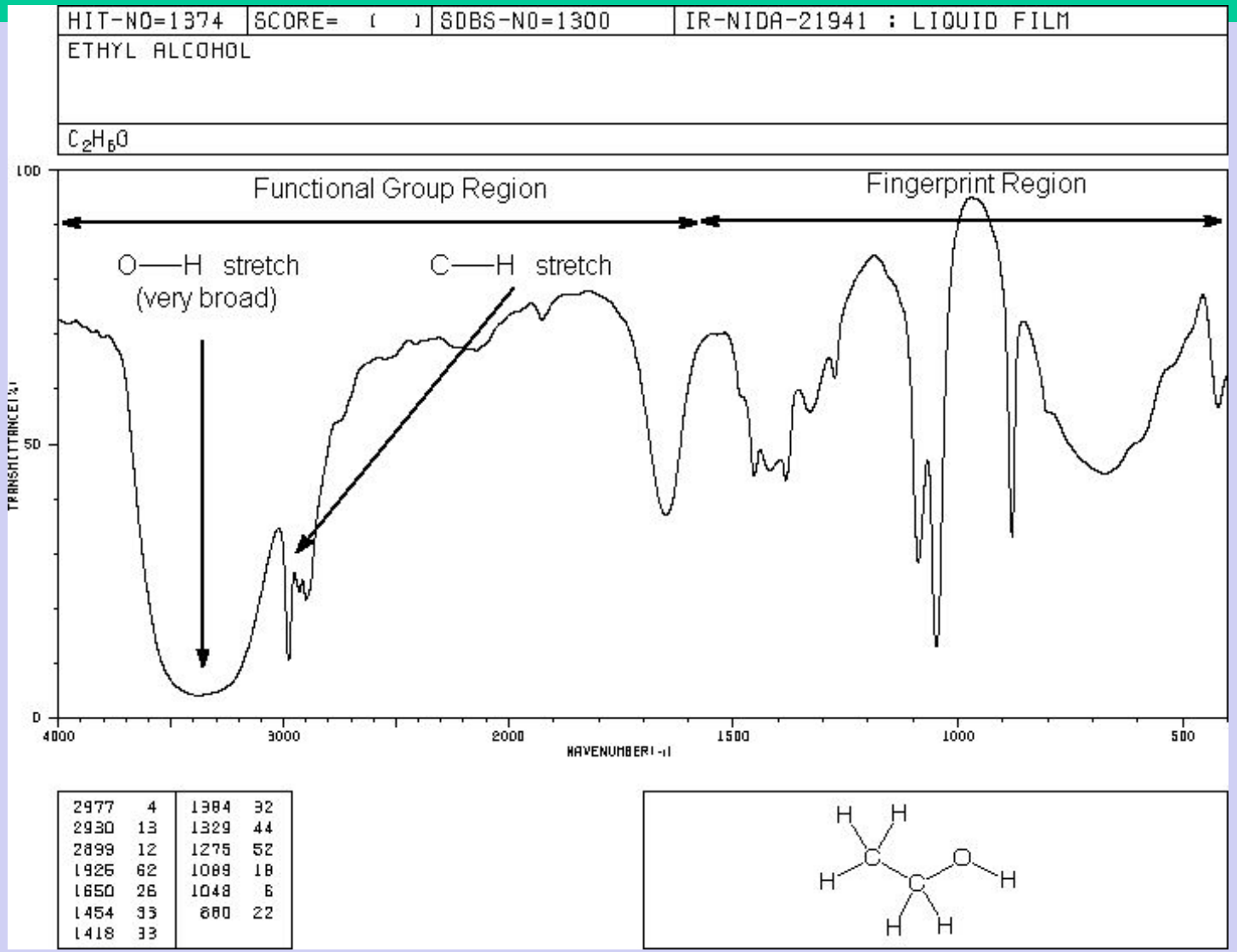


Depth of peak is related to ethanol content in breath

Infrared spectrometer

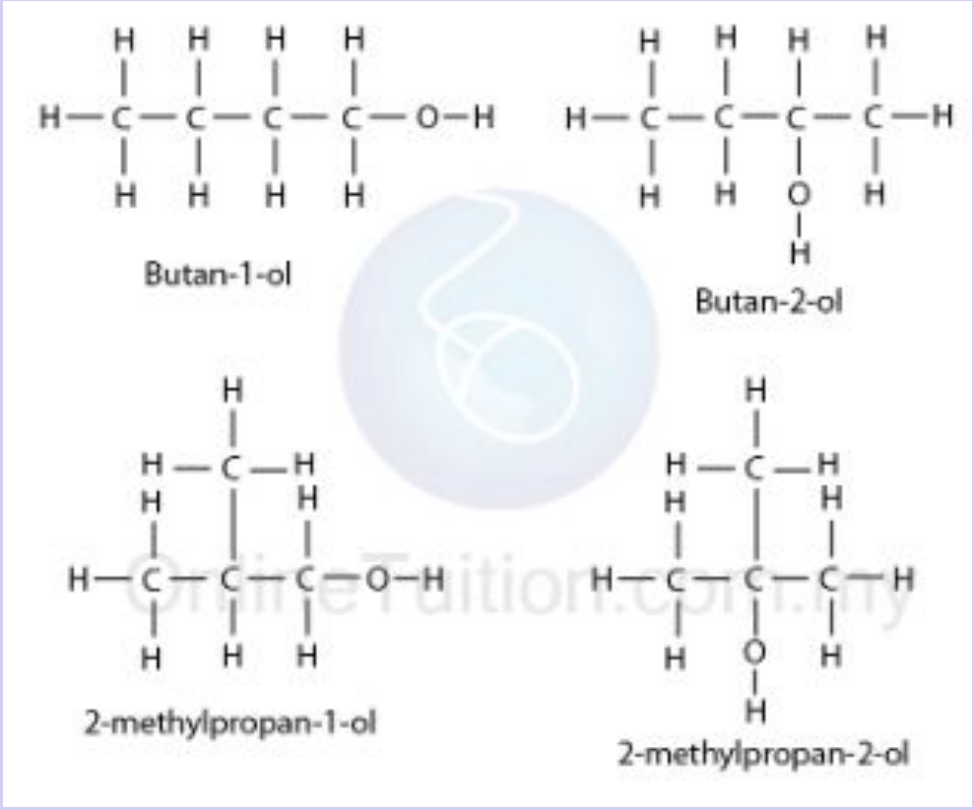
More accurate

Infra red spectrum of ethanol



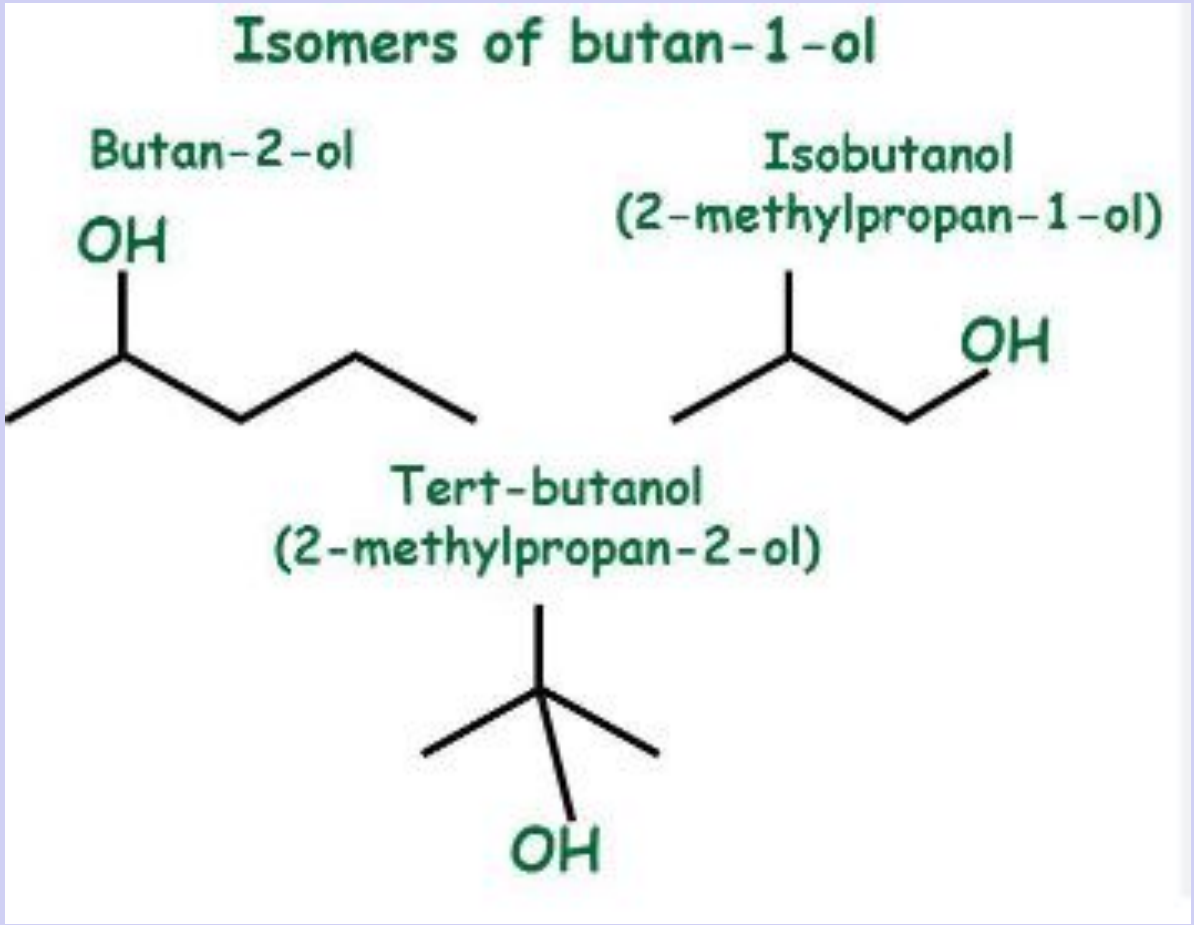
Activity: Molymods

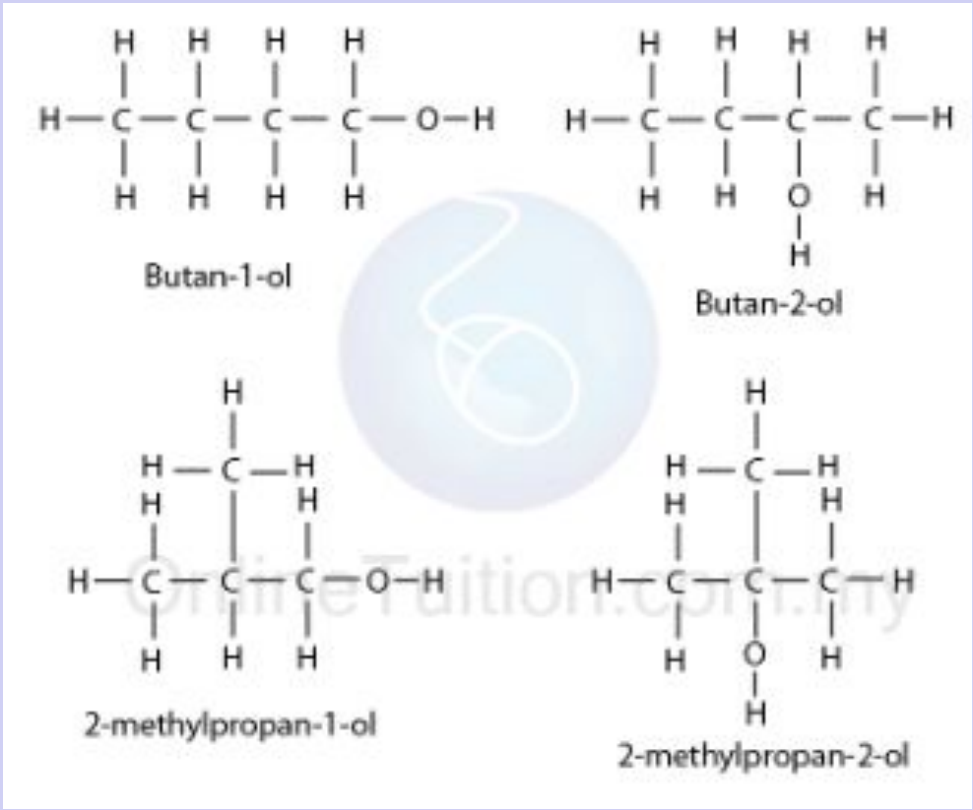
- Can you draw the skeletal formula for each isotope of Butanol?



Activity: Molymods

- Can you draw the skeletal formula for each isotope of Butanol?





Activity: Molymods

Compound	Formula
Propan-1-ol	$CH_3CH_2CH_2OH$
Propan-2-ol	$CH_3CHOHCH_2$
2-methyl-propan-ol	$CH_3COHCH_3CH_3$
Propanal	CH_3CH_2CHO
Propanone	CH_3COCH_3
Propanoic acid	CH_3CH_2COOH