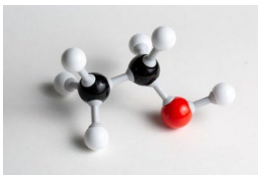
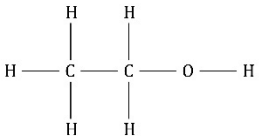
Alcohols: knowledge check

1.1 The table shows four different representations of a molecule of the alcohol ethanol.

Use the words provided to identify each of the representations and circle the alcohol functional group shown in each image.

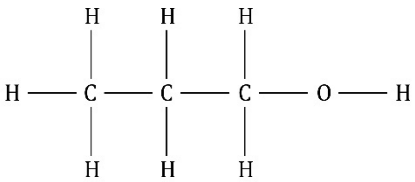
displayed structural formula **molecular formula**

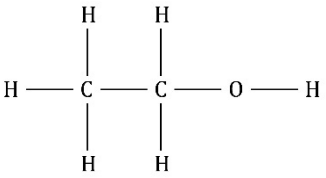
condensed structural formula **ball and stick model**

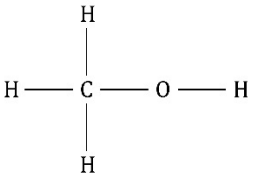
A	B	C	D
		CH_3CH_2OH	C_2H_5OH

1.1 The table on page 2 includes the names, molecular formulas, condensed structural formulas and displayed structural formulas for the first four members of the alcohols homologous series.

Use some of the formulas provided to complete the table.

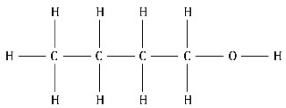






CH_3CH_2OH C_4H_9OH $CH_3CH_2CH_2CH_2OH$

CH_3OH C_2H_5OH $CH_3CH_2CH_2OH$

Name	Molecular formula	Condensed structural formula	Displayed structural formula
methanol		CH_3OH	
ethanol			
propan-1-ol	C_3H_7OH		
butan-1- ol			

1.2 Use some of the words provided to complete the gaps in the following sentences. Not all of the words will be used.

–ol **physical** C_nH_nOH **–al** **–OH** $C_nH_{2n+1}OH$

chemical **letters** $C{=}O$ **numbers**

Alcohols are a homologous series with the functional group _____ .

The general formula of alcohols is _____ .

All alcohols have names ending in _____ .

Alcohols with three or more carbon atoms in their molecules have _____ in their names to show the position of the –OH group.

The _____ properties, such as boiling points, vary gradually as the molecules increase in size.

1.3 Select the correct number or words from those provided in the list to complete the sentences and equations. Not all of the numbers or terms will be used. Some might be used twice.

ethanoic acid **propanoic acid** **hydrogen**

2 **3** **addition** **physical** **combustion** **chemical**

oxidised **oxygen** **reduced** CH_3CH_2OH

All alcohols have similar _____ properties.

Alcohols reacts with oxygen in _____ reactions. The equation for the complete combustion of ethanol is:

$$CH_3CH_2OH + \_\_\_\_\_O_2 \rightarrow \_\_\_\_\_CO_2 + \_\_\_\_\_H_2O$$

If a small piece of sodium is dropped into an alcohol, it reacts steadily and gives off _____ gas. A solution of sodium ethoxide is produced.

Alcohols can also be _____ to form carboxylic acids using an oxidising agent such as potassium manganate(VII).

The equation for the oxidation of ethanol is:

$$\_\_\_\_\_. + 2[O] \rightarrow CH_3COOH + H_2O$$

The carboxylic acid produced is named _____.

Alcohols: test myself

2.1 Which **two** compounds are alcohols?

ethanoic acid **decan-1-ol** **propane** **ethanal**

propanone **propan-2-ol** **propanal**

2.2 A molecule of pentan-1-ol has five carbon atoms. What is its molecular formula?

_____

2.3 Name the carboxylic acid produced when butan-1-ol is oxidised.

[*Hint: Think about the name of the alcohol that ethanoic acid is produced from.*]

_____

2.4 Complete the equation representing the oxidation of propan-1-ol.

[*Hint: Look back at* ***question 1.4*** *to remind yourself about the products of alcohol oxidation.*]

$$CH_3CH_2CH_2OH + 2[O] \rightarrow \_\_\_\_\_ + \_\_\_\_\_$$

2.5 Use some of the numbers and formulas provided to complete the balanced symbol equation for the complete combustion of propan-1-ol.

2 **3** **6** **8** **9**

C CO_2 H_2O O_2 CO

$$\_\_\_\_\_C_3H_7OH + \_\_\_\_\_ \rightarrow \_\_\_\_\_ + \_\_\_\_\_$$

2.6 Ethanol can be produced industrially from ethene gas. What is ethene gas reacted with to produce ethanol in this process?

[*Hint: Think about the difference between the functional groups of ethene and ethanol.*]

_____

2.7 Ethanol can also be produced from biomass such as sugar beet.

(a) What is the name of the process used?

[*Hint: Think about how the process used to make alcoholic drinks such as wine or beer.*]

_____

(b) State the three conditions required to produce ethanol from biomass.

[*Hint: Think about the temperature needed and whether any water or a catalyst are needed.*]

1 _____

2 _____

3 _____

2.8 Ethanol can be separated from a mixture of ethanol and water.

(a) What is the name of the process used to separate the ethanol?

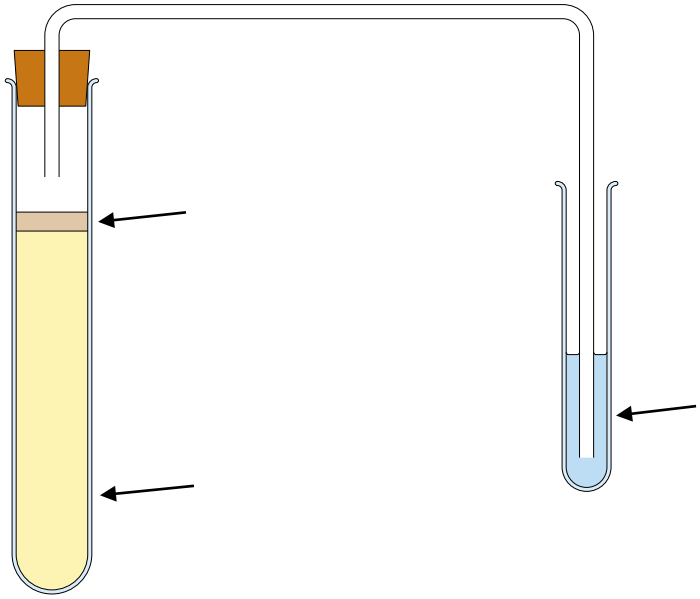
_____

(b) What property does the separation of ethanol and water depend on when using the method identified in (a)?

_____

Alcohols: feeling confident?

3.1 The image shows the apparatus used by learners to prepare a solution of ethanol.



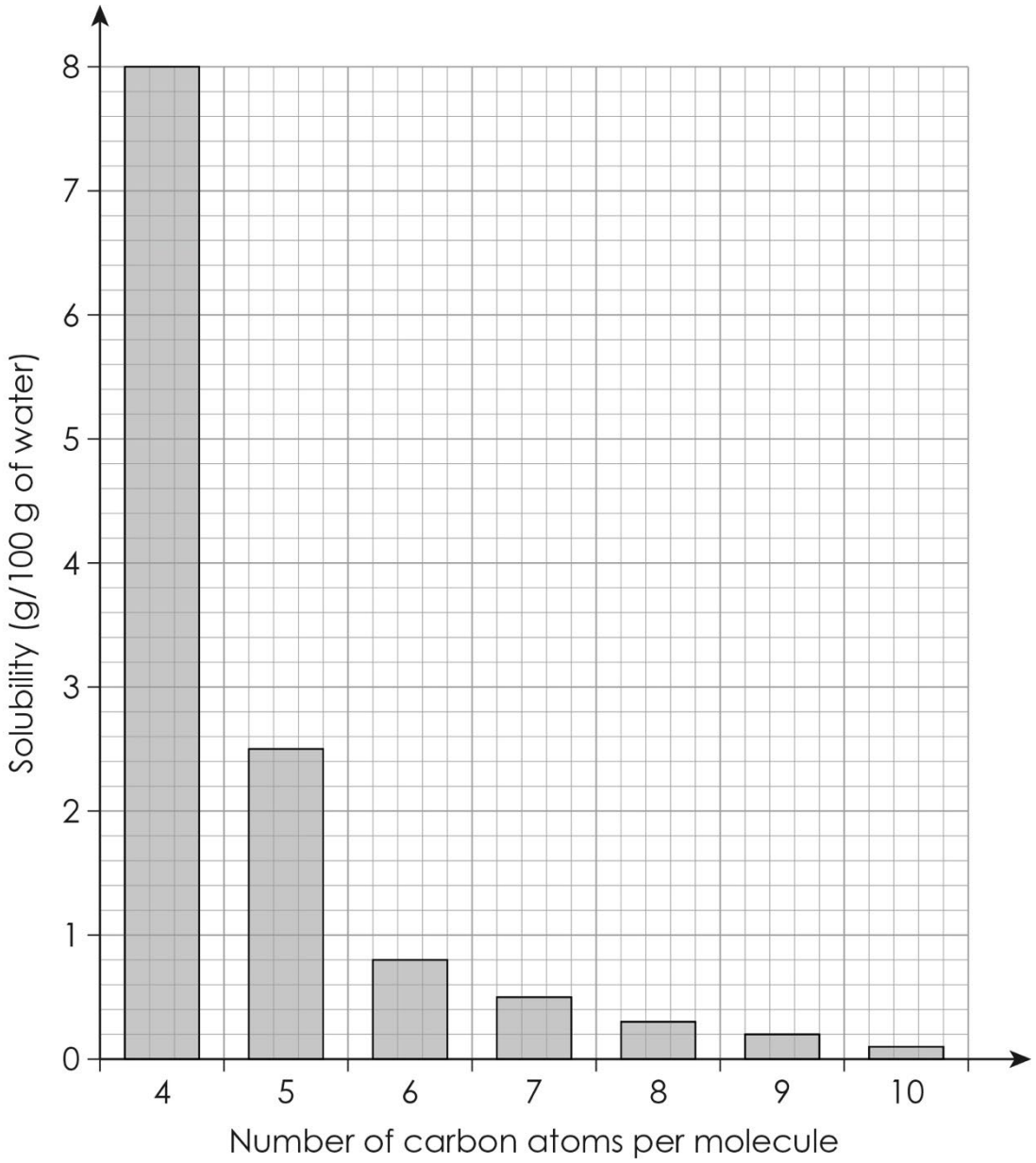
Label the diagram and complete the sentences to describe this process.

The _____ in yeast act as a _____ and convert glucose into ethanol and _____ . The gas produced bubbles through the limewater and turns it _____ . The equation for the reaction is:

$$C_6H_{12}O_6 \rightarrow 2C_2H_5OH + \_\_\_\_\_$$

3.2 The graph shows how the solubility of alcohols in water changes as the number of carbon atoms in the molecules increase.

Use the graph to answer the following questions.



(a) Which is more soluble in water, butan-1-ol or hexan-1-ol?

[*Hint: Think about what the name of the alcohol tells you about the number of carbon atoms in the molecule.*]

(b) How many grams of pentan-1-ol dissolve in 100 g water?

_____

(c) What conclusion can be made about the relationship between the number of carbon atoms per molecule and the solubility of the alcohol?

_____

_____

_____

_____

(d) What would you expect to see when decan-1-ol is mixed with water?

Explain your answer.

[*Hint: Think about the solubility of decan-1-ol.*]

I would expect to see _____ because

_____

_____

_____

Alcohols: what do I understand?

Think about your answers and confidence level for each mini-topic. Decide whether you understand it well, are unsure or need more help. Tick the appropriate column.

Mini-topic	I understand this well	I think I understand this	I need more help
I know that alcohols are a homologous series.			
I can identify the functional group and the molecular and general formulae of alcohols.			
I can draw the condensed structural and displayed structural formulas of alcohols.			
I understand how alcohols are named.			
I can describe the combustion reactions of alcohols.			
I can describe the reactions of alcohols with sodium metal and with oxidising agents.			
I can describe how ethanol is produced industrially.			
I can describe the process of fermentation.			
Feeling confident? topics	**I understand this well**	**I think I understand this**	**I need more help**
I can describe a fermentation reaction and complete the equation.			
I can describe the solubility of alcohols.			