

Answers  
page

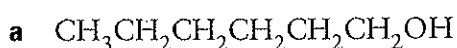
# 5

WORKSHEET

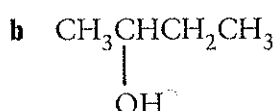
## EXERCISES INVOLVING ALCOHOLS

Syllabus reference 9.2.3

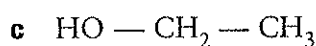
1 Name the following compounds.



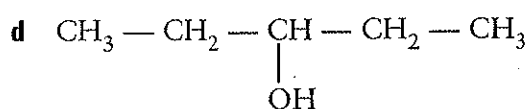
1-hexanol



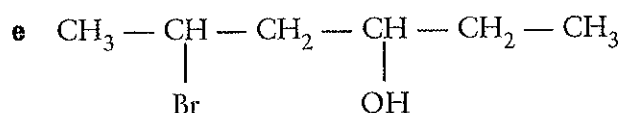
2-butanol



ethanol



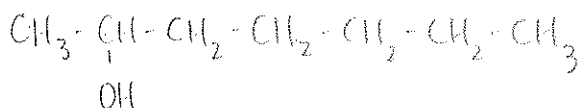
3-pentanol



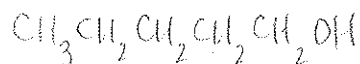
5-bromo-3-hexanol

2 Draw the structural formula of the following.

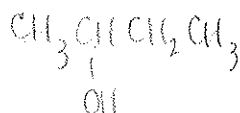
a 2-heptanol



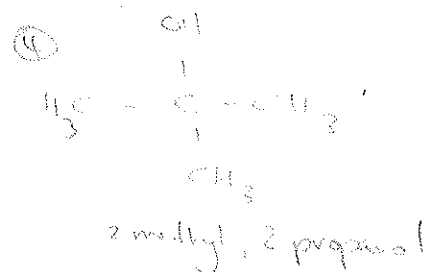
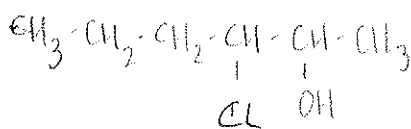
b 1-pentanol



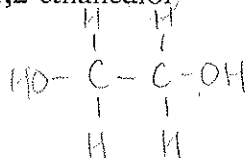
c 2-butanol



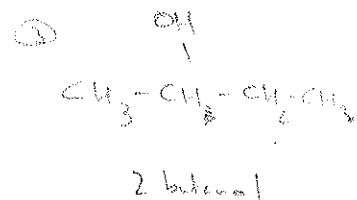
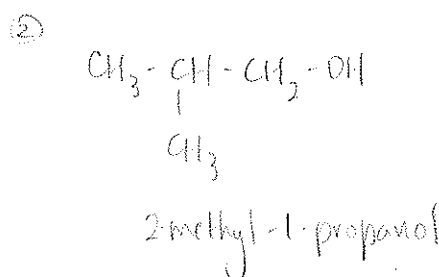
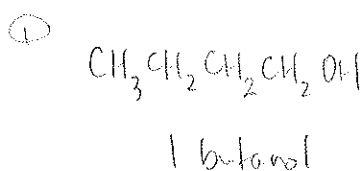
d 3-chloro-2-hexanol



e 1,2-ethanediol



3 Draw and name the structural formulae of two isomers with the formula  $\text{C}_4\text{H}_9\text{OH}$ .



4 Consider the following information.

ALKANE	BOILING POINT (°C)	ALKANOL	BOILING POINT (°C)
methane	-162	methanol	65
ethane	-89	ethanol	78
propane	-42	1-propanol	97

Explain why the alkanols have a much higher boiling point than the corresponding alkanes.

Alkanols contain -OH groups which undergo hydrogen bonding. Hydrogen bonding is a much stronger intermolecular force than the weak dispersion forces between corresponding alkane molecules.

5 The table below shows the solubility of some alcohols in water.

NAME	STRUCTURAL FORMULA (CONDENSED VERSION)	SOLUBILITY (g PER 100 g WATER)
methanol	$\text{CH}_3\text{OH}$	miscible in all proportions
ethanol	$\text{CH}_3\text{CH}_2\text{OH}$	
1-propanol	$\text{CH}_3\text{CH}_2\text{CH}_2\text{OH}$	
1-butanol	$\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{OH}$	8.0
1-pentanol	$\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{OH}$	2.7
1-hexanol	$\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{OH}$	0.6

a Write a generalised statement relating the solubility in water to the size of the molecule.

The solubility of alcohols in water decreases as the length of the alkyl chain increases.

b What type of bonding is used to explain the solubility of the smaller alcohols?

hydrogen bonding between -OH group and water molecules

c Explain why the alcohols with a longer carbon chain are less soluble in water.

The longer alkyl chain contains stronger dispersion forces and since this end of the alcohol is non-polar, it will not tend to be soluble in water which is polar.

6 Ethanol and water readily dissolve in each other (miscible), as do ethanol and hexane; however water and hexane do not dissolve in each other (immiscible).

a Explain why ethanol is miscible in both water and hexane, but water and hexane do not mix.

Ethanol has a polar end (OH group) and a non-polar end ( $\text{CH}_3\text{CH}_2-$ )

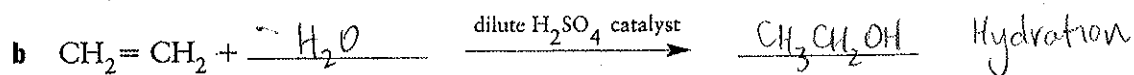
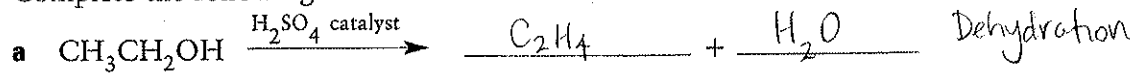
The polar end is soluble in  $\text{H}_2\text{O}$  (polar)

The non-polar end is soluble in hexane (non-polar)

b Considering your answer to a, suggest why ethanol is a solvent widely used in industry.

can dissolve polar & non-polar subst.

7 Complete the following reactions:

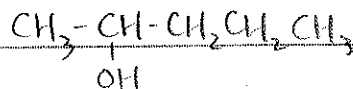
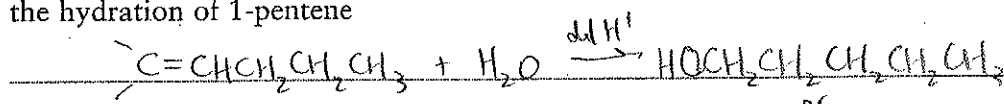


8 Write equations for the following reactions, naming the products.

a the dehydration of 2-butanol



b the hydration of 1-pentene



c the dehydration of 3-hexanol

d the hydration of 2-propene (no 2-propene only propene)