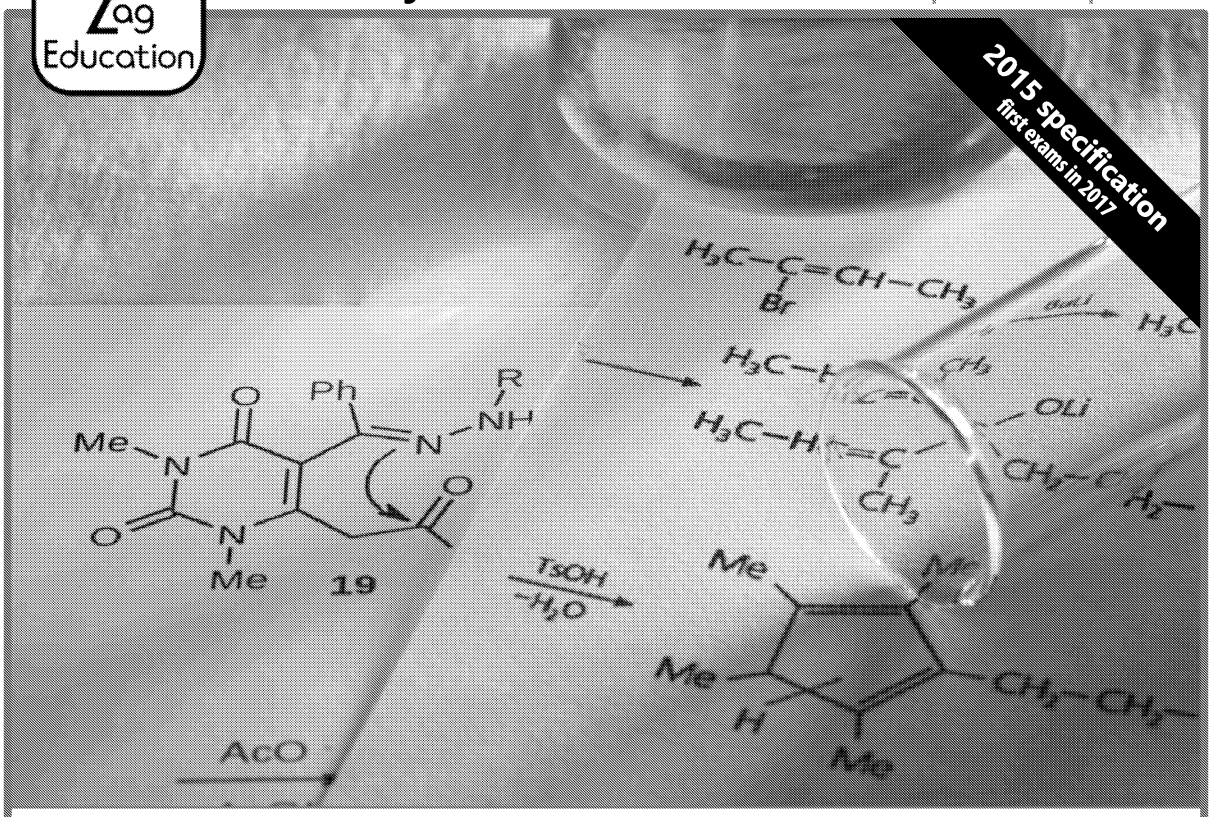
Zig Zag Education

Chemistry

A Level | OCR A | H432



Learning Grids for OCR A Level Year 2 Chemistry A

Module 6: Organic chemistry and analysis

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Teacher's Introduction

These learning grids are a tool designed to help you deliver **AS and A Level Year 2 OCR Chemistry A Module 6: Organic chemistry and analysis** (for first teaching in September 2015). The concept is that your students are assigned a set of pages to read from their notes or a textbook, possibly for homework, and then asked to complete the relevant learning grids. These activities may be particularly useful for your weaker learners, who may benefit from both the requirement to read all the notes to find the information and the act of writing down the answers.

The grids are designed to ask questions in sufficient detail that your students are able to study the relevant sections and find the correct answers. Completed grids are provided so that your students' answers can be marked or checked. It may also be useful to hand them out to students during their revision to assist them with answers they cannot find.

This edition supports students using and is cross-referenced to:

- ***A Level Chemistry A for OCR Year 2 Student Book; Ritchie and Gent; Oxford University Press, 2015; ISBN 978-0198357650***
- ***OCR A Level Chemistry A 2015: Student Book 2; Holyman, Scott and Stutt; Pearson Education Limited, 2015; ISBN 978 1447990819***

Advantages of using these learning grids are:

- Some students will find this method of studying of great value, particularly if they find it difficult to absorb information in class.
- Resulting grids contain a bullet-point summary that may be useful for revision.
- They are an easy-to-set yet valuable homework.
- They are a useful catch-up tool to help students who have missed a lesson.
- They can be used as a basis for cover lessons that require minimal preparation and no interaction from the cover teacher.
- They are an independent learning resource.

You may want to photocopy the sheets onto A3 paper, particularly for students with reading or writing difficulties.

Some questions will require use of a calculator.

Remember!
Always check the exam board website for new information, including changes to the specification and sample assessment material.

Word + PDF

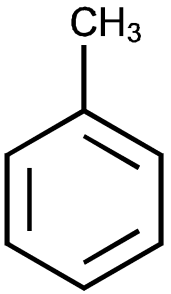
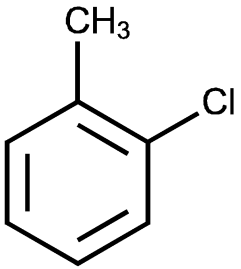
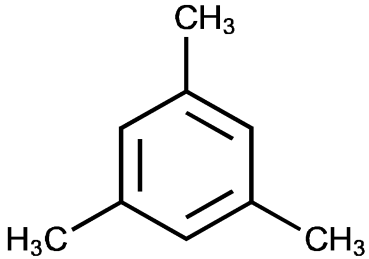
Note that there is the option to pay an additional 30% to get this resource in PDF format or an additional 50% to get this resource in Word format. The latter allows you to edit the resource to adapt it for your students, and also to put it on your intranet or VLE so students can fill in the grids electronically.

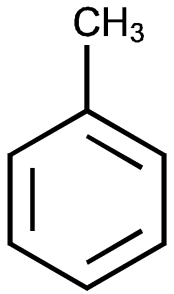
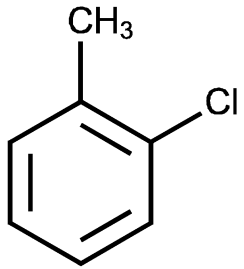
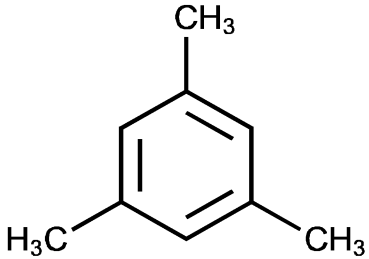
For all formats the licence terms are that the purchasing institution can make unlimited copies on a single site, for students and teachers officially registered at that site.

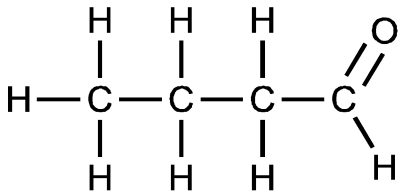
We hope you find these grids useful during your teaching.

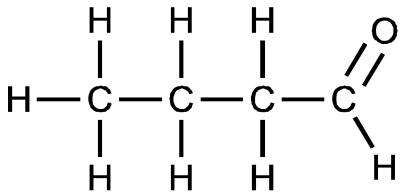
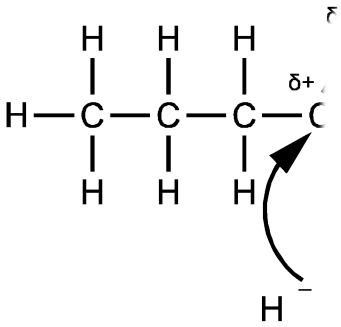
Selected Question and Answer Pages

For demonstration only, the sample answer pages immediately
follow their corresponding question pages

	Question	Answer		
Aromatic Chemistry (continued)	**The delocalised model of benzene describes a planar, hexagonal ring with delocalised electrons. What is meant by the term 'delocalised electrons'?**			
	Name the following aromatic compounds using IUPAC rules.			
	Benzene can be converted to nitrobenzene. What type of reaction is this?			
	In the nitration reaction mentioned above, NO_2^+ reacts with benzene. With the aid of an equation, explain how NO_2^+ is formed.			

	Question	Answer		
Aromatic Chemistry (continued)	**The delocalised model of benzene describes a planar, hexagonal ring with delocalised electrons. What is meant by the term 'delocalised electrons'?**	Delocalised electrons are electrons that are not situated on a specific atom, but are spread around an area of overlapping orbitals. In the case of benzene, these overlapping orbitals form a ring above and below the plane of the molecule, and the delocalised electrons can spread around the system of π bonds that links all 6 carbon atoms.		
	Name the following aromatic compounds using IUPAC rules.			
		Methylbenzene	1-chloro-2-methylbenzene	1,3,5-trimethylbenzene
	Benzene can be converted to nitrobenzene. What type of reaction is this?	Electrophilic substitution		
	In the nitration reaction mentioned above, NO_2^+ reacts with benzene. With the aid of an equation, explain how NO_2^+ is formed.	$2H_2SO_4 + HNO_3 \rightarrow NO_2^+ + 2HSO_4^- + H_3O^+$ [Accept: $H_2SO_4 + HNO_3 \rightarrow HSO_4^- + H_2NO_3^+$ $H_2NO_3^+ \rightarrow H_2O + NO_2^+$]		

	Question	Answer
Carbonyl Compounds (continued)	What is the product of oxidation of a secondary alcohol?	
	How is an oxidising agent represented in an equation?	
	Aldehydes can undergo further oxidation reactions. What is formed as a result of this further oxidation?	
	What colour change occurs when aldehydes are oxidised by potassium dichromate?	
	Write the overall equation for formation of butanoic acid from butan-1-ol.	
	Aldehydes can be converted back to alcohols by what process?	
	What reagents and conditions are usually required for this conversion of an aldehyde to an alcohol?	
	By what mechanism does this conversion take place?	
	Using butanal, show the first step of the mechanism to convert an aldehyde to an alcohol. 	

	Question	Answer
Carbonyl Compounds (continued)	**What is the product of oxidation of a secondary alcohol?**	A ketone (and water)
	How is an oxidising agent represented in an equation?	[O]
	Aldehydes can undergo further oxidation reactions. What is formed as a result of this further oxidation?	Carboxylic acids
	What colour change occurs when aldehydes are oxidised by potassium dichromate?	From orange to green
	Write the overall equation for formation of butanoic acid from butan-1-ol.	$CH_3CH_2CH_2CH_2OH + 2[O] \rightarrow CH_3CH_2CH_2COOH + H_2O$
	Aldehydes can be converted back to alcohols by what process?	Reduction
	What reagents and conditions are usually required for this conversion of an aldehyde to an alcohol?	$NaBH_4(aq)$, gentle heating
	By what mechanism does this conversion take place?	Nucleophilic addition
	Using butanal, show the first step of the mechanism to convert an aldehyde to an alcohol. 	 

Oxford: pp. 266–269
Pearson: pp. 199–201

	Question	Answer
Combined Techniques	**Explain how mass spectrometry, IR spectroscopy and NMR spectroscopy can be used in combination to determine the structure of an unknown molecule.**	
	A chemist needs to identify an unknown organic molecule. The following tests were carried out, with the results shown. • **A mass spectrum with a molecular ion peak at 74. three main fragment peaks seen at 29, 43 and 45.** • **An infrared spectrum showed a broad peak at approximately 3000 cm^{-1}.** • **A carbon-13 NMR spectrum showed four individual peaks.** **Suggest, with reasons, an identity for the unknown compound.**	

	Question	Answer
Combined Techniques	**Explain how mass spectrometry, IR spectroscopy and NMR spectroscopy can be used in combination to determine the structure of an unknown molecule.**	Mass spectrometry can be used to find the molecular mass and masses of fragments in the compound. IR and NMR can be used to confirm the identity of the functional groups in the compound. NMR provides information about the arrangement of carbons or hydrogens in the molecule. In conjunction, these often provide enough information to determine the structure of an unknown molecule.
	A chemist needs to identify an unknown organic molecule. The following tests were carried out, with the results shown. • **A mass spectrum with a molecular ion peak at 74. three main fragment peaks seen at 29, 43 and 45.** • **An infrared spectrum showed a broad peak at approximately 3000 cm^{-1}.** • **A carbon-13 NMR spectrum showed four individual peaks.** **Suggest, with reasons, an identity for the unknown compound.**	The molecular ion peak of the mass spectrum shows the compound has a relative molecular mass of 74. The carbon-13 NMR spectrum shows there are four carbon environments in the molecule. The broad absorption peak at approximately 3000 cm^{-1} in the infrared spectrum shows the presence of an OH pea The identity of the molecule is therefore C_4 The peak at 43 can only be due to CH_3CH_2C butan-1-ol (rather than butan-2-ol or meth

Additional Selected Question Pages

6.2.2 Amino Acids, Amides and Chirality

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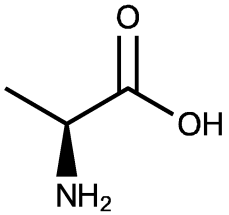
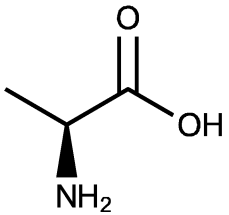
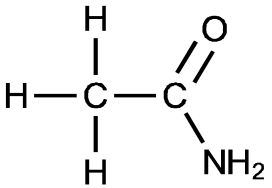
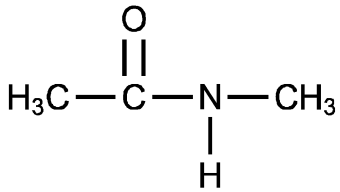
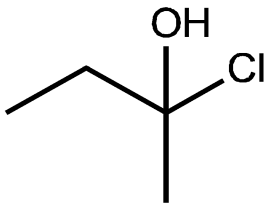
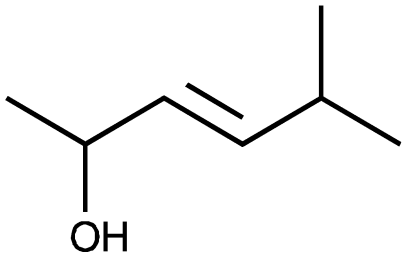
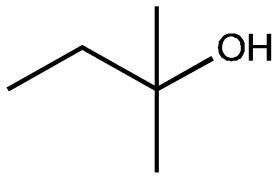
Oxford: pp. 214–218
Pearson: pp. 154–159

	Question	Answer
Amino Acids, Amides and Chirality	**Give the general formula for an amino acid and draw a 3D representation of it.**	
	Sodium hydroxide is added to alanine. Show what happens to this amino acid in an alkaline solution. 	
	Show the structure of alanine when it is added to an acidic solution. 	

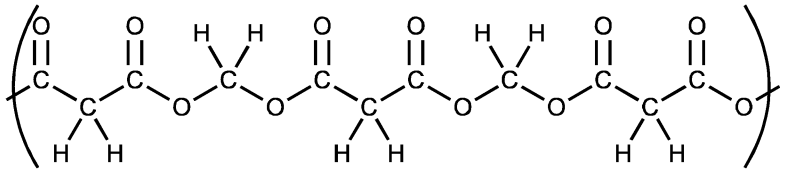
	Question	Answer
Amino Acids, Amides and Chirality (continued)	**What product is obtained from the reaction of an amino acid with an alcohol? Show the reaction between alanine and propan-2-ol.**	
	Identify whether the following are primary or secondary amides. **a)**  **b)** 	a) b)
	What is a chiral carbon?	

	Question	Answer
Amino Acids, Amides and Chirality (continued)	**Identify whether the following molecule contains a chiral centre. Mark any chiral centre present with a circle.** **a)**  **b)**  **c)**  	a) b) c)
	What are optical isomers?	

6.2.3 Polyesters and Polyamides

6

Oxford: pp. 219–223
Pearson: pp. 160–165

	Question	Answer
Polyesters and Polyamides	**Polyesters can be made in two ways. State the types of monomers required for these two methods.**	
	What type of polymerisation is the formation of a polyester?	
	Identify the monomer(s) required to create the following polyester. 	
	State a use of polyesters.	