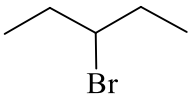
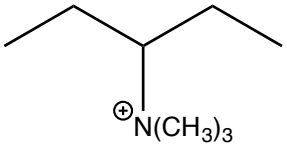
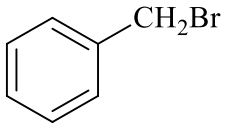
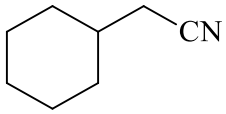
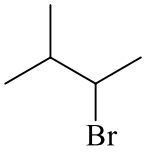
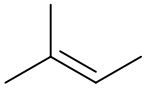
Marks
2

- Complete the following table. Make sure you give the name of the starting material where indicated.

STARTING MATERIAL	REAGENTS/ CONDITIONS	CONSTITUTIONAL FORMULA(S) OF MAJOR ORGANIC PRODUCT(S)
 **Name: 3-bromopentane**	$N(CH_3)_3$	 $Br^{\ominus}$

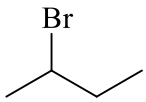
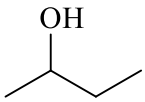
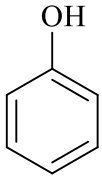
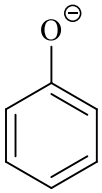
Marks 2

- Complete the following table. Make sure you give the name of the starting material where indicated.

STARTING MATERIAL	REAGENTS/ CONDITIONS	CONSTITUTIONAL FORMULA(S) OF MAJOR ORGANIC PRODUCT(S)
	KCN / ethanol (solvent)	
	**hot conc. KOH in ethanol solvent**	

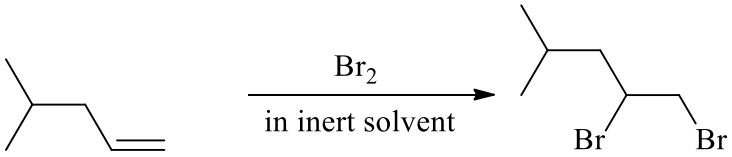
Marks 2

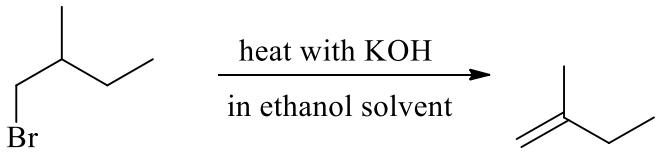
- A number of functional groups react with hydroxide ion. Complete the following table. NB: If there is no reaction, write "no reaction".

Starting Compound	Reaction Conditions	Organic Product(s)
	1 M aqueous NaOH	
	1 M aqueous NaOH	

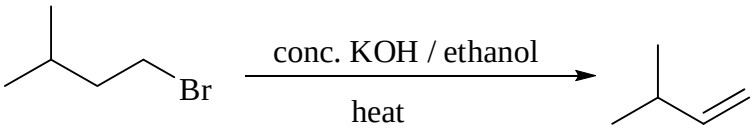
- Give the major organic product(s) from the following reactions. Pay particular attention to the stereochemistry and/or the correct ionic from where relevant.

Marks 2



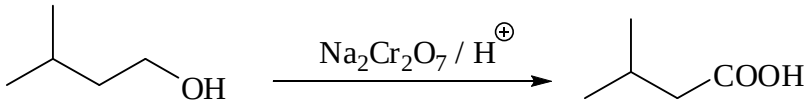


	Marks
• Give the name of the starting material where indicated and the constitutional formula(s) of the major organic product(s) formed in each of the following reactions. NB: if there is no reaction, write "no reaction".	**1**

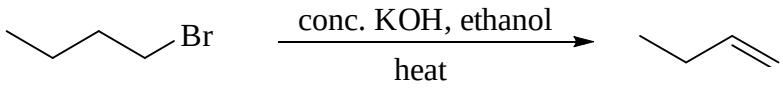


Marks 5

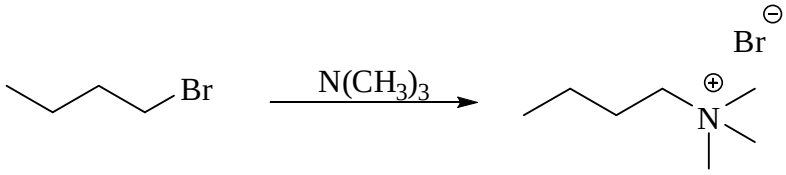
- Give the name of the starting material where indicated and the constitutional formula of the major organic product formed in each of the following reactions.



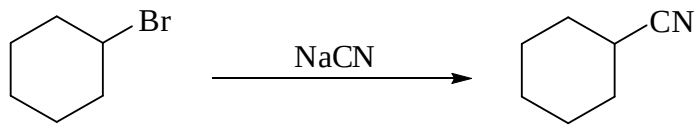
Name: 3-methyl-1-butanol



Name: 1-bromobutane

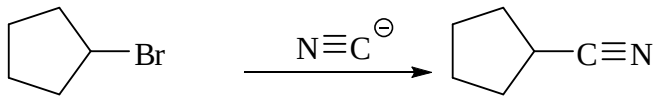


- Give the constitutional formula(s) of the organic products formed in each of the following reactions.



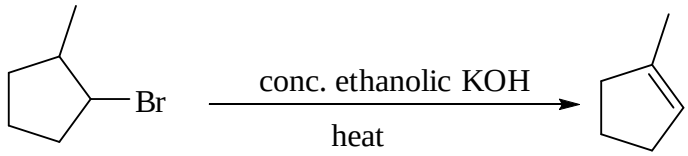
Marks 3

- Give the name of the starting material where indicated and the constitutional formula of the major organic product formed in each of the following reactions.



Name: bromocyclopentane

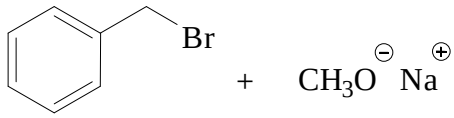
(Nucleophilic substitution by Br^- by CN^-)

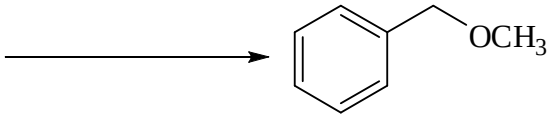


(Base catalysed elimination of H-Br to form a C=C, following Zeitsev's rule).

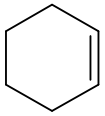
Marks 6

- Classify the starting materials for each of the following reactions as nucleophile and electrophile in the boxes provided and draw the structure of the product.

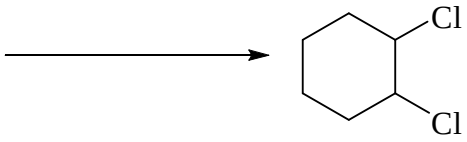




electrophile	**nucleophile**



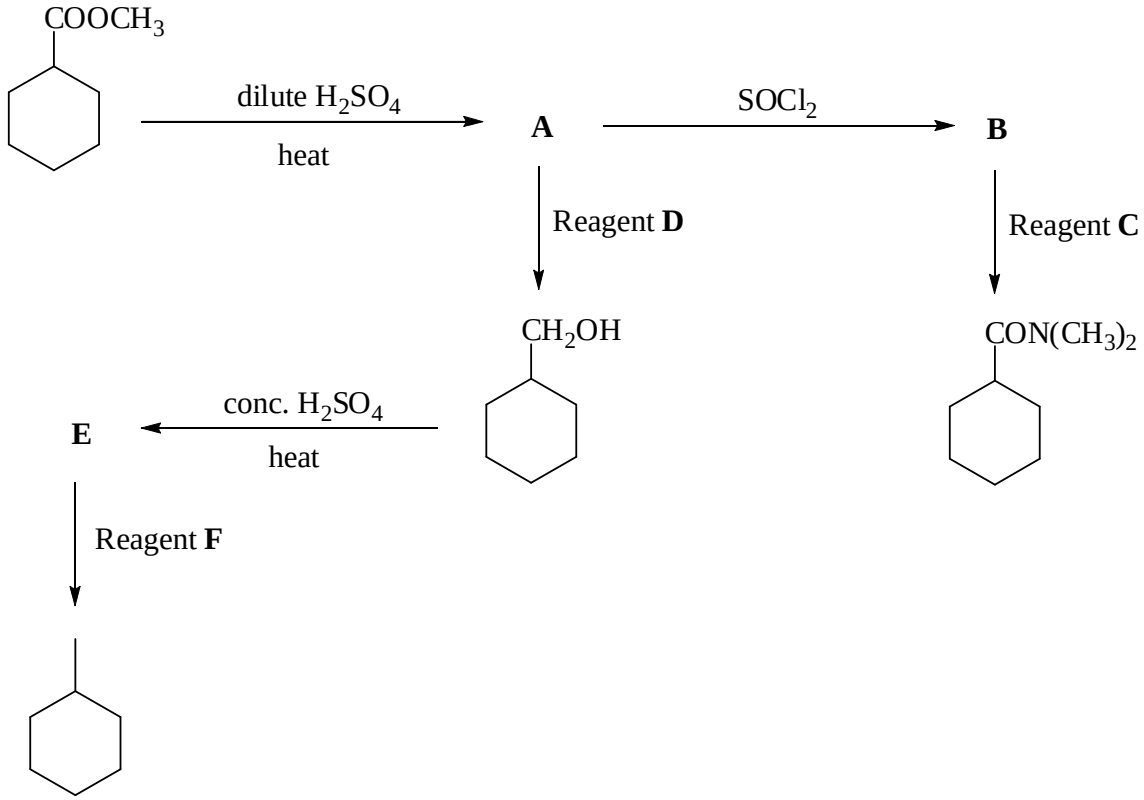
+ Cl_2



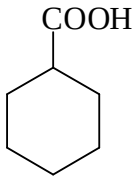
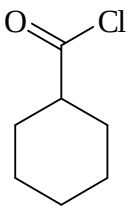
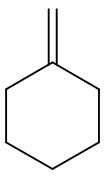
nucleophile	**electrophile**

Marks 6

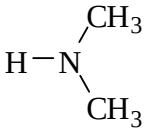
- Consider the following reaction sequence.



Give the reagents **C**, **D** and **F** and draw the structures of the major organic products, **A**, **B** and **E**, formed in these reactions.

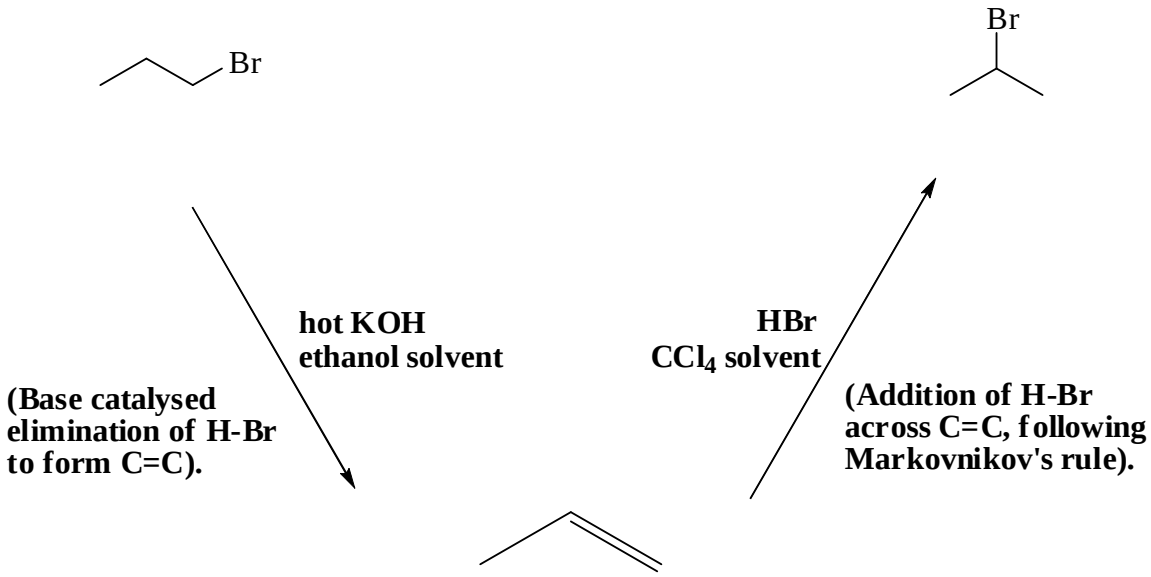
A  **(Hydrolysis of an ester to a carboxylic acid).**	**D** **(1). $LiAlH_4$ / dry ether** **(2). H^+ / H_2O** **(Reduction of carboxylic acid to primary alcohol).**
B  **(Formation of an acid chloride from a carboxylic acid).**	**E**  **(Acid catalysed elimination of H-OH ("dehydration") to form C=C).**

ANSWER CONTINUES ON THE NEXT PAGE

C	**F**
 **(Formation of amide from acid chloride).**	**H_2 / Pd/C** **(Reduction of alkene to alkane).**

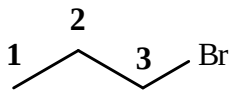
Marks 5

- Show clearly the reagents you would use to carry out the following chemical conversion. Two steps are required. Give the structure of the intermediate compound.

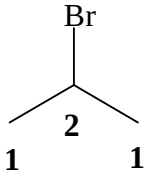


How could you distinguish between the starting material and the product by ^{13}C NMR spectroscopy?

The starting material has 3 different carbon environments so will give 3 resonances in the ^{13}C NMR.



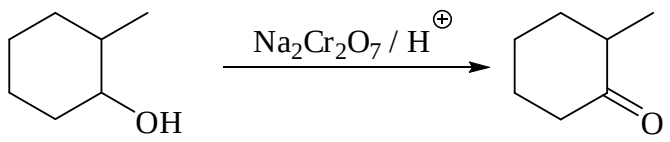
The produt has 2 different carbon environments so will give 2 resonances in the ^{13}C NMR.



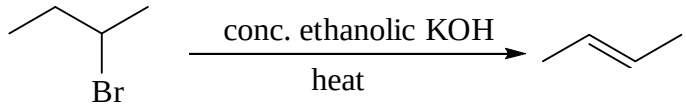
The two carbon atoms labelled as '1' are equivalent.

Marks 5

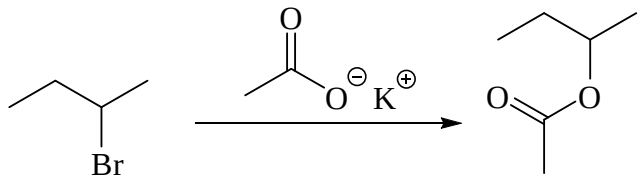
- Give the name of the starting material where indicated and the constitutional formula of the major organic product formed in each of the following reactions.



Name: 2-methylcyclohexanol

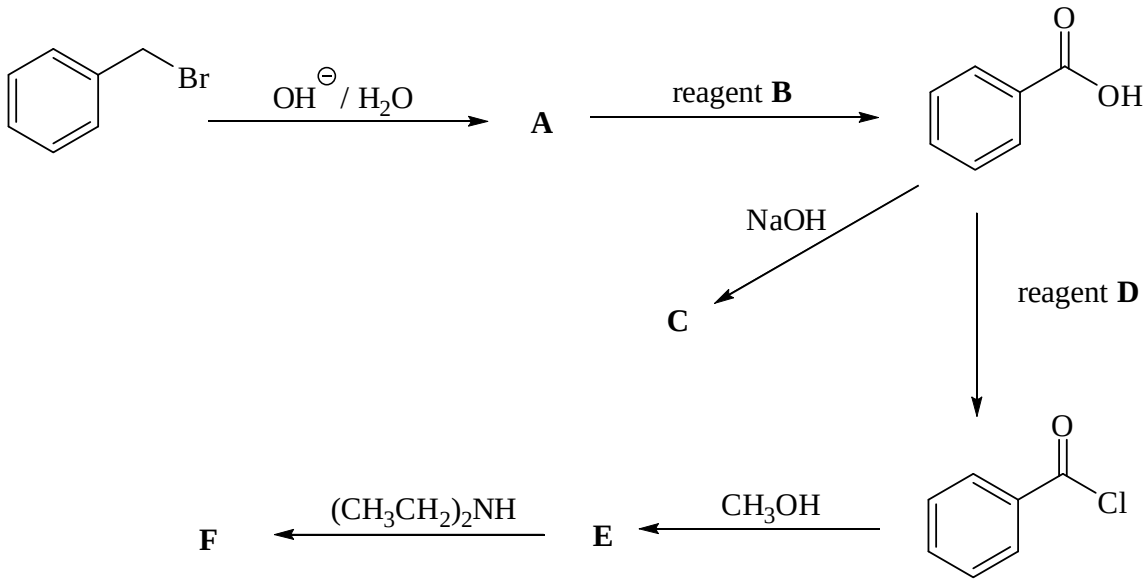


Name: 2-bromobutane

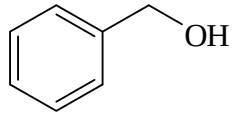
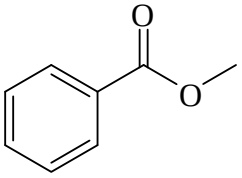
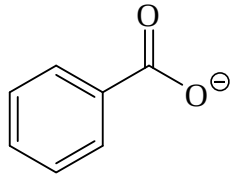
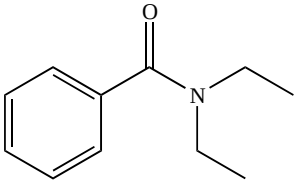


Marks 6

- Consider the following reaction sequence.

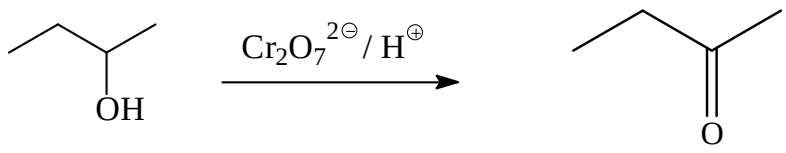


Give the reagents **B** and **D** and draw the structures of the major organic products, **A**, **C**, **E** and **F**, formed in these reactions.

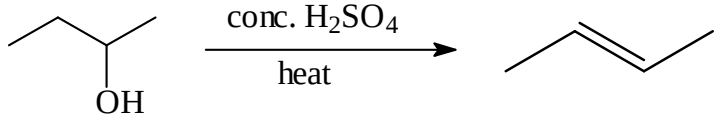
A 	**D** **$SOCl_2$ / heat**
B **$Cr_2O_7^{2-}$ / H^+**	**E** 
C 	**F**  CH_3OH

Marks 5

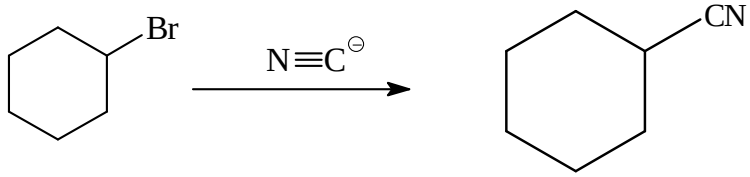
- Give the name of the starting material where indicated and the constitutional formula of the major organic product formed in each of the following reactions.



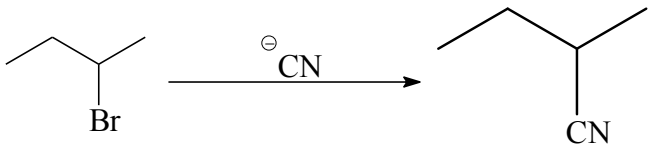
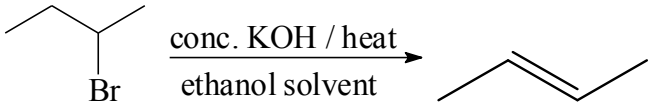
Name: 2-butanol



(Dehydration leading to more substituted double bond: Zeitsev's rule)

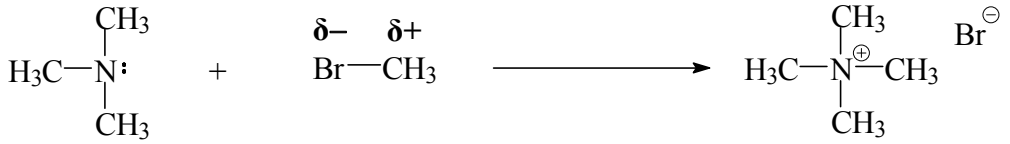


Name: bromocyclohexane

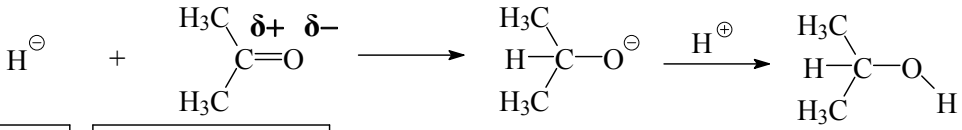
• Give the name of the starting material where indicated and the constitutional formula of the major organic product formed in each of the following reactions.	**Marks**
 **Name: 2-bromobutane**	**3**
	**1**

Marks

- Classify the starting materials of the following reactions as nucleophile or electrophile and indicate with δ⊕ and δ⊖ the polarisation of the C–Br and C=O bonds. **4**

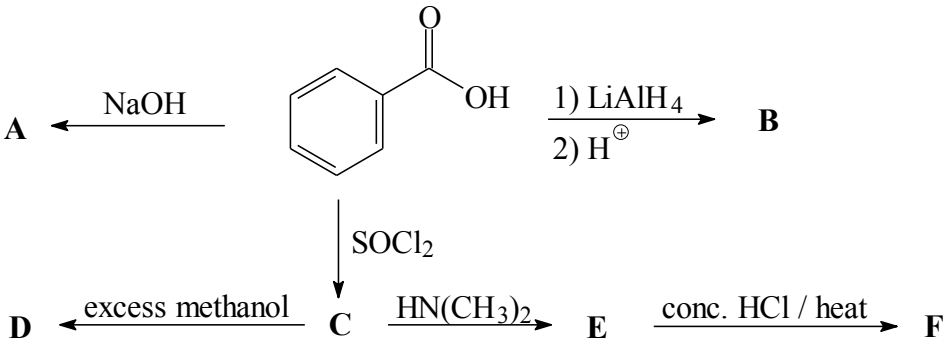


nucleophile **electrophile**



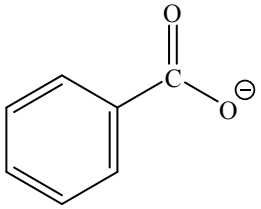
nucleophile **electrophile**

- Consider the following reaction sequence. **6**

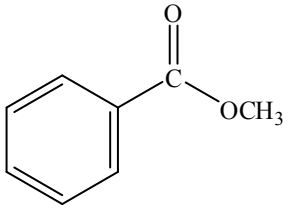


Draw the structures of the major organic products, **A-F**, formed in these reactions.

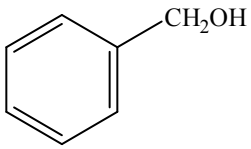
A



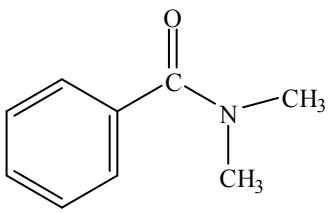
D



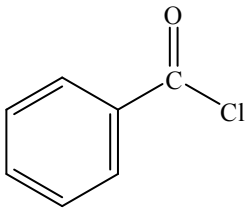
B



E



C



F