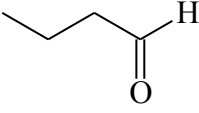
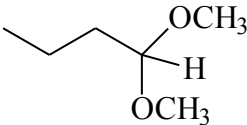
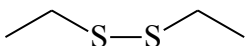
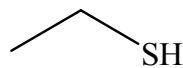
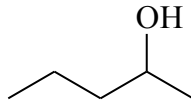
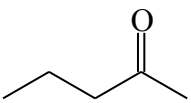
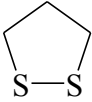
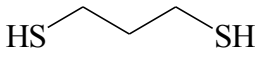
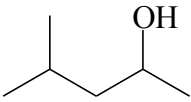
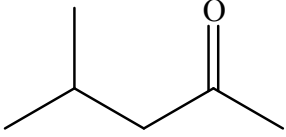
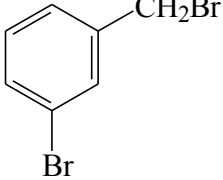
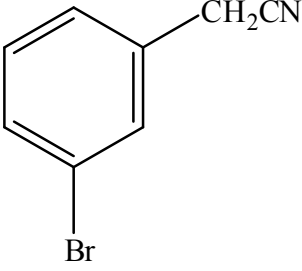
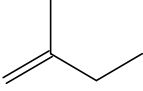
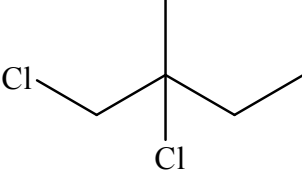
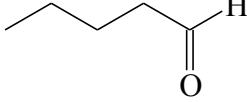
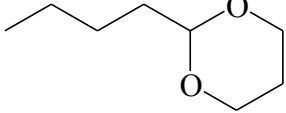


• Complete the following table.

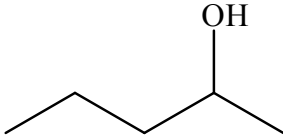
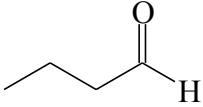
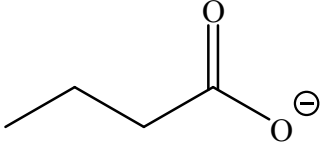
STARTING MATERIAL NAME (where required)	REAGENTS/ CONDITIONS	CONSTITUTIONAL FORMULA(S) OF MAJOR ORGANIC PRODUCT(S)
	excess CH₃OH H⁺ / heat	
	Zn / dilute HCl	2 
	Cr₂O₇²⁻ / H⁺	

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

STARTING MATERIAL NAME (where required)	REAGENTS/ CONDITIONS	CONSTITUTIONAL FORMULA(S) OF MAJOR ORGANIC PRODUCT(S)
	Zn / H^+	
 Name: 4-methyl-2-pentanol	$\text{H}^+ / \text{Cr}_2\text{O}_7^{2-}$	
	$\text{K}^+ \text{CN}^-$	
 Name: 2-methyl-1-butene	$\text{Cl}_2 / \text{CCl}_4(\text{solvent})$	
 Name: pentanal	$\text{HOCH}_2\text{CH}_2\text{CH}_2\text{OH}$ H_2SO_4 (catalyst) heat	

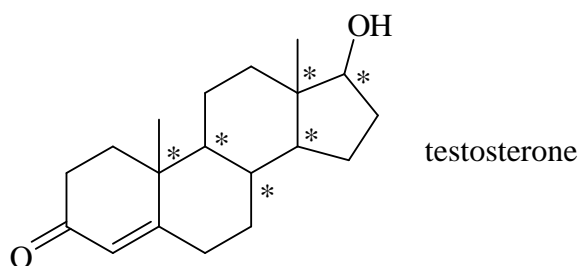
Marks
5

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

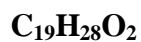
STARTING MATERIAL NAME (where required)	REAGENTS/ CONDITIONS	CONSTITUTIONAL FORMULA(S) OF MAJOR ORGANIC PRODUCT(S)
$\begin{array}{c} \text{CH}_3\text{CH}_2\text{CHCH}_2\text{CH}_3 \\ \\ \text{Br} \end{array}$ <p>Name: 3-bromopentane</p>	$\text{N}(\text{CH}_3)_3$	$\begin{array}{c} \text{CH}_3\text{CH}_2\text{CHCH}_2\text{CH}_3 \\ \\ \text{Br}^- \text{ } ^+\text{N}(\text{CH}_3)_3 \end{array}$
$\begin{array}{c} \text{O} \\ \\ \text{CH}_3\text{CH}_2\text{CH}_2-\text{C}-\text{CH}_3 \end{array}$ <p>Name: 2-pentanone</p>	1. LiAlH_4 / dry ether 2. H^+ / H_2O	
	$[\text{Ag}(\text{NH}_3)_2]^+$ / dil. OH^-	

The structure of testosterone, an important male hormone, is shown below.

Marks
8



Give the molecular formula of testosterone.



Identify the functional groups present in testosterone.

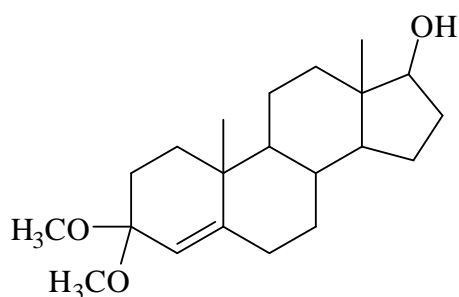
conjugated ketone, alkene, alcohol (secondary)

How many stereogenic (chiral) centres are there in testosterone?

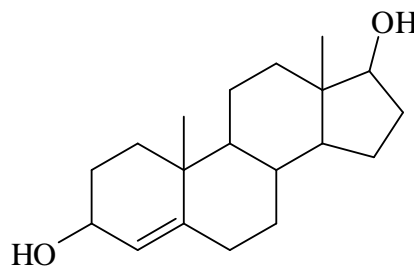
6 (marked above)

Draw the constitutional formula of the product formed when testosterone is treated with the following reagents.

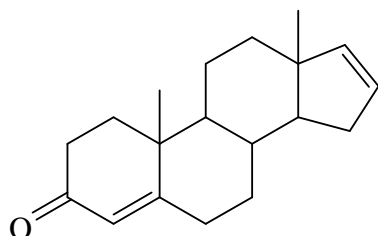
excess methanol / HCl



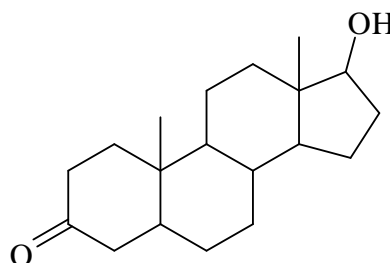
LiAlH_4 in dry ether; then $\text{H}^+ / \text{H}_2\text{O}$



concentrated H_2SO_4 / heat

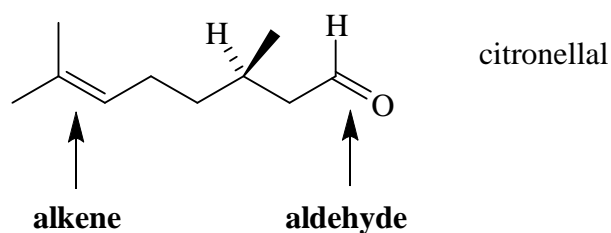


H_2 / Pd catalyst



Marks
5

- (+)-Citronellal is a widely occurring natural product present in citronella oil, lemon and lemon grass. It is used as a soap perfume and in insect repellents.



Give the molecular formula of citronellal.



Identify the functional groups present in citronellal.

Alkene and aldehyde (see structure above)

Draw the constitutional formula of the product(s) formed when citronellal is treated with each of the following reagents.

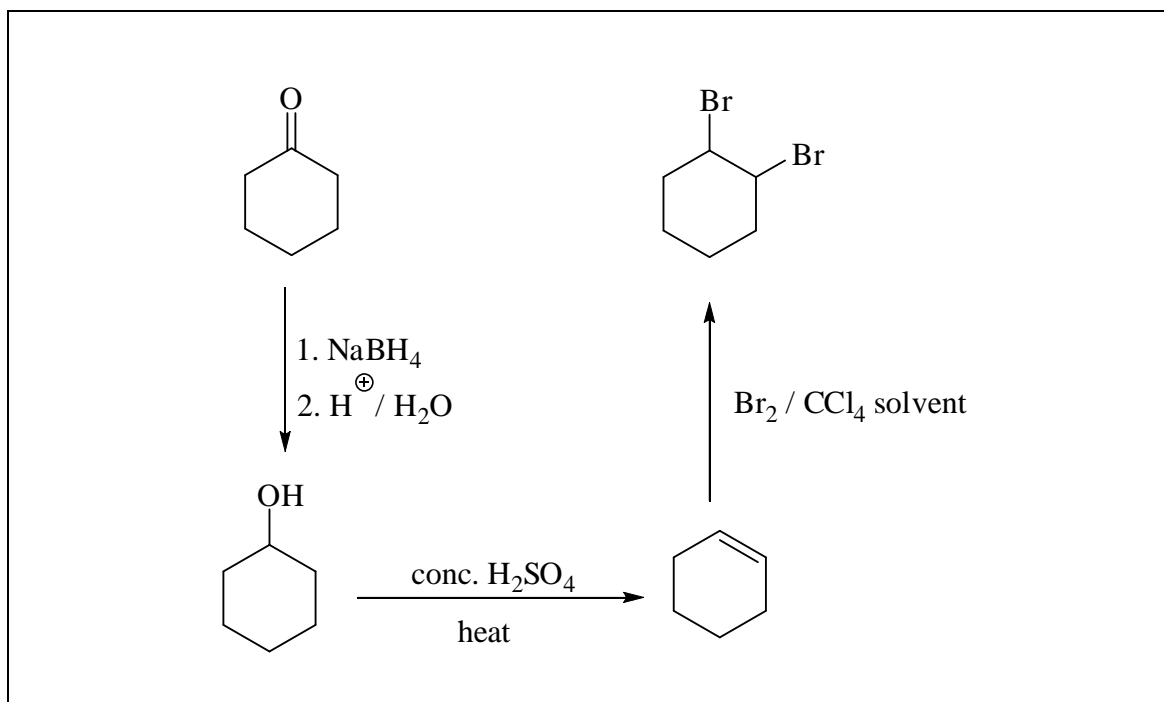
$\text{Cr}_2\text{O}_7^{2-} / \text{H}^+$	
3 M H_2SO_4	
excess CH_3OH / catalytic amount H_2SO_4	

THE REMAINDER OF THIS PAGE IS FOR ROUGH WORKING ONLY.

- Devise a synthesis of 1,2-dibromocyclohexane from cyclohexanone. Note that more than one step is required and you should indicate all necessary steps and the constitutional formulas of any intermediate compounds.

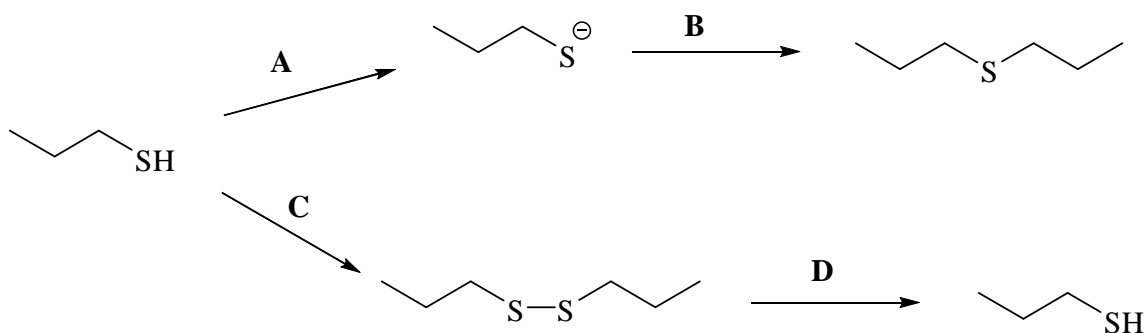
Marks

3



- Indicate the reagents used in the laboratory to undertake the following transformations.

4

A: **NaOH** (deprotonation of RSH by strong base)B: **CH₃CH₂CH₂Br** (nucleophilic attack by RS⁻ with substitution of Br⁻)C: **I₂** (formation of disulfide bridge by oxidation)

Provide a description for transformation B.

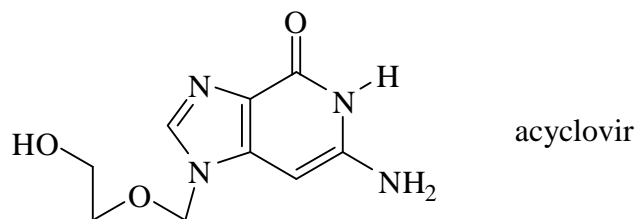
nucleophilic substitution

Provide a description for transformation D.

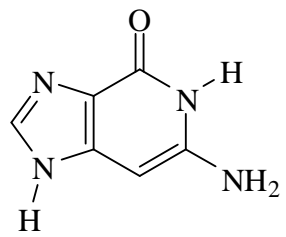
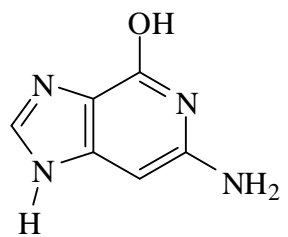
reduction

Marks
4

- Acyclovir is an analogue of the nucleoside guanosine, and is used clinically as an antiviral agent.



Hydrolysis of acyclovir gives the nucleic base guanine, a diol and a carbonyl compound. Give the structures of guanine, a tautomer of guanine, and the diol and carbonyl compounds formed.

guanine 	tautomer of guanine 
the diol <p style="text-align: center;">HOCH₂CH₂OH</p>	the carbonyl compound <p style="text-align: center;">CH₂O</p>

- Show clearly the reagents you would use to carry out the following chemical conversions. Note that more than one step is required and you should indicate all necessary steps and the constitutional formulas of any intermediate compounds.

