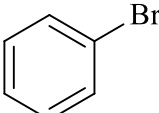
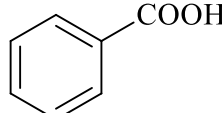
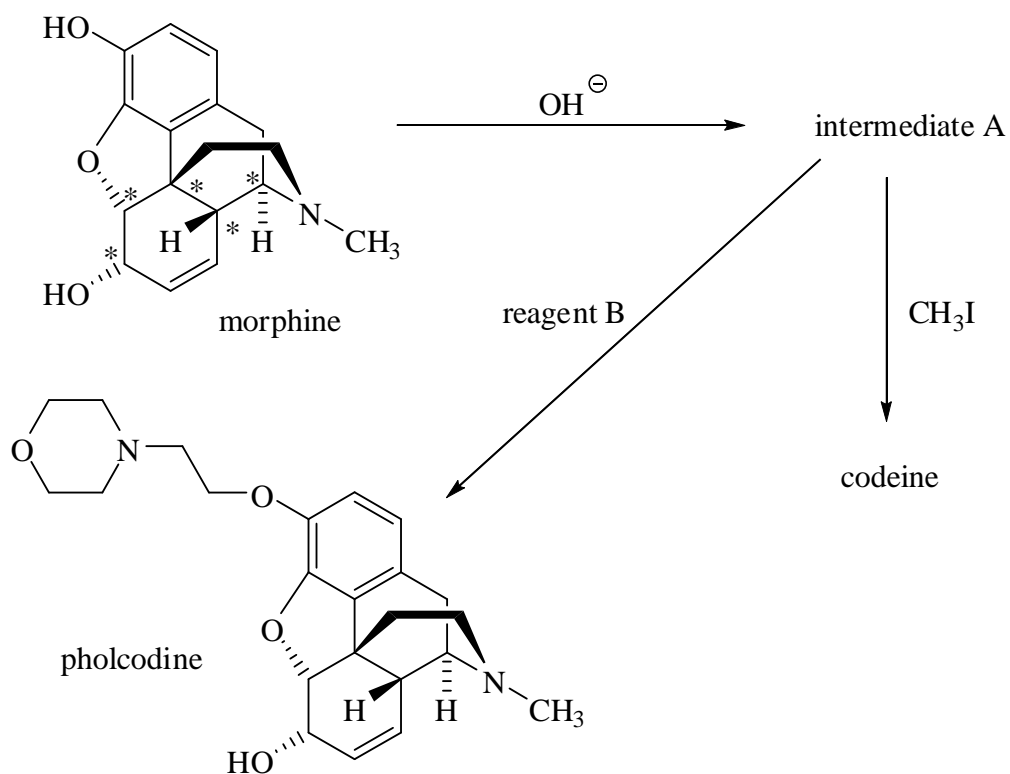


Marks
1

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

STARTING MATERIAL	REAGENTS/ CONDITIONS	CONSTITUTIONAL FORMULA(S) OF MAJOR ORGANIC PRODUCT(S)
	1. Mg / dry ether 2. CO ₂ 3. H [⊕] / H ₂ O	

- Morphine is the principal active agent in opium and is a highly potent analgesic drug. Its structure and conversion into codeine (a moderate analgesic) and pholcodine (a cough suppressant) are shown below.



Give the molecular formula of morphine.

$\text{C}_{17}\text{H}_{19}\text{O}_3\text{N}$

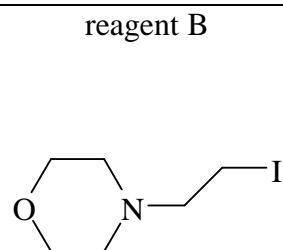
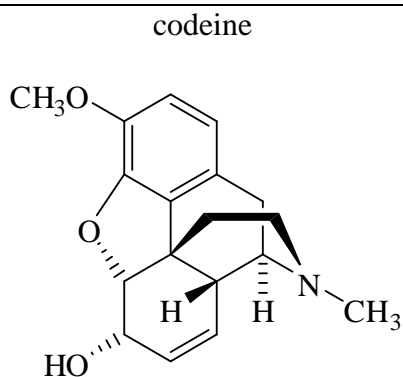
How many stereogenic (chiral) centres are there in morphine?

5 (* on picture)

Identify the functional groups present in morphine.

phenol, amine, alcohol, ether, alkene

Draw the structures of codeine and reagent B.

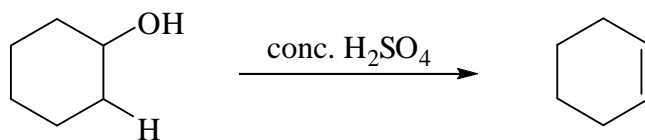


- Define the term "elimination" and illustrate your answer with an equation.

2

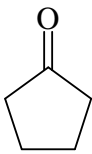
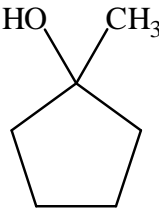
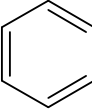
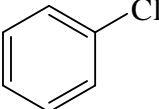
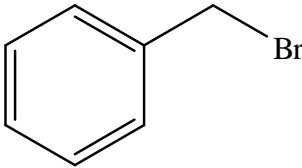
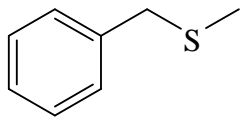
Elimination is the removal of an H^+ and a nucleophile from adjacent atoms, leading to the formation of a double bond between those atoms.

Dehydration is an example of elimination:



Marks
3

• Complete the following table.

STARTING MATERIAL	REAGENTS/ CONDITIONS	CONSTITUTIONAL FORMULA(S) OF MAJOR ORGANIC PRODUCT(S)
	1. CH_3MgBr 2. $\text{H}^+ / \text{H}_2\text{O}$	
	$\text{FeCl}_3 / \text{Cl}_2$ or $\text{AlCl}_3 / \text{Cl}_2$	
	$\text{CH}_3\text{S}^- \text{Na}^+$	

- Show clearly the reagents you would use to carry out the following chemical conversions. Draw constitutional formulas for any intermediate compounds. NOTE: more than one step is necessary in each case.

