

36 ORGANIC SYNTHESIS

Learning outcomes

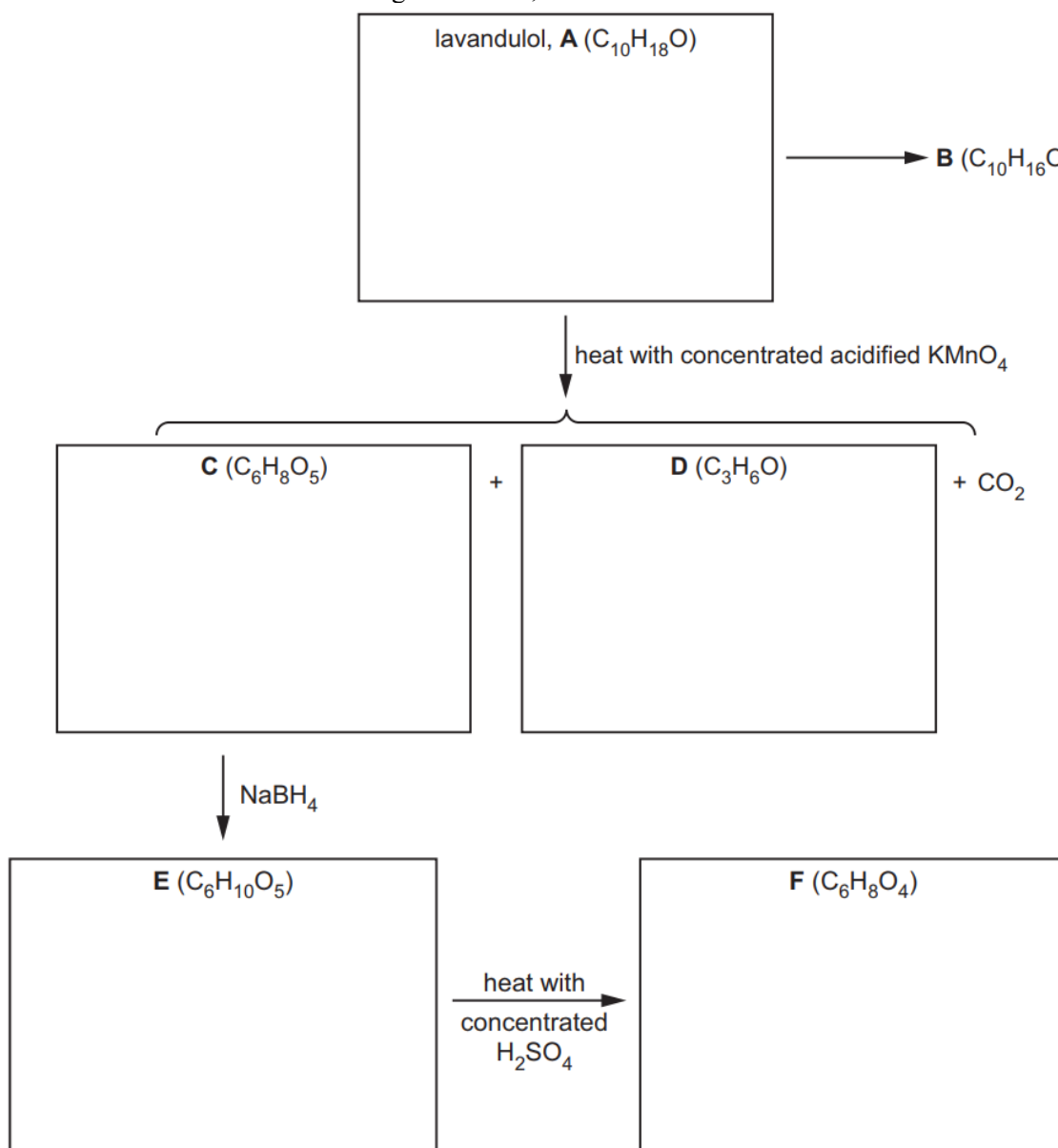
Candidates should be able to:

- for an organic molecule containing several functional groups:
 - identify organic functional groups using the reactions in the syllabus
 - predict properties and reactions
- devise multi-step synthetic routes for preparing organic molecules using the reactions in the syllabus
- analyse a given synthetic route in terms of type of reaction and reagents used for each step of it, and possible by-products

Introduction

- Lavandulol is an aliphatic organic compound and the major component of lavender oil.

Fig. 6.1 shows a reaction scheme involving lavandulol, A.



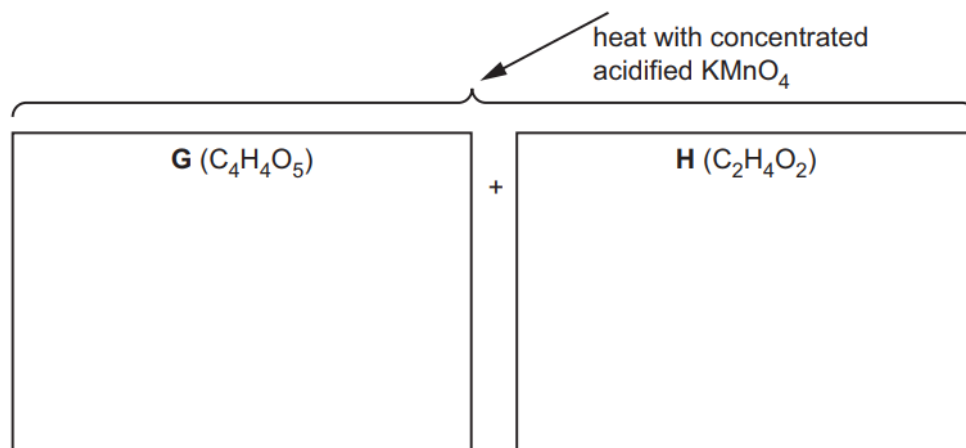


Fig. 6.1

Table 6.2 shows the results obtained when the tests in Table 6.1 are carried out on the eight organic compounds, A–H, in the reaction scheme in Fig. 6.1.

Table 6.2

letter of compound	test					
	sodium metal	$\text{Na}_2\text{CO}_3(\text{aq})$	2,4-DNPH	$\text{I}_2(\text{aq}) + \text{OH}^-(\text{aq})$	warm with Fehling's reagent	$\text{Br}_2(\text{aq})$
A	✓	✗	✗	✗	✗	✓
B	✗	✗	✓	✗	✓	✓
C	✓	✓	✓	✓	✗	✗
D	✗	✗	✓	✓	✗	✗
E	✓	✓	✗	✓	✗	✗
F	✓	✓	✗	✗	✗	✓
G	✓	✓	✓	✗	✗	✗
H	✓	✓	✗	✗	✗	✗

- (i) Deduce the functional group present in compound A using both the molecular formulae of A and B and the reaction of B with Fehling's reagent.
 [1]
- (ii) Name the type of reaction that occurs in each of the following conversions.
- A B
 - C E
 - E F [3]
- (iii) Use the information in Table 6.2 and the molecular formulae to deduce structures for G and H. Draw your structures in Fig. 6.1. [2]
- (iv) Use the information in Table 6.2, the molecular formulae and your answer to (b)(iii) to deduce structures for A, C, D, E and F. Draw your structures in Fig. 6.1. [5]

2. Fig. 9.3 shows the synthesis of compound R from compound P.

3.

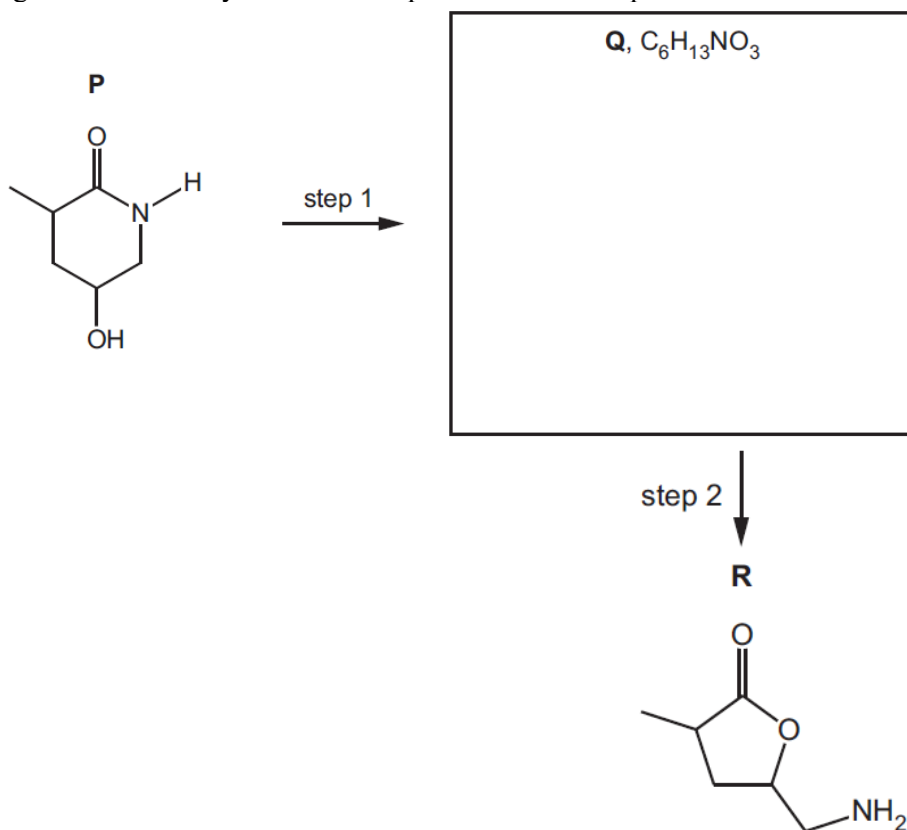


Fig. 9.3

- (i) Draw the structure of Q in Fig. 9.3. [1]
- (ii) State the reagents and conditions for steps 1 and 2 in Fig. 9.3.

step 1

step 2 [2]

4. A group of drugs known as statins are used to lower cholesterol in the blood. A commonly used statin is atorvastatin.

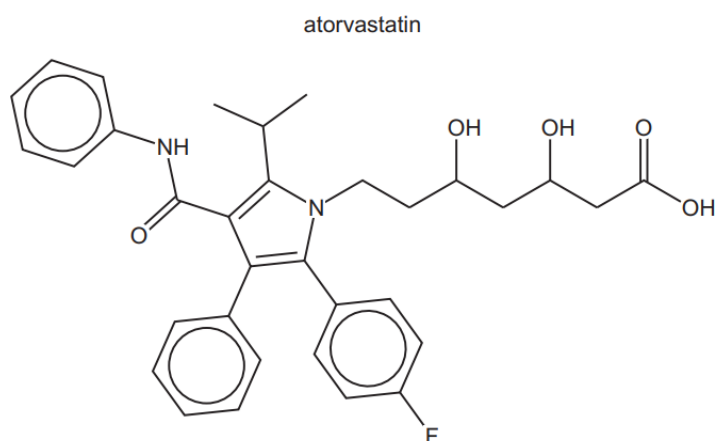


Fig. 5.1

- (a) Statins can break down in the acid found in the stomach.
- (i) Draw a line through the bond in the atorvastatin structure in Fig. 5.1 that could be broken under acid conditions. [1]

(ii) By referring to the structure, explain why atorvastatin dissolves in water.

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..... [1]

5. Isocyanic acid, HNCO , can form cyanuric acid, $\text{C}_3\text{H}_3\text{N}_3\text{O}_3$, under certain conditions. $\text{C}_3\text{H}_3\text{N}_3\text{O}_3$ has a cyclic structure containing alternating carbon and nitrogen atoms in the ring system. Suggest a structure for cyanuric acid. [1]

*****This is not a complete note. It is to guide you. It is recommended to study the prescribed textbooks along with this material. *****