

9 (a) Explain why amides are much weaker bases than amines.

.....

 [2]

(b) Fig. 9.1 shows the preparation of 2-phenylethylamine, $C_6H_5CH_2CH_2NH_2$, by three different routes.

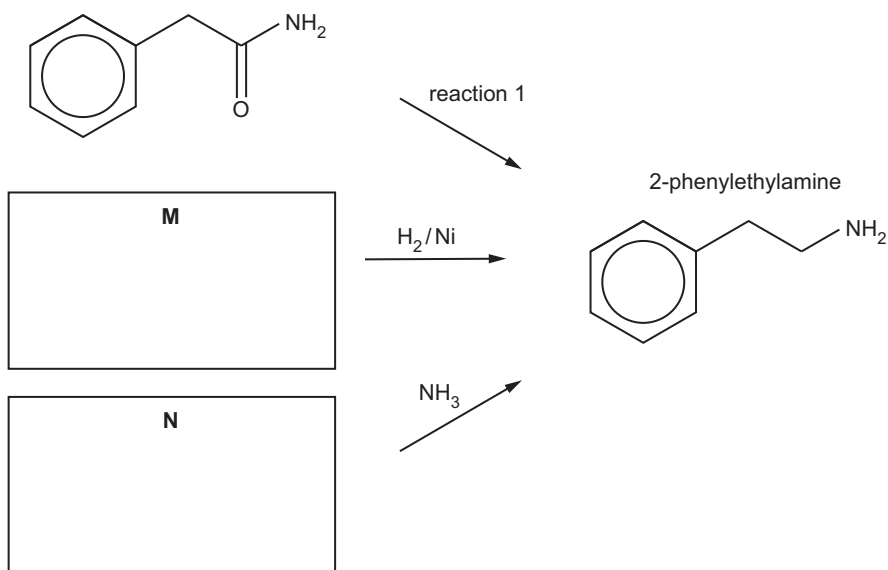


Fig. 9.1

(i) Suggest structures for compounds **M** and **N** and draw them in the boxes in Fig. 9.1. [2]

(ii) Give the reagents and conditions for reaction 1.

..... [1]

(c) Fig. 9.2 shows compound **H** which is a useful starting material in organic synthesis.

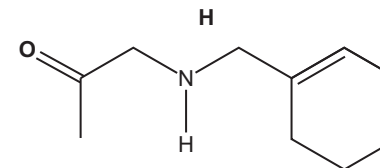


Fig. 9.2

H contains an alkene and an amine functional group.

Name the **other** functional group and give the classification of the amine group in **H**.

other functional group in **H**

classification of amine

[1]

(d) Ozonolysis involves the oxidative cleavage of a C=C bond in alkenes using ozone, O_3 , as shown in Fig. 9.3.

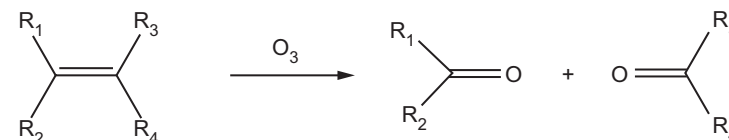


Fig. 9.3

Fig. 9.4 shows the first step in this reaction which involves the formation of an ozonide intermediate.

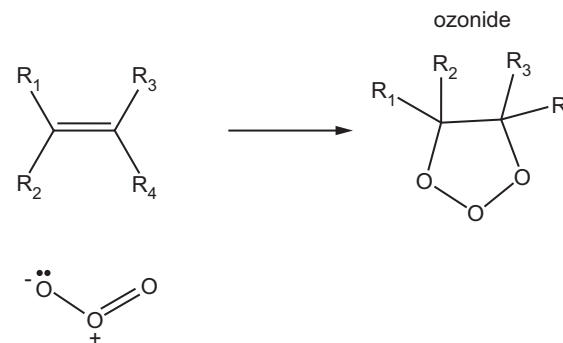
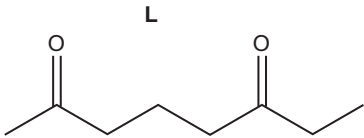


Fig. 9.4

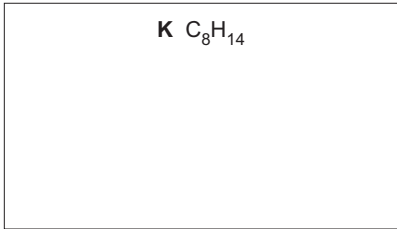
(i) On Fig. 9.4, draw **three** curly arrows to complete the mechanism of this step.

[2]

(ii) L is formed from alkene K, C₈H₁₄, by a similar reaction to that shown in Fig. 9.3.



Suggest the structure of K.



[1]
[Total: 9]

Important values, constants and standards

molar gas constant	$R = 8.31 \text{ J K}^{-1} \text{ mol}^{-1}$
Faraday constant	$F = 9.65 \times 10^4 \text{ C mol}^{-1}$
Avogadro constant	$L = 6.02 \times 10^{23} \text{ mol}^{-1}$
electronic charge	$e = -1.60 \times 10^{-19} \text{ C}$
molar volume of gas	$V_m = 22.4 \text{ dm}^3 \text{ mol}^{-1}$ at s.t.p. (101 kPa and 273 K) $V_m = 24.0 \text{ dm}^3 \text{ mol}^{-1}$ at room conditions
ionic product of water	$K_w = 1.00 \times 10^{-14} \text{ mol}^2 \text{ dm}^{-6}$ (at 298 K (25°C))
specific heat capacity of water	$c = 4.18 \text{ kJ kg}^{-1} \text{ K}^{-1}$ (4.18 J g ⁻¹ K ⁻¹)

The Periodic Table of Elements

Group																			
1	2	Key										13	14	15	16	17	18		
		atomic number atomic symbol name relative atomic mass										1							2
3 Li lithium 6.9	4 Be beryllium 9.0											1 H hydrogen 1.0							He helium 4.0
11	12																	10	
Na sodium 23.0	Mg magnesium 24.3																	Ne neon 20.2	
19	20																	9	
K potassium 39.1	Ca calcium 40.1																	F fluorine 19.0	
37	38																	17	
Rb rubidium 85.5	Sr strontium 87.6																	Ar argon 39.9	
55	56																	54	
Cs caesium 132.9	Ba barium 137.3																	Xe xenon 131.3	
87	88																	86	
Fr francium	Ra radium																	Rn radon	
																		118	
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