34. Nitrogen compounds

34.3 Amides

Paper 4

Question Paper

1 Neotame is an artificial sweetener added to some foods.

neotame

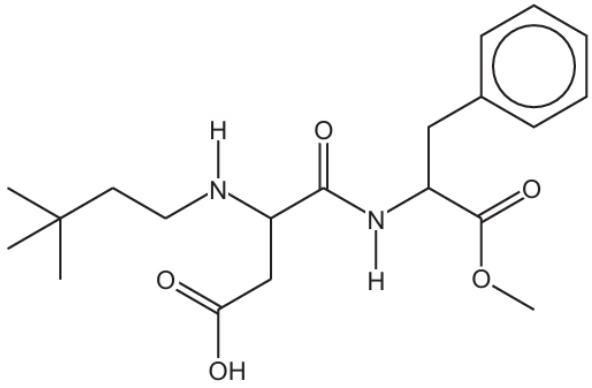


Fig. 8.1

(b) Neotame reacts with an excess of hot NaOH(aq) to form three organic products.

(i) State the **two** types of reaction that occur when neotame reacts with hot NaOH(aq).

1 .....

2 .....

[2]

neotame

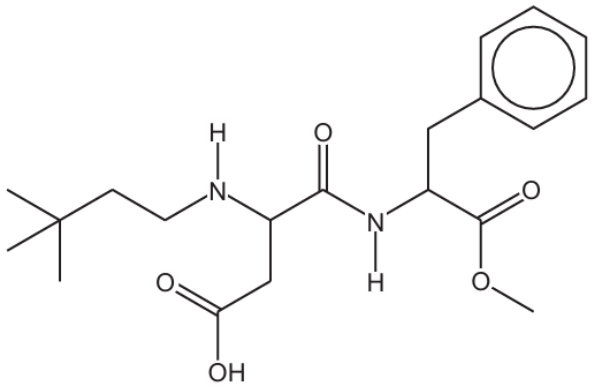


Fig. 8.1

(ii) Draw the structures of the **three** organic products formed from the reaction of neotame with an excess of hot NaOH(aq).

[3]

2 **(c)** Explain why benzamide, $C_6H_5CONH_2$, is a much weaker base than ammonia, NH_3.

.....

..... [1]

3 **(a)** State the relative basicities of ethanamide, diethylamine and ethylamine in aqueous solution.

Explain your answer.

..... > ..... > .....
most basic least basic

.....

.....

.....

.....

.....
[4]

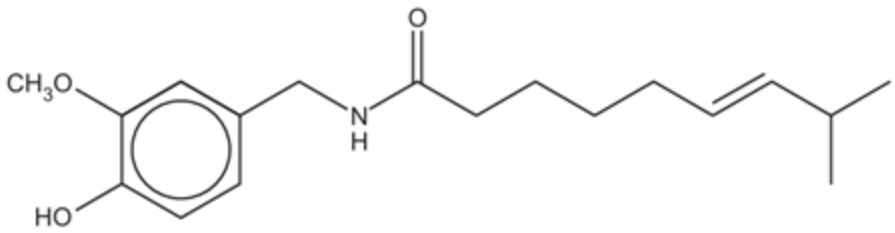
4 **(b)** **(ii)** A sample of perindopril is hydrolysed with hot aqueous acid.

Draw the structures of the **three** organic products of the **complete** acid hydrolysis of perindopril.

[3]

5 Capsaicin is found in chilli peppers.

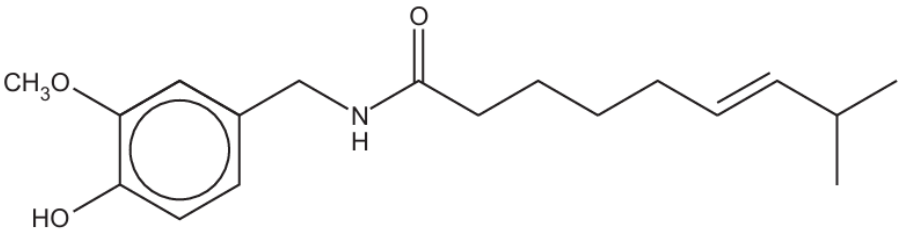
capsaicin



You should assume the CH_3O group is unreactive in the reactions involved in this question.

(e) (i) Capsaicin is heated with an excess of hot aqueous NaOH.

capsaicin



Draw the structures of the two organic products **H** and **K**.

H $C_8H_{10}NO_2Na$

K $C_{10}H_{17}O_2Na$

[2]

(ii) Name the **two** types of reaction occurring in **(e)(i)**.

..... [1]

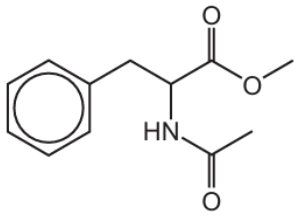
(f) Draw the structure of the organic product **L** formed when capsaicin is treated with $LiAlH_4$ in dry ether.

L

[1]

6 **(b)** **P** can be used to make compound **Q** in a single step reaction.

Q



(iii) Compare the relative basicities of compound **P**, compound **Q** and phenylamine.

..... < ..... < .....

least basic most basic

Explain your answer.

.....

.....

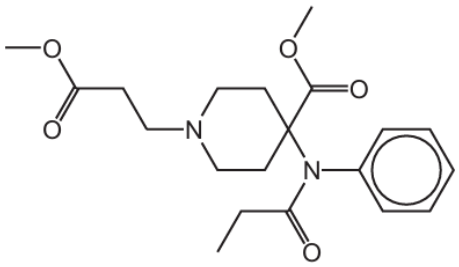
.....

.....

[3]

7 **(b)** The drug remifentanil is shown.

remifentanil



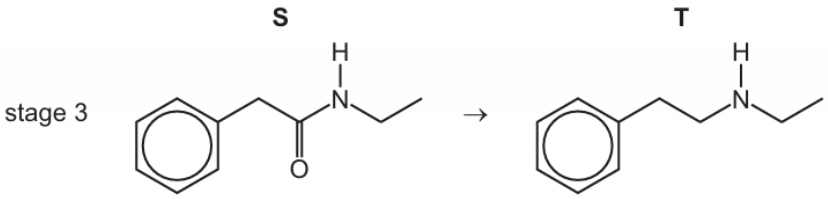
Remifentanil is **completely** hydrolysed under acidic conditions. Three different organic compounds are formed.

Draw the structures for these organic compounds in the boxes.

[3]

8 Compound **T** is made by a three-stage synthesis.

(c) In stage 3, compound **S** reacts with a suitable reagent to form compound **T**.



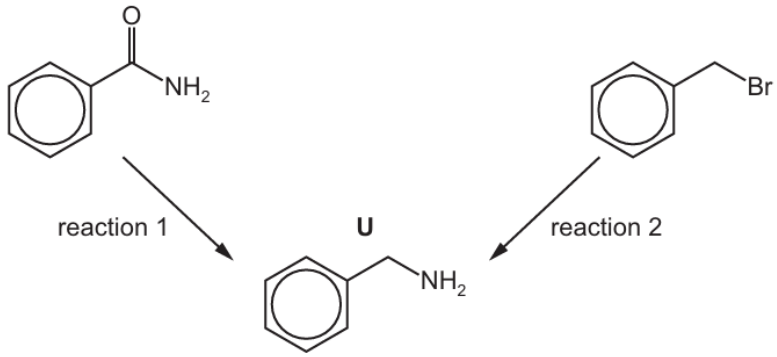
(i) State the formula of a suitable reagent for stage 3.

..... [1]

(ii) Name the type of reaction that occurs in stage 3.

..... [1]

9 **(b)** Compound **U** can be prepared by two different methods as shown.



(i) Suggest reagents and conditions for reaction 1 and for reaction 2.

reaction 1 .....

reaction 2 .....

[2]

(ii) State the type of reaction in reaction 1 and name the mechanism in reaction 2.

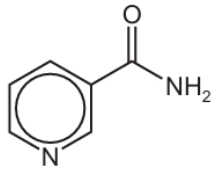
type of reaction in reaction 1 .....

mechanism of reaction 2 .....

[2]

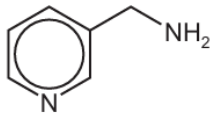
10 The structure of nicotinamide is shown.

nicotinamide



(d) Nicotinamide can be reduced to compound **X**.

X



(i) Identify a suitable reducing agent for this reaction.

..... [1]

(ii) Predict and explain the relative basicities of the NH_2 groups in phenylamine, $C_6H_5NH_2$, nicotinamide and compound **X**.

.....

.....

.....

..... [3]