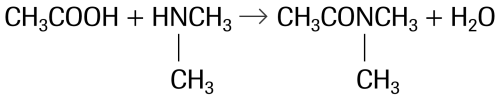
7. (a) Each small unit must contain an amino group and a carboxyl group, so that an amide bond can form between small units.
   (b) Because they have both amino groups and carboxyl groups, amino acids are likely fairly soluble in water and are capable of forming strong amide bonds.

Making Connections

8. The carboxylic acids, such as citric acid in lemons and acetic acid in vinegar, react with the amines responsible for the fishy taste in fish to produce amides, thereby reducing the smell. For example,



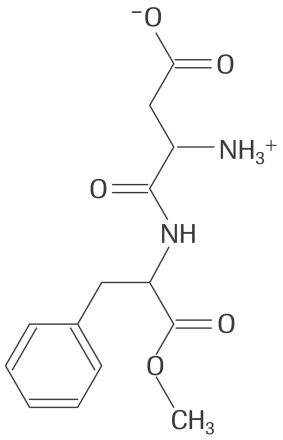
ethanoic acid + dimethylamine $\rightarrow$ *N, N*-dimethyl ethanamide + water

3.16 EXPLORE AN ISSUE: REGULAR OR DIET?

Understanding the Issue

(Page 232)

1. cyclamates, saccharin, aspartame
2. (a) People who are trying to reduce their food energy intake, or who are living with diabetes, can still enjoy sweetened drinks and foods. Also, artificially sweetened products do not contribute to tooth decay.
   (b) People who use artificial sweeteners are not avoiding highly sweetened foods and drinks, so are likely to continue to consume them, whether sweetened naturally or artificially. Consuming sweetened foods may lead to continued weight gain and tooth decay. Furthermore, studies indicate that artificial sweeteners may be bad for your health.
3. (a)



aspartame

$M_{\text{aspartame}} = 294.34$ g/mol

   (b) $M_{\text{aspartame}} = 294.34$ g/mol

The portion in the aspartame molecule attributable to methanol is CH_3O.

$m_{CH_3O} = 31.04$ g

$$\%CH_3O = \frac{31.04\text{ g}}{294.34\text{ g/mol}} \times 100\%$$

$\%CH_3O = 10.55\%$

   (c) $$m_{CH_3OH} = 200\text{ mg} \times \frac{M_{CH_3OH}}{M_{aspartame}}$$

$$= 200\text{ mg} \times \frac{32.05\text{ g/mol}}{294.34\text{ g/mol}}$$

$m_{CH_3OH} = 21.8$ mg

(d) $LD_{50(70\ kg)} = 0.07\ g/kg \times 70\ kg$
$LD_{50(70\ kg)} = 4.9\ g = 4900\ mg$

(e) number of cans of diet pop $= \dfrac{4900\ mg}{21.8\ mg/can}$
$= 220$ cans

TAKE A STAND: HEALTH BENEFIT OR HEALTH HAZARD?

(Page 232)

(a) Student answers will vary.
Aspartame:
Reasons for its use: reducing caloric intake, to counter obesity; for sugar-reduced or sugar-free diets, e.g., for diabetic patients; to reduce incidence of tooth-decay

(b) Student answers will vary.
Factors to consider: experimental design, e.g., use of controlled variables; type of system tested, e.g., tests done on mice, and the information transferred to human applications; size of population tested; number of independent research groups reporting findings; funding of the research group, e.g., whether the research is funded by the manufacturer of the product.

(c) [Sample answer] Risks are still uncertain and debatable. In some cases, benefits outweigh the risks, as in sugar-free diets prescribed by doctors. In other cases, any possible risk should be reduced by minimizing the daily use of aspartame.

3.17 ACTIVITY: CLASSIFYING PLASTICS

(Pages 233–236)

Observations

(a)

Table 2 Summary of Observations and Possible SPI Codes (sample answer)

Sample tested	Density	Flame colour	Acetone	Melting	Possible SPI code
1	floats in water, in alcohol solution, and in corn oil				code 5: PP
2	floats in water and in alcohol solution, and sinks in corn oil				code 4: LDPE
3	floats in water, and sinks in alcohol solution				code 2: HDPE
4	sinks in water	green			code 3: PVC
5	sinks in water	not green	increased softness in acetone		code 6: PS
6	sinks in water	not green	no increased softness in acetone	increased softness in boiling water	code 1: PETE

Analysis

(b) **Part 1**
In water: Samples that float may be resin codes 2, 4, or 5 (less dense than water, whose density is 1 g/mL). Samples that sink may be resin codes 1, 3, or 6.

In alcohol solution: Samples that float may be resin codes 4 or 5 (less dense than alcohol solution). Samples that sink may be resin code 2.

In oil: Samples that float may be resin code 5 (less dense than resins 4 and 5). Samples that sink may be resin code 4.

Part 2
Flame test: Of possible resin codes 1, 3, or 6, resin code 3 contains chlorine atoms. The sample that produces a green flame is resin code 3.