14.20 For a copolymer consisting of 35 wt% ethylene and 65 wt% propylene, we are asked to determine the fraction of both repeat unit types.

In 100 g of this material, there are 35 g of ethylene and 65 g of propylene. The ethylene (C_2H_4) molecular weight is

$$m(\text{ethylene}) = 2(A_C) + 4(A_H)$$

$$= (2)(12.01 \text{ g/mol}) + (4)(1.008 \text{ g/mol}) = 28.05 \text{ g/mol}$$

The propylene (C_3H_6) molecular weight is

$$m(\text{propylene}) = 3(A_C) + 6(A_H)$$

$$= (3)(12.01 \text{ g/mol}) + (6)(1.008 \text{ g/mol}) = 42.08 \text{ g/mol}$$

Therefore, in 100 g of this material, there are

$$\frac{35 \text{ g}}{28.05 \text{ g/mol}} = 1.25 \text{ mol of ethylene}$$

and

$$\frac{65 \text{ g}}{42.08 \text{ g/mol}} = 1.54 \text{ mol of propylene}$$

Thus, the fraction of the ethylene repeat unit, $f(\text{ethylene})$, is just

$$f(\text{ethylene}) = \frac{1.25 \text{ mol}}{1.25 \text{ mol} + 1.54 \text{ mol}} = 0.45$$

Likewise,

$$f(\text{propylene}) = \frac{1.54 \text{ mol}}{1.25 \text{ mol} + 1.54 \text{ mol}} = 0.55$$