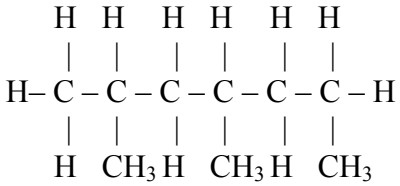
Name: _____

3.091 Fall Term 2002

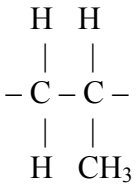
Homework Quiz #11B

Propylene or propene, $H_2C{=}CH{-}CH_3$, can be reacted to form isotactic polypropylene (PP), a rigid polymer used, among other things, to make stackable chairs.

(a) Draw a trimer of isotactic polypropylene.



(b) What is the value of the degree of polymerization, n, for isotactic polypropylene with a molecular weight of 500,000 g/mol?

the mer unit is  which has the molecular weight (MW)

$(3 \times 12 \text{ for C}) + (6 \times 1 \text{ for H}) = 42 \text{ g/mol}$

$$n = \frac{500,000}{MW(PP)} = \frac{500,000}{42} = 1.2\times10^4$$

(c) Would you expect the glass transition temperature, T_g, of isotactic polypropylene to be higher or lower than that of polyethylene ($-CH_2-CH_2-$)? Explain.

PE is more fluid than *i*PP owing to simpler sidegroups in PE

$\therefore$ glass forming is more difficult in PE or, conversely, xtallization is easier in PE

$\therefore$ lower T_g for PE ☞ higher T_g for *i*PP