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Compute repeat unit molecular weights for the following

a

polytetrafluoroethylene

✓ Answer ✓

$$4F + 2C$$
$$100.014 \text{ g/mol}$$

b

poly(methyl methacrylate)

✓ Answer

$$5C + 8H + 2O$$
$$100.12 \text{ g/mol}$$

c

nylon 6,6

✓ Answer

$$12C + 22H + 2O + 2N$$
$$226.32 \text{ g/mol}$$

d

poly(ethylene terephthalate)

✓ Answer

$$10C + 8H + 4O$$
$$192.2 \text{ g/mol}$$

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The following table lists molecular weight data for a polytetrafluoroethylene material. Compute the following:

Molecular Weight Range	x_i	w_i
10000-20000	0.03	0.01
20000-30000	0.09	0.04
30000-40000	0.15	0.11
40000-50000	0.25	0.23
50000-60000	0.22	0.24
60000-70000	0.14	0.18
70000-80000	0.08	0.12
80000-90000	0.04	0.07

a

the number-average molecular weight

✓ **Answer**

$$\sum_w w x_i(w), w \in \{15000, 25000, 35000, 45000, 55000, 65000, 75000, 85000\}$$
$$= 49800 \text{ g/mol}$$

b

the weight-average molecular weight

✓ **Answer**

$$\sum_w w x_i(w), w \in \{15000, 25000, 35000, 45000, 55000, 65000, 75000, 85000\}$$
$$= 55200 \text{ g/mol}$$

c

the degree of polymerization.

✓ **Answer**

$$DP = \frac{M_w}{M_0} = \frac{49800}{100.014} = 497.93$$

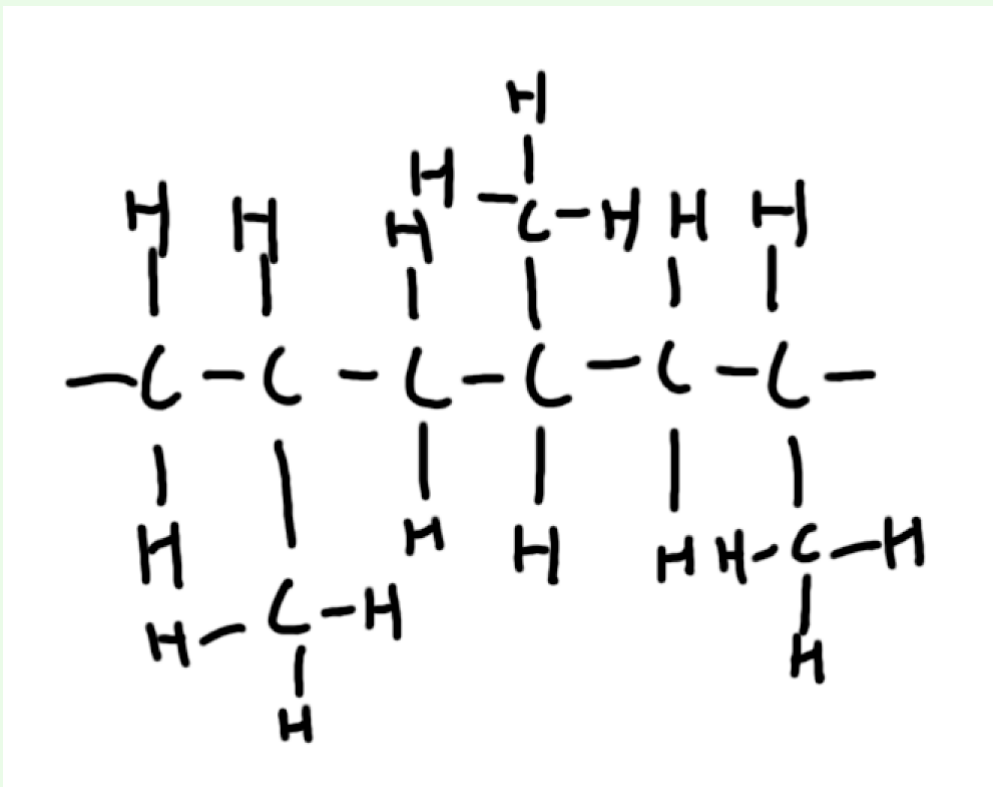
11

Sketch portions of a linear polypropylene molecule that are

a

syndiotactic

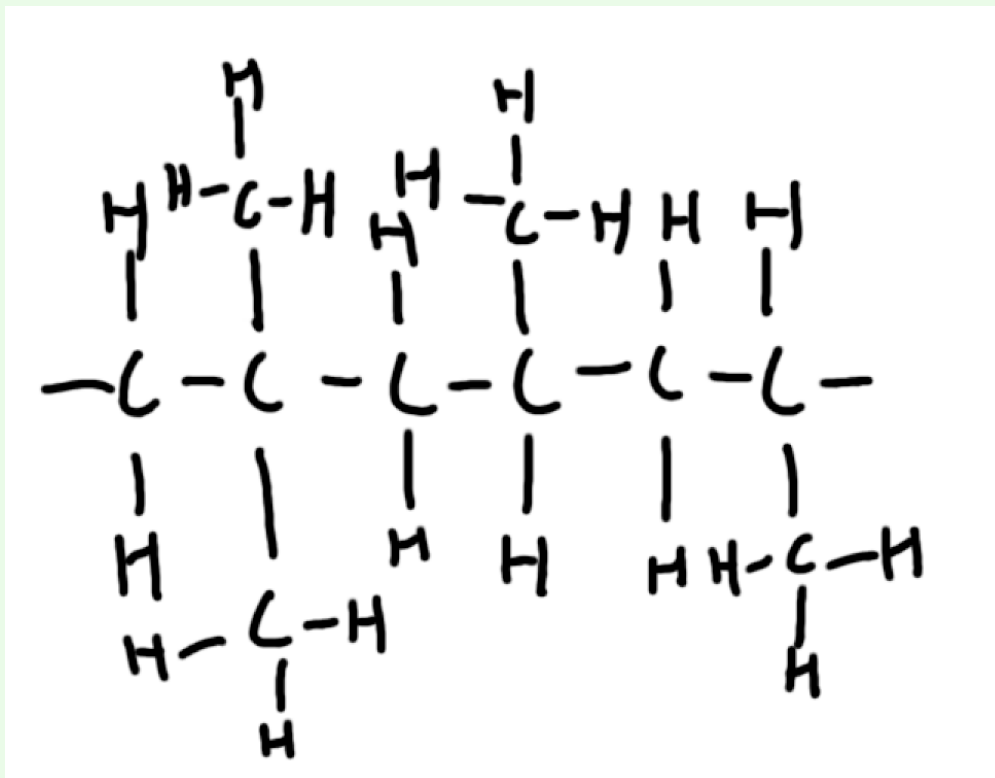
✓ Answer



b

atactic

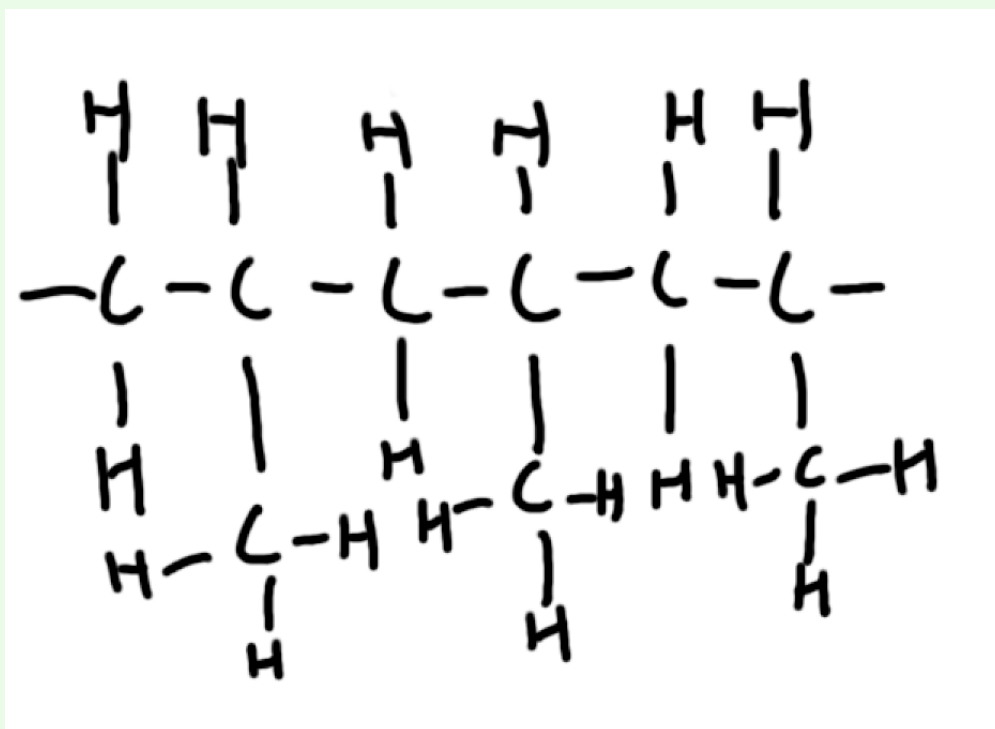
✓ Answer



C

isotactic

✓ Answer



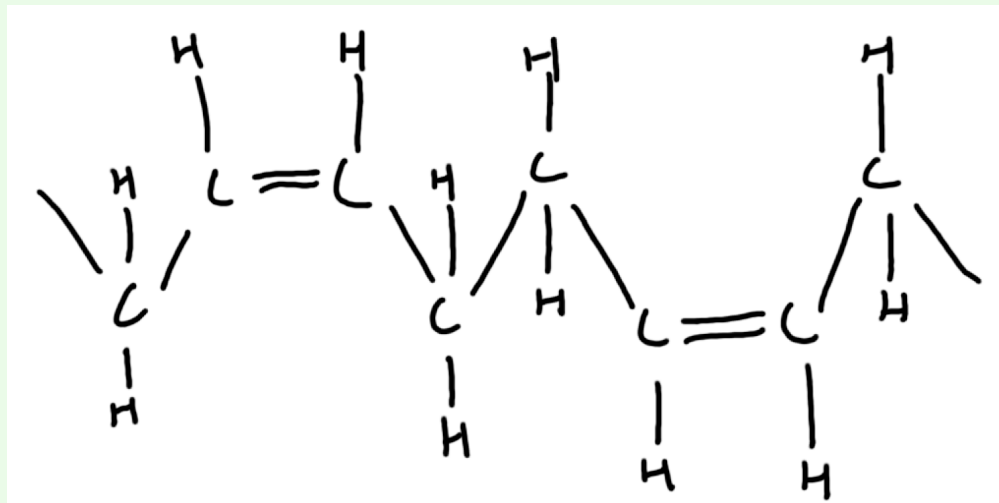
Sketch cis and trans structures for

a

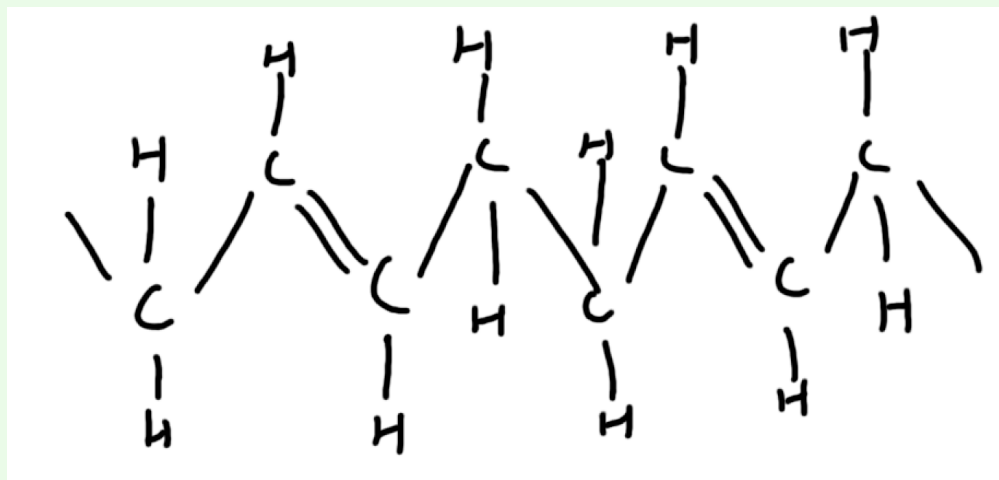
polybutadiene

✓ Answer

Cis



Trans

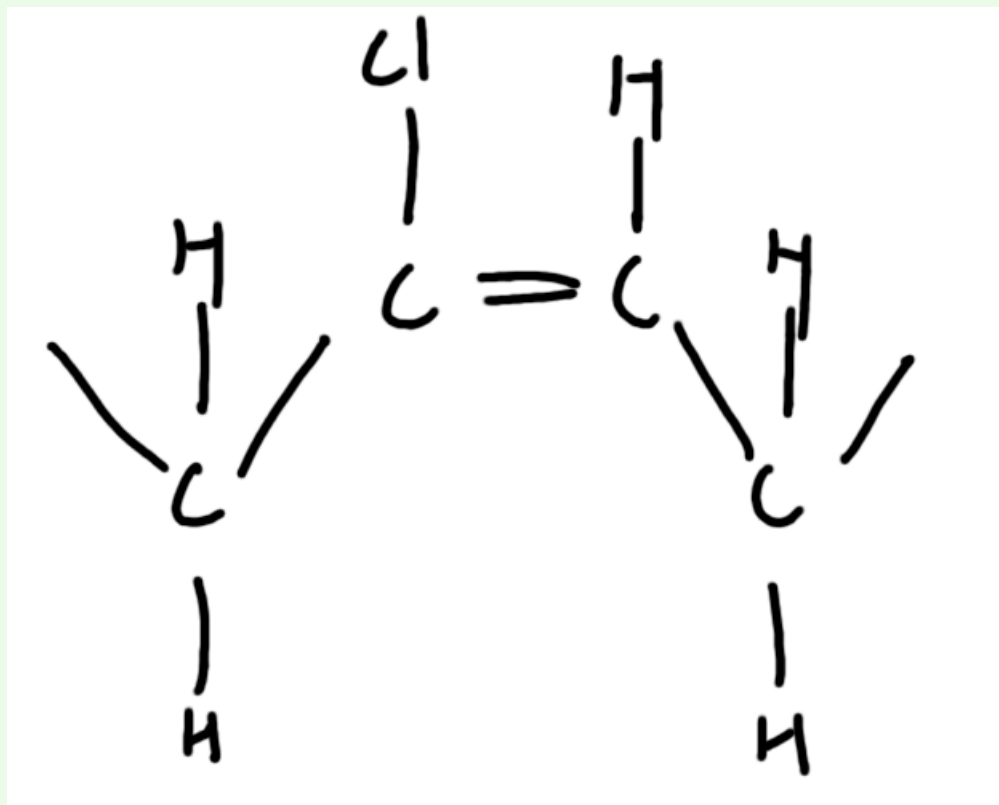


b

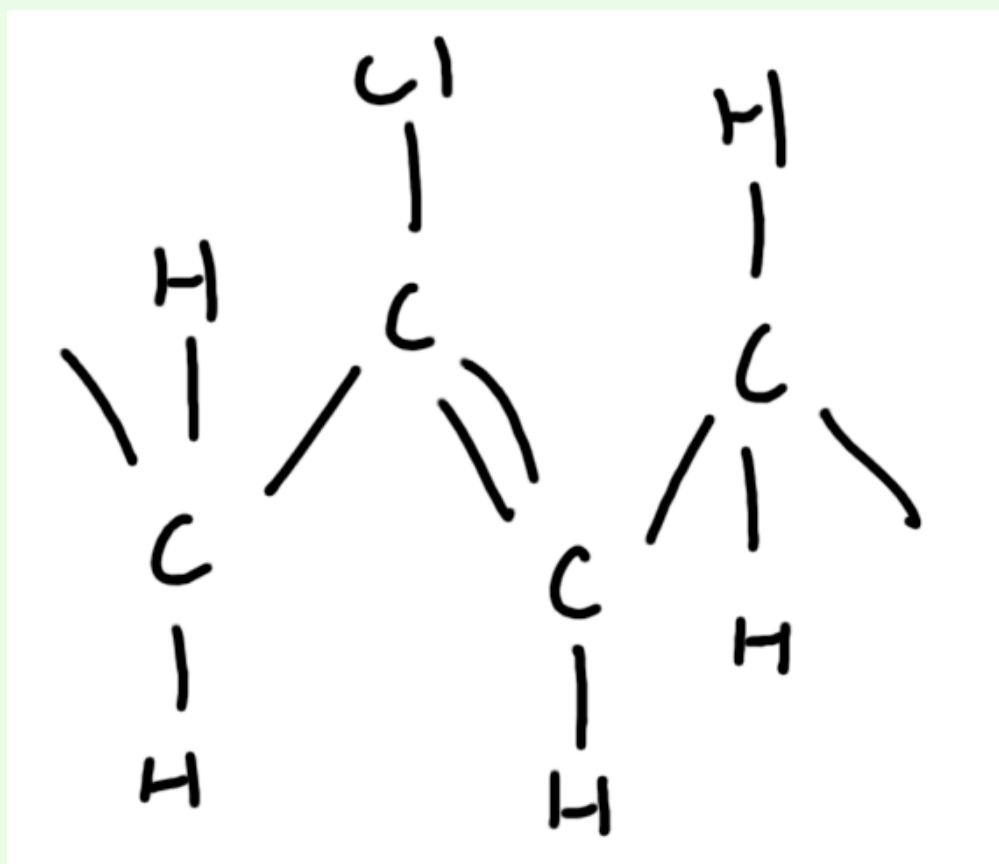
polychloroprene

✓ Answer

Cis



Trans

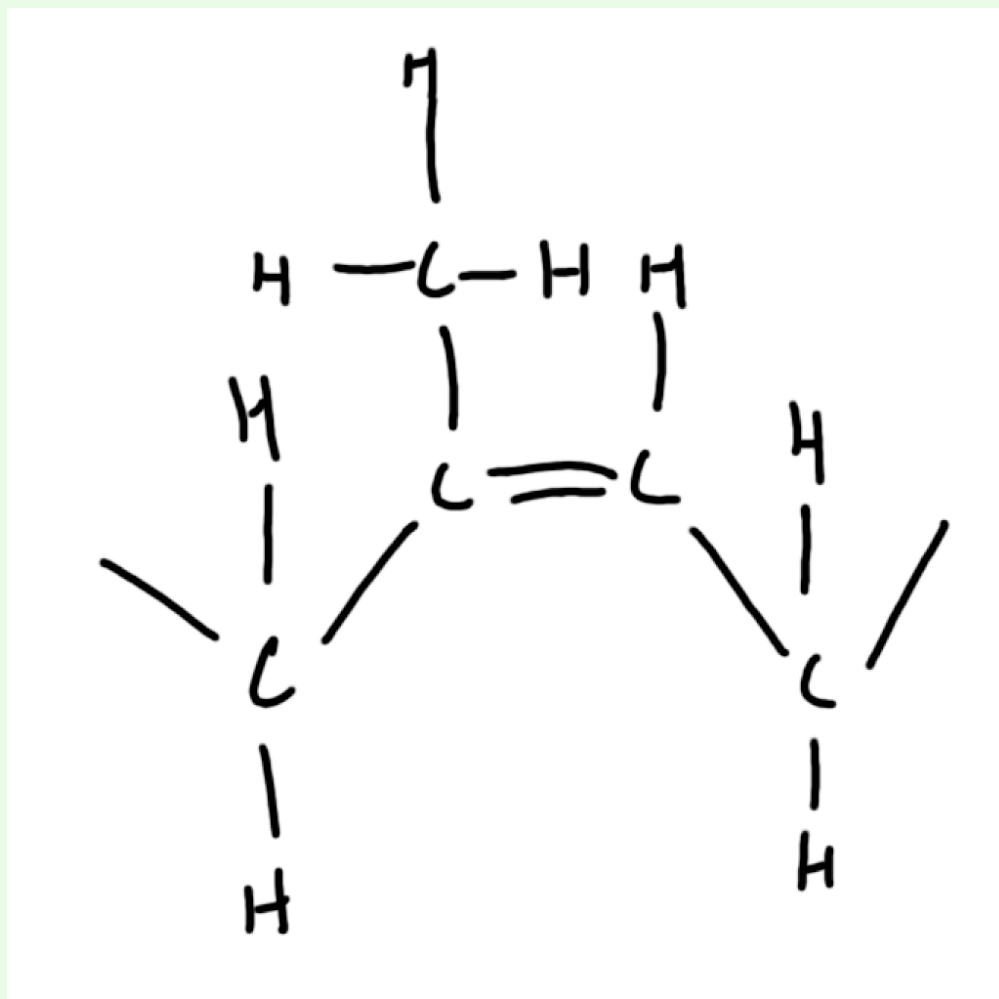


C

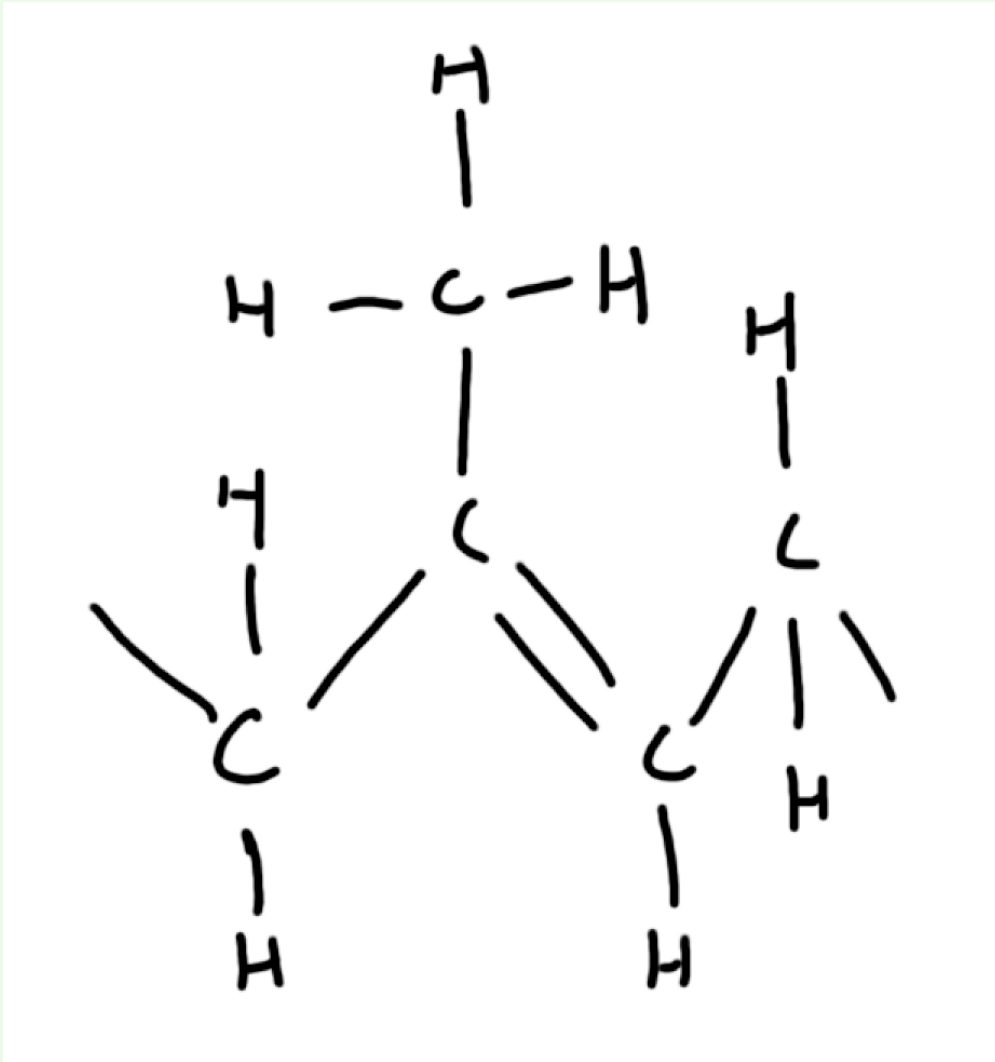
polyisoprene

✓ Answer

Cis



Trans



23

a

✓ Answer

Unable to tell, since isotactic PP is isotactic, but it also has a larger side group than the atactic PVC.

b

✓ Answer

Linear and syndiotactic is more likely to crystallize than cross-linked. So the polypropylene is more likely to crystallize

c

✓ **Answer**

Linear and isotactic as it is more likely to crystallize than network, which is a 3D structure. So Polystyrene is more likely to crystallize.

d

✓ **Answer**

Block is more likely to crystallize than graft, as the shape of connected polymers are completely different in size. So the poly(acrylonitrile-isoprene) is easier to crystallize.