

# One molecule is THAT long?

The length of a piece of yarn represents the relative size of the molecule.  
Each “kink” or “zig” in the yarn [about 1/3 cm] represents one carbon atom.

1 carbon atom == methane  
natural gas for cooking and heating—a gas

10 carbon atoms == decane  
like charcoal lighter fluid—a liquid

20 carbon atoms == dodecane  
a very soft solid paraffin wax

100 carbon atoms == a waxy poly(ethylene)

1000 carbon atoms == a “smallish” polymer

Some polymers have **100 000** carbon atoms.  
That would take a piece of yarn 300 meters long!

Developed from an idea of Mel Kohan, [mel95pa@aol.com](mailto:mel95pa@aol.com), as part of the Delaware Science Kit project.

## TEACHER NOTES

Photocopy the previous page onto a piece of cardstock. You also need a 4 meter piece of any solid color of HOMESPUN brand “Kinky” yarn.

<http://www.lionbrand.com/yarns/homespun.htm>

Cut the yarn into the lengths suggested in the table below, and glue to the card.

Use a glue from a craft store that claims to be “tacky”, or even “super tacky”. Regular white glue dries sloooowly and takes a long, messy, time.

## FEATURES OF ALKANES OF DIFFERENT SIZES

Number carbon atoms	Feature	Name	Example	Yarn length	Melting point in C
one	smallest hydrocarbon	methane	natural gas	.3 cm	-183
10	a <u>liquid</u> hydrocarbon	decane	charcoal lighter fluid	3 cm	-95
20	a <u>solid</u> hydrocarbon	dodecane	very soft paraffin wax	6 cm	35
100	a “waxy” poly(ethylene)	deca-decane	souvenir animals molded at the zoo	30 cm	softens at 110
1 000	a “small” poly(ethylene)		poly(ethylene)	3 m	softens at 130
10 000	typical poly(ethylene)		poly(ethylene)	30 m	softens at 150

From an idea of Dan L Hertz, ACS-Rubber Division Chair '98, Seals Eastern Inc, RedBank NJ

**NOTE:** A characteristic of polymers is that they do NOT have a sharp “Melting point”. Instead, they soften over a range of several degrees.