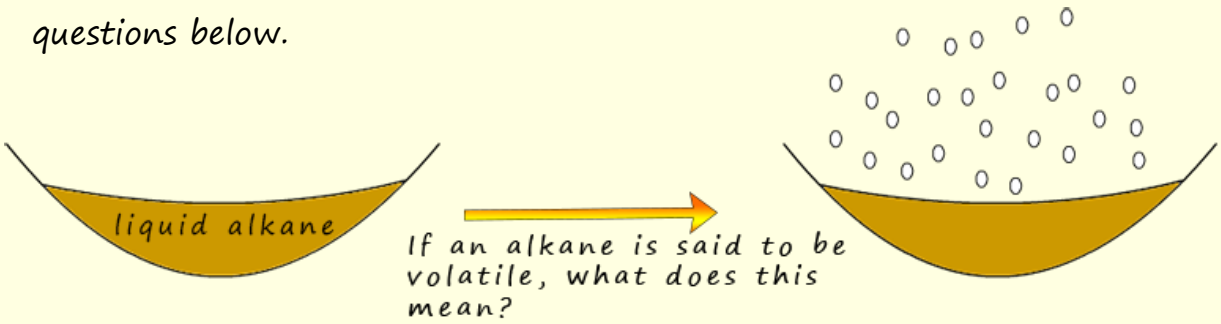
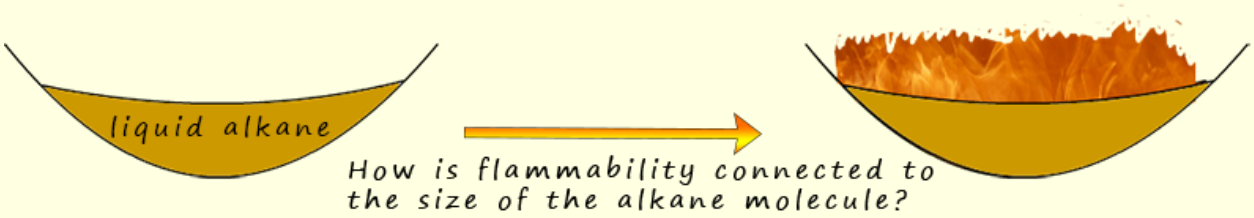
Answer all the questions below then check your answers

1. Two keywords which are often used when discussing the physical properties of alkanes are volatile and flammable. The image below may help you with the questions below.



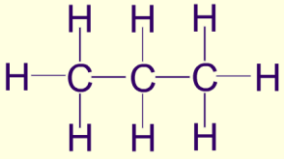


a. What do the words volatile and flammable mean?

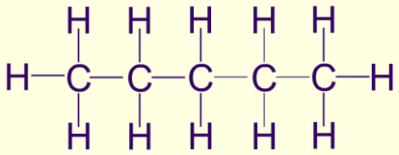
b. Will a large or small molecule be the most volatile?

c. Will a large or small molecule be the most flammable?

2. Below are models of 2 alkanes, propane and pentane.



propane



pentane

a. Which molecules above is the most flammable? Explain your answer.

b. Which molecule is the most volatile? Explain your answer.

c. Which of the 2 alkanes shown will burn with the cleanest flame?

d. Will propane or pentane have the highest boiling point? How is the boiling point of alkanes affected by the size of the molecule?

e. Viscosity is how easily a liquid flows. Will large or small molecule be the most viscous?

3. Use the data below to plot a graph of boiling point against number of carbon atoms present in alkane molecules.

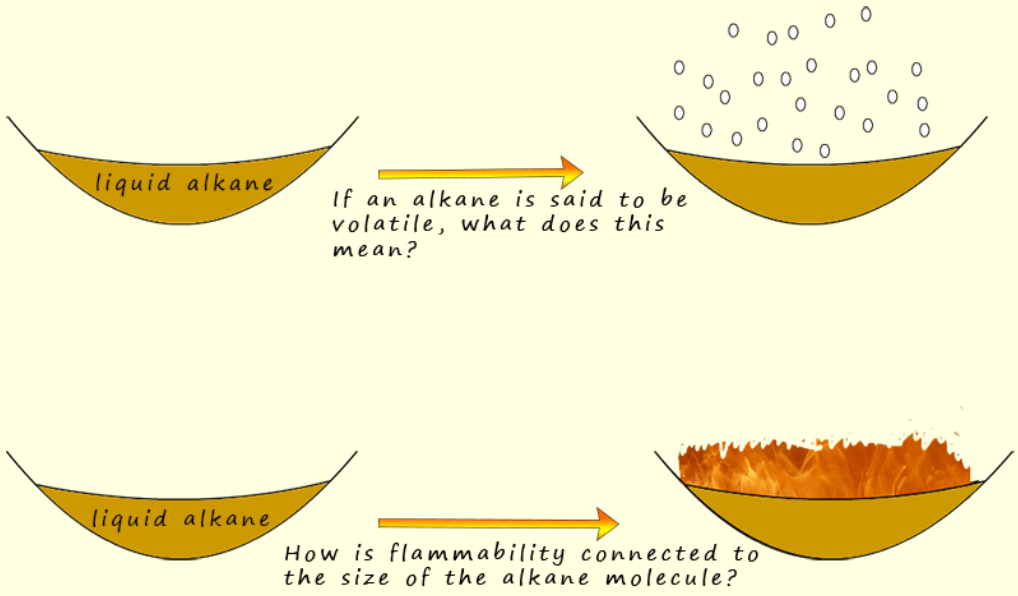
alkane	molecular formula	boiling point °C
methane		-161
ethane		-88
propane		-42
butane		-0.5
pentane		36
hexane		69
heptane		
octane		
nonane		
decane		174

a Fill in all the blanks in the table. Use your graph to estimate the missing boiling points.

b Which of the alkanes are solids, which are liquids and which are solids at room temperature?

Answers

1. Two keywords which are often used when discussing the physical properties of alkanes are volatile and flammable. The image below may help you with the questions below. Volatile is how easily it evaporates to form a gas. Small molecules are generally more flammable than larger molecules.



a. What do the words volatile and flammable mean?

Volatile: how easily the liquid evaporates

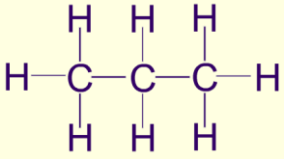
Flammable: How easily the substance catches fire.

b. Will a large or small molecule be the most volatile? Small molecules more volatile

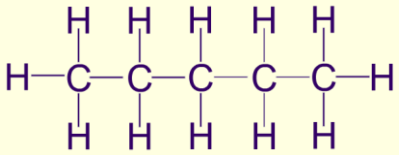
c. Will a large or small molecule be the most flammable?

Small molecules more flammable

2. Below are models of 2 alkanes, propane and pentane.



propane



pentane

a. Which molecules above is the most flammable? Explain your answer.

Propane will be more flammable than pentane. It has a lower boiling point and so will have more gas particles above the liquid at any given temperature. This will make it more flammable than pentane.

b. Which molecule is the most volatile? Explain your answer.

Propane is more volatile, smaller molecule, lower boiling point, so easier to evaporate

c. Which of the 2 alkanes shown will burn with the cleanest flame?

The smallest molecule will be the most flammable and burn with the cleanest flame. In this the answer is propane.

d. Will propane or pentane have the highest boiling point? How is the boiling point of alkanes affected by the size of the molecule? The larger the molecule the more and stronger will be the intermolecular bonding, so boiling point increases. So pentane will have the highest boiling point.

e. Viscosity is how easily a liquid flows. Will large or small molecule be the most viscous?

Smaller molecules will generally be less viscous than larger ones. Larger the molecules the thicker or more gloopy the liquid is likely to be. Honey is very viscous, petrol flows easily and is not viscous.

3. Use the data below to plot a graph of boiling point against number of carbon atoms present in alkane molecules.

alkane	molecular formula	boiling point °C
methane	CH_4	-161
ethane	C_2H_6	-88
propane	C_3H_8	-42
butane	C_4H_{10}	-0.5
pentane	C_5H_{12}	36
hexane	C_6H_{14}	69
heptane	C_7H_{16}	98
octane	C_8H_{18}	126
nonane	C_9H_{20}	151
decane	$C_{10}H_{22}$	174

a Fill in all the blanks in the table. Use your graph to estimate the missing boiling points.

b Which of the alkanes are solids, which are liquids and which are solids at room temperature? Methane to butane are gases, the rest of the alkanes in the table are liquids