ALKANES: INTRODUCTION

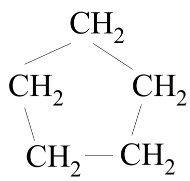
1. a) (i) C_4H_{10}

(ii) C_6H_{14}

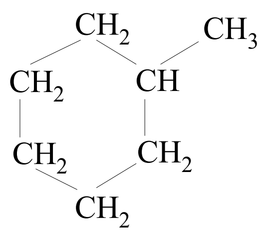
(iii) C_3H_8

(iv) $C_{18}H_{38}$

b) (i)

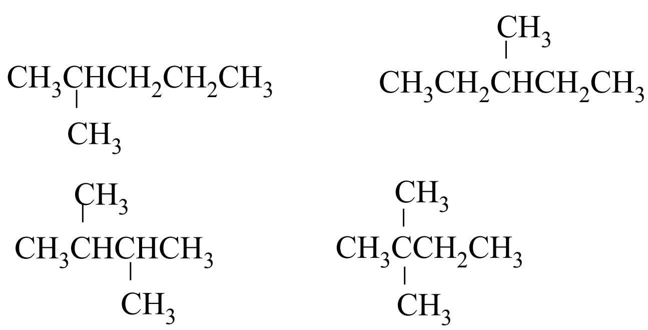


(ii)



(It doesn't matter which carbon in the ring you attach the CH_3 group to – but it must be attached to CH and ***not*** CH_2.)

2. $CH_3CH_2CH_2CH_2CH_2CH_3$



That is all there are! When you draw them, make sure that the longest chain is drawn horizontally. Where you have branches, it doesn't matter whether you draw the CH_3 groups pointing up or down, or which end of the chain the branch is nearest to.

I have set these out in the way I would work them out. Start with the longest chain, and then remove a CH_3 group from the end and place it somewhere in the middle. Once you have thought of all the possibilities for that, do the same thing with a 4-carbon chain. You can't, by the way, attach an ethyl group to the middle of a 4-carbon chain. Your longest chain wouldn't be horizontal any more – the longest chain would just be bent, and you would be repeating an earlier isomer.

Chemguide – answers

3. a) liquid

   b) gas

   c) liquid

   d) solid

   e) liquid

4. a) van der Waals dispersion forces (London forces)

   b) Dispersion forces only operate over short distances, and are greater the longer the molecule. The branched molecules are shorter (which makes the potential induced dipoles less), and can't come into such close contact with each other over their entire length.

5. a) If pentane is to dissolve in water, you would have to break the van der Waals forces dispersion attracting the pentane molecules to each other, and break the attractions holding water molecules to each other as well – these include van der Waals forces and hydrogen bonds. Each of these needs energy – more in the case of the water molecules. New attractions could be made between the pentane molecules and water molecules, but these would only be relatively weak van der Waals forces. You wouldn't get out as much energy as you had to put in, and so pentane doesn't dissolve in water.

   b) The new attractions between the pentane and the hexane will be similar in strength to those between the molecules in the pure substances. You get back a similar amount of energy when the new attractions form as you put in to break the old ones.

6. a) The molecules are made of strong carbon-carbon and carbon-hydrogen bonds which have to be broken before anything else can happen. And because the polarity of the carbon-hydrogen bond is small, there aren't any significantly negative or positive regions in the molecules for something else to attack.

   b) The C-C bond angles in cyclopropane are only 60° instead of 109.5° in alkanes. That means that you get a lot of repulsion between the bonding pairs which makes it relatively easy to break the ring.