NITRILES: PREPARATION

1. a) (i) $CH_3CH_2CH_2Br$ (You could equally well replace the bromine by chlorine or iodine. And you could also have the halogen attached to the middle of the chain.)

(ii) sodium of potassium cyanide

(iii) Heat under reflux using ethanol as the solvent.

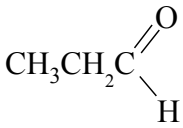
(iv) $CH_3CH_2CH_2CN$ (If you started with the halogen in the middle of the chain, then the CN group obviously ends up attached to the same carbon atom: $CH_3CH(CN)CH_3$.)

b) (i) $CH_3CH_2CH_2CONH_2$

(ii) phosphorus(V) oxide

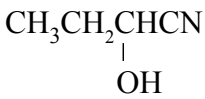
(iii) Heat a solid mixture of the amide and phosphorus(V) oxide, and distil off the nitrile.

(iv) $CH_3CH_2CH_2CN$

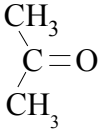
c) (i) 

(ii) A solution of sodium or potassium cyanide to which has been added a little dilute sulphuric acid to adjust the pH to about 4 – 5.

(iii) The reaction happens at room temperature.

(iv) 

(In this and the next question, you could also quote hydrogen cyanide as the reagent, and then say in part (iii) that some sodium hydroxide solution has to be added to it. That isn't mentioned on the Chemguide page, but you may have come across it elsewhere.)

d) (i) 

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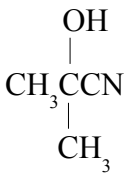
(iii) The reaction happens at room temperature.

(iv)



(If you have drawn the structures in this part differently in space, that's fine as long as everything is joined up properly.)

2. Apart from the amide to nitrile change, in all the other cases you are lengthening the carbon chain by making a new carbon-carbon bond. The nitrile group is then easily converted into other things. In the aldehyde and ketone to nitrile changes, you are also getting another reactive group (the OH group) into the chain.