Organic Chemistry and Instrumental Analysis Topics 4 and 5

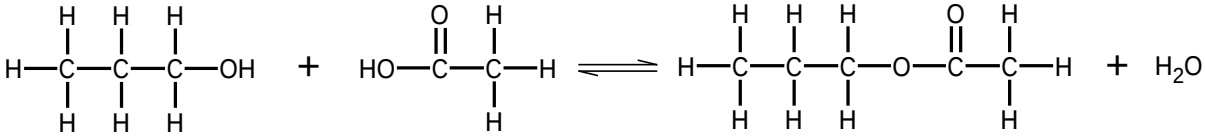
For each of the following reactions, decide whether it is:

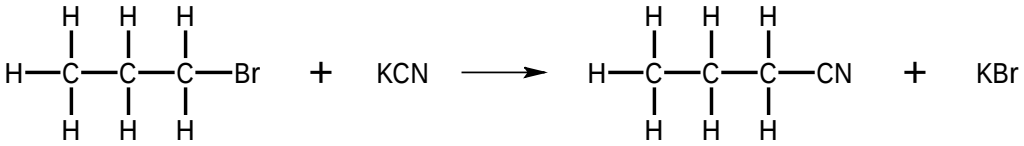
A Nucleophilic substitution

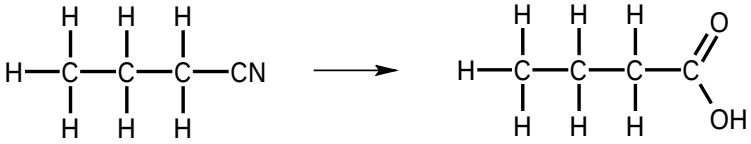
B Electrophilic substitution

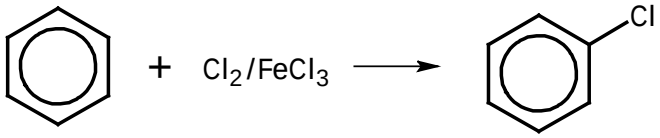
C Electrophilic addition

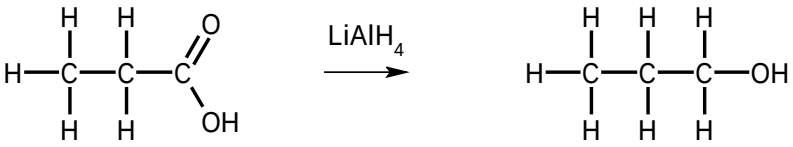
D Something else

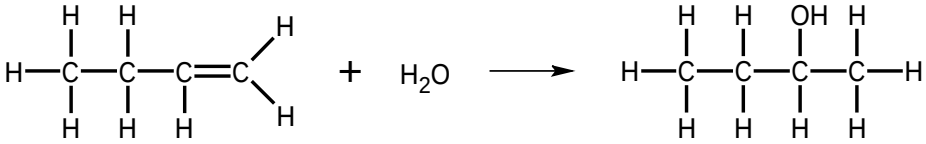
1. 

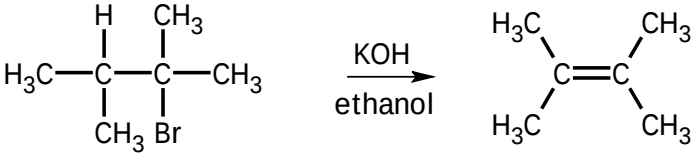
2. 

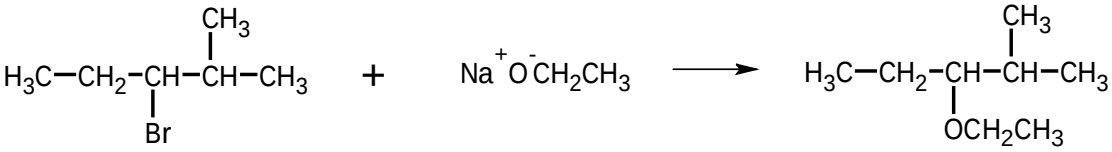
3. 

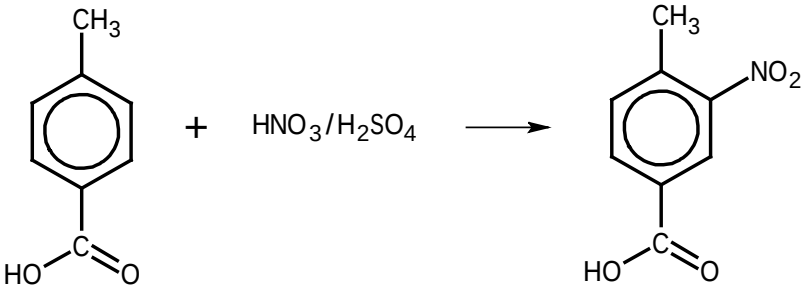
4. 

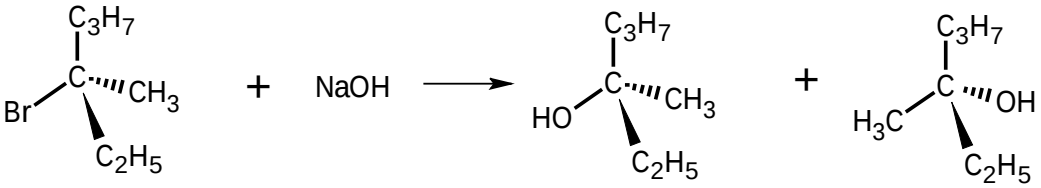
5. 

6. 

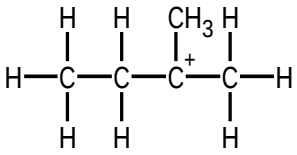
7. 

8. 

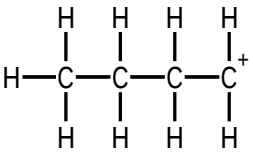
9. 

10. 

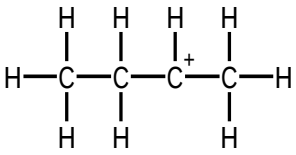
11. Which line in the table is correct for the stability of the carbocations below?



X



Y



Z

	Most stable	Least stable
A	X	Y
B	X	Z
C	Y	X
D	Z	X

12. Draw out reaction mechanisms for the following electrophilic addition reactions.

    (a) But-1-ene reacting with bromine.

    (b) But-1-ene reacting with hydrogen bromide to produce the major product.

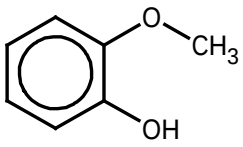
    (c) The acid-catalysed addition of water to but-2-ene.

13. Draw out reaction mechanisms for the following nucleophilic substitution reactions.

    (a) 1-bromopropane reacting with sodium methoxide (S_N2 mechanism).

    (b) 2-bromo-2-methylbutane reacting with sodium hydroxide (S_N1 mechanism).

14. The following substance was analysed using an infrared spectrometer.



The spectrum produced would **not** have a significant peak in the wave number range

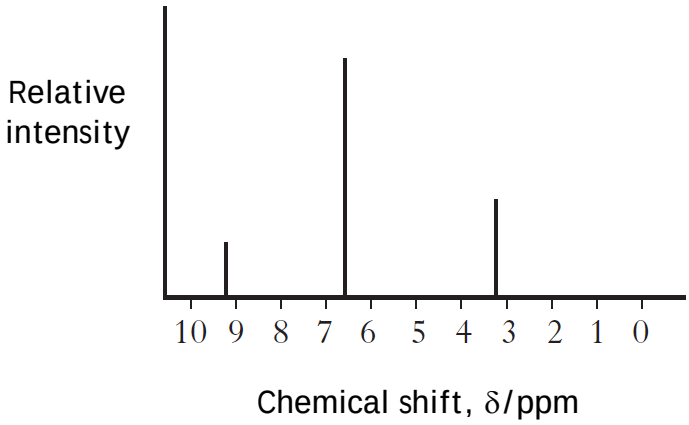
A 3650 – 3590 cm^{-1}

B 3100 – 3000 cm^{-1}

C 1730 – 1717 cm^{-1}

D 1275 – 1200 cm^{-1}.

15. The low resolution ^1H NMR spectrum of a compound is shown.



The compound could be

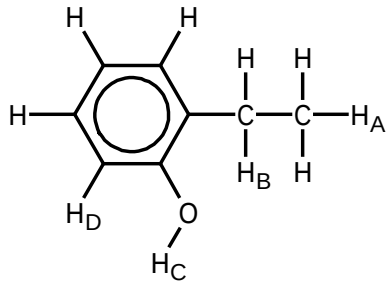
A propanal

B 2-methylpropanal

C 3-methylbutanal

D phenylethanal.

16.



Which hydrogen atom in the structure shown would produce a quartet of peaks in a high resolution ^1H NMR spectrum?

A H_A

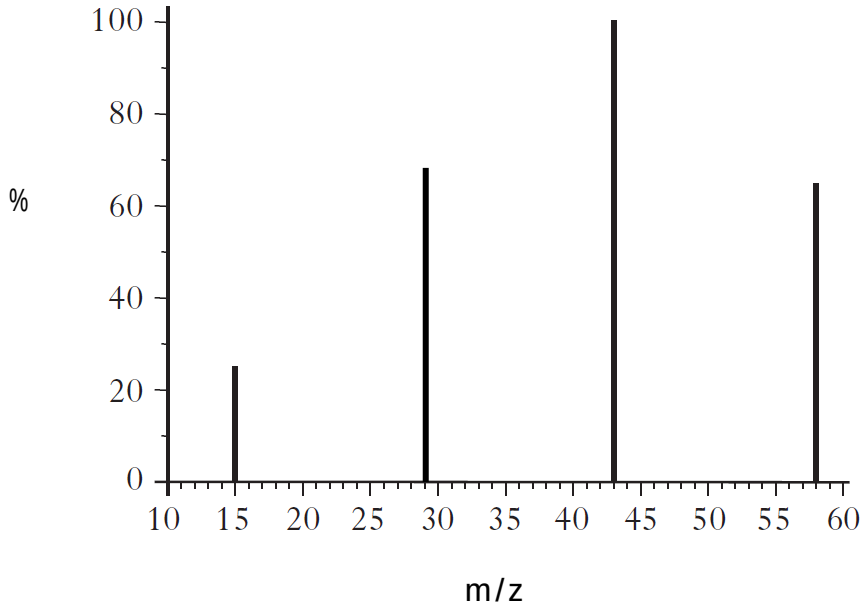
B H_B

C H_C

D H_D

17. Analysis of an organic compound showed the empirical formula to be C_2H_5.

A simplified mass spectrum of this compound is shown.



(a) Write the molecular formula for the compound.

(b) Suggest a possible ion fragment that may be responsible for the peak at m/z = 29.

(c) Draw a structural formula for the compound.