Useful Experiments — What Do I Use to ...

Here is a list of common NMR experiments, arranged by the kind of information that they provide.

Connectivity

H–H	Selective Decoupling	1D	difference spectra useful if peak is buried
	COSY	2D	workhorse technique
	SPT / SPI	1D	
	TOCSY	1- or 2D	shows spin groups
X–H	HMQC, HSQC	2D	fast. HSQC has better X-resolution (F1)
	HETCOR	2D	slow but good resolution in X-dimension
X–X	INADEQUATE	2D	slow!! F1 is *not* J_{XX}; instead, J_{XX} is seen in F2
	ADEQUATE	2D	less slow: INEPT/INADEQUATE hybrid, so has polarzn transfer.

Coupling Constants

H–H	Direct Observation	1D	sufficient if simple, non-overlapping peaks
	Selective Decoupling	1D	simplifies multiplets to allow extraction of J values
	J-Resolved Spectr.	2D	chem shift *vs* coupling const.
X–H	Gated Decoupling		slow but simple; interlaced (2nd order?) multiplets if peaks overlap
	^{1}H Satellite peaks		need good S/N; difficult to find with certainty — spinning sidebands?
	INEPT	1D	
	J-Resolved Spectr.	2D	chem shift *vs* coupling const.
X–X	INADEQUATE	1D	Slow: filters out central peak leaving sidebands. No polarzn xfr.
	ADEQUATE	1D	INEPT/INADEQUATE hybrid. Polarization transfer, so less slow.

Carbon Assignment

	APT	1D	CH_2 and quats go one way; CH and CH_3 the other
	DEPT	1D	full spectral editing possible. DEPT-135 similar to APT.
	(see also "Connectivity" above)		

Distance

	NOE Difference Spectra	1D	Allows quantitative NOE values
	NOESY	2D	

Kinetics/Exchange

Qualitative Evidence

	NOE Difference Spectra	1D	Has polarized proton moved to another peak?
	EXSY (NOESY)	2D	ditto

Quantitative (rates, $\Delta G^{\ddagger}$, etc)

	Lineshape Analysis	1D	fitting lineshapes to calculated ones at several temps
	Coalescence Temp.	1D	single-point version of Lineshape Analysis

Other handy techniques

Water Suppression

	presaturation		
	WATERGATE		easy to do; excellent results
	WATR		

etc

	RIDE	1D	suppresses baseline distortion with quadrupolar nuclei
	ACOUSTIC	1D	phase-cycled version of RIDE