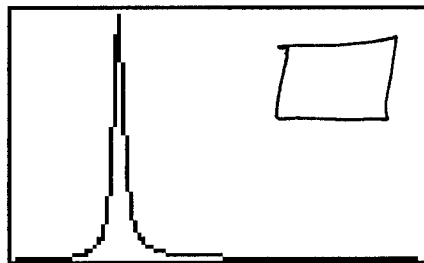
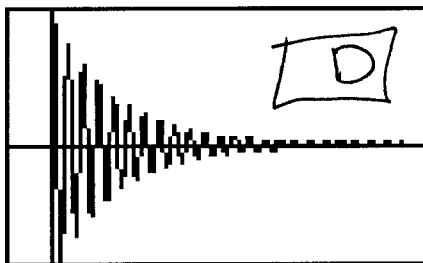
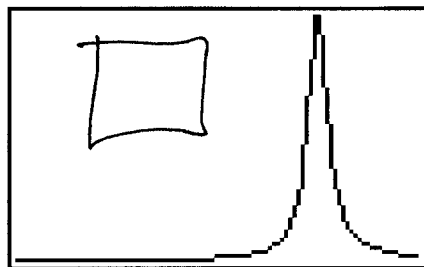
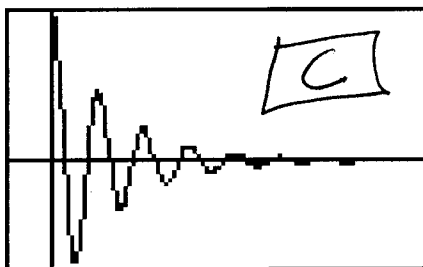
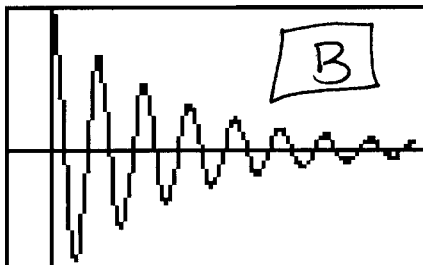
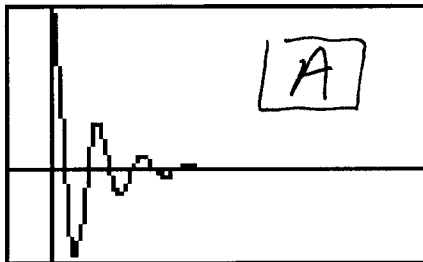


Quiz 2: Pchem

1. Match the appropriate Fourier transform pairs. All time (frequency) graphs are plotted over the same time (frequency) range.

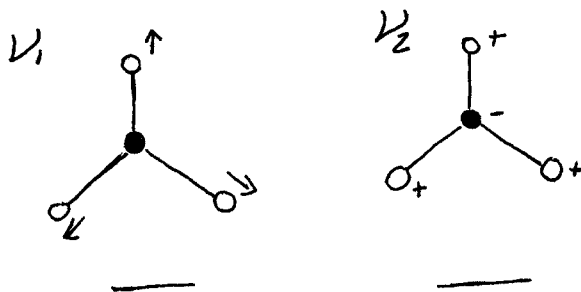


2. BCl_3 is a trigonal planar molecule belonging to the D_{3h} point group.

D_{3h}	E	$2C_3$	$3C_2$	σ_h	$2S_6$	$3\sigma_v$			
A_1'	1	1	1	1	1	1	R_x (x, y)	$x^2 + y^2, z^2$ $(x^2 - y^2, xy)$	$x(x^2 - 3y^2)$
A_2'	1	1	-1	1	1	-1			$y(3x^2 - y^2)$
E'	2	-1	0	2	-1	0			(xz^2, yz^2)
A_1''	1	1	1	-1	-1	-1	z (R_z, R_y)	(xz, yz)	z^3
A_2''	1	1	-1	-1	-1	1			$[xyz, z(x^2 - y^2)]$
E''	2	-1	0	-2	1	0			
$\Gamma_{x,y,z}$	3	0	-1	1	-2	1			

(a) How many normal modes does BCl_3 have?

(b) Below are ^{2 of} the normal modes of BCl_3 . Assign each mode to a vector in the character table, and also indicate the degeneracy of the mode.



(c) Which of the above modes are Raman active and which are IR active?

3. Sketch a picture illustrating in the complete process of absorption followed by fluorescence. Include all important information. Also sketch a qualitative gas phase spectrum which shows both the absorbance and fluorescence spectra. Then do the same for a condensed (liquid) phase spectrum. Indicate the Stokes shift on this spectrum

