Revision (Point groups)

1. Write down the point groups and show the symmetry elements in :
(a) 1,2,3 trichloro - 4,5,6 trifluoro benzene
(b) monodeuterated ammonia (NH_2D).
(c) CO_2

2. Find the matrix for the overall transformation of the x,y,z coordinates for reflection on x - axis and then inversion.

3. Given below is the character Table for the T_d point group.

Td	E	$8C_3$	$3C_2$	$6S_4$	$6\sigma_d$	
A_1	1	1	1	1	1	$(x^2 + y^2 + z^2)$
A_2	1	1	1	-1	-1	
E	2	-1	2	0	0	$(2z^2 - x^2 - y^2, x^2 - y^2)$
T_1	3	0	-1	1	-1	
T_2	3	0	-1	-1	1	(x, y, z), (xy, xz, yz)

(a) Explain the symbols A_2 and T_2.
(b) What is the order and the number of classes in this group ?
(c) Show that d - d transitions are electric - dipole allowed in this point group .

4. Write down the point groups and show the symmetry elements in : (3)
(d) 1,2,3 trichloro benzene
(e) monodeuterated water (HDO).
(f) CO

5. Find the matrix for the overall transformation of the x,y,z coordinates for reflection on y - axis and then inversion. (3)

6. Given below is the character Table for the T_d point group. (4)

Td	E	$8C_3$	$3C_2$	$6S_4$	$6\sigma_d$	
A_1	1	1	1	1	1	$(x^2 + y^2 + z^2)$
A_2	1	1	1	-1	-1	
E	2	-1	2	0	0	$(2z^2 - x^2 - y^2, x^2 - y^2)$
T_1	3	0	-1	1	-1	
T_2	3	0	-1	-1	1	(x, y, z), (xy, xz, yz)

(a) What is the order and the number of classes in this group ?
(b) What are the basis functions for the E and T2 representations
(c) Write down the representation formed by the direct product of E X T_1