

CHEM 260
Assignment 10

Due Monday 24th March 2003

31. Use check marks (✓) to indicate which molecules in the following table have active (i.e. one of more allowed spectroscopic transitions) microwave (pure rotation), infra-red (vibrational), rotational Raman, and vibrational Raman spectra.

	microwave	IR	Rotational Raman	Vibrational Raman
CO				
OCS				
HCCH				
F ₂				
CF ₄				
CH ₃ F				

32. N₂O in the gas phase has three strong IR absorption bands. The rotational fine structure indicates that the molecule is linear. What is the middle atom? Justify your answer (no credit for a guess).
33. A molecule with the general formula A₂B₂ has two IR absorptions (3287 and 729 cm⁻¹) and three vibrational Raman bands (3374, 1973 and 612 cm⁻¹). Deduce its structure (and guess its identity if you can) by considering the following:
- Is the molecule linear or not?
 - Does it have a centre of symmetry?
 - Which bands correspond to stretching modes?
 - Which bands arise from bending modes?
34. The spacing between lines in the rotational Raman spectrum of H₂ is 119.2 cm⁻¹.
- Calculate the bond length.
 - Predict the frequency (in cm⁻¹) of the second line in the rotational Raman spectrum of MuH.