

## NUCLEAR MAGNETIC RESONANCE

Describe the proton n.m.r. spectra of the compounds shown in the table below. In each case give the number of signals which would be seen together with their relative areas. State the splitting pattern which you would expect to arise in each signal as a result of spin-spin coupling.

Compound	No. of signals	Relative areas	Splitting patterns
$  \begin{array}{cccccc}  & \text{H} & \text{H} & \text{O} & \text{H} & \text{H} \\  &   &   &    &   &   \\  \text{H} & - \text{C} & - \text{C} & - \text{C} & - \text{C} & - \text{C} - \text{H} \\  &   &   & &   &   \\  & \text{H} & \text{H} & & \text{H} & \text{H}  \end{array}  $			
$  \begin{array}{cccccc}  & \text{Cl} & \text{H} & \text{H} & \text{H} & \\  &   &   &   &   & \\  \text{H} & - \text{C} & - \text{C} = \text{C} & - \text{C} & - \text{H} & \\  &   & &   & & \\  & \text{H} & & \text{Cl} & &   \end{array}  $			
$  \begin{array}{cccccc}  & \text{H} & \text{Cl} & \text{H} & & \\  &   &   &   & & \\  \text{H} & - \text{C} = \text{C} & - \text{C} & - \text{H} & & \\  & & &   & & \\  & & & \text{H} & &   \end{array}  $			
$  \begin{array}{cccccc}  & \text{H} & \text{Cl} & \text{H} & \text{H} & \\  &   &   &   &   & \\  \text{H} & - \text{C} & - \text{C} & - \text{C} & - \text{C} & - \text{H} \\  &   &   &   &   & \\  & \text{H} & \text{Cl} & \text{H} & \text{H} &   \end{array}  $			
$  \begin{array}{cccccc}  & \text{H} & \text{H} & \text{O} & & \text{H} & \text{H} \\  &   &   &    & &   &   \\  \text{H} & - \text{C} & - \text{C} & - \text{C} & - \text{O} & - \text{C} & - \text{C} - \text{H} \\  &   &   & & &   &   \\  & \text{H} & \text{H} & & & \text{H} & \text{H}  \end{array}  $			
$  \begin{array}{cccccc}  & \text{H} & \text{Br} & \text{H} & \text{H} & \\  &   &   &   &   & \\  \text{H} & - \text{C} & - \text{C} & - \text{C} & - \text{C} & - \text{H} \\  &   &   &   &   & \\  & \text{H} & \text{CH}_3 & \text{H} & \text{H} &   \end{array}  $			
$  \begin{array}{cccccc}  & \text{H} & \text{H} & & & \\  &   &   & & & \\  \text{Cl} & - \text{C} & - \text{C} & - \text{H} & & \\  &   &   & & & \\  & \text{Cl} & \text{H} & & &   \end{array}  $			