

<ul style="list-style-type: none">Explain what is meant by hybridisation of atomic orbitals.	Marks 1
<p>The mathematical combining of atomic orbitals to produce equivalent orbitals which point in the direction of the bonds and lone pairs.</p> <p>There is no energy gain in this process, but the overlap of the hybridised orbitals to form bonds results in a lower energy situation because of reduced repulsion of the electron pairs.</p>	
<ul style="list-style-type: none">Carbon has atomic number $Z = 6$. What is the ground state electron configuration for an atom of carbon?	5
$1s^2 2s^2 2p^2$	
What compound would you expect to form between a carbon atom with that electron configuration and hydrogen, <i>i.e.</i> what is the value of x in the formula CH_x ? Explain.	
<p>CH_2 <i>i.e.</i> $x = 2$.</p> <p>The bonds would form using the unpaired electrons in the p orbitals. These orbitals would overlap with the $1s$ orbitals of the H atoms.</p> <p>As there are only 2 unpaired electrons, only 2 bonds would form.</p>	
What shape would that molecule have? Explain.	
<p>The molecule would be bent with approx 90° bond angle as the p orbitals are at right angles to each other.</p>	
What molecule forms instead? Explain.	
<p>CH_4 - methane.</p> <p>The s orbital and the three $2p$ orbitals of carbon undergo hybridisation to form 4 equivalent sp^3 orbitals that point to the corners of a tetrahedron.</p> <p>Overlap of these orbitals with the $1s$ orbital of each H atom results in the formation of the tetrahedral molecule, methane.</p>	