(i) Many more samples repeating the same number of unpaired electrons should be tested. This would make the pattern on the graph and a specific relationship more certain.
(j) I am relatively confident in the answer because the trend on the graph seems clear.
(k) The prediction was verified because the experimental answer agrees in principle with the predicted answer.
(l) The hypothesis that the number of unpaired electrons determines the strength of the paramagnetism appears to be acceptable. The relationship is not a simple, direct one but the strength of the paramagnetism clearly increases with an increasing number of unpaired electrons per ion in the sample.

ACTIVITY 3.7.1 MODELLING STANDING ELECTRON WAVES

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(a) Nodes are points along the wire that do not move, while antinodes are regions along the wire that move back and forth more than anywhere else. The antinodes appear like a blur because the wire is moving very quickly back and forth.
(b) Only certain frequencies produce standing wave patterns. The patterns can form for only specific numbers of wavelengths “contained” around the wire.
(c) The number of antinodes ranges from as few as one, to as many as about twelve (depending on the size of the loop).
(d) The wave mechanics model of the atom is thought to be similar, in that electrons act like standing waves within an atom, with only certain allowable vibration energies based on electron wavelength. Some limitations of this comparison are that this activity is restricted to very simple finite patterns restricted to a circular path, whereas electron “standing waves” are three-dimensional probability structures, and sometimes very complex in nature.

ACTIVITY 3.7.2 SIMULATION OF ELECTRON ORBITALS

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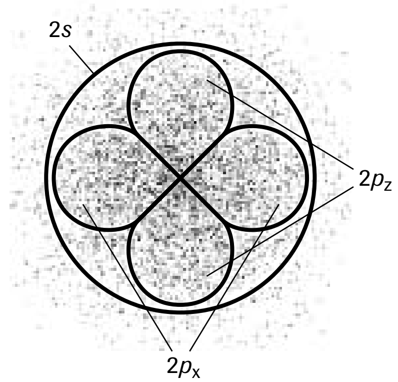
(a) Quantum mechanics theory describes a region in space (an orbital) where an electron is likely to be found at many instances of time. The Bohr theory shows an electron as a tiny particle in a specific orbit or path.
(b) The 1*s* orbital shows a probability density that is circular (in 2-D) and decreases in density from the centre. The 2*s* orbital also has a circular probability density but it is not uniform. There is a high-density region near the centre, then a zero density shell, and then an outer high-density shell.
(c) A 2*s* orbital is much larger, and has a much higher energy than a 1*s* orbital.
(d) The 2*s* orbital has a circular electron probability density, whereas the 2*p* orbital has two lobes (∞). The $2p_x$ and $2p_y$ are identical in distribution but oriented at right angles to each other.
(e) The $2p_z$ orbital is missing. This orbital is identical in shape to the $2p_x$ and $2p_y$ orbitals except for orientation. It is oriented with its long axis at 90° to the other two *p* orbitals—into and out of the plane of the screen.
(f) With 6 electrons, the atom represented would be carbon, C.
(g) The combined electron probability distribution would be spherical.
(h)



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