

- Provide a brief explanation of each of the following terms. (You may include an equation or a diagram where appropriate).

**Marks**  
**4**

(a) Pauli exclusion principle

**No two electrons may occupy the same orbital with the same spin, thereby having the same set of quantum numbers,  $n$ ,  $l$ ,  $m_l$ ,  $s$  and  $m_s$ .**

(b) the Bohr model of the atom

**In the Bohr model, electrons in atoms occupy only discrete circular orbits. By being restricted to certain orbits, the energy of the electron can only have certain discrete values. The orbit occupied is labelled by a quantum number,  $n$ , which can only take integer values:  $n = 1, 2, 3, \dots$**

- Write down the ground state electron configurations for the following elements. The configuration of lithium is given as an example.

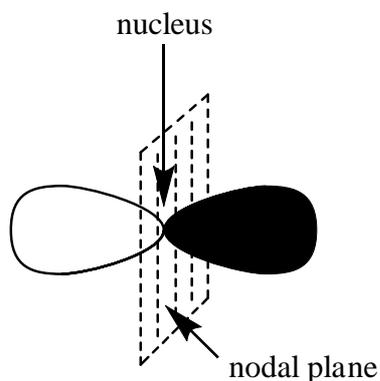
**2**

Li	$1s^2 2s^1$
Ne	$1s^2 2s^2 2p^6$ or [He] $2p^6$
Br	$1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^5$ or [Ar] $4s^2 3d^{10} 4p^5$

- Sketch the following wave functions as lobe representations. Clearly mark all nodal surfaces and nuclear positions.

**4**

(a) a  $2p$  orbital



(b) a  $\pi$  molecular orbital

