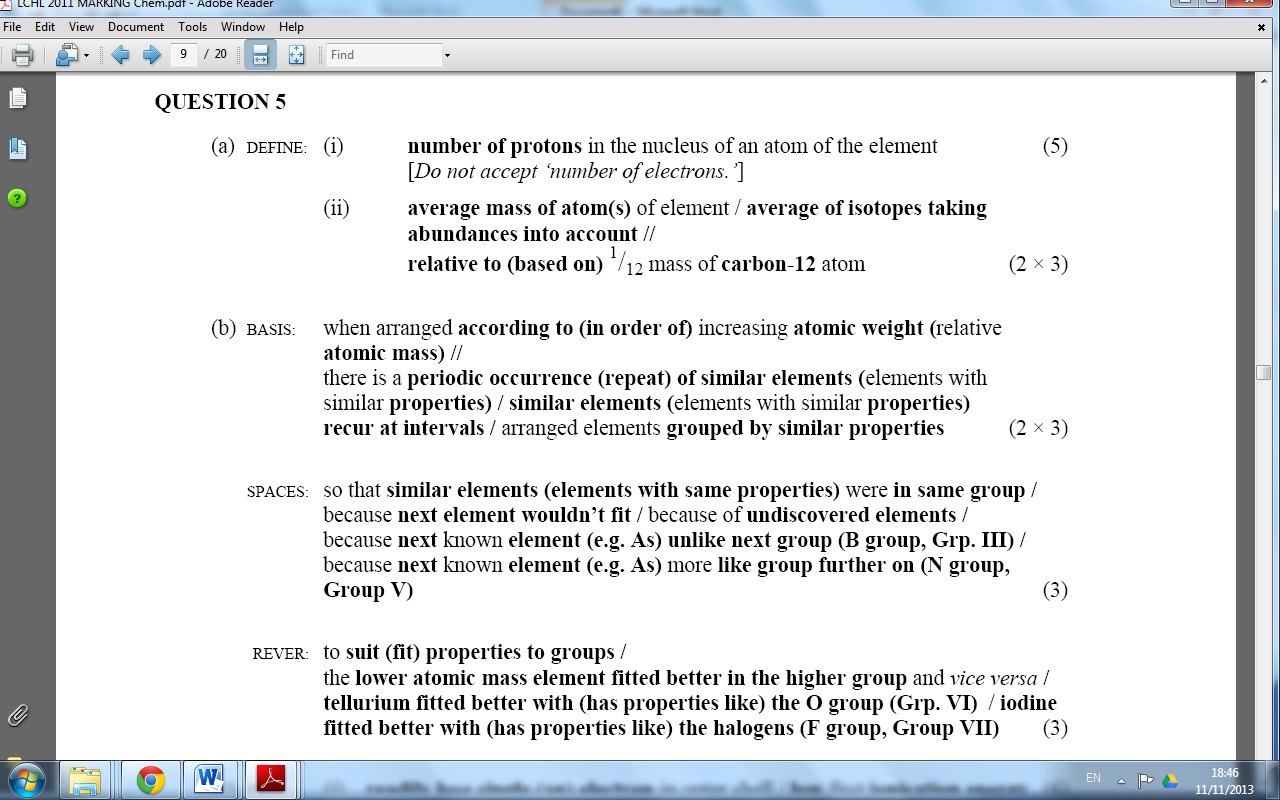
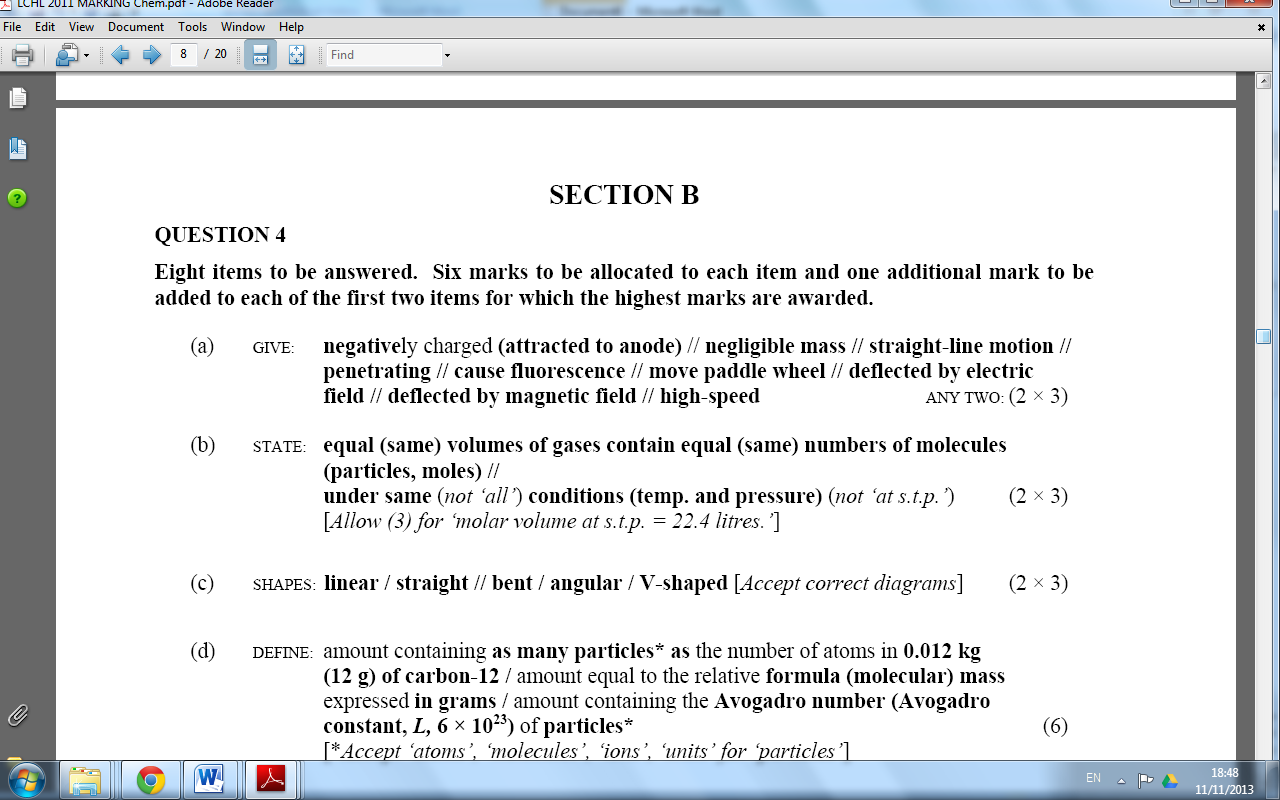
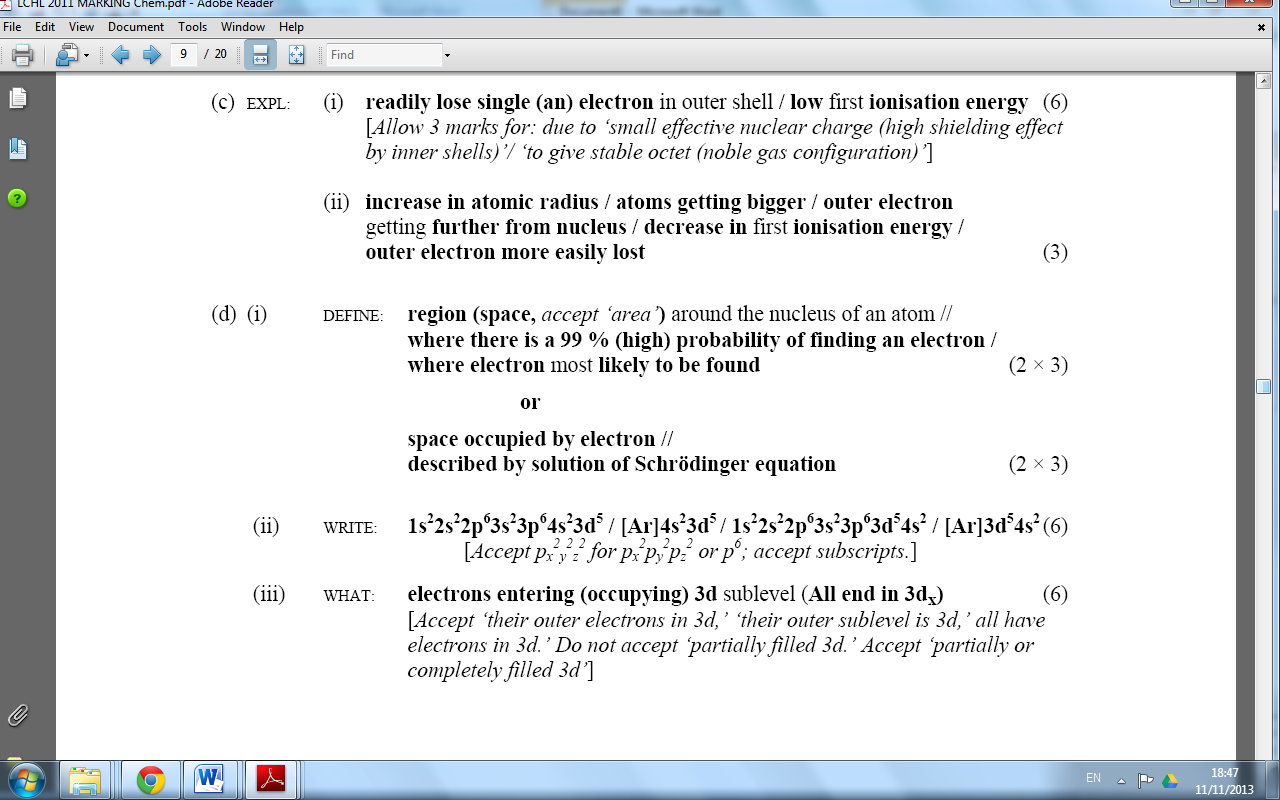
2011

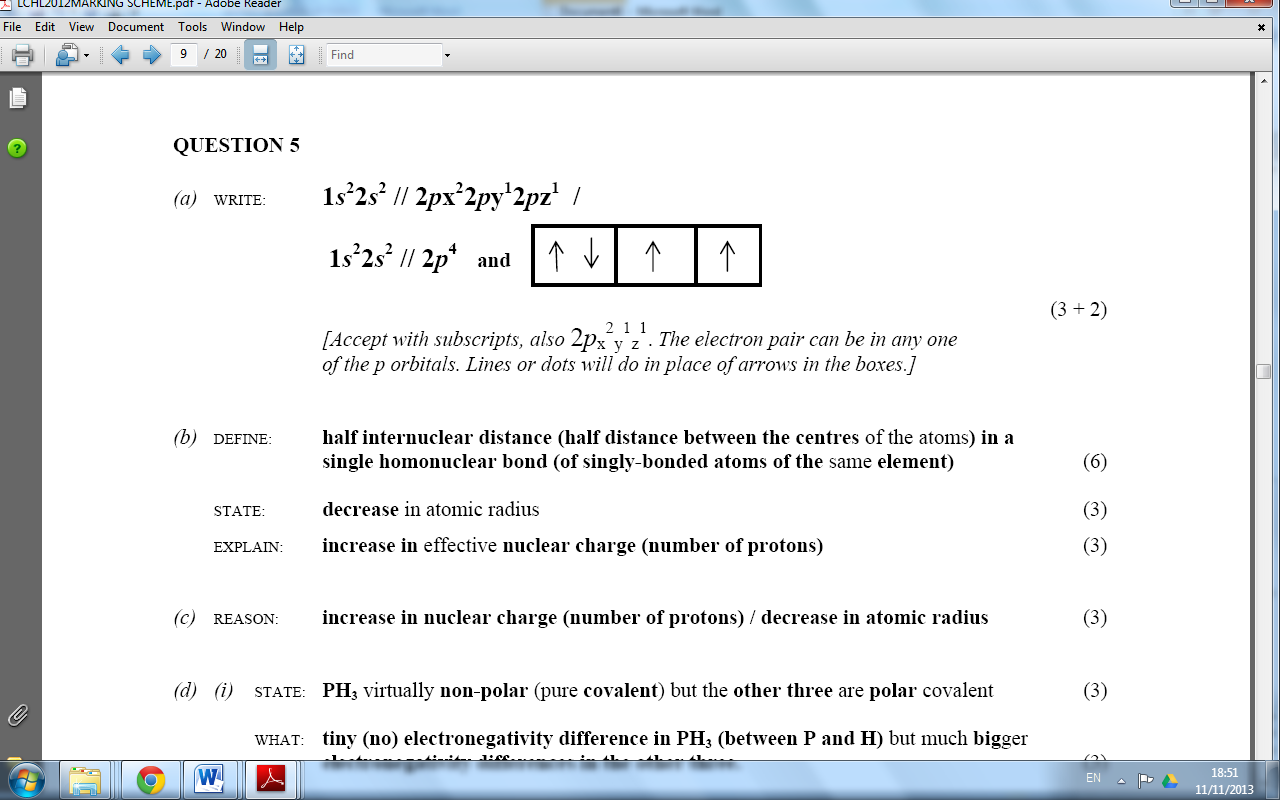


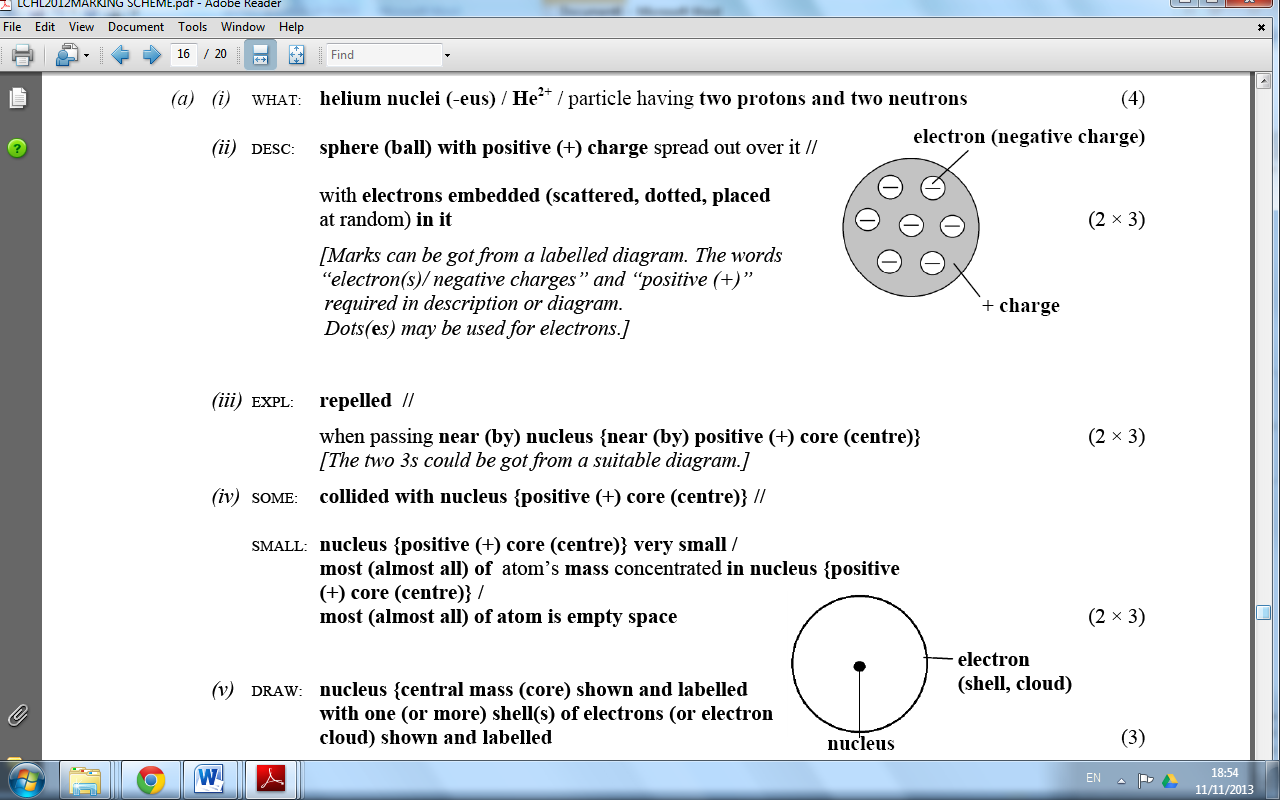


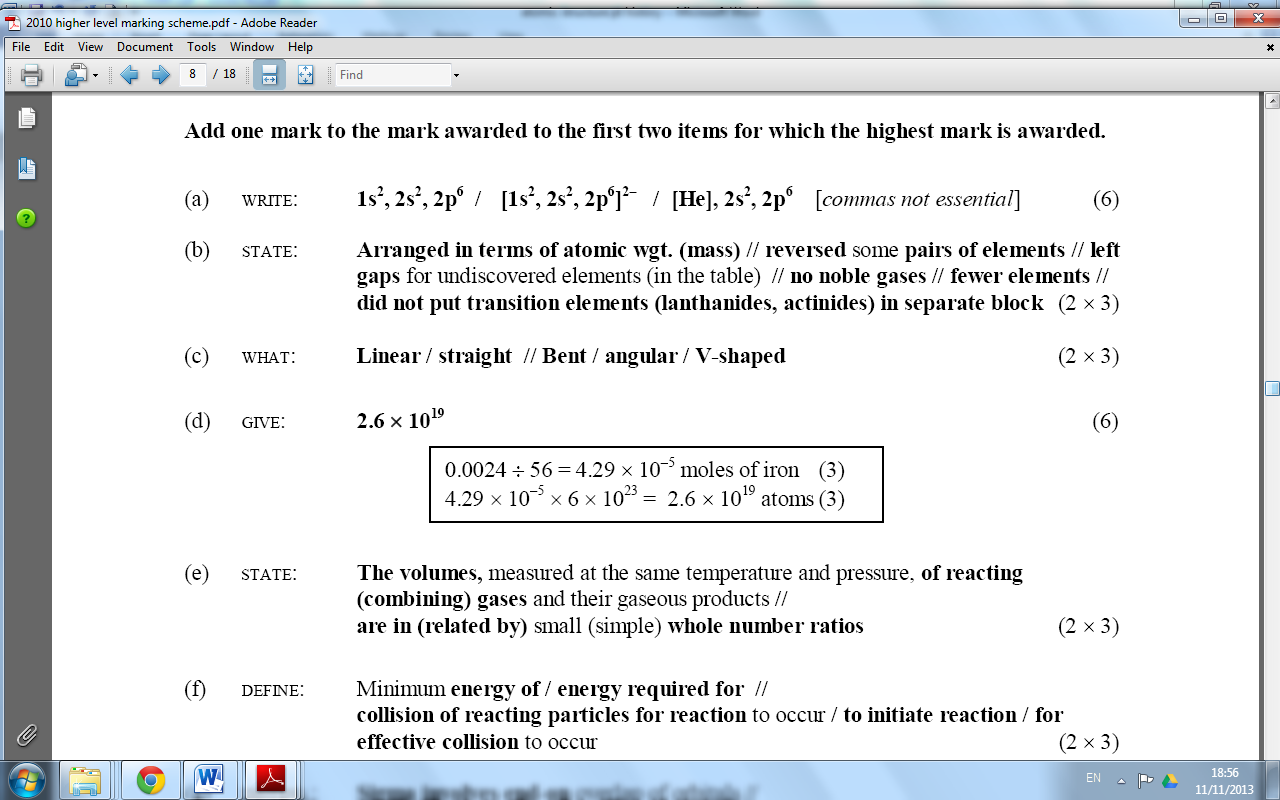
2012 Q4

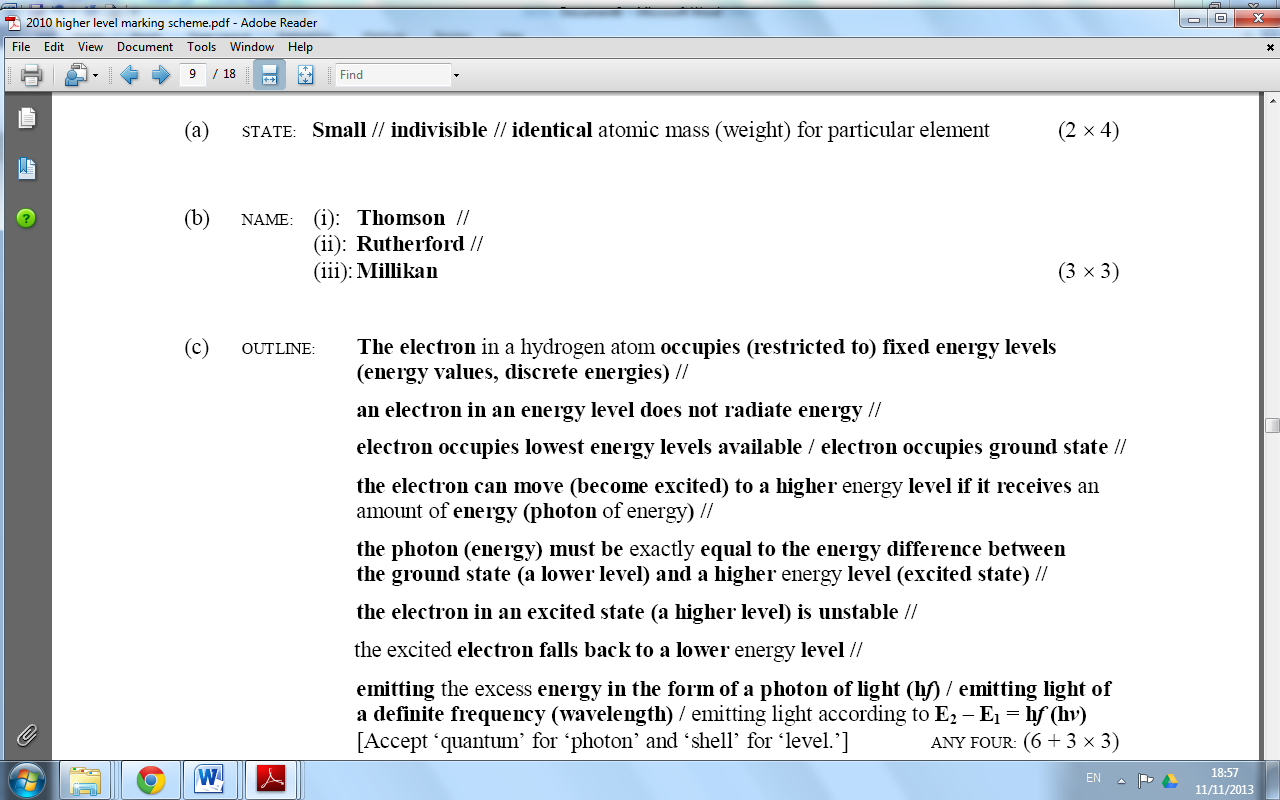
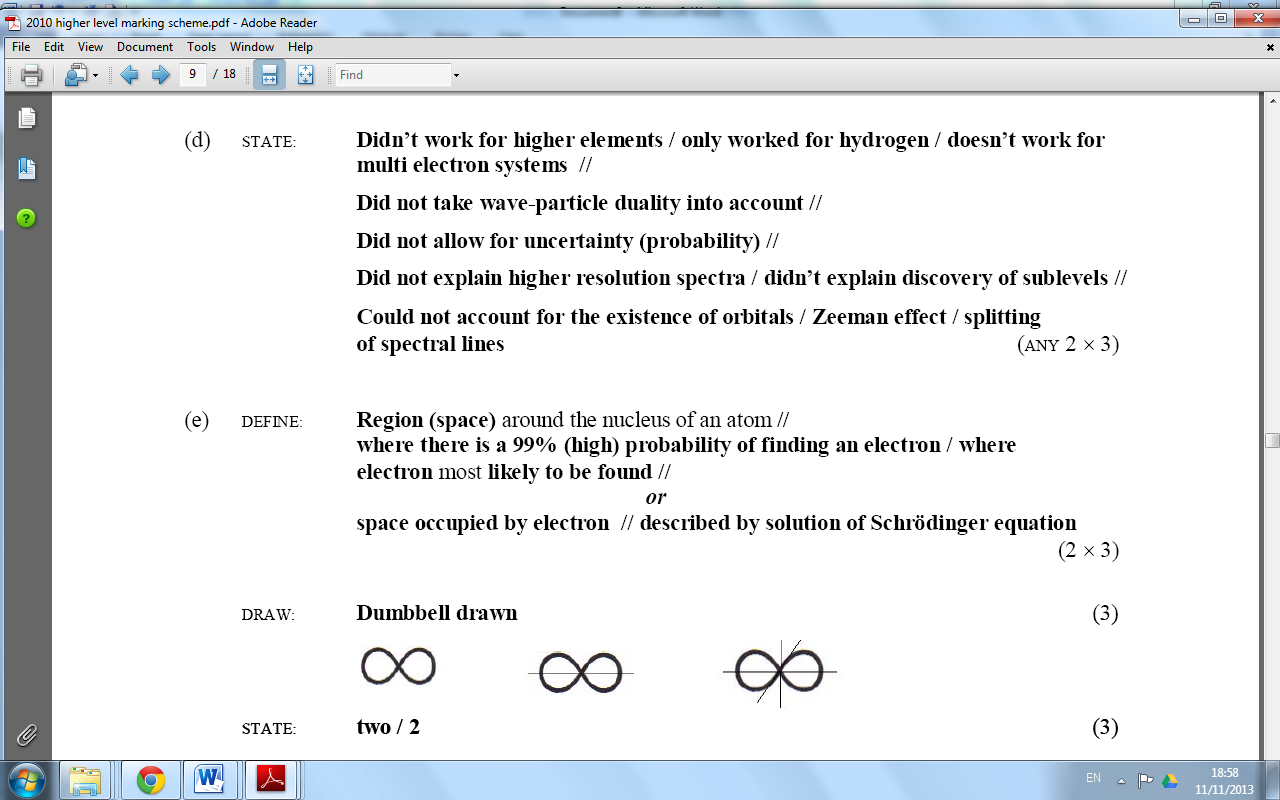
*(a)* STATE: *(i)* **5**, *(ii)* **9** (2 × 3)

*(c)* DEFINE: **average mass of atom(s)** of element / **average of isotopes taking abundances into account // relative to (based on)** 1/12 the mass of a **carbon-12** atom (2 × 3)

Q5 

Q11 

2010 Q4 

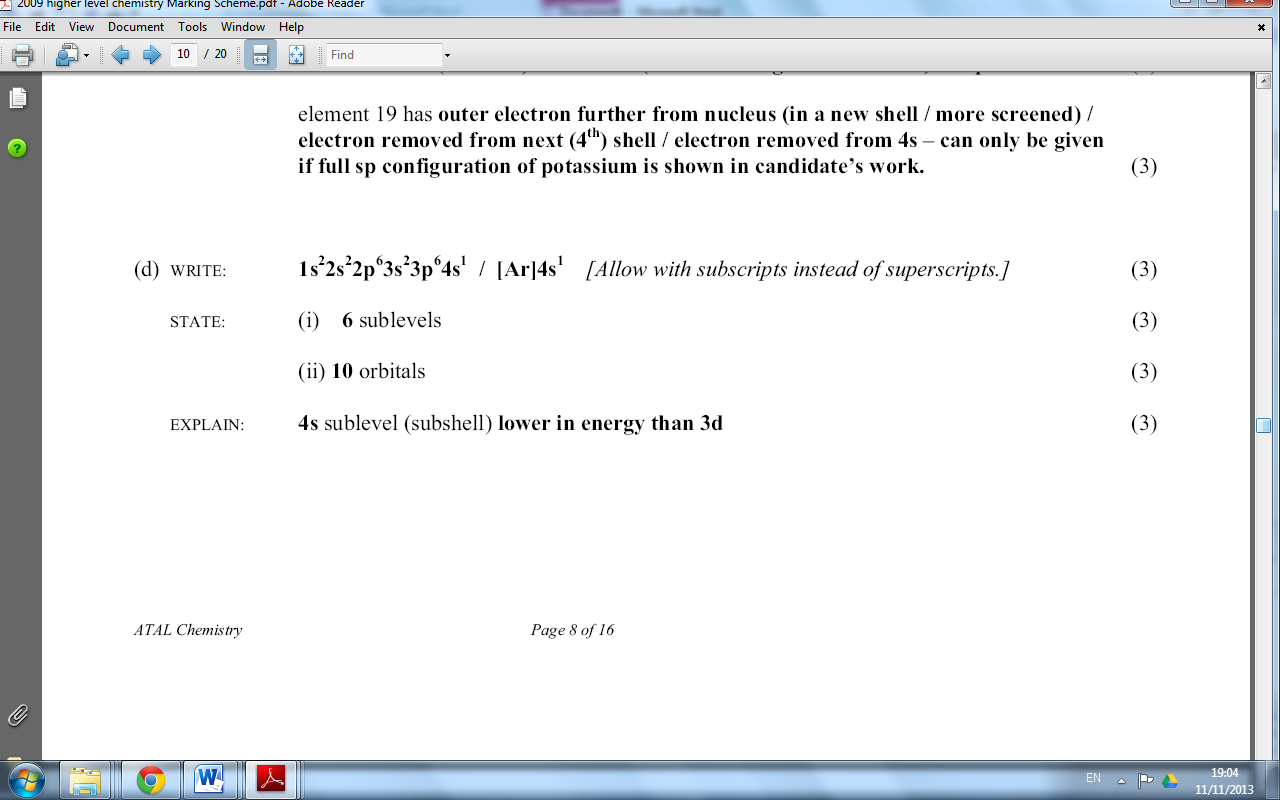
Q5  

2009 Q4

(a) NAME: Robert **Millikan** (3) PARTICLE: **electron** (3)

(c) STATE: **not possible to measure the** exact **position (location) and momentum (energy, velocity) of electron** (3)

in atom **simultaneously (at same time)** (3)

Q5 

**2008 Q4** (a) **1s22s22p6 / [1s22s22p6]3+ / [He] 2s22p6** (6)

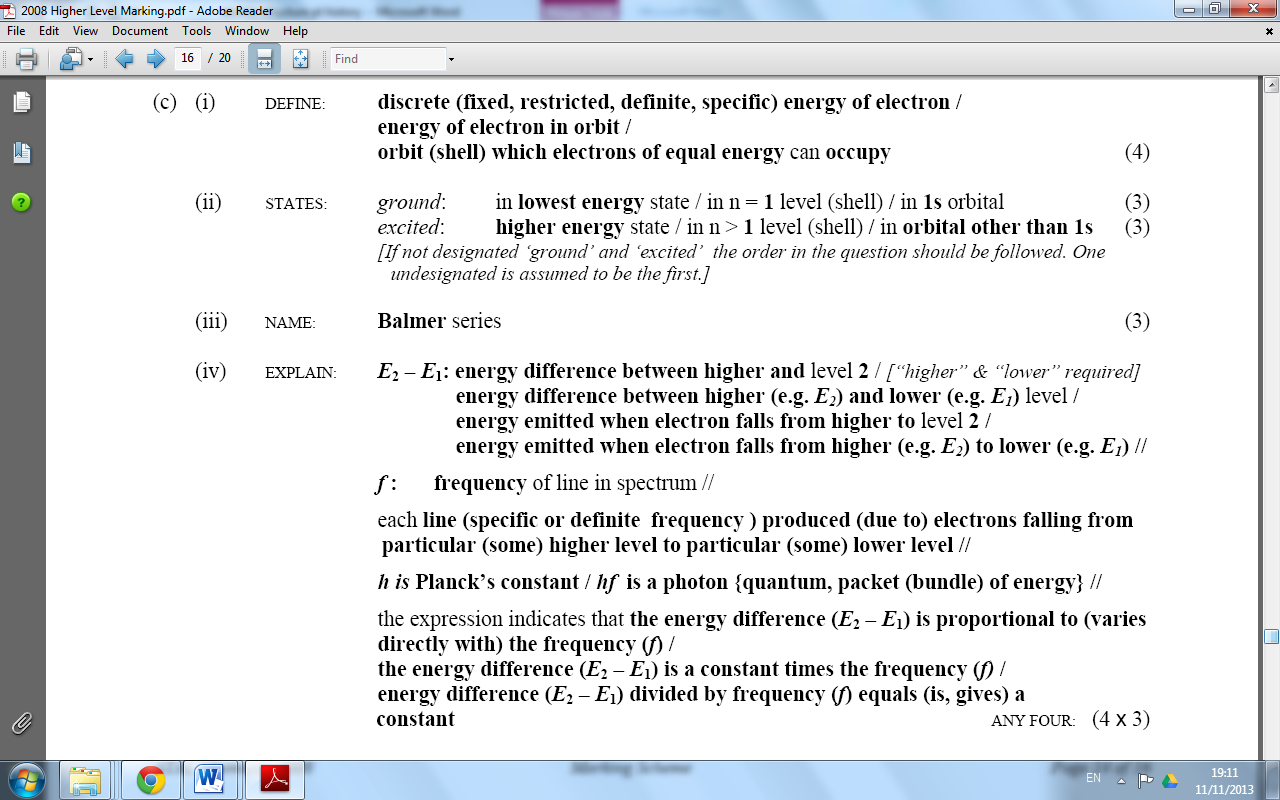
(b) **characteristic positive charge** for element / **atomic number / number of protons** in nucleus (6)

*[Accept “arranged in increasing atomic number”.]*

(c) **positive (+)** charge (**attracted to negative)** // **mass 4 //** relatively **low velocity (speed) // poor penetration (high absorption, stopped by skin, stopped by** few **sheet(s) of paper, stopped by few cm of air) //** strong **ionisation //stable nucleus** // **gains two electrons to form helium** atom // **damages cells (causes cancer) // deflected by electric fields // deflected by magnetic fields //** causes **luminescence (fluorescence, phosphorescence)** ANY TWO: (2 ×3)

*[Accept “low energy” in place of “low velocity”. Do not accept* “*helium nucleus” or “2 protons + 2 neutrons”.]*

**Q10**



**2007 Q5** (a) DEFINE: **discrete (fixed, restricted, definite, specific) energy of electron /energy of electron in orbit / orbit (shell) which electrons of equal energy can occupy** (5)

**Q11** 