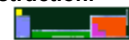


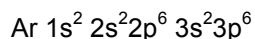
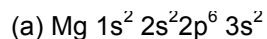
Revised August 2012



AP WORKED ANSWERS

1982, 6

Points 1, 3, 2, 2



(b) The first and second ionization energies of Mg and Ar each involve the loss of an electron from the same (3^{rd}) principal quantum shell, and therefore the degree of shielding in each case is the same. However, Ar has 18 protons as opposed to Mg's 12, and the increased number of protons means that there is an increased Coulombic attraction between the Ar nucleus and the electrons that are being removed.

Ar's third electron is still found in the third principal quantum shell, but Mg's third electron is in the second principal quantum shell, significantly closer to the nucleus and with less shielding than Ar's third electron, so the Coulombic force it experiences is much greater, making it much harder to remove.

(c) MgCl_2 if formed, but Ar will not react.

Mg readily loses its two valence electrons to form a more energetically stable electronic configuration, where the outer s and p orbitals are complete, taking on a noble gas configuration.

Ar already has that stability, so tends not to react.

(d) QCl

Q is able to lose its first electron relatively easily to form Q^+ , but the extremely large second ionization energy suggests that Q will not easily lose any further electrons. Q is in group 1.