

SL & HL Answers to The periodic table questions

1. Mendeleev did not know about isotopes. Although for most elements the atomic mass increases in the same order as atomic number increases this is not always true. For example argon ($Z = 18$) has a relative atomic mass of 39.95 whereas potassium ($Z = 19$) has a relative atomic mass of 39.10. The chemical and physical properties depend on the number (and arrangement) of electrons which is equal to the number of protons (atomic number) rather than on the mass.
2. Periodicity describes the repeating pattern of physical and chemical properties that can be seen when the elements are arranged according to their atomic number.
3. None of the noble gases (He – Rn), which make up the eighth group, had been discovered when Mendeleev first produced his periodic table in 1869.
4. Al, Si and P all have the third outer energy level partially filled.
5. Be, Mg and Ca all contain the same number of electrons in their outer energy level.
6. K contains one electron in its outer energy level.
7. Because it is in period 3 it has the electron arrangement 2.8.n (where n is the number of electrons it contains in the third level). Because it is in Group 6 $n = 6$ so the electron arrangement is 2.8.6. This means that it contains sixteen electrons. As it is an atom (which is neutral) it must also contain sixteen protons so the atomic number is 16.
8. (a) (top of group 1) Because it contains one electron in its outer energy level.
(b) (top of group 7) Because it requires just one more electron to gain a full outer energy level.
(c) Because it is not a metal (so not group 1) and it does not contain seven electrons in its outer energy level (so not group 7)
(d) Because hydrogen and helium together make up the first period where the first energy level is being filled.

