LESSON 8

Introducing Chlorine

Turn your hydrogen, H, cubes into chlorine, Cl, cubes. Cover the sides, but not the holes, with self-adhesive labels, and colour them green with a highlighter. Write "Cl" with a black pen on one side, and "35" on the opposite side.

Q1. What is the atomic weight of chlorine? *[35 u. The new models tell us so.]*

Q2. How many bonds does a Cl atom make? *[One, the same as an H atom.]*

From now onwards, H atoms will be represented by the white-ended rods. We will use them straight away. Remember that the symbol for hydrogen is H and that the atomic weight is 1, because the new H models don't remind you.

Q3. Given 2 C cubes, 4 H rods, and 2 tubes, model two different molecules (excluding *H_2 which can't be modelled with H rods).* Write the formulas. *[CH_4 and C_2H_4.]*

Q4. You have just modelled the molecules of two more gases. Work out their molecular weights to see if either of them would make buoyant balloons. *[CH_4 gas (methane) has molecular weight 16 u, which is less than the molecular weight of air, so a balloon of it would rise in air.]*

Q5. How many different molecules could there be if H and Cl were the only kinds of atoms in the world.? Write the formulas. *[Only H_2, Cl_2, and HCl.]*

These three are the molecules of three gases that have been known for 230 years. If you discovered a fourth you would change science and be famous!

Q6. Jot down as many as you remember of the 15 molecules we have so far modelled in these lessons. *[He, H_2, HF, NF_3, O_2, N_2, NH_3, CH_2O, CH_3F, CH_2F_2, CO_2, CH_4, C_2H_4, Cl_2, HCl. Remembering six of them would be fair.]*

Q7. All fifteen are the molecules of gases. If you bought one of the gases, do you think it would be supplied in a bottle with a stopper? Or would it be compressed into a strong cylinder? *[Since gases are mostly empty space they are <u>compressed</u> into cylinders fitted with valves.]*

Notes for Parents

The CH_4 gas is called methane. It is the main constituent of 'natural gas', which is widely used for domestic heating and cooking and powering buses. It is unfortunately responsible for explosions in coal mines, and miners once used caged birds to give early warning of its build up. (Why did they hang the cages high up rather than keeping them on the ground?). It would be a useful coup if you could get safe access to natural gas, and show your pupil that it really does make balloons buoyant.

The chlorine-containing molecules of Q5 are both important. HCl gas dissolves in water to give hydrochloric acid, and without this acid in our stomachs we would be unable to digest food. Although Cl_2 gas was the first one to be used as a war weapon, it has saved millions of lives through its use in killing cholera and other lethal bacteria in drinking water. Surely there is more ideology than sense in the Green activists' aversion to chlorine?

Telling children the uses of molecules needs policy. It would be boring if we made them feel they must know about every stuff they make model molecules of. Better to tell them, or get them to look up, the things most likely to interest them (such as substances that taste good or explode?) With your child, you will know best.