

10. Milestones given in the program to 1865 are.. Democritus and the idea of atoms. Jons Berzellius proclaims the Vitalist Divide. Berzelius also introduces modern chemical symbols. Wohler disapproves Vitalism. Frankland proposes valency. Kekule publishes his structural formulas, showing the versatility of carbon compounds and isomers.

We said Kekule's structural diagrams showed how carbon could support a huge number of variations. So far there are 16 million organic compounds known. The alchemists made many discoveries, but they confused them with religion and magic. Their "Holy Grail" was to turn lead into gold. Often they would write in secret code; as a result when an alchemist died, his knowledge usually died with him. Much had to be rediscovered again and again. How does modern science try to avoid this problem?

Unfortunately, valency is a concept that only works in a general way. There are exceptions. Find out about some of these and gain a more sophisticated understanding of how elements combine. Our program says that the periodic table started out as a list of elements in order of atomic weight. What is atomic weight and what is atomic number? Why was the change made and did it change the order at all? Where double and triple bonds are concerned we see types of isomerism called "cis" and "trans". What are these and why can they not occur with single bonds?

PART II

A Taste of Hydrocarbons

Tells of carbon's place in the periodic table of elements; reveals the logic of the alkane family and alkane isomers; looks at the IUPAC name system and the consolidation of valency; and the consolidation of valency; and presents the unique case of benzene.

Question work sheet. Again use your good judgment with this sheet.

1. Mendeleev's periodic table of the elements started out as a list of the elements in the order of their weight. But it was more than just a list. In what order did he list them?
2. What is the commonest atom with which carbon combines?
3. In the case of alkane hydrocarbons, what determines their density?
4. How many carbon atoms are there in a molecule of a. propane. B. methane. C. octane?
5. The alkane family of hydrocarbons is said to be 'saturated'. What does this mean?
6. Write the family formula of the alkanes.
7. Name two families of hydrocarbons other than alkanes. In each case state the main distinguishing feature.
8. Why do many organic substances have more than one name?
9. Write the basic formula for benzene.

Answers to above question sheet:

1. Mendeleev arranged the elements in rows so that similar elements went under each other in columns. In other words he grouped them according to their behavior.
2. Hydrogen
3. The density of alkanes is determined by the length of their carbon chain.
4. Propane 3, Methane 1, Octane 8.
5. "Saturated" means that the carbon atoms are attached to the maximum number of hydrogens possible. In other words all the bonds are single.
6. Alkane family formula $-C_nH_{2n+2}$

7. Alkanes –double bonds Alkynes –triple bonds Alicyclics –cyclical or ring shaped versions of alkanes, alkanes and alkynes. Aromatics –benzene compounds.
8. Many organic substances have more than one name because these substances were known before IUPAC system names were applied. This means that many have both common names (or names) and an IUPAC name.
9. Benzene-C₆H₆

Mendeleev used to write out the properties of the elements and their atom weights on cards, which he pinned to the laboratory wall. He would move them around and stand back to see the effect. He began to see patterns. But he was not sure where to put hydrogen so he left it out. Even today hydrogen's place on a chemical table is of some dispute. In fact his various omissions were his triumph because other elements would later be discovered that filled the gaps, proving that his table was valid.

PART III

A Bit of Bonding

A basic introduction to electrons and the octet rule and the formulae of alcohols, ethers, amines, aldehydes, ketones, carboxylic acids, and esters; an explanation of the difference between polar and non-polar and how the attachment of polar groups renders non-polar hydrocarbons non-soluble: and a simple look at how substitute groups create other organic families.

Question work sheet:

1. In the cathode ray tube an invisible ray makes a shadow on the phosphor at one end. But it isn't a light ray, it is a ray of electrons. How do we know this?
2. It's an atom's inner electrons which are important in chemistry. True or false.
3. In terms of electrons (ignoring protons and neutrons) how does each element in the periodic table differ from the one before it?
4. Elements with a certain number of electrons in their outer shell are generally stable and unreactive. What is this number?
5. Benzene shows how electron bonds can be delocalized over a whole molecule. True or false.
6. Oil does not dissolve in water because hydrocarbon molecules do not show the characteristics of What?
7. What is a substitution reaction?
8. Write the family formula of alcohols.
9. Other than carbon, hydrogen, and oxygen – what other element makes an amine compound?
10. Animal and vegetable fats and oils are from the group of triglycerides. They are triple tailed molecules of what organic family?

Answers to above question sheet:

1. The ray responds to a magnetic field. Light is unaffected by magnetism so it is not a light ray.
2. False – It's the Outer electrons that matter in Chemistry.
3. Each element in the table has one more electron in its structure than the one before it.
4. 8. The octet rule.
5. True.
6. Polarity. Carbon atoms share electrons equally so hydrocarbons are not electrically polar. They are not attached to polar substances like water.