chemistry

Q1) Proton, charge = +1

Neutron, charge = 0

Atomic number is the number of protons in the nucleus of an atom.

Mass number is the total number of protons and neutrons in an atomic nucleus.

Isotopes are variants of chemical elements which differ in neutron number but have the same number of protons.

Q2) Aluminium electron structure = $1s^2 2s^2 2p^6 3s^2 3p^1$

Fluorine electron structure = $1s^2 2s^2 2p^5$

Aluminium valence = +3

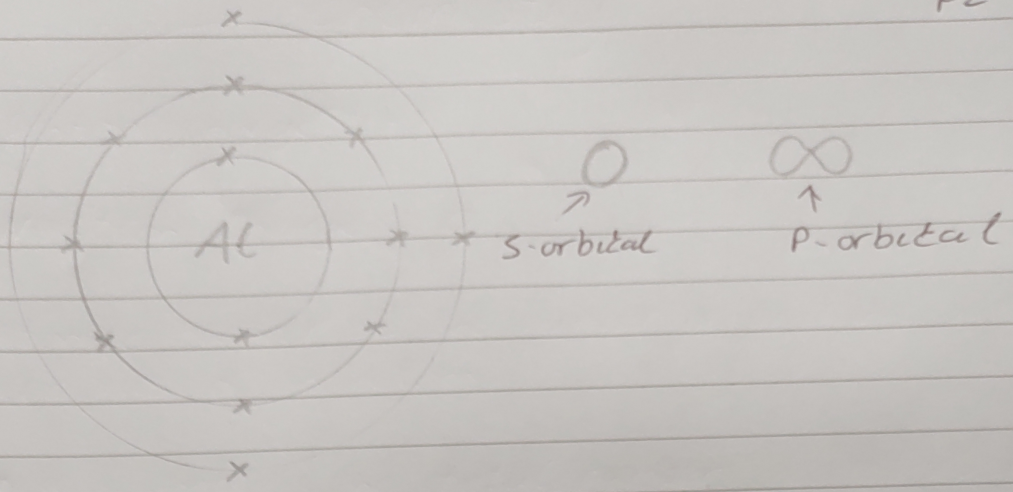
Fluorine valence = +1

They have these valences due to the number of electrons needed to form a stable outer shell.

Aluminium fluoride = AlF_3

Joseph S

Q3)



Q4) Heat of formation is the amount of heat absorbed when one mole of a compound is formed from it's constituents elements.

An endothermic reaction is a process with an increase in the enthalpy of the system.

An exothermic reaction is a process with a decrease in the enthalpy of the system.

Combustion of acetylene;

$2C_2H_2 + 5O_2 \rightarrow 4CO_2 + 2H_2O$

$\Delta H_f = ((-393.5)\times 4 + (-241.8)\times 2) - 227\times 2$

$= -2511.6\ kJ$

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Q5) Stoichiometry is the calculation of products and reactants in chemical reactions to form balanced equations.

In the case of acetylene reaction if the amount of oxygen was insuffient for the quantity of acetylene then the flame produced would be less feirce as all the acetylene would not be able to combust.

Aluminium and potassium perchlorate reaction;

$3KClO_4 + 8Al \rightarrow 3KCl + 4Al_2O$

$3 \times (39 + 35.5 + (16 \times 4)) + 8 \times 27 = 631.5$

$\frac{8 \times 27}{631.5} \times 100 = 34\%$

Q6) The lines are caused due to materals absorbing Photons of certain wave lengths. These wave length of light are emitted when the material is heated.

Barium, Strontium and Sodium all produce one clear line in the visable wave band and of therefore easily identified from a flame test. Barium = pale green, Strontium = red and Sodium = Strong orange.

You can enhance the lines in a pyrotechnic formulation by adding substances that emit in similar wave bands providing a greater overall effect.

Joseph S

Pu

Q8) The Primary ~~chemical~~ chemical difference betueen a ~~explosive~~ pyrotechnic and an explosive substance is the combustion reaction. In pyrotechnics it occurs by deflagration, ie. layer to layer propagation, in contrast to ~~explosives~~ explosives where combustion leads to detonation and the establishment of a shock wave.

magnesium and strontium nitrate reaction;

$6Mg + Sr(NO_3)_2 \rightarrow 6MgO + SrN_2$

The rate of reaction of a mixture is also governed by the particle size of the reactants (surface area).

To ~~find~~ predict the decomposition products for a high explosive you would use kistiakowsky-wilson rules.

For RDX, $C_3H_6N_6O_6 \rightarrow 3CO + 3N_2 + 3H_2O + Heat$

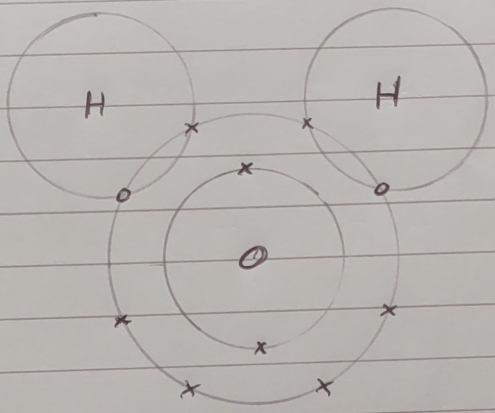
For TNT, $C_7H_5N_3O_6 \rightarrow 3.5CO + 3.5C + 1.5N_2 + 2.5H_2O + Heat$

Josephs

Q9) Hydrogen = $1s^1$

Oxygen = $1s^2 2s^2 2p^4$

A water molecule consists of two hydrogen atoms and one oxygen atom. These atoms are coralently bonded as to share a pair of electrons completing the outer shell of all three as shown in the sketch below.



The water molecule forms an angle with an oxygen atom at the vertex and hydrogen atoms at the tips. Because oxygen has a higher electronegativity than hydrogen, the side of the molecule with the oxygen atom has a partial negative charge. The oxygen end is partially negative, and the hydrogen ends are partially positive, because of this, the direction of the dipole moment points from the oxygen towards the centre position between the two hydrogens. This charge difference causes water molecules to be attracted to one another as well as to other polar molecules. This attraction causes the physical property commonly refered to as surface tension as well as causing the edges to lip upwards in a container causing a meniscus.

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In an ome device water can react with several things to cause an undesirable performance. The most common being if the device contains gunpowder the addition of water will alter the burn rate causing incorrect timing or could prevent combustion causing total failure of the device. Water can also react with magnesium or phosphorus causing them to combust which in an ome device would cause premature function and possible detonation.

Joseph S