Chemistry Exam. ACDA 4011 15/07/20
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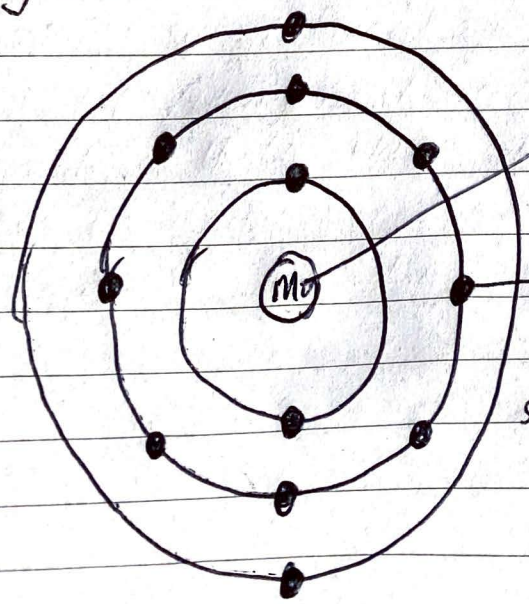
1) Protons and neutrons are the particles of similar mass in the atomic nucleus.
Atomic number - the number of protons in the nucleus of an atom.
Mass number - the total number of neutrons and protons in an atomic nucleus.
Isotope - ~~[illegible]~~ two or more forms of the same element that contain equal numbers of protons but different number of neutrons in the nuclei and differ in atomic mass.

2) Magnesium - $1s^2 2s^2 2p^6 3s^2$
Chlorine - $1s^2 2s^2 2p^6 3s^2 3p^5$

Mg valence - 2.
~~Cl~~ Cl valence - -1 this is because it has 7 electrons in the outer most shell and needs one to complete the set.

MgCl2 is the formula for magnesium chloride.

3)



$1s_2 2s_2 2p^6 3s^2$
protons and neutrons
electrons
magnesium can be made up of s, p, d, and f shaped orbitals.

4). The heat of formation is the energy change when one mole of the compound is formed directly from its elements.

Exothermic reaction is a reaction which has a negative enthalpy change. it evolves heat.
Endothermic reaction is a reaction which has a positive enthalpy change. it absorbs heat.

For Al + CuO the reaction is -

$$Al + CuO = Al_2O_3 + Cu$$
$$= 2Al + 3CuO \rightarrow Al_2O_3 + 3Cu$$

$CuO = -155.8 Kj/Mol$
$Al_2O_3 = -1675.7 Kj/Mol$

$\Delta H\ CuO = -155.8$
$\Delta H\ Al_2O_3 = -1675.7$

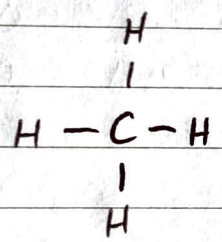
$$(-155.8 + -1675.7) = -1519.9 Kj/Mol.$$

5). At temperatures above absolute zero, molecules are in a state of a constant motion. The bonds sway and vibrate and the electric dipole changes. The molecule can absorb electromagnetic radiation of the same frequency as that of the oscillation. The vibrations can be observed at different frequencies on the IR spectra. The lines observed are the frequency on the IR spectra where its visible.

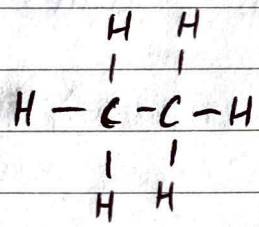
6). Thermal decomposition of sodium chlorate.

$$2NaClO_3 = 2NaCl + 3O_2$$

B)i). Alkanes consist of hydrogen and carbon atoms arranged in a ~~to~~ tree structure in which all the carbon-carbon bonds are single They have the general formula C_NH_{2n+2}

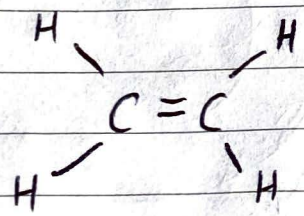


methane



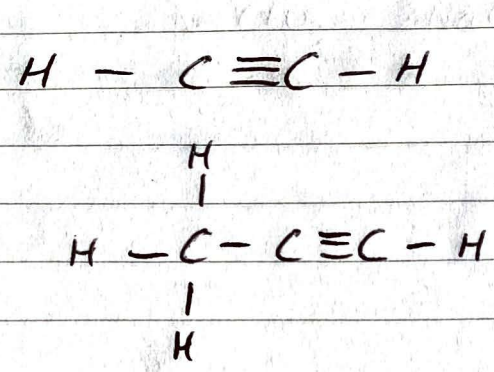
ethane.

Alkenes is also made entirely of hydrogen and carbon and they are connected by double bonds. general formula is C_nH_{2n}



ethene.

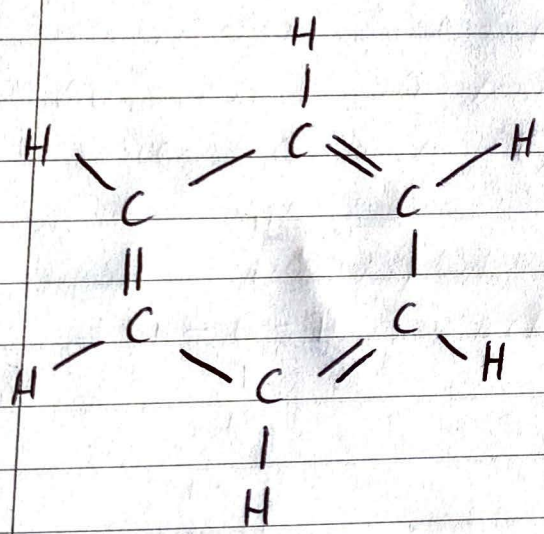
Alkyne contain atleast one carbon-carbon triple bond. The general formula is C_nH_{2n+2}



ethyne C_2H_2

propyne C_3H_4

benzene (C_6H_6)

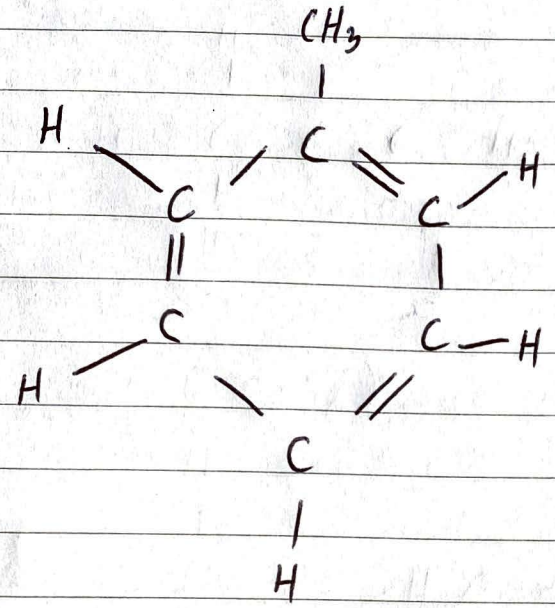


Benzene is a alkene because it has 3 carbon-carbon double bonds. Each carbon atom is bonded to one hydrogen atom

Nitration happens when one or more hydrogen atoms on the benzene ring is replaced by a nitro group. Nitro group is an electron withdrawing group. It withdraws the electrons from the benzene ring towards itself such that the electrons of the benzene group are transfered to the nitro group.

toluene C_7H_8

This is a compound with a benzene ring with a methly group attached to one carbon atom.



When nitration of toluene takes place nitro group gets attached to the ortho and para positions to form 2,4,6-trinitrotoluene.

B)2) ~~Use~~

Phosphorus is a non-metallic element that belongs to group 5 on the periodic table.
It has 3 different allotropes, red, white and black.

The white ~~phosp~~ allotrope is a tetratomic molecule and each phosphorous atom is attached to three others by simple covalent bonds to produce a tetrahedral molecule. It is a waxy, white, soft and translucent solid. It isn't so stable at room temp. It is very toxic and ignition temp is 35°c.

The red allotrope is formed when heating white phosphorous to a temperature of 250°c. Once formed it is a red brittle powder. It is insoluble in water, has a high ignition temperature which makes it safe to handle. It is non-toxic when pure.

White phosphorous is used in smoke, fireworks and incendiary bombs. It can be used in making some bronze and tri alloys. These can be used to manufacture many different items. The phosphates are used as detergents, fertilisers, flame retardant or medicine.

The manufacture of white phosphorous is obtained by the chemical ~~reaction~~ reduction of phosphate rock.
~~Red phosphorous~~