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CHEMISTRY EXAM (ACDA4011)

(1) Protons and Neutrons reside in the nucleus. Atomic number is the number of protons in the nucleus. Mass number is the total ~~weight~~ number of heavy particles, i.e. protons and neutrons. Isotopes are two or more forms of the same element that contain equal numbers of protons but different number of neutrons.

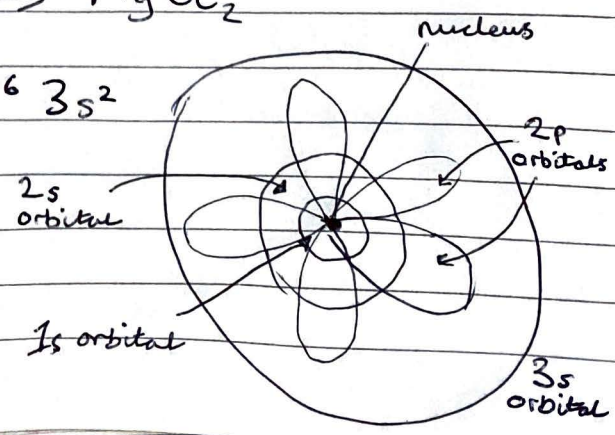
(2) Magnesium (Mg) $1s^2 2s^2 2p^6 3s^2$
Chlorine (Cl) $1s^2 2s^2 2p^6 3s^2 3p^5$

Valency of Mg = 2
Valency of Cl = −1

Mg loses 2 electrons to complete octet configuration in its outer valence shell. Chlorine has ~~2~~ 7 electrons in its outer shell and needs to gain 1 electron.

Formula – $Mg + Cl_2 \rightarrow MgCl_2$

(3) Magnesium $1s^2 2s^2 2p^6 3s^2$



(4) Heat of formation is the energy change when one mole of the compound is formed from its elements.

Endothermic – a process which requires or absorbs thermal energy and has a positive enthalpy change.

Exothermic – a process/reaction which has a negative enthalpy change and releases energy in the form of heat.

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

ΔH_f CuO – -155.8 kJ/mol

Al_2O_3 – -1675.7 kJ/mol

Heat of reaction =

-1675.7 kJ/mol $-$ 155.8 kJ/mol $= -1831.5$ kJ/mol

~~Al + CuO~~

(5) Molecules are in a state of constant motion. The bonds move and vibrate and the electric dipole changes. The molecule can absorb electro-magnetic radiation of the same frequency as the oscillation.

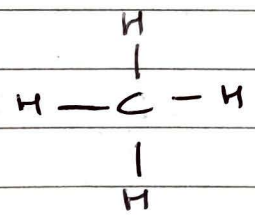
The origin of the lines observed in the infrared spectra for chemical compounds is the wavelength at which it is visible.

(6) $2NaClO_3 \rightarrow 2NaCl + 3O_2$

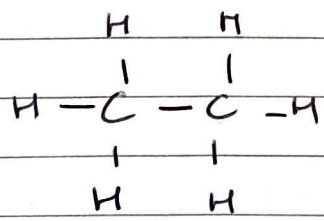
Question (1)

Alkanes have the general chemical formula C_nH_{2n+2}
It consists of hydrogen and carbon atoms arranged where all the carbon to carbon bonds are single

For Eg.



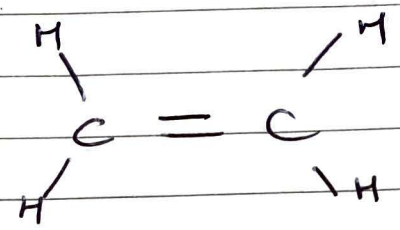
(Methane)



(Ethane)

Alkenes – The general formula of an alkene is C_nH_{2n}. It is a molecule made up of carbon and hydrogen atoms where one or more carbon atoms are connected by double bonds.

For example –



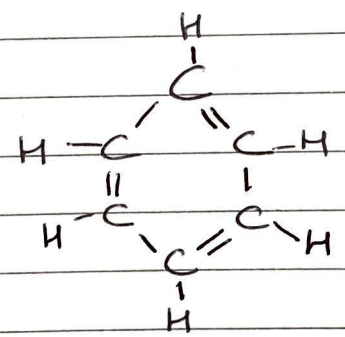
(Ethene)

Alkynes – have the general chemical formula C_nH_{2n-2} and they contain at least one carbon to carbon ~~to~~ triple bond.

For example –

$H-C\equiv C-H$ (ethyne)

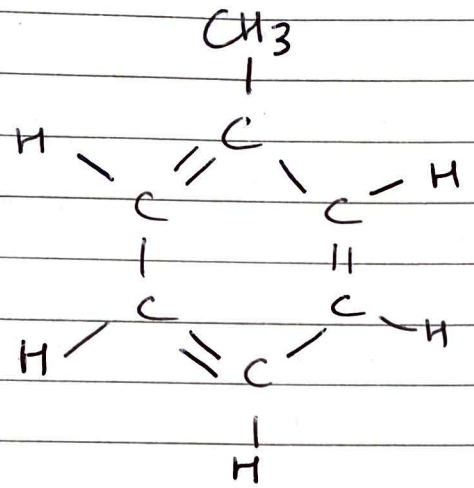
Benzene – C_6H_6



Benzene has 3 double carbon to carbon bonds and each carbon atom is bonded to one hydrogen atom

Nitration occurs when one of the hydrogen atoms is replaced with a nitro group (for example NO_2) on the benzene ring, which form Nitobenzene.

Toluene – is an organic compound which has a benzene ring attached to a methl group.



When a nito group gets attached during nitration it is located at the ortho and para position to form trinitrotoluene.

Question 2

Phosphorus belongs to group 5 of the periodic table and is non-metallic.
The element Phosphorus exists in three different allotropes of different visual ~~col~~ colour. Red, White and Black.

The white allotrope exists where each phosphorus atom is attached to three others by covalent bonding producing a tetratomic molecule.

White allotrope of phosphorus is a waxy, White, Soft Solid substance and is not stable at room temperature.

The red allotrope of phosphorus has a higher density than white phosphorus. It has a high ignition temperature of 250°c which makes it safe to handle and is non-toxic.

	White Phosphorus	Red Phosphorus
Density	$1.8 g/cm^3$	$2.2 g/cm^3$
Toxicity	Toxic	Non-toxic
Ignition temp.	35°c	250°c
Melting point.	44°c	600°c

White Phosphorus is used for military smoke producing munitions. Red phosphorus is also used to create an effect within a munition.

Phosphorus can also be used in the manufacture of alloys, for example, phosphor-bronze which can be used for under water metal parts to reduce rust and corrosion.

Some ~~phosphorous~~ phosphorus compounds are used as herbicides in killing weed and preparing rat poisons.

The red allotrope of phosphorus is used to coat the sides of match boxes.