George Atkins Chemistry Pg1

Section A

Q1) Protons and Neutrons. Protons have positive Charge. Neutrons have no charge.

Atomic number: The number of Protons in an atoms nucleus

Mass number: The number of Protons and Neutrons in an atoms nucleus.

Isotope: A variant of an element. The number of Protons stays the same, but the number of Neutrons changes.

Q2) Aluminium: $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^1$

Flourine: $1s^2\ 2s^2\ 2p^5$

Aluminium has 3 electrons in its outermost shell, so has a Valence of +3

Flourine Needs 1 electrons to fill its outermost shell, so has a Valence of −1.

∴

Aluminium Flouride = AlF_3

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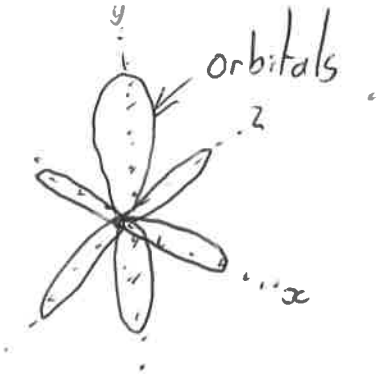
Q3)



Q4) Heat of Formation - The amount of heat absorbed when 1 mole of a Compound is formed from it's constituent parts under standard conditions.

Endothermic reactions - Reactions that take in heat.

Exothermic reactions - Reactions that give off heat.

$$C_2H_2 + 2\tfrac{1}{2}O_2 \longrightarrow 2CO_2 + H_2O$$

$$\downarrow$$

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

Q4) products - reactants = Heat

$CO_2 = -393.5$

$H_2O = -241.8$

$C_2H_2 = +227$

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

$= -1574 - 483.6 - 454$

Heat of Reaction $= -2511.6$ kJ/mole.

Q5) Stoichiometry is the relationship between products and reactants. And determines the quantity of each required for a reaction to take place.

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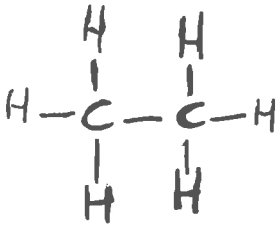
Question 6) The lines observed in electronic spectra are the result of electrons moving from one orbital to another. when they move, the energy is released as electromagnetic radiation which can be observed.

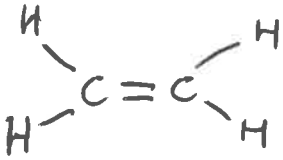
The Significance of Barium, Strontium and Sodium emissions are the bright colours that could be used in signal flares.

The effect may enhanced by the addition of other chemicals which may lengthen the burn time etc.

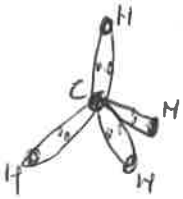
Q7) Alkane



Alkene

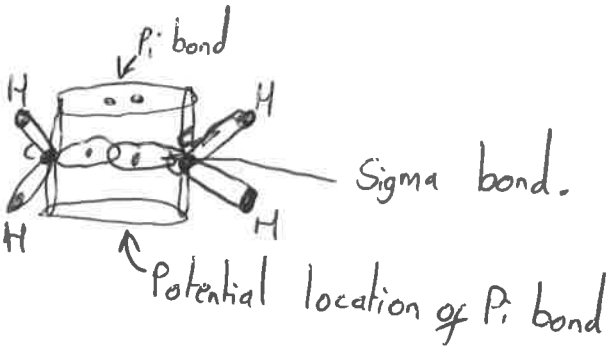


Alkanes are linked together by single Sigma bonds between each of the atoms. This results in tetrahedral shapes.

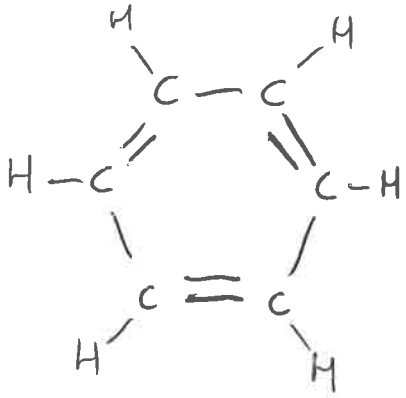


Methane.

Alkenes have a carbon-carbon double bond which is formed by a Sigma bond and a pi bond. the pi bond can either be above or below the plane of the Sigma bond.



Q7)

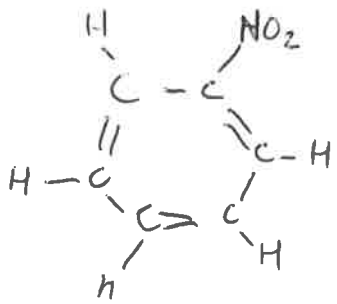


The structure of benzene is shown in the diagram to the left. The pi bonds that are resultant of the carbon - carbon double bonds can again be above or below the plane of the molecule, which results in 2 "donuts" of electron rich areas above and below the carbons.

hard to draw!!

In this state, all the carbons have the same reactivity.

If another molecule replaces a Hydrogen, eg. a nitrogroup, the negative charge of this group pushes the electrons of the pi bonds away, which in turn, changes the reactivity of the remaing carbons.



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Question 8) Pyrotechnics defraglate and produce burning and light. Explosives react faster the speed of Sound to produce a shockwave.

The products of detonation can be calculated using k-w rules or modified rules. The rule set to use depends on Oxygen balance. (Ω)

for Example TNT

$$\Omega = \frac{6 - (2 \times 7) - (5 \div 2) \times 1600}{227}$$

$$\Omega = -74\%$$

As Ω is <u>more</u> negative than -40% the modified k-w rules apply.

$$2(C_7H_5N_3O_6) \rightarrow 7CO + 7C + 3N_2 + 5H_2O$$

For RDX

$$\Omega = \frac{6 - (2 \times 3) - (6 \div 2) \times 1600}{222}$$

$$\Omega = -21\%$$

As Ω is <u>less</u> negative than -40% the k-w rules apply.

$$C_3H_6N_6O_6 \rightarrow 3CO + 3N_2 + 3H_2O$$

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Question 8) ~~The~~ The relative performance can be anticipated by calculating the heat of detonation of the explosives.