

Jordan Timberlake 1810310
L4 Chemistry (ONE) ACDA 4011
Page 1 of 8

Section A

1

Particles of similar mass contained in a nucleus are:

Protons

Neutrons

The Atomic number refers to the amount of Protons in the nucleus of an atom + so defines its place in the Periodic Table

The mass number or Atomic weight defines the total number of Protons + Neutrons in a nucleus

an Isotope is a different form of the same element with a different amount of Neutrons
i.e. Uranium 235 + Uranium 238

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

Valence is in reference to the number of electrons found in the outer shell and available for chemical bonding

Mg: .Cl: .:

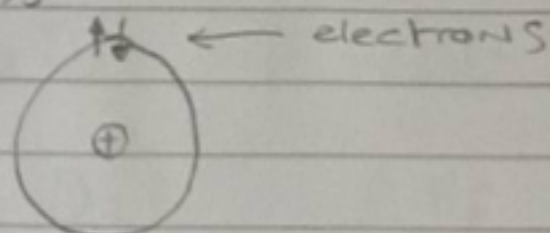
given Cl has one space + Mg has 2 free electrons
1 Mg will attach to 2 Cl $\therefore$
formula is

MgCl₂

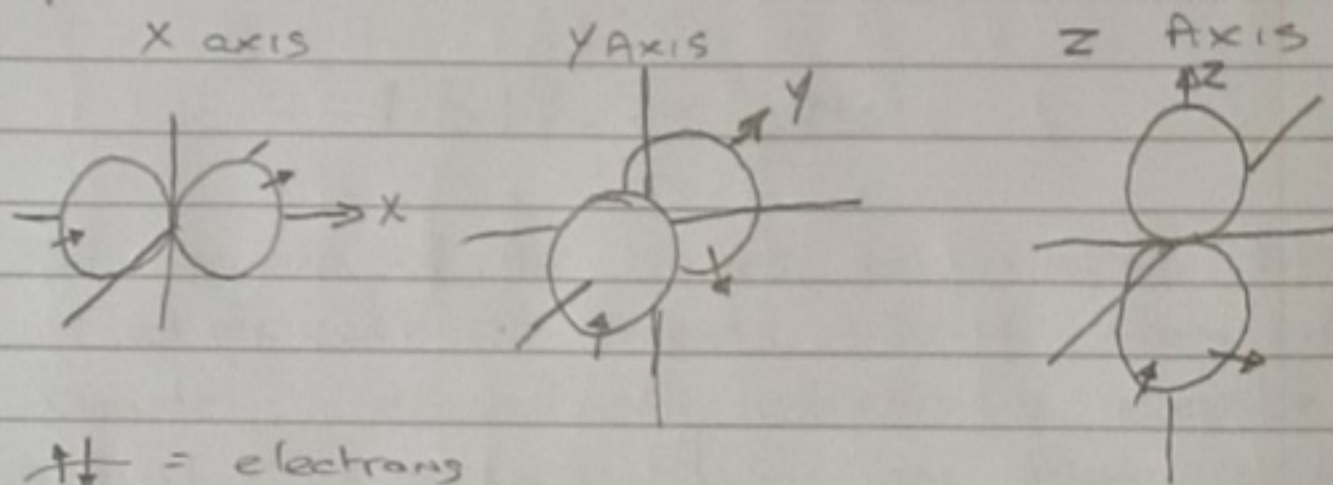
Jordan Timberlake 1810310
L4 Chemistry (ONE) ACDA 4011
Page 2 of 8

$1s^2, 2s^2, 3s^2$

3



$2p^6$

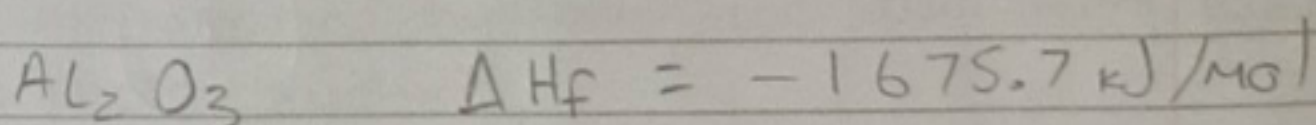
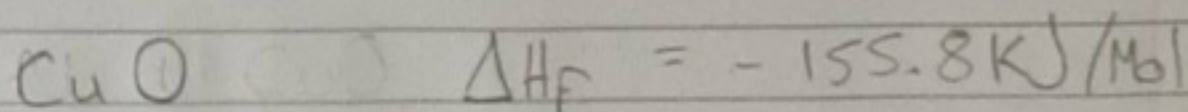


Atomic orbitals found in Mg Atom

- 4 heat of formation of a chemical Compound is the change in energy when one mole of the compound is formed from its elements an Endothermic reaction will absorb heat and so will have a positive Enthalpy change An exothermic reaction will exude heat and so will have a negative Enthalpy change i.e. it is lost from system $\therefore$ negative
- $$Al + CuO = Al_2O_3$$

Jordan Timberlake 1810310
L4 Chemistry (ONE) ACDA 4011
Page 3 of 8

4
continued



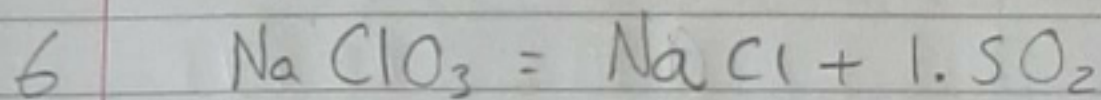
$$\Delta H_f = -1675.7 + 155.8$$

$$= 1519.9 \text{ kJ/mol}$$

5 The origin of the lines in infrared spectra of chemical compounds comes from dipole change, essentially electrons elevate to a higher energy shell + on their return to the original shell (following 'stretch') they give out infrared spectra following vibration

Methane (CH_4) has 2 main outputs a strong output at 3000 cm^{-1} and a smaller at 1350 cm^{-1}

ethane (C_2H_6) has 3 observable outputs its major output around $2900 - 3000 \text{ cm}^{-1}$ A smaller output at $1400 - 1500 \text{ cm}^{-1}$ and its smallest at approximately 800 cm^{-1}



$$\text{O}_2 \text{ Vol per mole} = \frac{33.6}{\text{MW}}$$

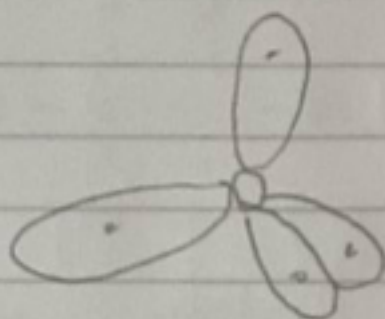
$$\therefore \frac{33.6}{106.4} = \text{Volume of Oxygen Produced} = 0.3158$$

Jordan Timberlake 1810310
L4 Chemistry (OME) ACDA4011
Page 4 of 8

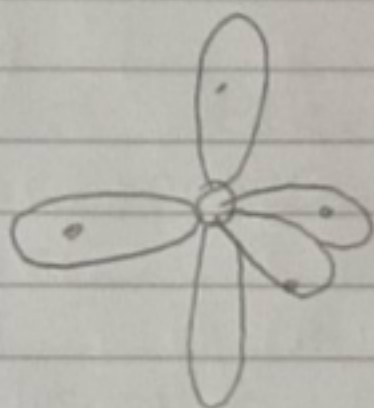
Section B

- 1 Nonaromatic hydrocarbons will form hybrid orbitals such as

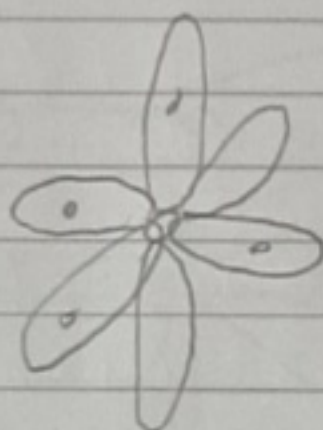
sp^3 hybrid



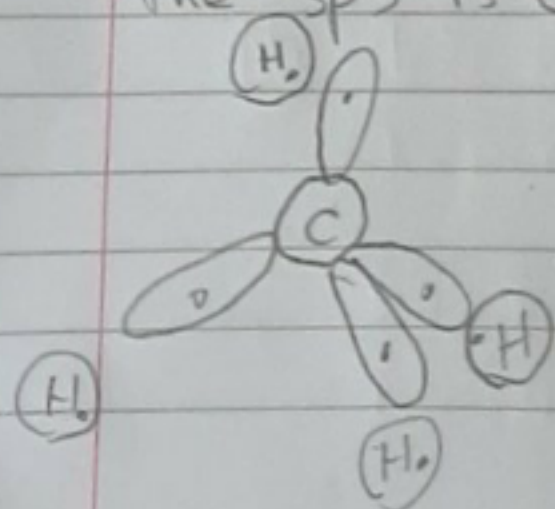
sp^2 hybrid



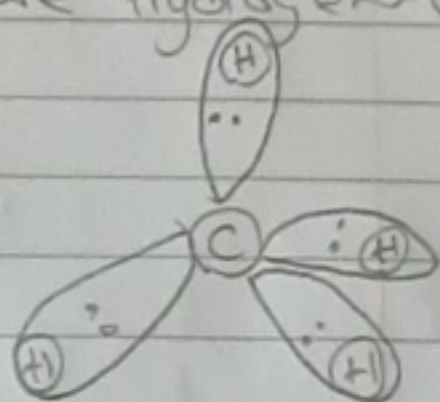
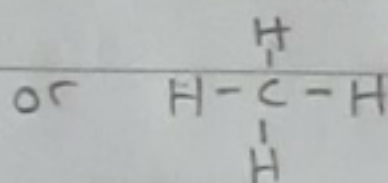
sp hybrid



In the case of an Alkane such as Methane the sp^3 is C and attached are Hydrogen (C_nH_{2n+2})



this becomes $\rightarrow$



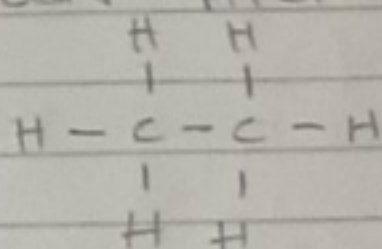
Jordan Timberlake 1810310
L4 Chemistry (OME) ACOA 4011
Page 5 of 8

Section B

continued

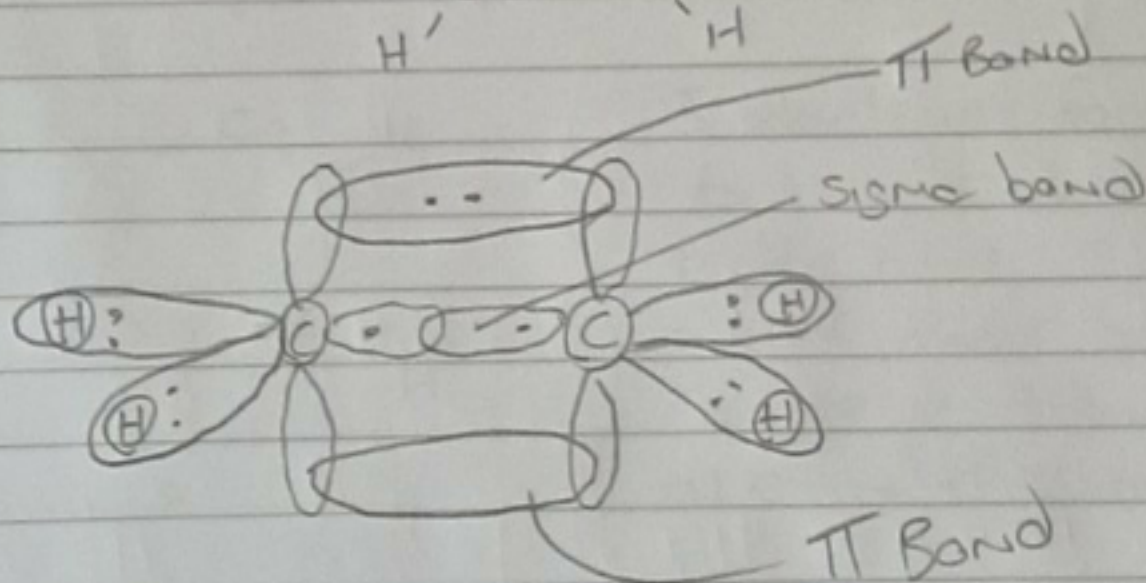
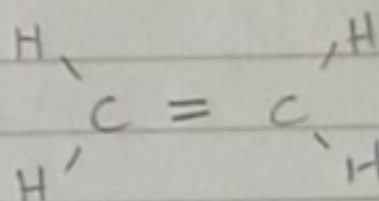
1

IN the case of ethane it would require the combination of 2 off sp^3 hybrids where carbon atoms are required to bond



Alkanes are covalent bonded

IN the case of Alkenes ($C_n H_{2n}$) an sp^2 is applied
i.e. ethene



Jordan Timberlake 1810310

L4 Chemistry (OME) ACDA4011

Page 6 of 8

Section

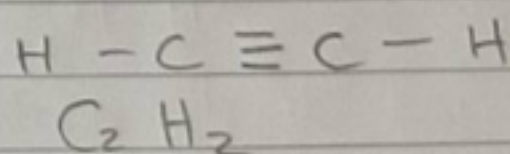
B

1

Continued

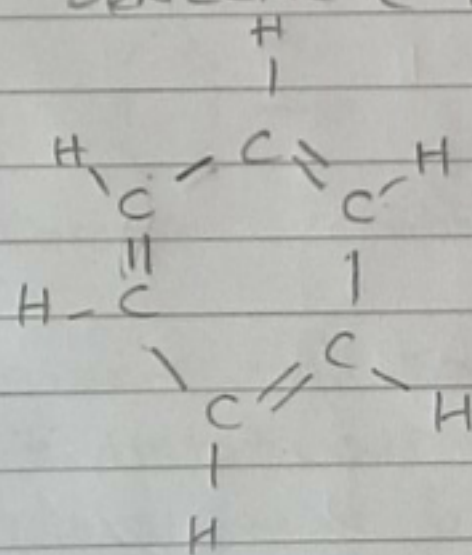
In the case of Alkynes an sp hybrid orbital is used + culminates in the implication of Multiple π Bonds

an example maybe found in acetylene (ethyne)



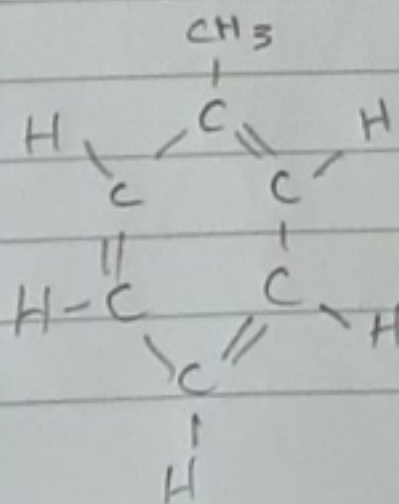
Simple Aromatic Hydrocarbons such as Benzene and toluene are in a ring format

Benzene (C_6H_6)



3 electrons form sigma bonds to two Carbon atoms and 1 H and 2 electrons given their orbital position above + below the molecule are in π Bonds

toluene

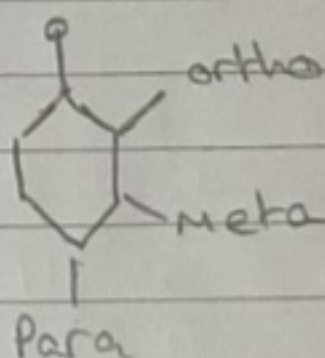


Jordan Timberlake 1810310
L4 Chemistry (OME) ACDA 4011
Page 7 of 8

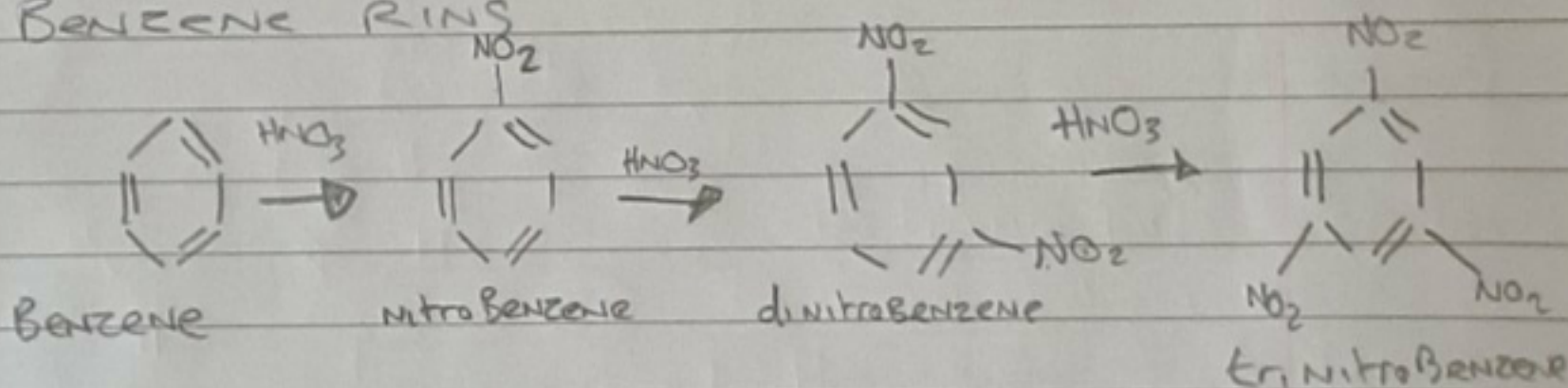
Section B

1
Continued

Introduction of a substituent will cause Aromatic Substitution to occur depending on its relative direction



The application of a nitro-group for instance would culminate in a meta-directing substituent eg. with each application of HNO_3 a substitution will occur on the BENZENE RING



given full saturation of the meta directing substituent has been applied no more Nitro may be Absorbed

Jordan Timberlake 1810310
L4 Chemistry (ONE) ACDA4011
Page 8 of 8

Section B

2

Phosphorous is a Hygroscopic non metal
in Period 3 of the Periodic Table
it has an Atomic number of 15
so has the following shell structure

$1s^2 2s^2 2p^6 3s^2 3p^3$
its valence is 3

Phosphorous is hence a very reactive material
in its purest form however Phosphorous
has many Allotropes

above approximately 280°C Phosphorous Gas
has a simple structure

as it cools the solid formed will depend
on the pace of cooling + condensation

if the process is fast it will produce white
phosphorous

a slow process will produce Red Phosphorous
+ if a slow process is performed under immense
pressure there is possibility to produce the
most stable form Black phosphorous

Phosphorous has a Deep rooted history
in ONE white phosphorous in munitions
such as grenades + Red phosphorous in
signaling smokes due to its high yield
factor from Hygroscopy