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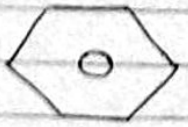
Q 3)
a)

i) Benzene  has the chemical formula C_6H_6.

ii) Each carbon atom is bonded to two other Carbon atoms and a single Hydrogen atom.

iii) The 4th bond pair of electrons from each Carbon atom is delocalised, creating a delocalised cloud of electrons above and below the plane.

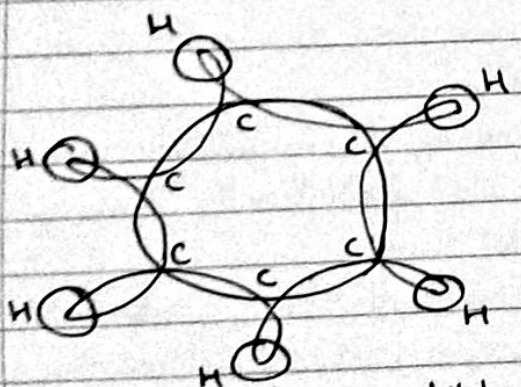
iv) Benzene is an hexagonal ring in shape with bond angles of 120 degrees between Carbon atoms.

v) All the bond lengths in Benzene are equal.

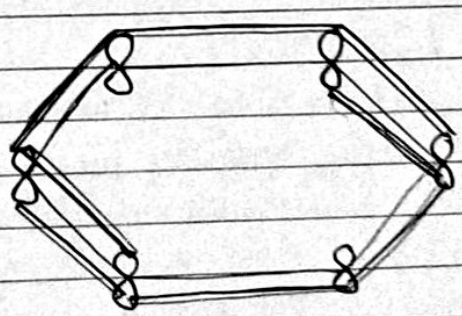
vi) Due to the system of delocalised electrons, Benzene is also far more energetically stable that it should be.

vii) Its extra stability is known as its delocalisation energy.

viii) Because of its increased ~~energy~~ stability, Benzene will not readily undergo addition reactions, instead it undergoes addition reactions whereby a Hydrogen atom is replaced by another atom or group.
(Example. Chlorine in the chlorination of Benzene).



overlap of sp^2 orbitals



overlap of p orbitals

Q3

d)

→ for Phase Rule:

Advantages:

i) Applies to both, physical and chemical phase reactions.
ii) Provides a suitable basis for classification of equilibrium states of systems by means of phases, components and degrees of freedom.
iii) Applies to macroscopic systems, therefore information about molecular structures is not needed.
iv) It does not take into account the nature or amount of substances present in the system.
v) Specifies that different systems with the same degrees of freedom behave in a similar manner.
vi) Useful in predicting the behaviour of a system under different conditions of temperature, pressure and composition.
vii) Helps in deciding whether the given number of substances together would exist in equilibrium under a given set of conditions or whether some of them will have to be inter-converted or eliminated.

Limitations:

i) Applies only to systems in equilibrium.
ii) Only applicable, provided all the phases of the system are present under the same condition of temperature, pressure and gravitational force.
iii) Applies to a single equilibrium state only.
iv) Considers only the number of phases and not thier quantities.
v) It takes into account only the intensive variables such as temperature, pressure and composition. It does not consider other factors such as influence of.

electric or magnetic field

vi) The solid and liquid phases should not be finely sub-divided as to bring about deviation from their normal values of vapour pressure.

Q 3.
b)

→ The roles played by the following are:

i) Plasticizer.

These are substances added to enhance the plasticity of the material and to reduce the cracking on the surface.

Plasticizers are added to plastics to increase the flexibility and toughness.

They also increase the flow property of the plastics.

Eg. Tricresyl phosphate, dibutylsebalate, castic oil, etc.

ii) Filler.

These are generally added to thermosetting plastics to increase elasticity and crack resistance.

Fillers improve thermal stability, strength, non-combustibility, water resistance, electrical properties and external appearance.

Eg. Mica, cotton, carbon black, graphite, etc.

iii) Catalyst.

These are used in the case of thermosetting plastics to accelerate the condensation polymerisation to form the cross (+) linked product.