

Hydrocarbons

Q-1) What are alkanes?

- Alkanes are saturated hydrocarbons (single C-C bonds).
- As the no. of C increases, the no. of e⁻ increases, ∴ VWF increases ∴ melting & boiling point increases.
- As the surface area increases, VWF increases ∴ MP & BP increase; as branching increases (isomers), MP & BP decreases.
- Alkanes are generally unreactive because they are non-polar and don't have a great difference in electronegativity. (∴ they don't dissolve in water)

Q-2) Combustion / oxidation of alkanes.



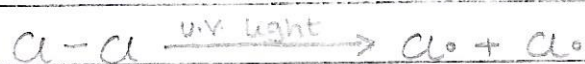
incomplete combustion releases carbon-monoxide.

Q-3) Substitution / halogenation of alkanes.

- > H-atom in the alkane is replaced by a halogen.

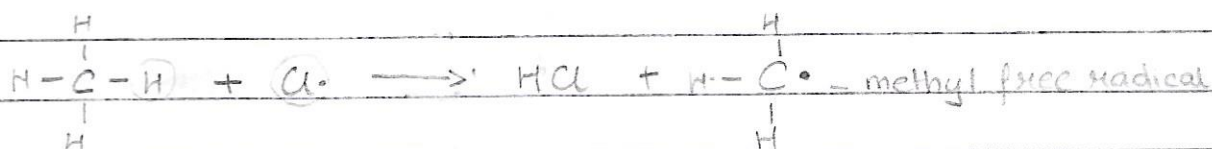
① Initiation.

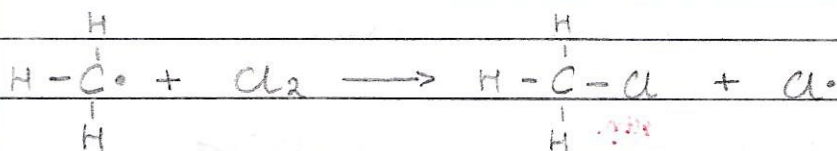
Breaking of C-Cl bond to form free-radicals (in presence of UV-light); homolytic fission.



② Propagation

Free radicals are v. reactive & will attack the alkanes.





③ Termination

2 free-radicals will react to form a single product.



Q-4) Cracking of alkanes

→ Breaking of high m_n alkane into smaller alkane + alkenes.

Thermal cracking - heat

800-900°C

Catalytic cracking

Δ 500-600°C, SiO₂ or Al₂O₃ catalyst

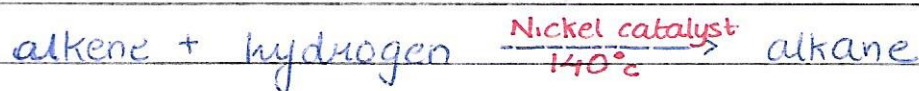


Q-5) What are alkenes?

→ Alkenes are unsaturated hydrocarbons (C=C double bonds)

→ They are formed by the cracking of alkanes.

Q-6) Addition of hydrogen / hydrogenation of alkenes.

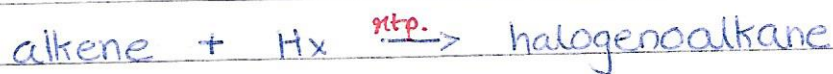


↳ used to convert fats to margarine.

Q-7) Addition of steam to alkenes.



Q-8) Addition of hydrogen halides (Hx) to alkenes.



The x (halogen) attaches to a C with a double bond.

* When 2 products are formed, the major product is the one which has the halogen atom bonded to a carbon with the least no. of hydrogens.

Q-9) Addition of halogens (x₂) to alkenes.



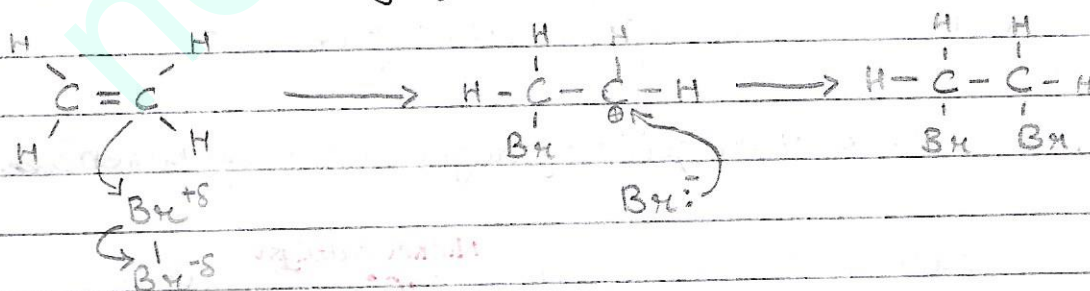
↳ used for test for alkene.

↳ IF Br₂ water decolourises, alkene is present.

Mechanism of electrophilic addition.

Electrophiles are e⁻ loving; e⁻ deficient species (+ charged).

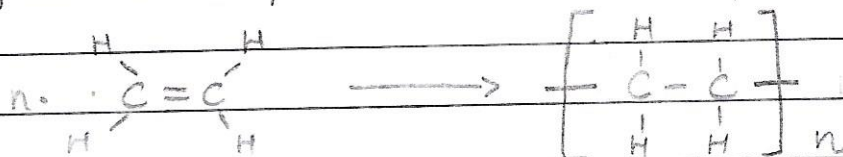
① As the halogen approaches the alkene, high density e⁻ cloud around the C=C double bond repels a pair of e⁻ away from the closer halogen, making + & - charged halogen.



② As the new bond between Cx⁺ forms, the bond between the x₂ breaks heterolytically.

③ The x⁻ ion then attacks the carbocation.

Q-10) Polymerisation of alkenes. - addition polymerisation



↳ used to make polyethene / polythene

* LDPE (low density polyethene)

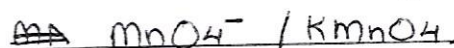
↳ bin bags

* HDPE (high density polyethene)

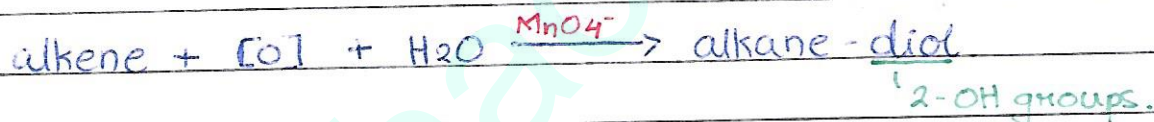
↳ detergent bottles, milk jugs

Q-11) Oxidation of alkenes

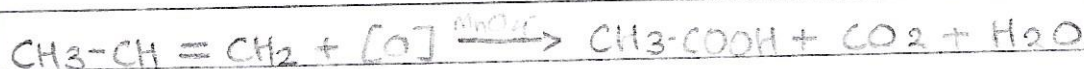
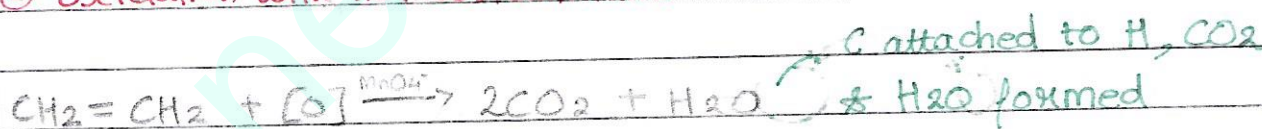
↳ oxidation with manganate (VII) ions



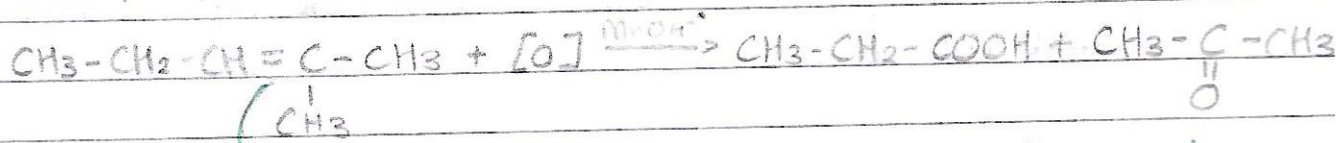
① oxidation with cold dilute acidified MnO_4^-



② oxidation with hot concentrated acidified MnO_4^-



↳ C attached to methyl (R) & H, R-COOH formed



↳ C attached to only R-groups, ketone (R-C(=O)-R') formed.