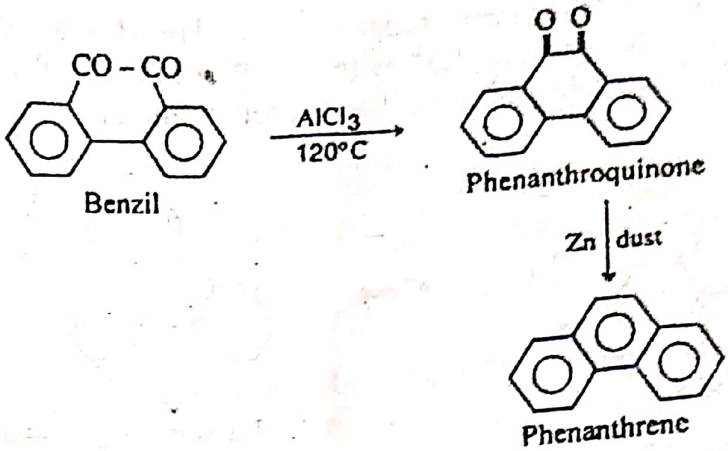
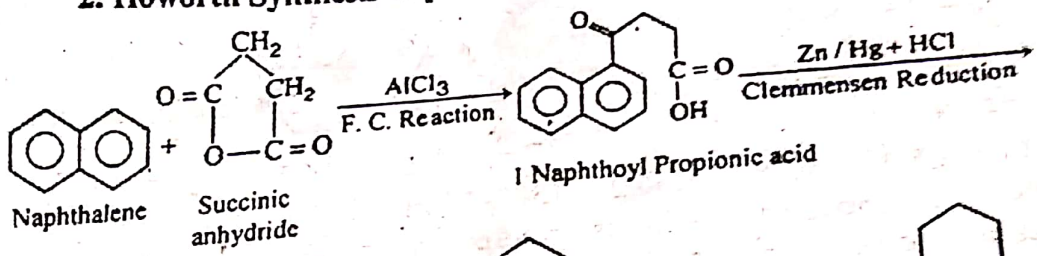
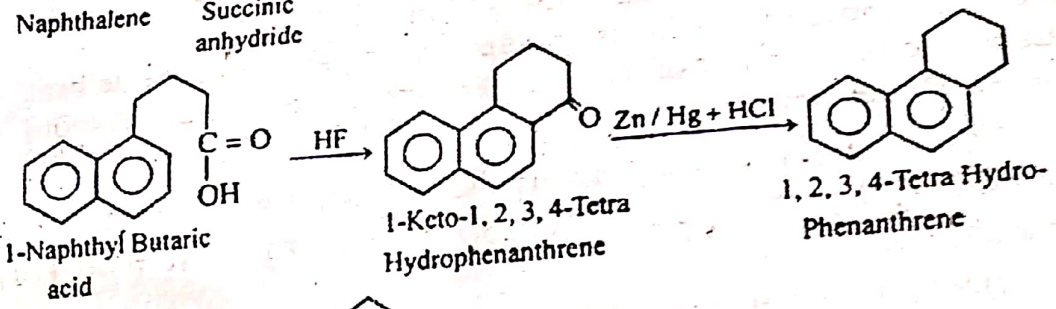
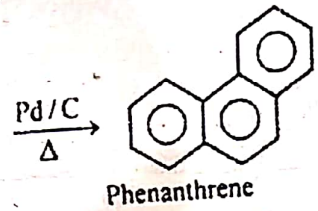


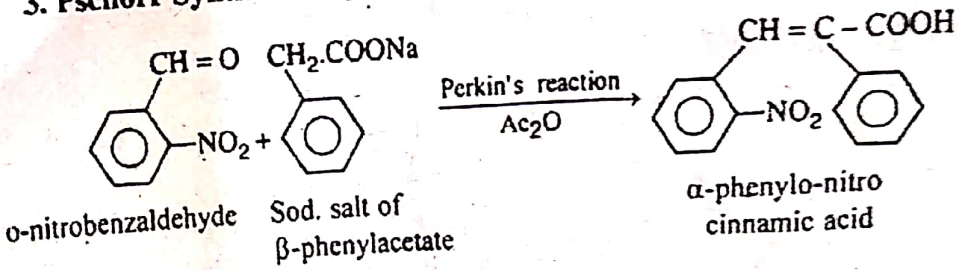
2. Howorth Synthesis of phenanthrene :

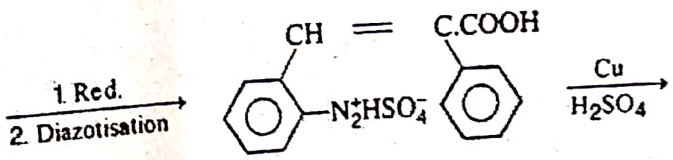


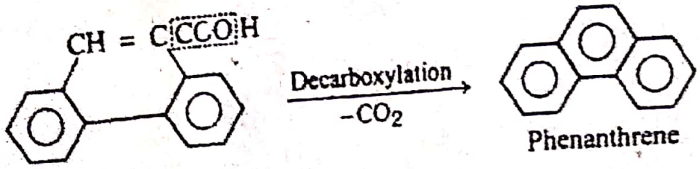




3. Pschorr Synthesis of phenanthrene :

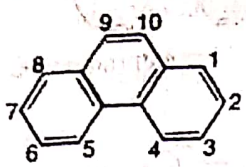




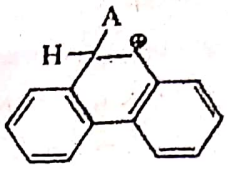


Q.53. Phenanthrene is very reactive at 9 : 10 positions—explain why?

Ans. : The carbocation formed by the electrophillic attack at position 9 or 10 is more resonance stabilised than that formed by the electrophillic attack at position 1 or 2—



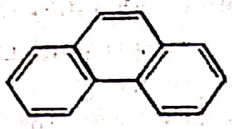
$+ A^+ \rightleftharpoons$



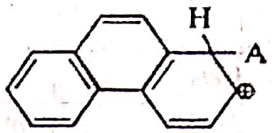
Attack at position-9
R.E. = 387 kJ mol^{-1}

Resonance energy (R.E.)
= 2 × 150.6 = 301.2 kJ mol^{-1}

$\therefore$ Loss of R.E. = 387 – 301.2 = 85.8 kJ mol^{-1}



$+ A^+ \rightleftharpoons$



Attack at position-1

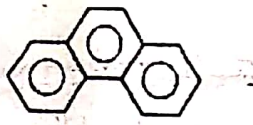
R.E. = 256.2 kJ mol^{-1}

$\therefore$ Loss of R.E. = 387 – 256.2 = 130.8 kJ mol^{-1}

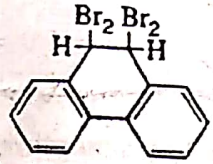
Hence the former cabocation is preferentially formed because its heat of formation is lower than that of the latter. Therefore phenanthrene is more reactive at 9 : 10 positions.

Q.54. How would you bring about the following conversions from phenanthrene (i) 9 : 10 dibromophanthrene (ii) diphenic acid (iii) Phenanthroquinone.

Ans. : ***(i) 9 : 10 dibromophenanthrene :***



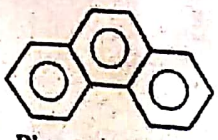
$\xrightarrow{Br_2}$



Phenanthrene

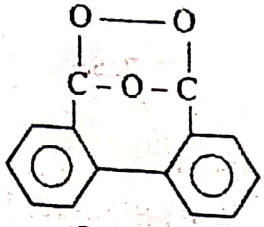
9 : 10 Dibromophenanthrene

(ii) *Diphenic acid* :



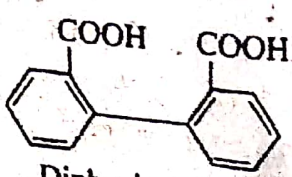
Phenanthrene

$\xrightarrow{O_3}$



Ozonide

$\downarrow$ [O] $KMnO_4$



Diphenic acid