

[DEPTH OF BIOLOGY]

- Effect of substituent on acidity of phenol.

Effect due to nature of substituent

Effect due to position of substituent.

e^- withdrawing e^- releasing.

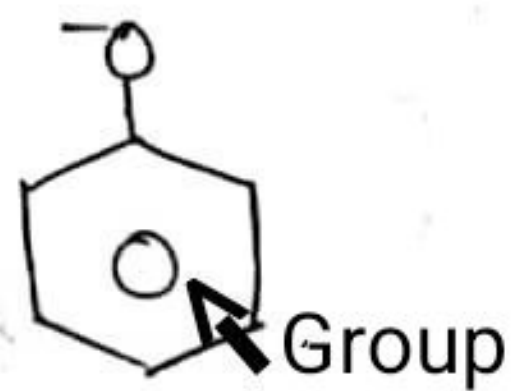
- Ortho & para position are more Influencing than meta. (In case of EWG)

↑ acidity



withdraw stabilize the phenoxide ion.
eg. NO_2

↓ acidity



e^- releasing makes less stable phenoxide ion
eg. CH_3

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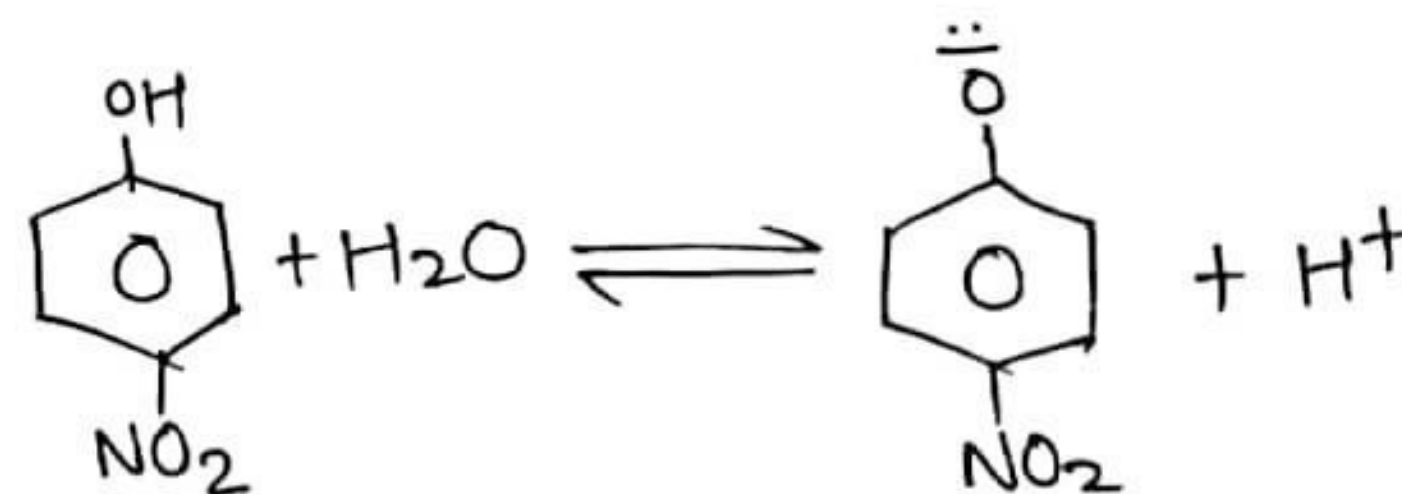
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E.W.G = $-\text{NO}_2$, $-\text{CN}$, $-\text{Cl}$, $-\text{CHO}$, $-\text{COOH}$, etc., on the Aromatic ring.

- ↑↑ the acidity of phenol → it enable the ring to withdraw more e^- from the phenoxy oxygen (makes easy to leave H^+)

↓

This ~~at~~ stabilizes phenoxide ion still further & results in stronger acid
eg: Nitrophenol is more acidic than phenol. [DEPTH OF BIOLOGY]



p-Nitrophenol

p-Nitrophenoxide Ion.

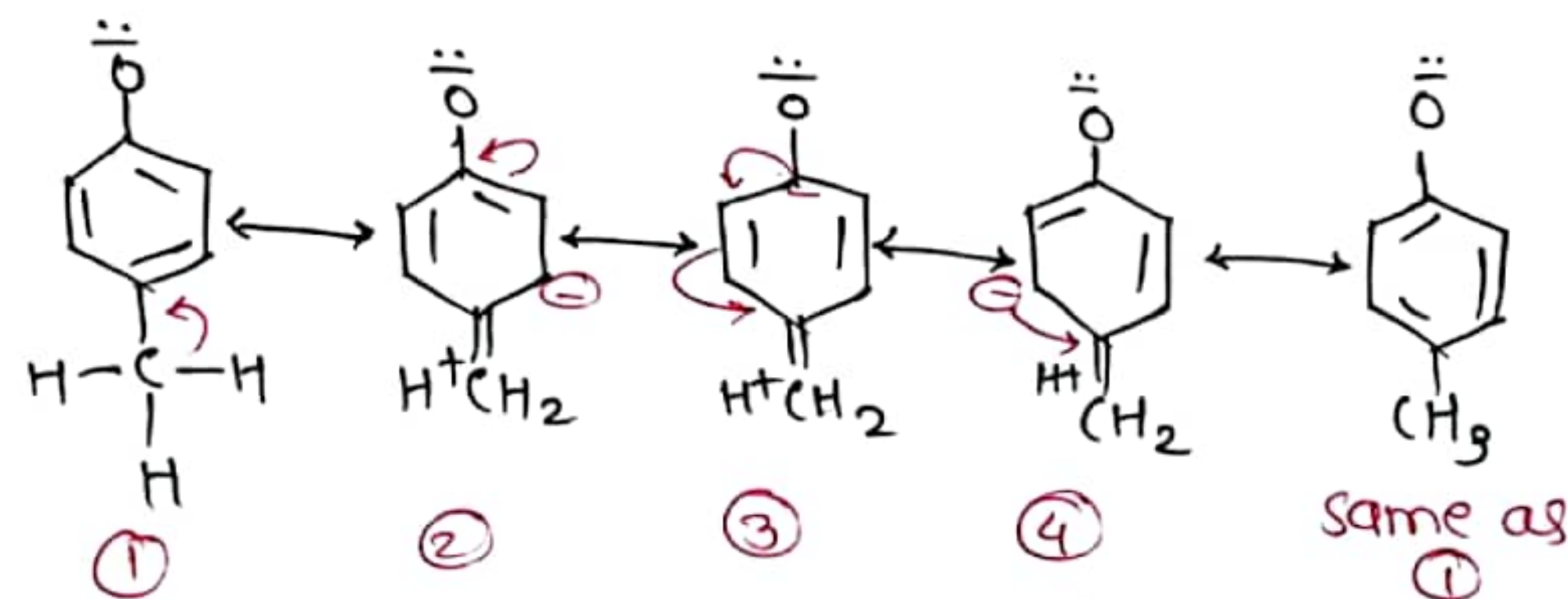
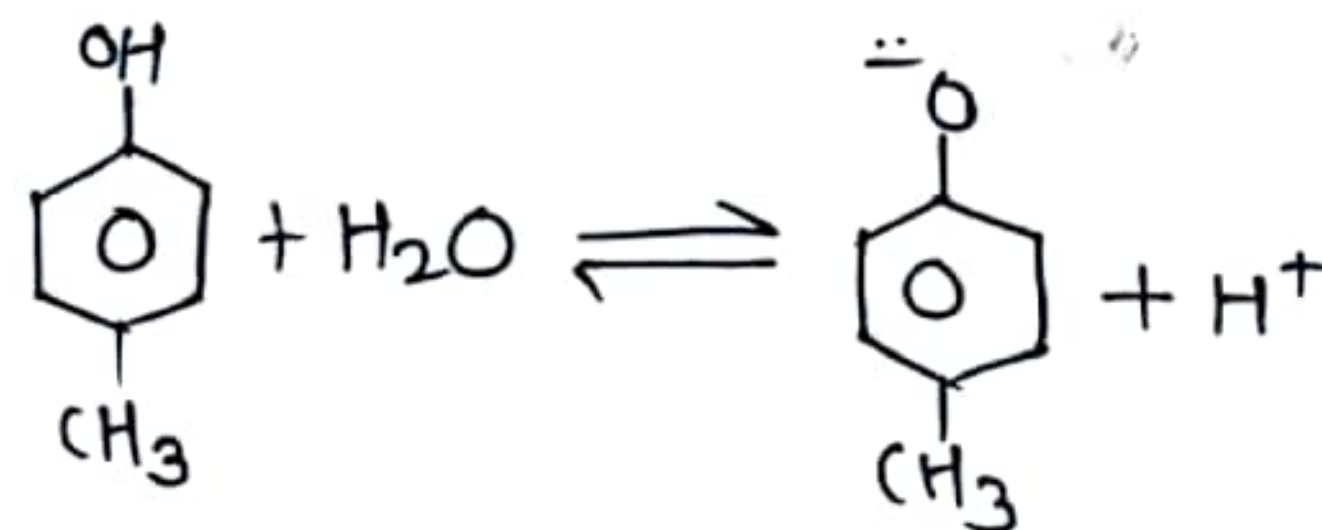
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eg: *p*-Cresol is less acidic than phenol.



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$\Rightarrow$ +I effect of CH_3 group $\uparrow\uparrow$ the magnitude & destabilises the ion.

★ Effect of position of substituent on Acidity.

- The presence of substituent at ortho & para position is more pronounced than the m-position.

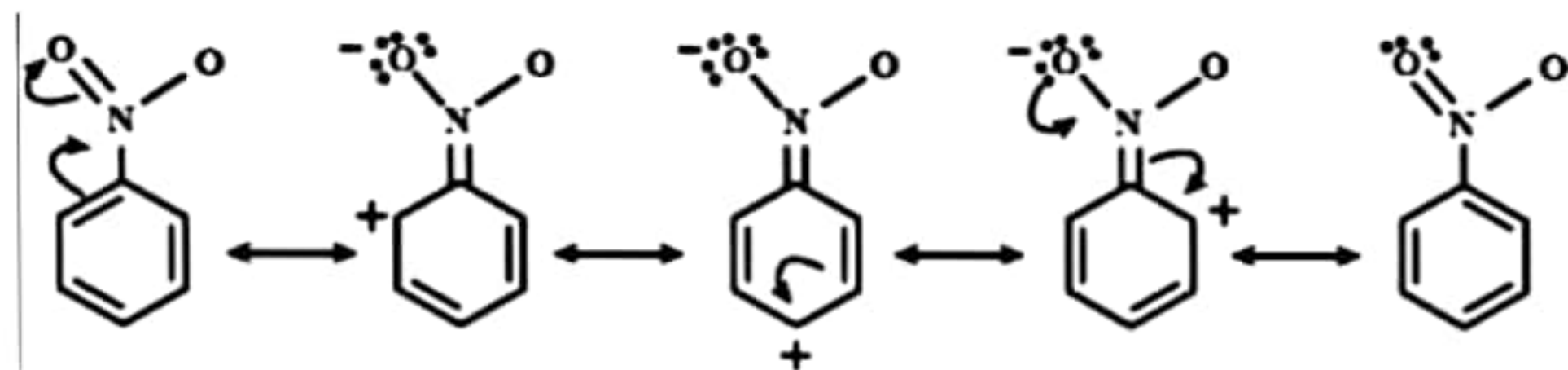
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This is due to resonance effect and Involvement of group.

ex: NO_2 group at ortho & para position is more able to delocalise.

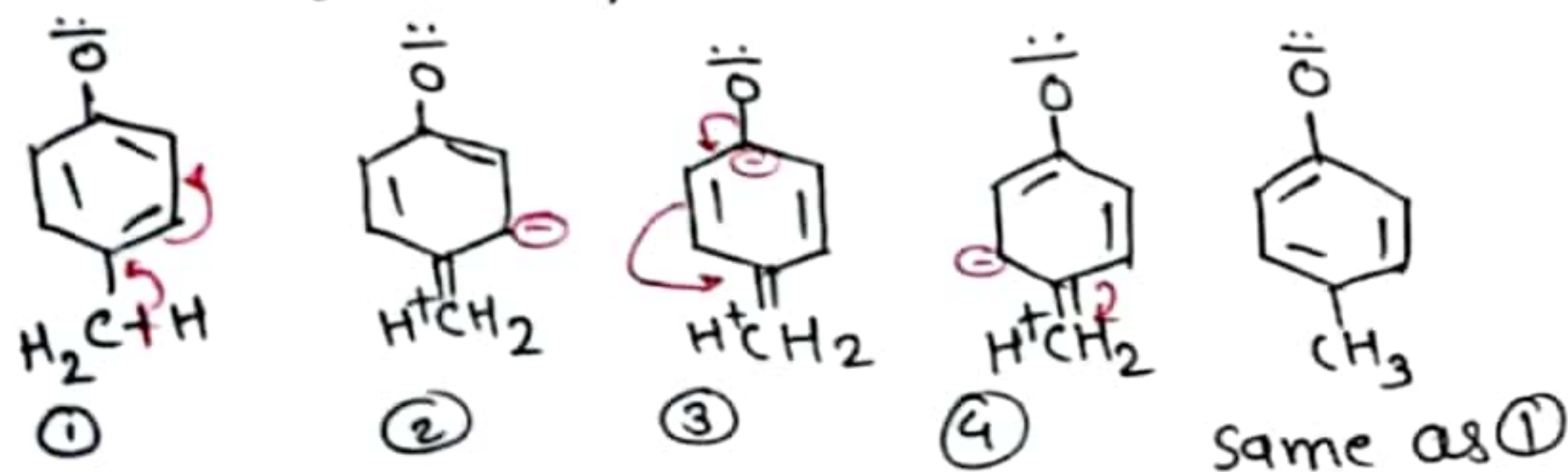
- The change on phenoxide ion then meta position.



★ m-cresol is more acidic than ortho & para cresol, this is due to Hyper-conjugation (Special resonance).

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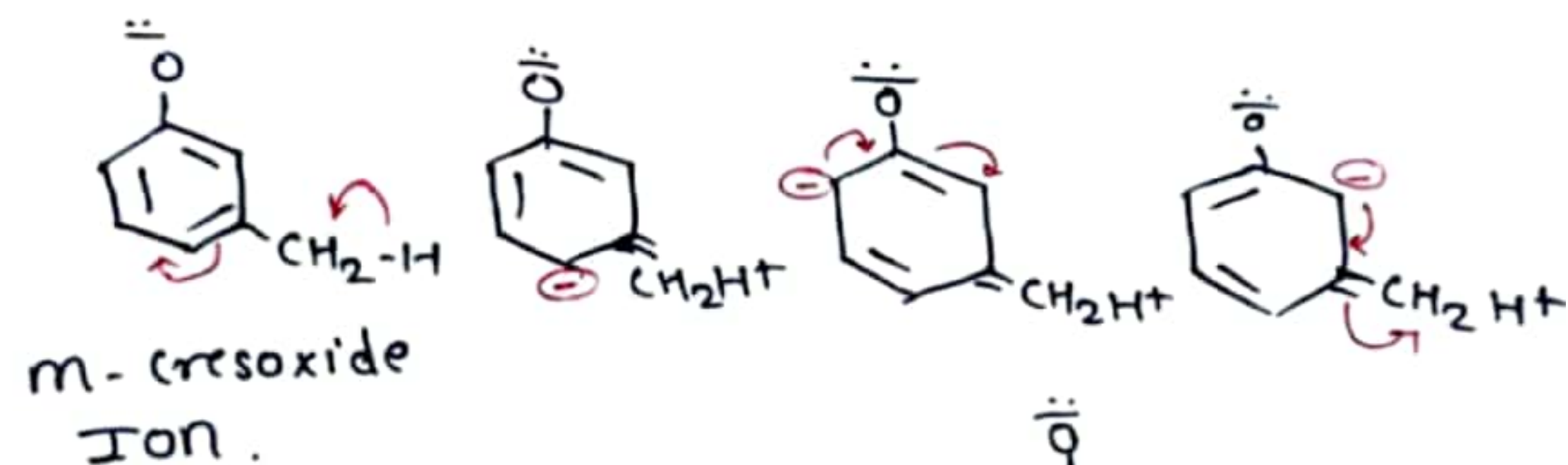
★ In the case of e^- -releasing the m-position effect is opposite to e^- -withdrawing group.



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In case of meta:

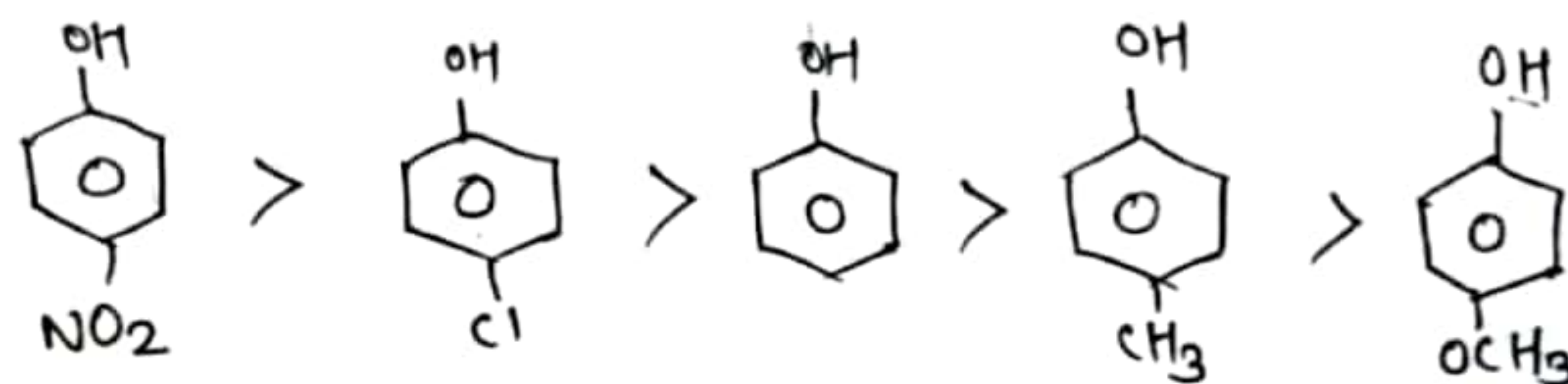


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more stable than ortho and para position.

• m-cresoxide Ion is more stable than ortho & para cresoxide Ion due to $\ominus$ ve charge on phenoxide carbon. Thus m-cresol is more acid.

we can say that,



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Imp:

- ① Acid strength of phenol also affect by
(no. of e^- w.G / e^- R.G)
- ② Tri Nitrophenol (picric acid) $>$ Di Nitrophenol (Acidic)
- ③ some phenol with 0 e^- w.G are weaker acid than p-substituted (group)
(same Group).
 - ① O- NO_2 phenol weaker than para.
 - ② O-Fluoro phenol weaker than para.