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pH pH pH

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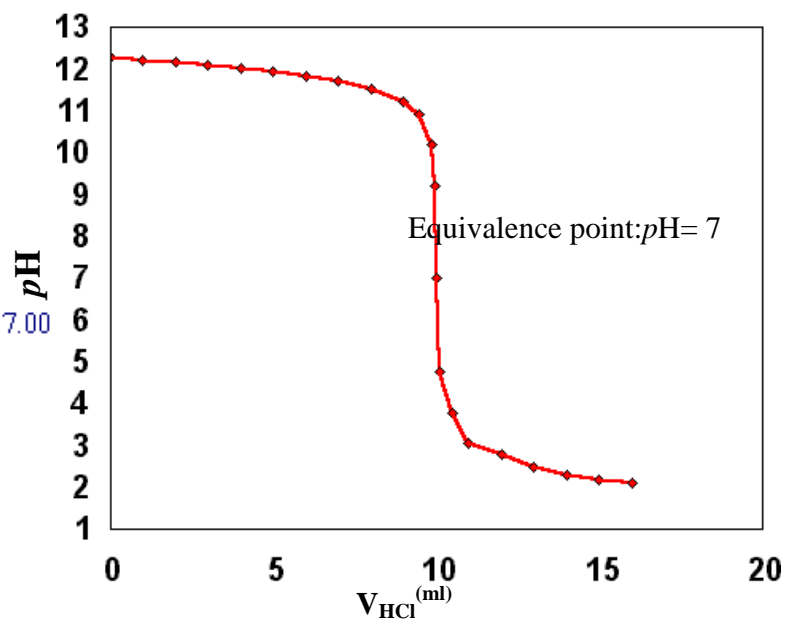
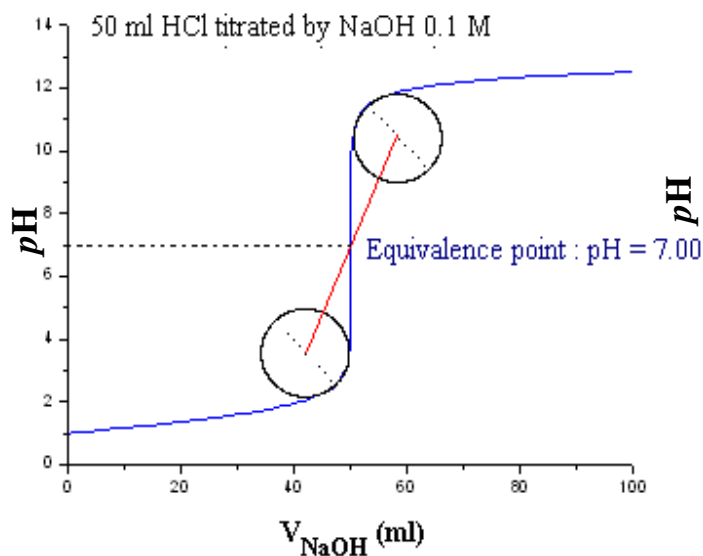
pH pH pH pH

pH pH pH pH pH

NaOH HCl pH HCl NaOH

pH

- Equivalence Point
- Eend Point



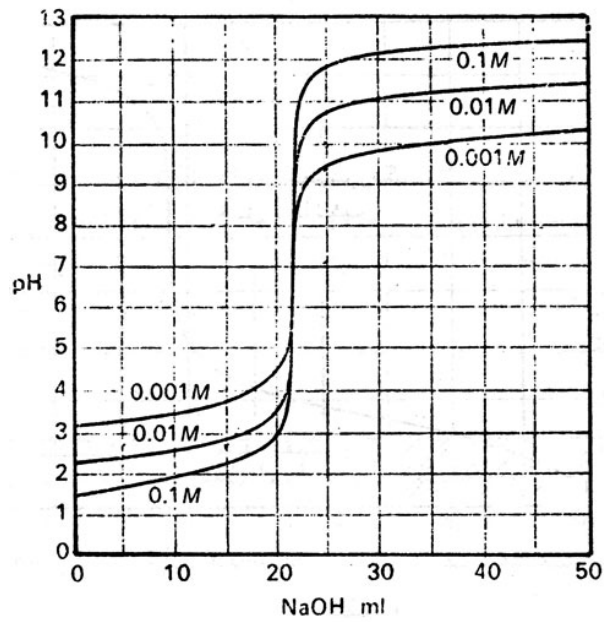
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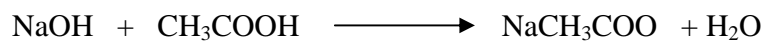
pH

Indicator	pH Range	Acid	Base	Indicator	pH Range	Acid	Base
Thymol Blue	1.2-2.8	red	yellow	Phenol red	6.4-8.0	yellow	Red
Pentamethoxy red	1.2-2.3	red-violet	colorless	Neutral red	6.8-8.0	red	yellow
Tropeolin OO	1.3-3.2	red	yellow	Rosolic acid	6.8-8.0	yellow	Red
2,4-Dinitrophenol	2.4-4.0	colorless	yellow	Cresol red	7.2-8.8	yellow	Red
Methyl yellow	2.9-4.0	red	yellow	$\alpha$ -Naphtholphthalein	7.3-8.7	rose	Green
Methyl orange	3.1-4.4	red	orange	Tropeolin OOO	7.6-8.9	yellow	rose-red
Bromphenol blue	3.0-4.6	yellow	blue-violet	Thymol blue	8.0-9.6	yellow	Blue
Tetrabromphenol blue	3.0-4.6	yellow	Blue	Phenolphthalein	8.0-10.0	colorless	Red
Alizarin sodium sulfonate	3.7-5.2	yellow	Violet	$\alpha$ -Naphtholbenzein	9.0-11.0	yellow	Blue
$\alpha$ -Naphthyl red	3.7-5.0	red	yellow	Thymolphthalein	9.4-10.6	colorless	Blue
<i>p</i> -Ethoxychrysoidine	3.5-5.5	red	yellow	Nile blue	10.1-11.1	blue	Red
Bromcresol green	4.0-5.6	yellow	Blue	Alizarin yellow	10.0-12.0	yellow	Lilac
Methyl red	4.4-6.2	red	yellow	Salicyl yellow	10.0-12.0	yellow	orange-brown
Bromcresol purple	5.2-6.8	yellow	purple	Diazo violet	10.1-12.0	yellow	Violet
Chlorphenol red	5.4-6.8	yellow	Red	Tropeolin O	11.0-13.0	yellow	orange-brown
Bromphenol blue	6.2-7.6	yellow	Blue	Nitramine	11.0-13.0	colorless	orange-brown
<i>p</i> -Nitrophenol	5.0-7.0	colorless	yellow	Poirrier's blue	11.0-13.0	blue	Violet-pink
Azolitmin	5.0-8.0	red	Blue	Trinitrobenzoic acid	12.0-13.4	colorless	orange-red



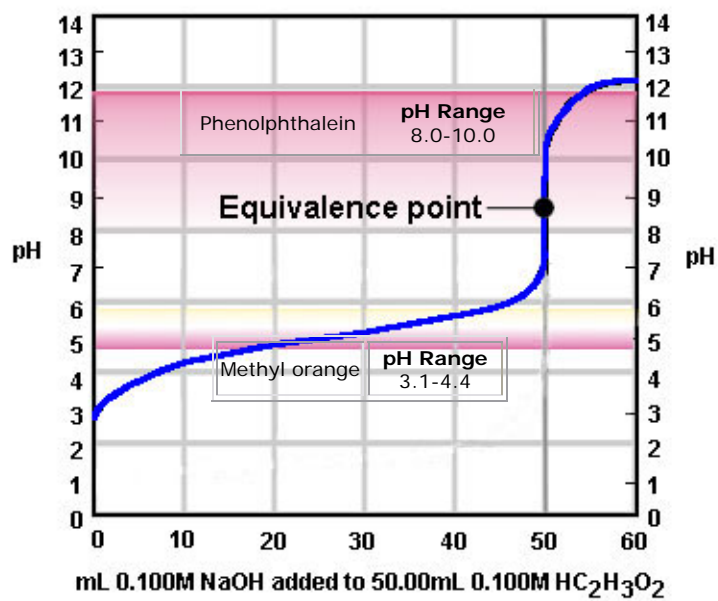
شکل ۲ منحنی حجم سنجی HCl به وسیله NaOH در غلظت های متفاوت

pH



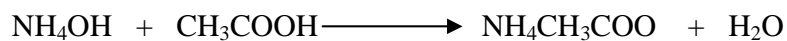
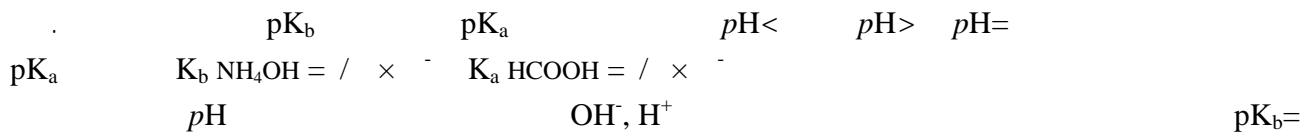
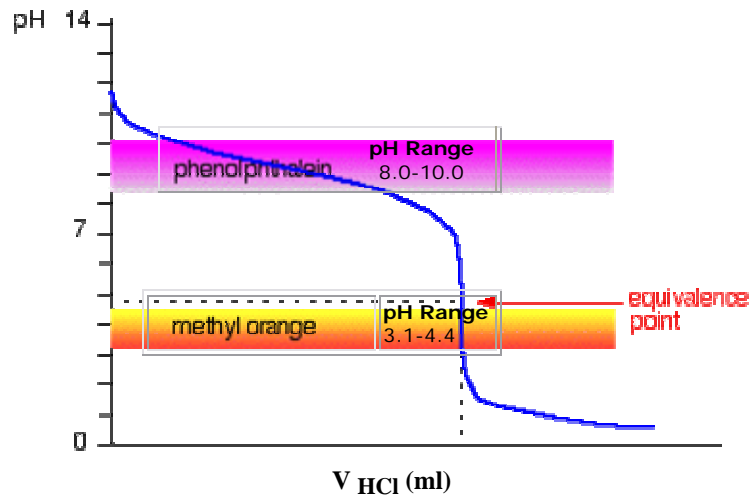
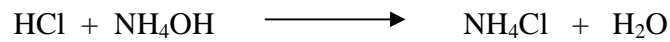
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pH

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3. <http://chemistry.about.com/library/weekly/aa112201a.htm>
4. [www.chem.ubc.ca/.../pH/section14/content.html](http://www.chem.ubc.ca/.../pH/section14/content.html)
5. [www.wcaslab.com/tech/titration.htm](http://www.wcaslab.com/tech/titration.htm)
6. [ww2.chem.sc.edu/Chem112/Ch16nf/sld019.htm](http://ww2.chem.sc.edu/Chem112/Ch16nf/sld019.htm)
7. [www.chemguide.co.uk/.../phcurves.html](http://www.chemguide.co.uk/.../phcurves.html)
8. [wine1.sb.fsu.edu/.../AddAqEq/Titrate/Titrate.htm](http://wine1.sb.fsu.edu/.../AddAqEq/Titrate/Titrate.htm)