

# How to Draw Line Chart: How to Draw Acid Base Titration Curve

Sara Rasoul-Amini, Pharm D, PhD in Medicinal Chemistry;  
Department of Medicinal Chemistry, School of Pharmacy, Shiraz University of Medical Sciences(SUMS); Mar2024

File Home **Insert** Page Layout Formulas Data Review View Help Tell me what you want to do

PivotTable Recommended Table Pictures Shapes Icons 3D SmartArt Screenshot Recommended Charts 2-D Line Maps PivotChart 2D Line Column Win/Loss Slicer Timeline Link Text Box Header & Footer WordArt Signature Object Equation Symbol

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A1 : x ✓ fx V(titratnt)= V(base)

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W
1	V(titratnt)= V(base)	pH																					
2	0	1.51																					
3	1	1.53																					
4	2	1.59																					
5	3	1.66																					
6	4	1.75																					
7	5	1.89																					
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23	11.2	11.81																					
24	12.2	12																					
25	13.2	12.13																					
26	15	12.27																					

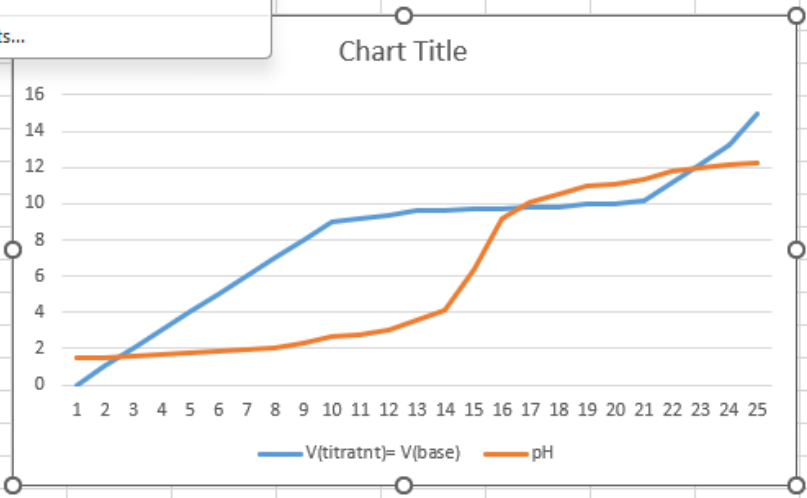
**2-D Line**

**Line**  
Use this chart type to:  
• Show trends over time (years, months, and days) or categories.  
Use it when:  
• The order of categories is important.  
• There are many data points.

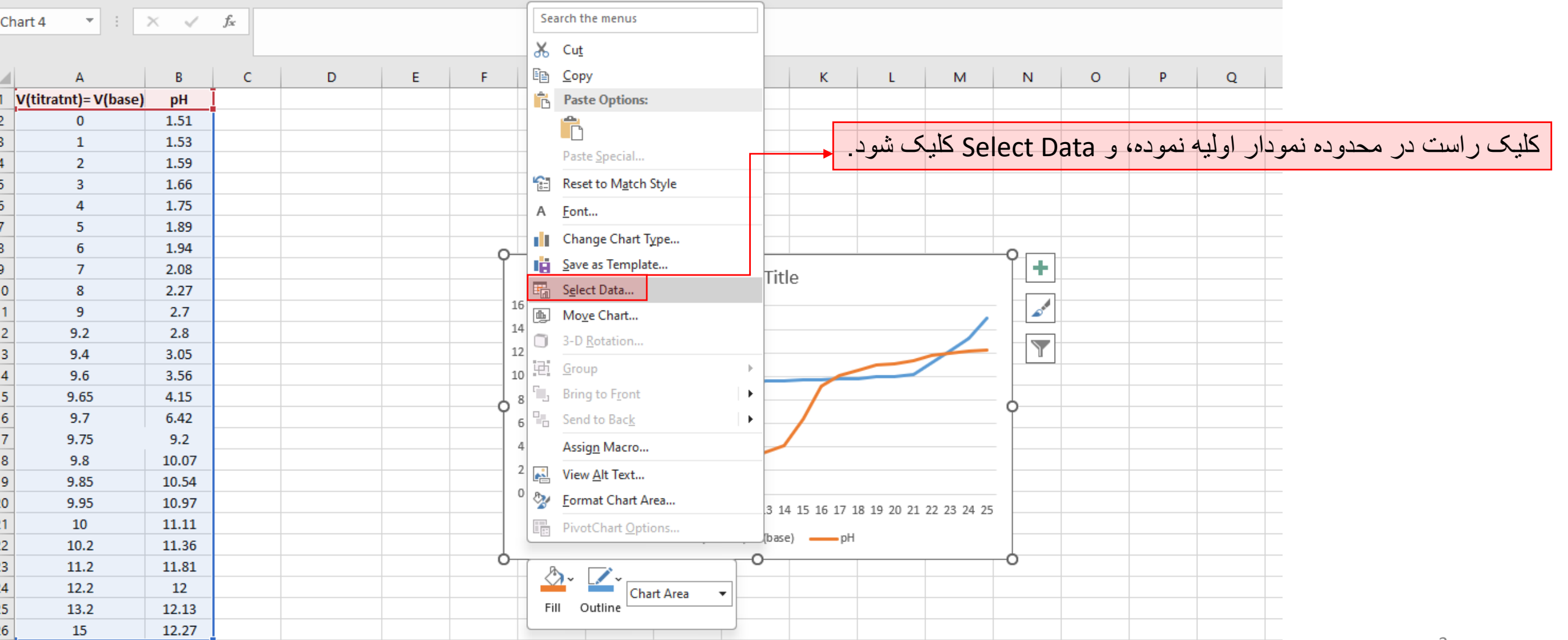
**3-D Area**

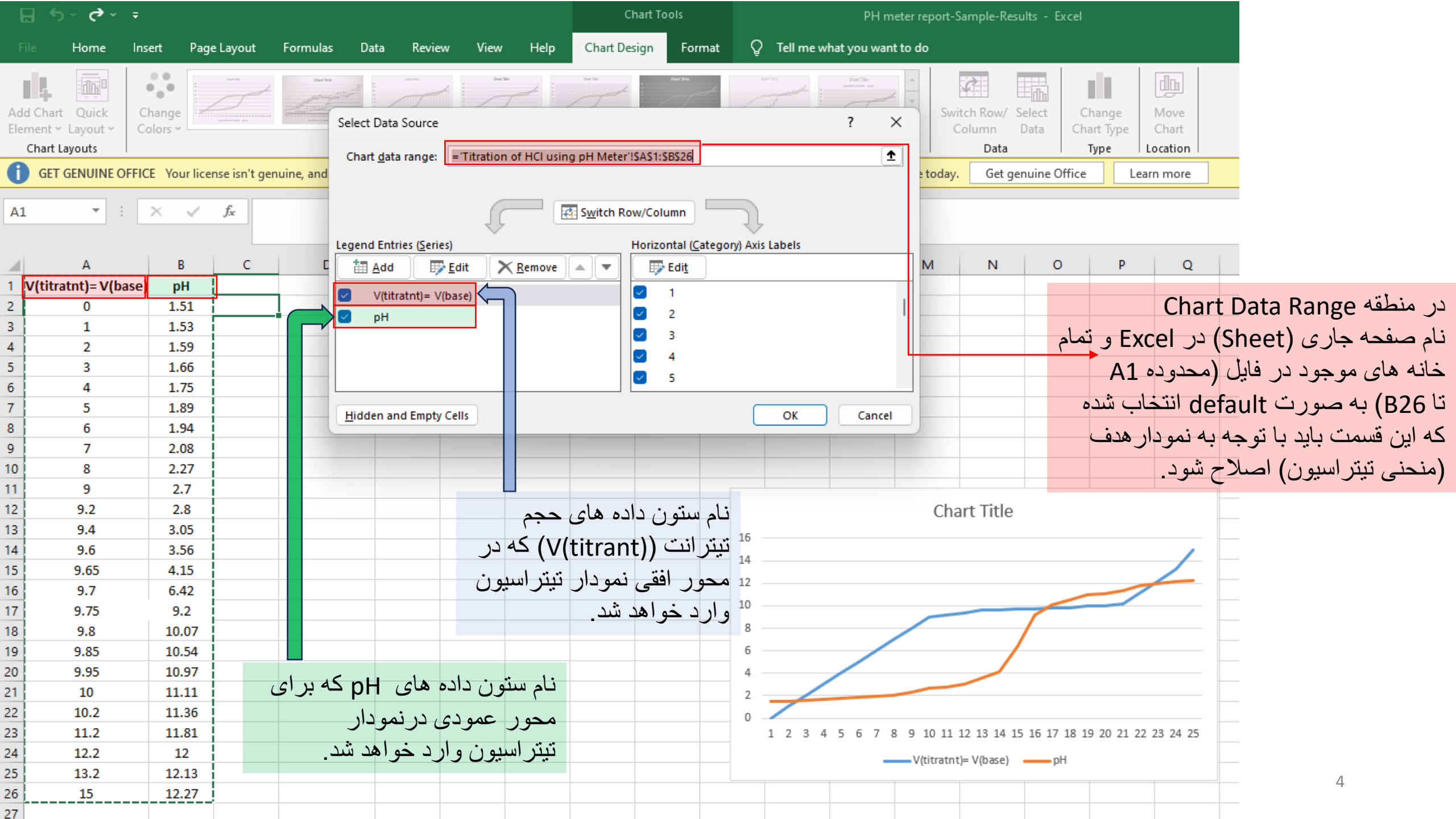
[More Line Charts...](#)

از insert در قسمت منوی tool bar نوع منحنی line انتخاب شود. یک منحنی الگو در صفحه ظاهر می شود.



منحنی الگو





در منطقه Chart Data Range نام صفحه جاری (Sheet) در Excel و تمام خانه های موجود در فایل (محدوده A1 تا B26) به صورت default انتخاب شده که این قسمت باید با توجه به نمودار هدف (منحنی تیتراسیون) اصلاح شود.

نام ستون داده های حجم تیترانت (V(titrant)) که در محور افقی نمودار تیتراسیون وارد خواهد شد.

نام ستون داده های pH که برای محور عمودی در نمودار تیتراسیون وارد خواهد شد.

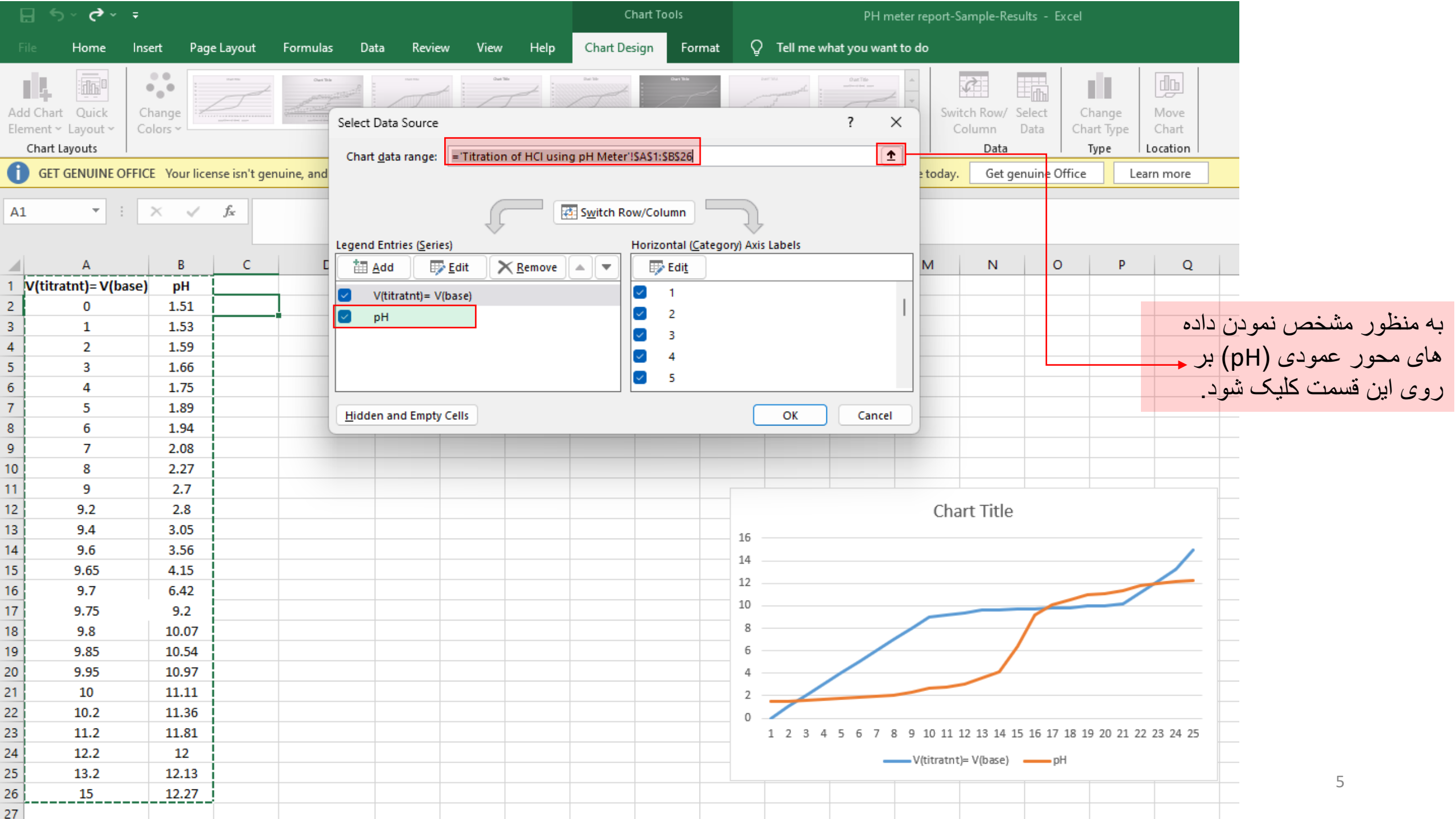


Chart Tools: Chart Design, Format, Tell me what you want to do

Switch Row/Column, Select Data, Change Chart Type, Move Chart

Data, Type, Location

Select Data Source

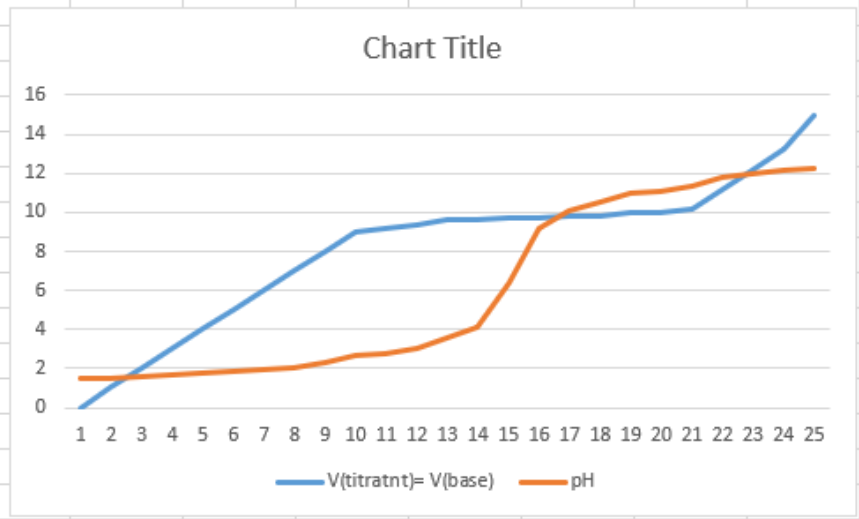
= 'Titration of HCl using pH Meter'!\$A\$1:\$B\$26

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C2

X ✓ fx

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
1	<b>V(titratnt)= V(base)</b>	<b>pH</b>																
2	0	1.51																
3	1	1.53																
4	2	1.59																
5	3	1.66																
6	4	1.75																
7	5	1.89																
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24	12.2	12																
25	13.2	12.13																
26	15	12.27																
27																		



	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
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23	11.2	11.81															
24	12.2	12															
25	13.2	12.13															
26	15	12.27															

در این مرحله برای مشخص کردن محدوده داده های محور عمودی (pH) از خانه B2 تا B26 با استفاده از کشیدن موس انتخاب شود: به این ترتیب در اطراف منطقه داده های انتخاب شده حاشیه نقطه چین سبز در صفحه Excel ظاهر می شود.

در پایان این مرحله در قسمت Select Data Range محدوده داده های انتخاب شده به صورت \$B\$2:\$B\$26 نمایش می شود؛ در این مرحله enter زده شود.

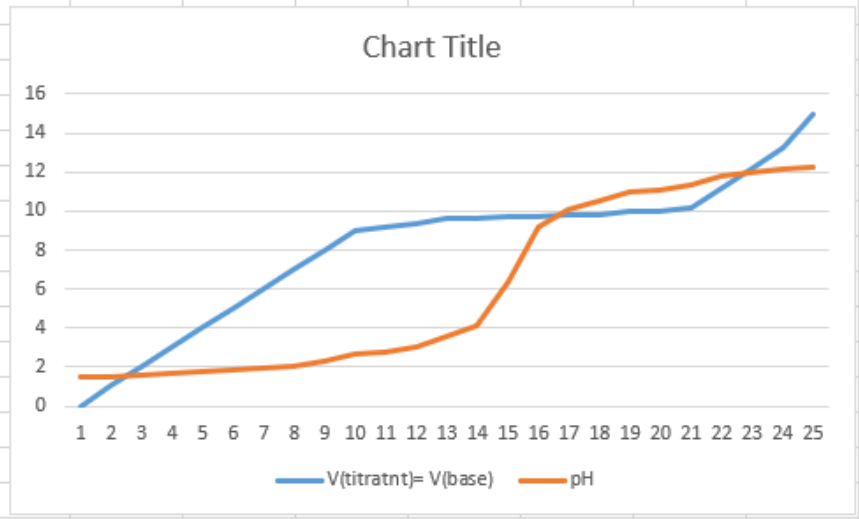


Chart Tools ribbon: Add Chart, Quick Element, Layout, Chart Layouts, Change Colors, Switch Row/Column, Select Data, Change Chart Type, Move Chart, Data, Type, Location.

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B2

	A	B	C
1	V(titratnt)= V(base)	pH	
2	0	1.51	
3	1	1.53	
4	2	1.59	
5	3	1.66	
6	4	1.75	
7	5	1.89	
8	6	1.94	
9	7	2.08	
10	8	2.27	
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12	9.2	2.8	
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23	11.2	11.81	
24	12.2	12	
25	13.2	12.13	
26	15	12.27	

Select Data Source dialog box. Chart data range: '=Titration of HCl using pH Meter!\$B\$2:\$B\$26'. Legend Entries (Series): Series1. Horizontal (Category) Axis Labels: 1, 2, 3, 4, 5.

نمودار با داده های مورد نظر برای محور عمودی شکل گرفته است.

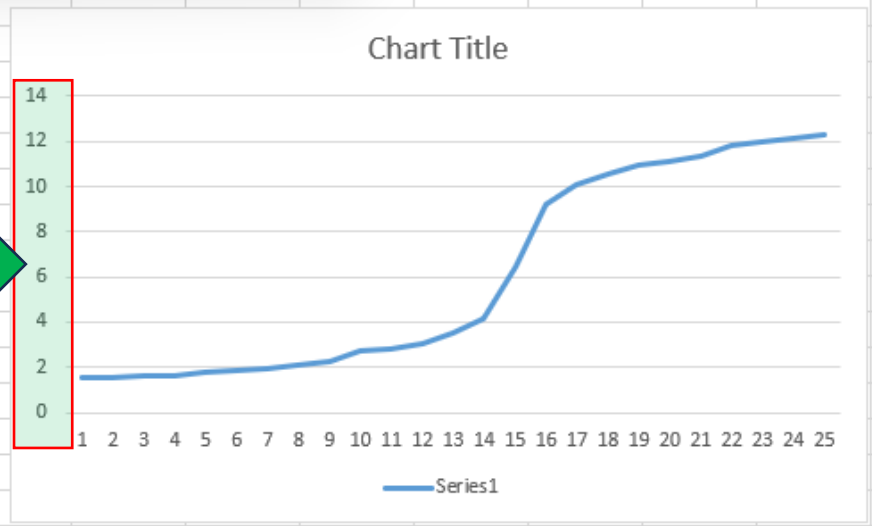




Chart Tools ribbon: Add Chart Element, Quick Layout, Change Colors, Chart Layouts, Switch Row/Column, Select Data, Change Chart Type, Move Chart, Data, Type, Location.

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B2

	A	B	C
1	V(titrant)= V(base)	pH	
2	0	1.51	
3	1	1.53	
4	2	1.59	
5	3	1.66	
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23	11.2	11.81	
24	12.2	12	
25	13.2	12.13	
26	15	12.27	

Select Data Source dialog box

Chart data range: ='Titration of HCl using pH Meter'!\$B\$2:\$B\$26

Switch Row/Column

Legend Entries (Series)

- Series1

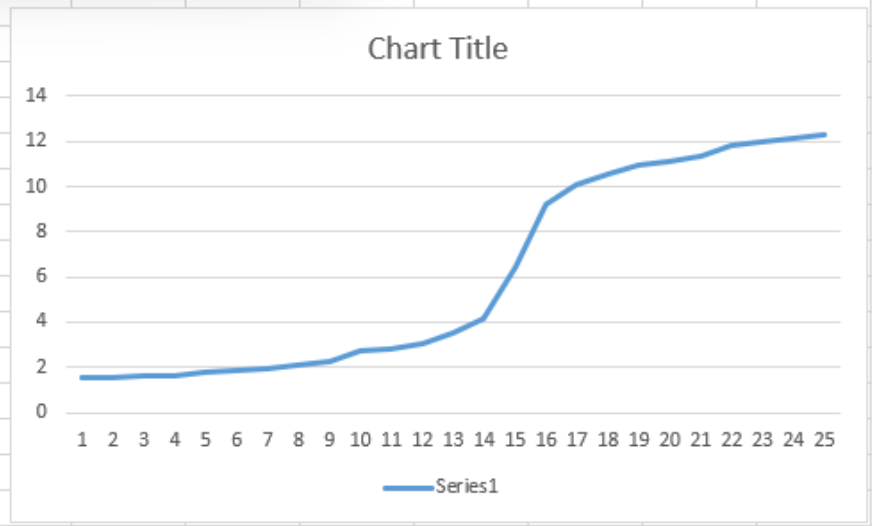
Horizontal (Category) Axis Labels

- 1
- 2
- 3
- 4
- 5

Hidden and Empty Cells

OK Cancel

انتخاب داده های محور افقی (V(titrant)) با کلیک بر روی Edit در قسمت Horizontal Axis Labels آغاز شود.



PH meter report-Sample-Results - Excel

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Add Chart Quick Element Layout Chart Layouts Change Colors Chart Styles Switch Row/Column Select Data Data Change Chart Type Type Move Chart Location

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B2

بر روی لوگوی مشخص شده در Axis Label Range کلیک شود.

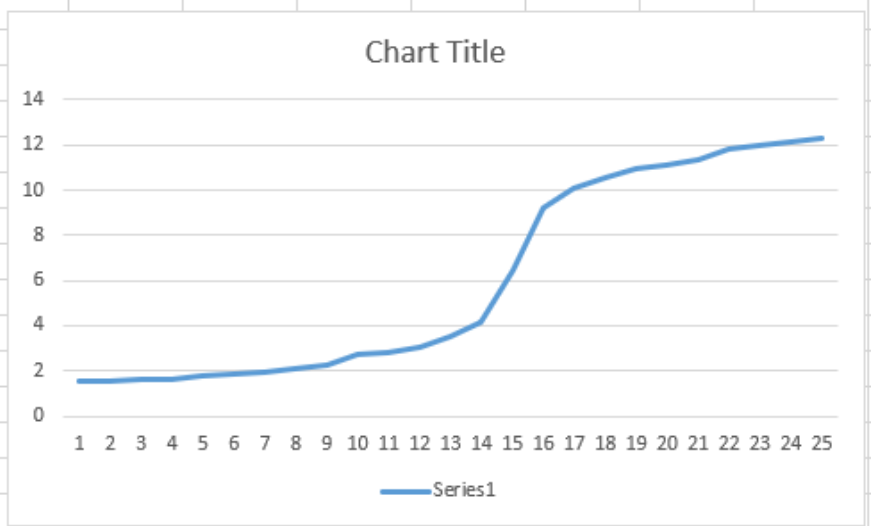
	A	B	C	D	E	K	L	M	N	O	P	Q
1	V(titratnt)= V(base)	pH										
2	0	1.51										
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24	12.2	12										
25	13.2	12.13										
26	15	12.27										

Axis Labels

Axis label range:

Select Range

OK Cancel





Add Chart Element Quick Layout Chart Layouts



Change Colors



Chart Styles



Switch Row/Column



Select Data



Change Chart Type



Move Chart

Data

Type

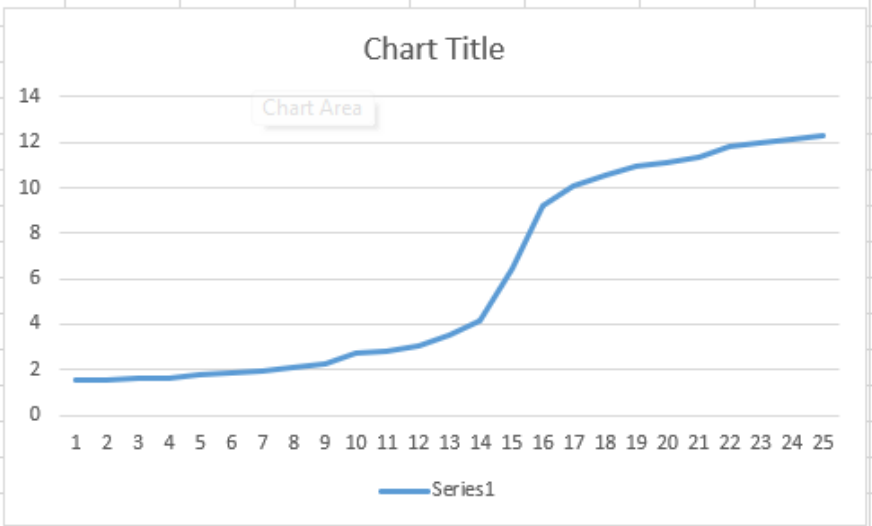
Location

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C2

Axis Labels

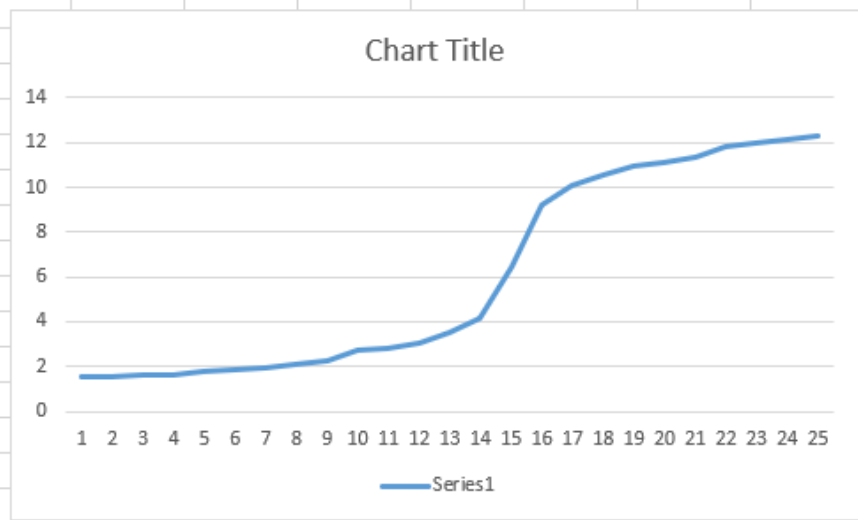
	A	B	C	D	E	K	L	M	N	O	P	Q
1	<b>V(titratnt)= V(base)</b>	<b>pH</b>										
2	0	1.51										
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	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
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Axis Labels  
 =Titration of HCl using pH Meter !\$A\$2:\$A\$26

در این مرحله برای مشخص کردن محدوده داده های محور افقی (V(titrant)) از خانه A2 تا A26 با استفاده از کشیدن موس انتخاب شود: به این ترتیب در اطراف منطقه داده های انتخاب شده، حاشیه نقطه چین سبز در صفحه Excel ظاهر می شود. در پایان این مرحله در قسمت Select Data Range محدوده داده های انتخاب شده به صورت \$A\$2:\$A\$26 نمایش می شود؛ در این مرحله enter زده شود.



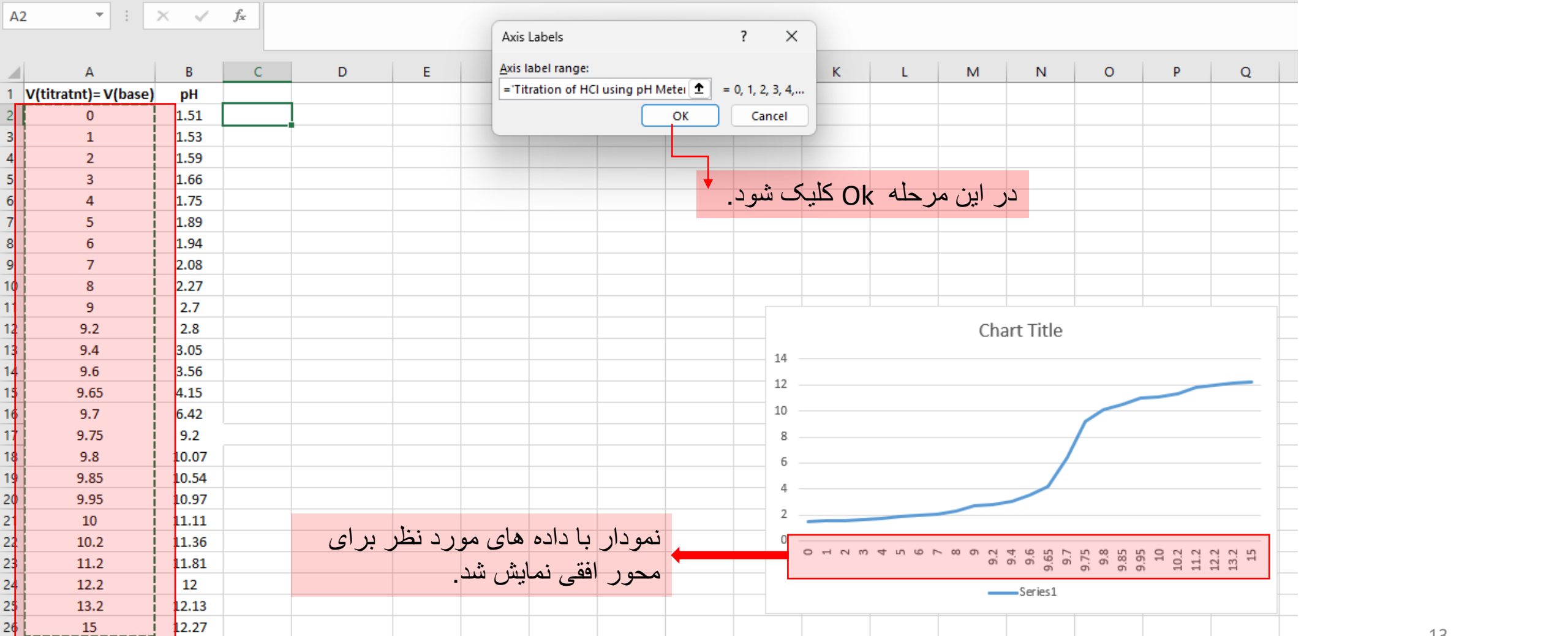
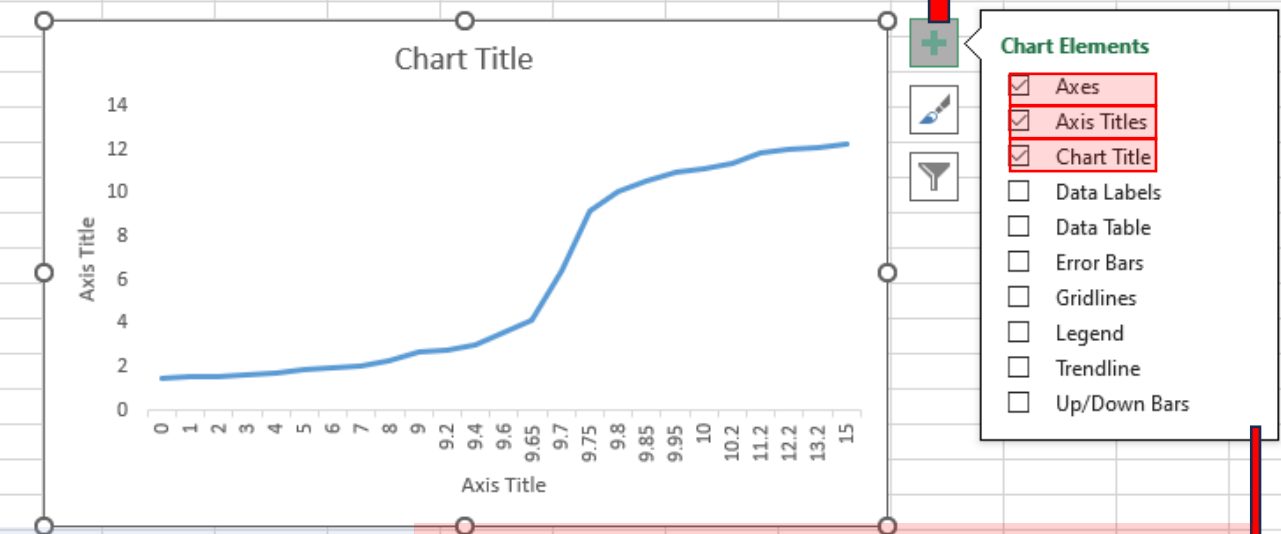


Chart 2

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U
1	V(titratnt)= V(base)	pH																			
2	0	1.51																			
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23	11.2	11.81																			
24	12.2	12																			
25	13.2	12.13																			
26	15	12.27																			
27																					

با کلیک بر روی علامت + در گوشه نمودار عناصر مختلفی در نمودار قابل ویرایش می باشد:



برای نوشتن عنوان نمودار Chart Title  
 برای نوشتن عنوان محورهای نمودار Axes  
 برای حفظ نمایش اعداد در محورهای نمودار Axes

PH meter report-Sample-Results - Excel

File Home Insert Page Layout Formulas Data Review View Help Chart Design Format Tell me what you want to do

Clipboard Font Alignment Number Styles

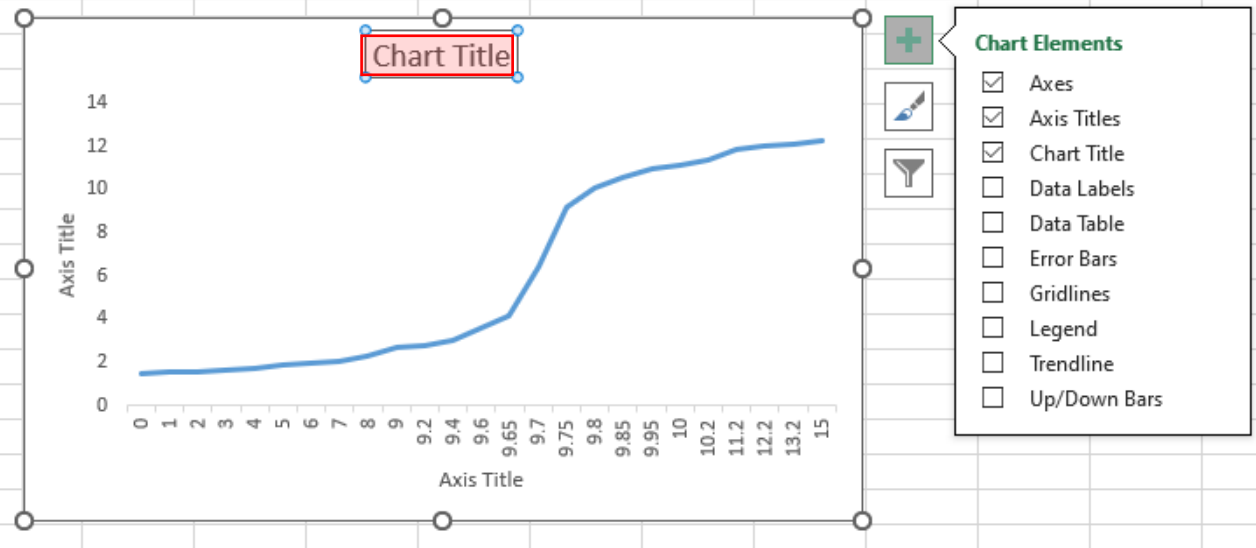
Normal Bad Good Neutral  
Calculation Check Cell Explanatory ... Input

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Chart 2

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	
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25	13.2	12.13																				
26	15	12.27																				

کلیک بر روی Chart Title برای نوشتن عنوان نمودار



File Home Insert Page Layout Formulas Data Review View Help Tell me what you want to do

Clipboard: Cut, Copy, Paste, Format Painter

Font: Calibri, 11, Bold, Italic, Underline, Paragraph, Color, Background Color

Alignment: Wrap Text, Merge & Center

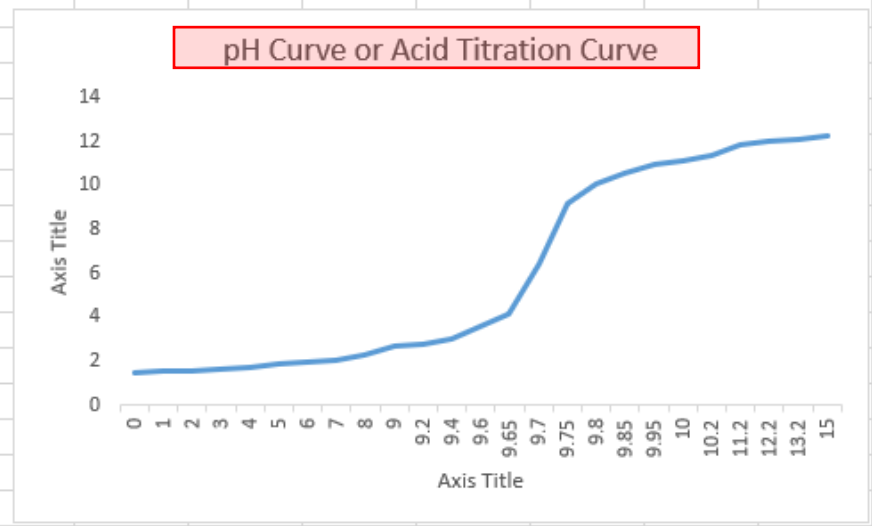
Number: General, Currency, Percentage, Decimals, Thousands Separator

Styles: Normal, Bad, Good, Calculation, Check Cell

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T24 : X ✓ fx

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
1	<b>V(titratnt)= V(base)</b>	<b>pH</b>																
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26	15	12.27																
27																		





PH meter report-Sample-Results - Excel

File Home Insert Page Layout Formulas Data Review View Help Chart Design Format Tell me what you want to do

Clipboard: Cut, Copy, Paste, Format Painter

Font: Calibri (Body), 10, Bold, Italic, Underline, Text Color, Background Color

Alignment: Wrap Text, Merge & Center

Number: General, Currency, Percentage, Decimals

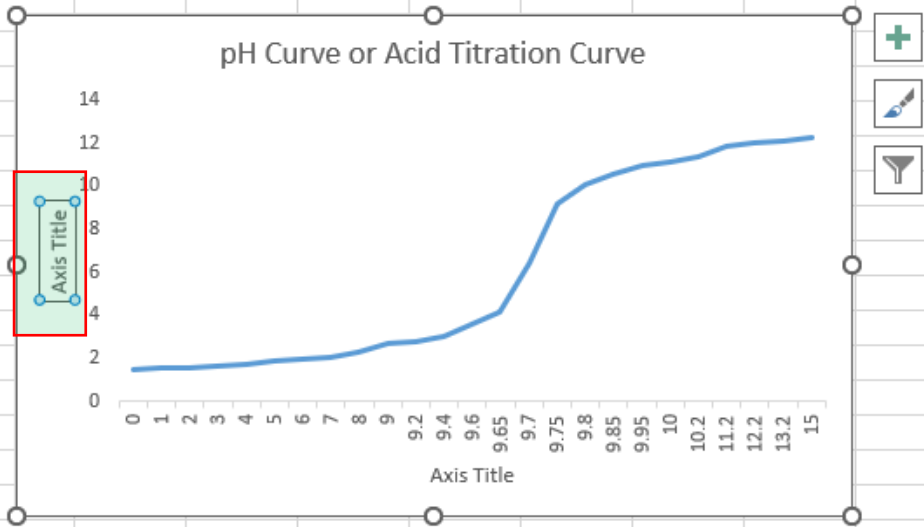
Styles: Normal, Bad, Good, Calculation, Check Cell, Explain

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Chart 2

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
1	<b>V(titratnt)= V(base)</b>	<b>pH</b>																
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24	12.2	12																
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26	15	12.27																

عنوان محور عمودی آماده ویرایش



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Clipboard: Cut, Copy, Paste, Format Painter

Font: Calibri, 11, Bold, Italic, Underline, Text Color, Background Color

Alignment: Wrap Text, Merge & Center

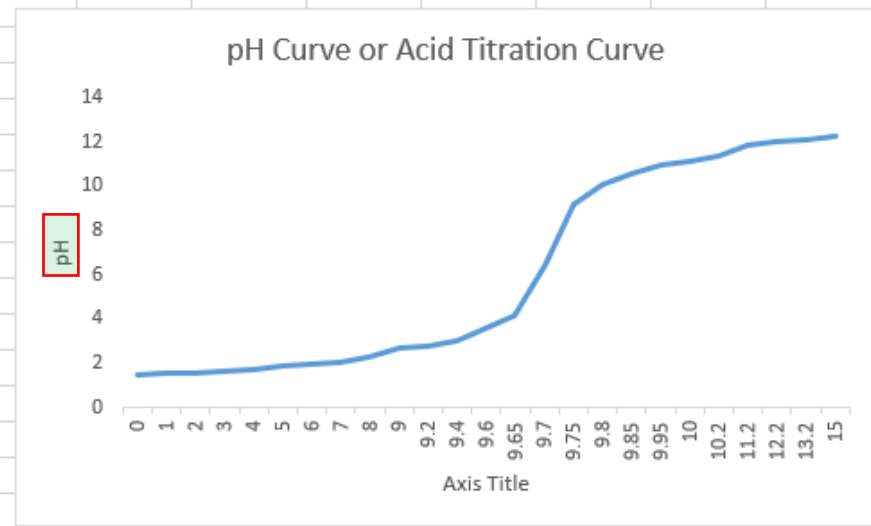
Number: General, Currency, Percentage, Decimals

Styles: Normal, Bad, Good, Calculation, Check Cell

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H24

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
1	<b>V(titratnt)= V(base)</b>	<b>pH</b>																
2	0	1.51																
3	1	1.53																
4	2	1.59																
5	3	1.66																
6	4	1.75																
7	5	1.89																
8	6	1.94																
9	7	2.08																
10	8	2.27																
11	9	2.7																
12	9.2	2.8																
13	9.4	3.05																
14	9.6	3.56																
15	9.65	4.15																
16	9.7	6.42																
17	9.75	9.2																
18	9.8	10.07																
19	9.85	10.54																
20	9.95	10.97																
21	10	11.11																
22	10.2	11.36																
23	11.2	11.81																
24	12.2	12																
25	13.2	12.13																
26	15	12.27																



Add Chart Quick Element Layout Chart Layouts

Change Colors

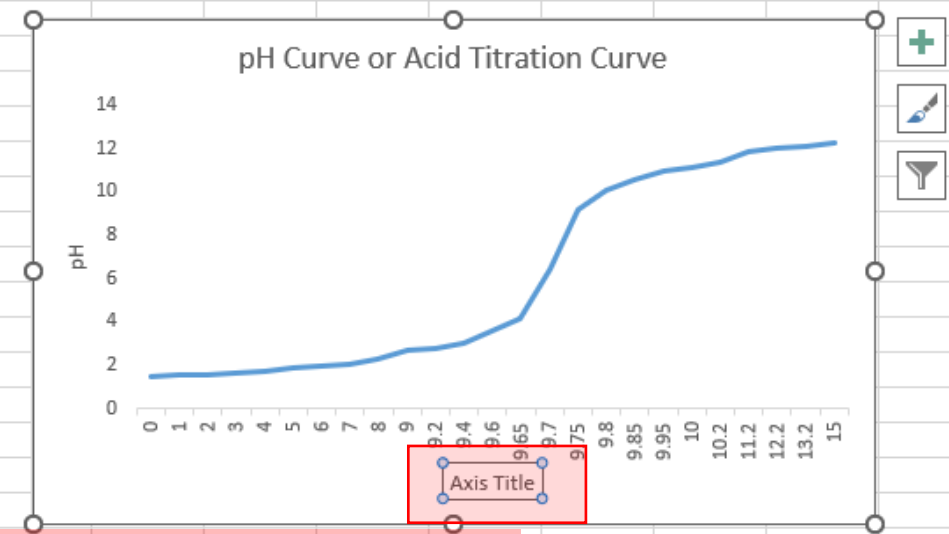
Chart Styles

Switch Row/Column Data Select Data Data Change Chart Type Type Move Chart Location

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Chart 2

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
1	<b>V(titratnt)= V(base)</b>	<b>pH</b>																
2	0	1.51																
3	1	1.53																
4	2	1.59																
5	3	1.66																
6	4	1.75																
7	5	1.89																
8	6	1.94																
9	7	2.08																
10	8	2.27																
11	9	2.7																
12	9.2	2.8																
13	9.4	3.05																
14	9.6	3.56																
15	9.65	4.15																
16	9.7	6.42																
17	9.75	9.2																
18	9.8	10.07																
19	9.85	10.54																
20	9.95	10.97																
21	10	11.11																
22	10.2	11.36																
23	11.2	11.81																
24	12.2	12																
25	13.2	12.13																
26	15	12.27																



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Cut Copy Paste Format Painter Clipboard

Calibri 11 Font

Wrap Text Alignment

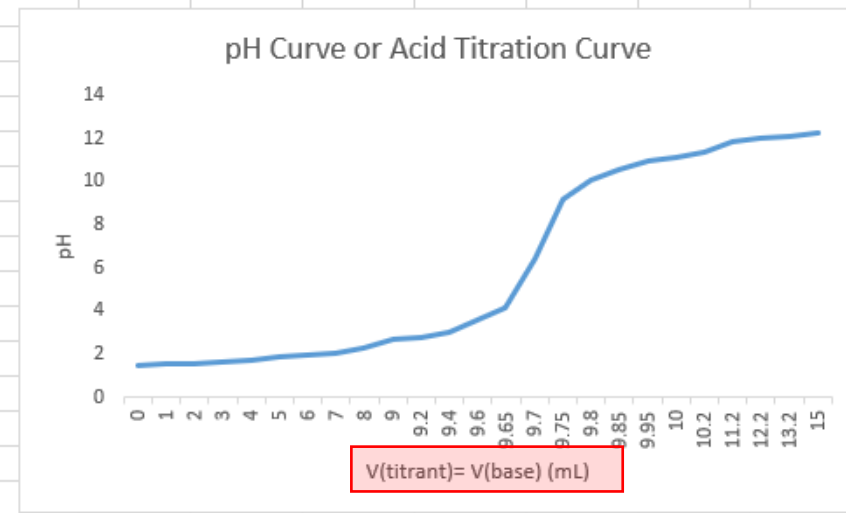
General Number

Normal Bad Calculation Check Cell Styles

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S34

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
1	<b>V(titrant)= V(base)</b>	<b>pH</b>															
2	0	1.51															
3	1	1.53															
4	2	1.59															
5	3	1.66															
6	4	1.75															
7	5	1.89															
8	6	1.94															
9	7	2.08															
10	8	2.27															
11	9	2.7															
12	9.2	2.8															
13	9.4	3.05															
14	9.6	3.56															
15	9.65	4.15															
16	9.7	6.42															
17	9.75	9.2															
18	9.8	10.07															
19	9.85	10.54															
20	9.95	10.97															
21	10	11.11															
22	10.2	11.36															
23	11.2	11.81															
24	12.2	12															
25	13.2	12.13															
26	15	12.27															



## How to Insert Function

How to Calculate  $\Delta\text{pH}$  in this Study

File Home Insert Page Layout Formulas Data Review View Help Tell

Cut Copy Paste Format Painter Clipboard

Calibri 11 A A B I U Font

Alignment

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F31

	A	B	C	D	E	F	G	H
1	V(titrant)= V(base)	pH	$\Delta$ pH	$\Delta$ V(base)				
2	0	1.51						
3	1	1.53						
4	2	1.59						
5	3	1.66						
6	4	1.75						
7	5	1.89						
8	6	1.94						
9	7	2.08						
10	8	2.27						
11	9	2.7						
12	9.2	2.8						
13	9.4	3.05						
14	9.6	3.56						
15	9.65	4.15						
16	9.7	6.42						
17	9.75	9.2						
18	9.8	10.07						
19	9.85	10.54						
20	9.95	10.97						
21	10	11.11						
22	10.2	11.36						
23	11.2	11.81						
24	12.2	12						
25	13.2	12.13						
26	15	12.27						
27								
28								
29								

File Home Insert Page Layout **Formulas** Data Review View Help Tell me what you want to do

Insert Function  $\Sigma$  AutoSum Recently Used  $\star$  Financial Logical  $?$  Text  $A$  Date & Time  $\text{📅}$  Lookup & Reference  $\text{🔍}$  Math & Trig  $\theta$  More Functions  $\dots$

Name Manager  $\text{📄}$  Define Name  $\downarrow$  Use in Formula  $\downarrow$  Create from Selection  $\text{📄}$  Defined Names

Trace Precedents  $\text{🔍}$  Show Formulas  $\text{📄}$  Trace Dependents  $\text{🔍}$  Error Checking  $\downarrow$  Remove Arrows  $\text{🔍}$  Evaluate Formula  $\text{🔍}$  Formula Auditing

Watch Window  $\text{👁}$  Calculate Now  $\text{📄}$  Calculation Options  $\downarrow$  Calculate Sheet  $\text{📄}$  Calculation

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B2  $\times$   $\checkmark$   $f_x$  **=B3-B2**  $\rightarrow$  نمایش محتویات خانه C2 (تابع تعریف شده در C2) در این قسمت

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S
1	V(titratnt)= V(base)	pH	$\Delta$ pH	$\Delta$ V(base)															
2	0	1.51	=B3-B2																
3	1	1.53																	
4	2	1.59																	
5	3	1.66																	
6	4	1.75																	
7	5	1.89																	
8	6	1.94																	
9	7	2.08																	
10	8	2.27																	
11	9	2.7																	
12	9.2	2.8																	
13	9.4	3.05																	
14	9.6	3.56																	
15	9.65	4.15																	
16	9.7	6.42																	
17	9.75	9.2																	
18	9.8	10.07																	
19	9.85	10.54																	
20	9.95	10.97																	
21	10	11.11																	
22	10.2	11.36																	
23	11.2	11.81																	
24	12.2	12																	
25	13.2	12.13																	
26	15	12.27																	
27																			
28																			
29																			
30																			
31																			
32																			

- مراحل تعریف تابع تفاضل در خانه C2:
- 1- تایپ علامت مساوی (=) در خانه C2
  - 2- انتخاب خانه مورد نظر برای استفاده در تابع تفاضل (B3)
  - 3- تایپ علامت تفاضل (-)
  - 4- انتخاب خانه مورد نظر برای استفاده در تابع تفاضل (B2)

File Home Insert Page Layout Formulas Data Review View Help Tell me what you want to do

fx Insert Function     $\Sigma$  AutoSum    Recently Used    Financial    Logical    Text    Date & Time    Lookup & Reference    Math & Trig    More Functions    Name Manager    Define Name    Use in Formula    Create from Selection    Trace Precedents    Trace Dependents    Remove Arrows    Show Formulas    Error Checking    Evaluate Formula    Watch Window    Calculate Now    Calculate Sheet Options    Calculate Sheet

Function Library    Defined Names    Formula Auditing    Calculation

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C3

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S
1	V(titrant)=V(base)	pH	$\Delta$ pH	$\Delta$ V(base)															
2	0	1.51	0.02																
3	1	1.53																	
4	2	1.59																	
5	3	1.66																	
6	4	1.75																	
7	5	1.89																	
8	6	1.94																	
9	7	2.08																	
10	8	2.27																	
11	9	2.7																	
12	9.2	2.8																	
13	9.4	3.05																	
14	9.6	3.56																	
15	9.65	4.15																	
16	9.7	6.42																	
17	9.75	9.2																	
18	9.8	10.07																	
19	9.85	10.54																	
20	9.95	10.97																	
21	10	11.11																	
22	10.2	11.36																	
23	11.2	11.81																	
24	12.2	12																	
25	13.2	12.13																	
26	15	12.27																	
27																			
28																			
29																			

بعد از تایپ تابع تفاضل در C2 با زدن enter عدد حاصل از تفاضل بین داده های انتخاب شده (B3-B2) در خانه C2 رویت می شود.



File Home Insert Page Layout Formulas Data Review View Help Tell me what you want to do

fx Insert Function  
 Σ AutoSum  
 ★ Recently Used  
 Financial  
 ? Logical  
 A Text  
 📅 Date & Time  
 🔍 Lookup & Reference  
 θ Math & Trig  
 ⋮ More Functions  
 Name Manager  
 Define Name  
 Use in Formula  
 Create from Selection  
 Trace Precedents  
 Trace Dependents  
 Remove Arrows  
 Show Formulas  
 Error Checking  
 Evaluate Formula  
 Watch Window  
 Calculate Now  
 Calculation Options  
 Calculate Sheet  
 Calculation

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C2    =B3-B2

	A	B	H	I	J	K	L	M	N	O	P	Q	R	S
1	V(titrant)=V(base)	pH												
2	0	1.51												
3	1	1.53												
4	2	1.59												
5	3	1.66												
6	4	1.75												
7	5	1.89												
8	6	1.94												
9	7	2.08												
10	8	2.27												
11	9	2.7												
12	9.2	2.8												
13	9.4	3.05												
14	9.6	3.56												
15	9.65	4.15												
16	9.7	6.42												
17	9.75	9.2												
18	9.8	10.07												
19	9.85	10.54												
20	9.95	10.97												
21	10	11.11												
22	10.2	11.36												
23	11.2	11.81												
24	12.2	12												
25	13.2	12.13												
26	15	12.27												
27														
28														

Calibri 11    A A \$ % '    B I    ΔpH    ΔV(base)

Search the menus  
 Cut  
 Copy  
 Paste Options:  
 Paste Special...  
 Smart Lookup  
 Insert Copied Cells...  
 Delete...  
 Clear Contents  
 Quick Analysis  
 Filter  
 Sort  
 Get Data from Table/Range...  
 Insert Comment  
 Format Cells...  
 Pick From Drop-down List...  
 Define Name...  
 Link  
 Open Hyperlink

مراحل کپی کردن تابع خانه C2 در خانه های پایین تر در ستون ΔpH:  
 1- با انتخاب خانه C2 و رایت کلیک عملکرد کپی انتخاب شود.

File Home Insert Page Layout Formulas Data Review View Help Tell me what you want to do

$fx$  Insert Function  
  $\Sigma$  AutoSum  
 Recently Used  
 Financial  
 Logical  
 Text  
 Date & Time  
 Lookup & Reference  
 Math & Trig  
 More Functions  
 Name Manager  
 Define Name  
 Use in Formula  
 Create from Selection  
 Trace Precedents  
 Trace Dependents  
 Remove Arrows  
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 Error Checking  
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C3

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S
1	V(titratnt)= V(base)	pH	$\Delta$ pH	$\Delta$ V(base)															
2	0	1.51	0.02																
3	1	1.53																	
4	2	1.59																	
5	3	1.66																	
6	4	1.75																	
7	5	1.89																	
8	6	1.94																	
9	7	2.08																	
10	8	2.27																	
11	9	2.7																	
12	9.2	2.8																	
13	9.4	3.05																	
14	9.6	3.56																	
15	9.65	4.15																	
16	9.7	6.42																	
17	9.75	9.2																	
18	9.8	10.07																	
19	9.85	10.54																	
20	9.95	10.97																	
21	10	11.11																	
22	10.2	11.36																	
23	11.2	11.81																	
24	12.2	12																	
25	13.2	12.13																	
26	15	12.27																	
27																			

ادامه مراحل کپی کردن تابع خانه C2 در خانه های پایین تر در ستون  $\Delta$ pH:  
 2- خانه های پایینتر از C2 (C3 تا C26) با موس انتخاب شود.

File Home Insert Page Layout Formulas Data Review View Help Tell me what you want to do

fx Insert Function   
  $\Sigma$  AutoSum   
 Recently Used   
 Financial   
 Logical   
 Text   
 Date & Time   
 Lookup & Reference   
 Math & Trig   
 More Functions

Function Library

Name Manager   
 Define Name   
 Use in Formula   
 Create from Selection

Defined Names

Trace Precedents   
 Trace Dependents   
 Remove Arrows   
 Show Formulas   
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 Evaluate Formula

Formula Auditing

Watch Window   
 Calculate Now   
 Calculation Options   
 Calculate Sheet

Calculation

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	A	B	C	H	I	J	K	L	M	N	O	P	Q	R	S
1	V(titratnt)= V(base)	pH	$\Delta$ pH												
2	0	1.51	0.0												
3	1	1.53													
4	2	1.59													
5	3	1.66													
6	4	1.75													
7	5	1.89													
8	6	1.94													
9	7	2.08													
10	8	2.27													
11	9	2.7													
12	9.2	2.8													
13	9.4	3.05													
14	9.6	3.56													
15	9.65	4.15													
16	9.7	6.42													
17	9.75	9.2													
18	9.8	10.07													
19	9.85	10.54													
20	9.95	10.97													
21	10	11.11													
22	10.2	11.36													
23	11.2	11.81													
24	12.2	12													
25	13.2	12.13													
26	15	12.27													
27															
28															
29															
30															

ادامه مراحل کپی کردن تابع خانه C2 در خانه های پایین تر در ستون  $\Delta$ pH:  
 3- سپس در حالی که خانه های مورد نظر به صورت انتخاب شده هستند، گزینه Paste (fx) انتخاب شود.

File Home Insert Page Layout Formulas Data Review View Help Tell me what you want to do

$fx$  Insert Function |  $\Sigma$  AutoSum | Recently Used | Financial | Logical | Text | Date & Time | Lookup & Reference | Math & Trig | More Functions |

Name Manager | Define Name | Use in Formula | Create from Selection |

Trace Precedents | Trace Dependents | Remove Arrows | Show Formulas | Error Checking | Evaluate Formula | Watch Window | Calculation Options | Calculate Now | Calculate Sheet |

Function Library | Defined Names | Formula Auditing | Calculation

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C3 :  $=B4-B3$ 

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S
1	V(titratnt)= V(base)	pH	$\Delta$ pH	$\Delta$ V(base)															
2	0	1.51	0.02																
3	1	1.53	0.06																
4	2	1.59	0.07																
5	3	1.66	0.09																
6	4	1.75	0.14																
7	5	1.89	0.05																
8	6	1.94	0.14																
9	7	2.08	0.19																
10	8	2.27	0.43																
11	9	2.7	0.1																
12	9.2	2.8	0.25																
13	9.4	3.05	0.51																
14	9.6	3.56	0.59																
15	9.65	4.15	2.27																
16	9.7	6.42	2.78																
17	9.75	9.2	0.87																
18	9.8	10.07	0.47																
19	9.85	10.54	0.43																
20	9.95	10.97	0.14																
21	10	11.11	0.25																
22	10.2	11.36	0.45																
23	11.2	11.81	0.19																
24	12.2	12	0.13																
25	13.2	12.13	0.14																
26	15	12.27	-12.27																
27																			
28																			

ادامه مراحل کپی کردن تابع خانه C2 در خانه های پایین تر در ستون  $\Delta$ pH:   
 4- به این ترتیب تابع تفاضل مشابه C2 در خانه های C3 تا C26 کپی می شود.

File Home Insert Page Layout Formulas Data Review View Help Tell me what you want to do

fx Insert Function     $\Sigma$  AutoSum    Recently Used    Financial    Logical    Text    Date & Time    Lookup & Reference    Math & Trig    More Functions    Name Manager    Define Name    Use in Formula    Create from Selection    Trace Precedents    Trace Dependents    Remove Arrows    Show Formulas    Error Checking    Evaluate Formula    Watch Window    Calculation Options    Calculate Now    Calculate Sheet

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R16    X    ✓    fx

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
1	V(titrant)=V(base)	pH	$\Delta$ pH	$\Delta$ V(base)	$\Delta$ pH/ $\Delta$ V(base)													
2	0	1.51	0.02															
3	1	1.53	0.06															
4	2	1.59	0.07															
5	3	1.66	0.09															
6	4	1.75	0.14															
7	5	1.89	0.05															
8	6	1.94	0.14															
9	7	2.08	0.19															
10	8	2.27	0.43															
11	9	2.7	0.1															
12	9.2	2.8	0.25															
13	9.4	3.05	0.51															
14	9.6	3.56	0.59															
15	9.65	4.15	2.27															
16	9.7	6.42	2.78															
17	9.75	9.2	0.87															
18	9.8	10.07	0.47															
19	9.85	10.54	0.43															
20	9.95	10.97	0.14															
21	10	11.11	0.25															
22	10.2	11.36	0.45															
23	11.2	11.81	0.19															
24	12.2	12	0.13															
25	13.2	12.13	0.14															
26	15	12.27	-12.27															
27																		

مشابه تابع قبلی برای تفاضل حجم بین هر دو خانه متوالی ( $\Delta$ V) در ستون D عمل می شود.  
همینطور برای تابع تقسیم در هر ردیف از ستون های C ( $\Delta$ pH) و D ( $\Delta$ V) می توان عمل کرد.