

-Eritmadagi vodorod ionlari konsentrasiyasining (molyar) teskari ishorali o`nlik logarifmi vodorod ko`rsatkich yoki pH deb ataladi:

ERITMANING pH QIYMATINI TOPISH UCHUN NIMA QILISH KERAK?

3 TA QOIDADAN IBORAT.

1-qoida. Nima qilib bo`lsa ham eritmadagi kislotaning molyar konsentratsiyasini topaman.

$$\text{a) } C_m = \frac{n(\text{mol})}{V(\text{litrlar})} \quad \text{b) } C_m = \frac{m \cdot 1000}{M_r \cdot V(\text{ml})} \quad \text{c) } C_m = \frac{C\% \cdot \rho \cdot 10}{M_r}$$

Masalan 2 litr eritmada 0,1 mol nitrat kislota yoki shuncha sulfat kislota erigan bo`lsa,

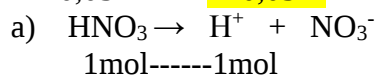
$$C_m = \frac{n(\text{mol})}{V(\text{litrlar})} = \frac{0,1 \text{ mol}}{2 \text{ litr}} = 0,05 \text{ M} \quad \text{konsentratsiyasi ekan.}$$

2-qoida. Nima qilib bo`lsa ham kislotaning dissotsiyanishidan (ionlarga ajralishi  $H^+$ ) hosil bo`lgan H^+ ionlarning konsentratsiyasini topaman.

Masalan birinchi qoida bo`yicha  $C_m=0,05$  molyarli eritma ekanligi aniqlangan bo`lsa, keyingi ish quyidagicha bo`ladi.

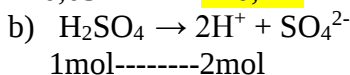
1-ERITMA

$$0,05\text{M} \text{-----} x=0,05\text{M}$$



2-ERITMA

$$0,05\text{M} \text{-----} x=0,1\text{M}$$



3-qoida. Nima qilib bo`lsa ham  $H^+$  ionlari konsentratsiyasidan teskari (-) ishora bilan o`nli (lg) logarifm olaman.

Masalan

$$1\text{-eritma} \quad - (0,05 \text{ M } H^+ \log) = -(-1,3) = 1,3 \quad \text{yani: } pH=1,3 \quad pOH=12,7$$

$$2\text{-eritma} \quad - (0,1 \text{ M } H^+ \log) = -(-1) = 1 \quad \text{yani: } pH=1 \quad pOH=13$$

Agar moboda mendan pOH so`rab qolsa,  $14-pH=pOH$  formulaga qo`yaman.

$$1\text{-eritma} \quad \text{Yani } 14-1,3=12,7 \quad pOH=12,7$$

$$2\text{-eritma} \quad \text{Yani } 14-1=13 \quad pOH=13$$

Ko`pchilikda savol tu`g`uladi **0,07 M** da logarifm olsam nechchi chiqadi yoki buni qanday hisolaymiz deyishadi. unday bo`lsa ularning aniqlanish sohasiga qarab topiladi.

Masalan :

$$C_m(H^+) == pH$$

$$0,1 \text{ M} = 1$$

$$0,01 \text{ M} = 2$$

$$0,001 \text{ M} = 3$$

Bundan ko`rinib turibdiki aniqlanish sohasi orqali juda kichik hato bilan istalgan eritmaning pH ni topish mumkin ekan.

VODOROD KO`RSATKICH (pH)

Eritmadagi vodorod ionlari konsentrasiyasining (molyar) teskari ishorali o`nlik logarifmi vodorod ko`rsatkich yoki pH deb ataladi: $\rightarrow pH = -\lg[H^+]$

pH	1 2 3	4 5 6	7	8 9 10 11	12 13 14
	Kuchli	Kuchsiz	neytral	Kuchsiz	Kuchli
	kislotali	kislotali		ishqoriy	ishqoriy

1-TOPSHIRIQ pH va pOH qiymatini toping.

1. Savol: HCl ning 0,001 M li eritmasini pH va pOH qiymatlarini toping.

Yechim:



$$0.001 \dots \dots a=0.001$$

$$\text{pH} = -[\text{H}^+ \log] = -[0,001 \log] = 3 \quad \text{pH} + \text{pOH} = 14 \quad \text{pOH} = 11$$

Nº	Modda formulasi	Molyar Konsentratsiya	pH	pOH	Nº	Modda formulasi	Molyar Konsentratsiya	pH	pOH
1	HCl	0,001			11	KOH	0,0015		
2	HNO ₃	0,005			12	NaOH	0,0025		
3	H ₂ SO ₄	0,0005			13	Ba(OH) ₂	0,00035		
4	H ₃ PO ₄	0,002			14	Ca(OH) ₂	0,0025		
5	H ₂ S	0,003			15	Al(OH) ₃	0,0035		
6	KOH	0,01			16	HCl	0,015		
7	NaOH	0,04			17	HNO ₃	0,045		
8	Ba(OH) ₂	0,05			18	H ₂ SO ₄	0,055		
9	Ca(OH) ₂	0,00005			19	H ₃ PO ₄	0,000025		
10	Al(OH) ₃	0,000333			20	H ₂ S	0,00333		

2-TOPSHIRIQ pH va pOH qiymatini toping

1-savol. 0.001 mol HCl 200 ml eritmada erisa, uning pH va pOH lar qiymati toping.

$$\text{Yechim; } C_m = n/V = 0.001/0.2(l) = 0.005 \text{ mol/l}$$



$$0.005 \dots \dots a=0.005$$

$$\text{pH} = -[\text{H}^+ \log] = -[0,005 \log] = 2.3 \quad \text{pH} + \text{pOH} = 14 \quad \text{pOH} = 11.7$$

Nº	Modda formulasi	Eritma hajmi	Modda miqdori (mol)	pH	pOH	Nº	Modda formulasi	Eritma hajmi	Modda miqdori (mol)	pH	pOH
1	HCl	200 ml	0,001			11	KOH	200 ml	0,0015		
2	HNO ₃	400 ml	0,005			12	NaOH	400 ml	0,0025		
3	H ₂ SO ₄	500 ml	0,0005			13	Ba(OH) ₂	500 ml	0,00035		
4	H ₃ PO ₄	800 ml	0,002			14	Ca(OH) ₂	800 ml	0,0025		
5	H ₂ S	1 litr	0,003			15	Al(OH) ₃	1 litr	0,0035		
6	KOH	1,5 litr	0,01			16	HCl	1,5 litr	0,015		
7	NaOH	2 litr	0,002			17	HNO ₃	2 litr	0,045		
8	Ba(OH) ₂	2,5 litr	0,005			18	H ₂ SO ₄	2,5 litr	0,055		
9	Ca(OH) ₂	2,8 litr	0,00005			19	H ₃ PO ₄	2,8 litr	0,000025		
10	Al(OH) ₃	1,2 litr	0,000333			20	H ₂ S	1,2 litr	0,00333		

3-TOPSHIRIQ pH va pOH qiymatini toping. a=100% deb hisoblansin

1-savol. 0.01825 gr HCl 200 ml eritmada erisa, ushbu eritmaning pH va pOH qiymatlarini aniqlang.

Yechim

$$C_m = \frac{m}{Mr \cdot V(l)} = \frac{0.01825}{36.5 \cdot 0.2} = 0.0025 \text{ mol/l HCl}$$



$$0.0025 \dots a = 0.0025$$

$$\text{pH} = -[\text{H}^+ \log] = -[0.0025 \log] = 2.6 \quad \text{pH} + \text{pOH} = 14 \quad \text{pOH} = 11.4$$

№	Modda formulasi	Eritma hajmi	Modda massasi	pH	pOH	№	Modda formulasi	Eritma hajmi	Modda massasi	pH	pOH
1	HCl	200 ml	0,01825			11	KOH	200 ml	0,00112		
2	HNO ₃	400 ml	0,0325			12	NaOH	400 ml	0,016		
3	H ₂ SO ₄	500 ml	0,0049			13	Ba(OH) ₂	500 ml	0,0178		
4	H ₃ PO ₄	800 ml	0,10888			14	Ca(OH) ₂	800 ml	0,074		
5	H ₂ S	1 litr	0,017			15	Al(OH) ₃	1 litr	0,078		
6	KOH	1,5 litr	0,084			16	HCl	1,5 litr	0,05475		
7	NaOH	2 litr	0,012			17	HNO ₃	2 litr	0,63		
8	Ba(OH) ₂	2,5 litr	0,0855			18	H ₂ SO ₄	2,5 litr	0,098		
9	Ca(OH) ₂	5 litr	0,074			19	H ₃ PO ₄	2,8 litr	0,09		
10	Al(OH) ₃	2 litr	0,156			20	H ₂ S	1,2 litr	0,78		

4-TOPSHIRIQ pH va pOH qiymatini toping.

1-savol. 0.001 M li HCl ning pH va pOH qiymatini anqlang (a=50%)

Yechim

$$0.001 \dots 100\%$$

$$A = 0.0005 \dots 50\%$$



$$0.0005 \dots a = 0.0005$$

$$\text{pH} = -[\text{H}^+ \log] = -[0.0005 \log] = 3.3 \quad \text{pH} + \text{pOH} = 14 \quad \text{pOH} = 10.7$$

№	Modda formulasi	Molyar konsen tratsiya	Diss. darajasi	pH	pOH	№	Modda formulasi	Molyar konsen tratsiya	Diss. darajasi	pH	pOH
1	HCl	0,001	50 %			11	KOH	0,0015	10 %		
2	HNO ₃	0,005	20 %			12	NaOH	0,0025	20 %		

3	H ₂ SO ₄	0,0005	10 %				13	Ba(OH) ₂	0,00035	30 %		
4	HClO ₄	0,002	50 %				14	Ca(OH) ₂	0,0025	20 %		
5	H ₂ S	0,003	66 %				15	Al(OH) ₃	0,0035	20 %		
6	KOH	0,01	50 %				16	HCl	0,015	60 %		
7	NaOH	0,04	70 %				17	HNO ₃	0,045	70 %		
8	Ba(OH) ₂	0,05	80 %				18	H ₂ SO ₄	0,055	80 %		
9	Ca(OH) ₂	0,00005	90 %				19	H ₃ PO ₄	0,000025	5 %		
10	Al(OH) ₃	0,000333	25 %				20	H ₂ S	0,00333	20 %		

5-TOPSHIRIQ pH va pOH qiymatini toping.

1-savol. 3.65 gr HCl 500 gr suvda eritildi. Zichligi 1,1 ga teng eritma olindi. Eritmaning pH va pOH qiymatlarini aniqlang.

Yechim; $v = m/p = 500 + 3.65/1.1 = 457.86 \text{ ml}$

$$C_m = \frac{m}{Mr \cdot V(l)} = \frac{3.65}{36.5 \cdot 0.45786} = 0.2184 \text{ M}$$



$0.2184 \dots a = 0.2184$

$\text{pH} = -[\text{H}^+ \log] = -[0.2184 \log] = 0.66 \quad \text{pH} + \text{pOH} = 14 \quad \text{pOH} = 13.33$

№	Modda formulasi	Modda massasi gramm	Suv massasi	Zichlik	pH	pOH
1	HCl	3.65	500	1,1		
2	HNO ₃	6.3	600	1,2		
3	H ₂ SO ₄	4.9	900	1,3		
4	H ₃ PO ₄	3.96	1200	1,4		
5	H ₂ S	0.34	1800	1,5		
6	KOH	0.0112	2700	1,15		
7	NaOH	0.04	4000	1,25		
8	Ba(OH) ₂	0.0171	6000	1,35		
9	Ca(OH) ₂	0.037	2500	1,45		
10	Al(OH) ₃	0.039	3200	1,55		

Konsentratsiyasini aniqlang

1-savol. pH qiymati 1 ga teng bo'lgan HCl eritmasi tarkibidagi H^+ va OH^- larning M konsentratsiyasini aniqlang.

Yechim; formula= $H^+ = (-pH \cdot 2^{ndf} \log) = 0.1 H^+ . H^+ * OH^- = 1 \cdot 10^{-14} \quad OH^- = 1 \cdot 10^{-13}$

№	pH	H ⁺ kons	OH ⁻ kons	Modda formulasi	Modda kons	№	pH	H ⁺ kons	OH ⁻ kons	Modda formulasi	Modda kons
1	1			HCl		11	10			KOH	
2	1,5			HNO ₃		12	11,5			NaOH	
3	3			H ₂ SO ₄		13	12			Ba(OH) ₂	
4	4,5			H ₃ PO ₄		14	12,5			Ca(OH) ₂	
5	6			H ₂ S		15	13			Al(OH) ₃	
6	7,5			KOH		16	2			HCl	
7	8			NaOH		17	2,5			HNO ₃	
8	8,5			Ba(OH) ₂		18	3,5			H ₂ SO ₄	
9	9			Ca(OH) ₂		19	4			H ₃ PO ₄	
10	9,5			Al(OH) ₃		20	5			H ₂ S	

TAYYORLOVCHI

Davomi bor.....

KIMYO

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fani

o'qituvchisi: