



## *Calibration of an Alkaline (NaOH or KOH) Solution*

### **Reagent preparation**

There are several ways to prepare free carbonate NaOH or KOH solution.

To prepare 0.1 eq/l NaOH or KOH solution the easiest way is to:

Take a new bottle of NaOH or KOH pellets and quickly weigh 4.00 g of NaOH or 5.60 g of KOH

(NaOH has a molecular weight of 40 g/mol and KOH 56 g/mol)

Using a conical flask, dissolve the pellets in 200 ml of hot (40°C approx.) freshly boiled distilled water, cover the flask with plastic film and leave to cool to room temperature.

Using a volumetric flask, quickly complete to 1000 ml with the same freshly boiled distilled water.

For long storage, use a polythene flask.

### **Standard preparation**

To calibrate NaOH solution, use oxalic acid  $H_2C_2O_4 \cdot 2H_2O$  as standard (molecular weight 126.0 g/mol). As in aqueous media, the 2 acid functions are titrated together; a 0.1 eq/l oxalic solution contains 0.05 mol/l (or 1/20 mol/l) of oxalic acid.

To prepare 1000 ml of 0.1 eq/l of standard.

Weigh exactly 6.300 g (126.0/20) of oxalic acid. Using a volumetric flask, dissolve to 1000 ml with freshly boiled distilled water.

### **Electrode and reagents**

pHC2401-8 Combined pH Electrode (part no. E16M336)

Freshly boiled distilled water

0.1 eq/l oxalic acid standard solution

IUPAC Series pH standards

pH 4.005 (part no. S11M002) and pH 10.012 (part no. S11M007)

### **End point titration settings**

Burette volume:	25 ml
Stirring speed:	400 rpm
Working mode:	pH
Number of end points:	1
End point:	8.55 pH
Stirring delay:	10 seconds
Minimum speed:	0.2 ml/min

Maximum speed:	6.0 ml/min
Proportional band:	3.0 pH
Direction:	Increasing pH
End point delay:	5 seconds
Sample unit:	ml
Standard amount:	20
standard conc.:	0.1 eq/l
Result:	eq/l

### **Electrode and reagents**

Prepare the titration system with a 25 ml burette and 0.1 eq/l NaOH solution as titrant.

Calibrate the pHC2401-8 electrode using IUPAC standards.

Do not forget to fill the reagent bottle absorption chamber with absorbent  $CO_2$ .

Pipette exactly 20 ml of oxalic acid 0.1 eq/l.

Complete to 100 ml with distilled water.

Dip electrode and delivery tip in the solution.

Start method by pressing the RUN key.

### **Results**

The result is expressed as eq/l concentration and based on the following formula

$$\text{Vol}(\text{NaOH sol}) * C(\text{NaOH sol}) = \text{Vol}(\text{oxalic acid sol}) * C(\text{oxalic acid sol})$$

The calibration result can be accepted if 5 determinations give a result with a relative standard deviation of less than 0.5%.

### **Notes**

a) Using a solution as standard, it is best to use a standard concentration close to the titrant concentration. This allows closed volumes for titrant and standard. For the best result accuracy, pipette a standard volume corresponding to a delivered titrant volume greater than 50% of the used burette cylinder.

b) The application note uses a 25 ml cylinder capacity. If you use a 5 or 10 ml cylinder for the burette, pipette 5 ml of standard and modify the method as follows:

Predose:	2 ml
Maximum volume:	8 ml

c) It is possible to calibrate a basic titrant by weighing an amount of oxalic acid.

With a 25 ml burette cylinder capacity

Exactly weigh approximately 120 mg of oxalic acid

In the STANDARD screen ENTER

Standard unit:	mg
Standard amount:	xx.x
Concentration unit:	%
Concentration:	100
	(or purity of the standard)
Molecular weight:	126.0

And in the RESULT screen ENTER

Result:	eq/l
Coefficients:	1 Standard + 2 Titrant

Note that for NaOH and KOH, concentration in eq/l is the same as in mol/l.

d) For alkaline solutions with higher concentration (1M or 1N for example), use the same procedure but take 40 g of NaOH, or 56 g of KOH, for 1000 ml of solution and calibrate the solution by exactly weighing approximately 1200 mg of oxalic acid.