

## Common Biological Buffers

The pH of many buffers varies with temperature. This is an important consideration, for example, when using thermostable enzymes at elevated temperatures. Use the temperature coefficient provided in the table to predict the pH of the associated buffer at any given temperature.

	pH 6	7	8	9	10	11	Useful pH range	pKa (at 25°)	Temperature Coefficient
Acetate	[Bar]						3.6-5.6	4.76	-0.0002
MES	[Bar]						5.5-6.7	6.10	-0.011
Citrate	[Bar (pK3)]						5.5-7.2	6.40	0.0
Bis-Tris	[Bar]						5.8-7.2	6.50	0.0
MOPS	[Bar]						6.5-7.9	7.20	0.015
Phosphate	[Bar (pK2)]						5.8-8.0	7.20	-0.0028
Carbonate	[Bar]						6.0-8.0	6.35	-0.0055
HEPES	[Bar]						6.8-8.2	7.48	-0.014
Tricine	[Bar]						7.4-8.8	8.05	-0.021
Tris	[Bar]						7.0-9.0	8.06	-0.028
Bicine	[Bar]						7.6-9.0	8.26	-0.018
TAPS	[Bar]						7.7-9.1	8.40	0.018
Taurine	[Bar]						8.4-9.6	9.06	-0.022
Borate	[Bar]						8.5-10.2	9.23	-0.0082
CAPS	[Bar]						9.7-11.1	10.40	-0.009

### Example: What is the pH of Tris pH 9.5 at 72°C?

#### Determine the temperature difference:

All Teknova buffers are adjusted at 25°C, unless specified otherwise.

$$72^{\circ}\text{C} - 25^{\circ}\text{C} = 47^{\circ}\text{C}$$

#### Multiply by the coefficient:

From the chart, the temperature coefficient of Tris is approximately -0.03.

$$47 \times -0.03 = -1.41$$

#### Calculate the new pH:

$$9.5 + (-1.41) = 8.09$$