

An isotonic phosphate vehicle prepared at the desired pH (Table 17.3) and adjusted for tonicity may be employed in the extemporaneous compounding of solutions. The desired solution is prepared with two stock solutions, one containing 8 g of monobasic sodium phosphate ( $\text{NaH}_2\text{PO}_4$ ) per liter and the other containing 9.47 g of dibasic sodium phosphate ( $\text{Na}_2\text{HPO}_4$ ) per liter, the weights being on an anhydrous basis.

The vehicles listed in Table 17.3 are satisfactory for many ophthalmic drugs, excepting pilocarpine, eucatropine, scopolamine, and homatropine salts, which show instability in the vehicle. The vehicle is used effectively as the diluent for ophthalmic drugs already in isotonic solution, such as those prepared according to the method presented in Table 17.2. When drug substances are added directly to the isotonic phosphate vehicle, the solution becomes slightly hypertonic. Generally, this provides no discomfort to the patient. However, if such a solution is not desired, the appropriate adjustment can be made through calculated dilution of the vehicle with purified water.

## Viscosity and Thickening Agents

*Viscosity* is a property of liquids related to the resistance to flow. The reciprocal of viscosity is *fluidity*. Viscosity is defined in terms

of the force required to move one plane surface past another under specified conditions when the space between is filled by the liquid in question. More simply, it can be considered as a relative property, with water as the reference material and all viscosities expressed in terms of the viscosity of pure water at 20°C (68°F). The viscosity of water is given as 1 centipoise (actually 1.0087 cP). A liquid material 10 times as viscous as water at the same temperature has a viscosity of 10 cP. The centipoise is a more convenient term than the basic unit, the poise; 1 poise is equal to 100 cP.

Specifying the temperature is important because viscosity changes with temperature; generally, the viscosity of a liquid decreases with increasing temperature. The determination of viscosity in terms of poise or centipoise results in the calculation of *absolute viscosity*. It is sometimes more convenient to use the kinematic scale, in which the units of viscosity are *stokes* and *centistokes* (1 stoke equals 100 centistokes). The kinematic viscosity is obtained from the absolute viscosity by dividing the latter by the density of the liquid at the same temperature:

$$\text{kinematic viscosity} = \frac{\text{absolute viscosity}}{\text{density}}$$

Using water as the standard, these are examples of some viscosities at 20°C:

**Table 17.3 ISOTONIC PHOSPHATE VEHICLE**

MONOBASIC SODIUM PHOSPHATE SOLUTION (ML)	DIBASIC SODIUM PHOSPHATE SOLUTION (ML)	RESULTING BUFFER SOLUTION (PH)	SODIUM CHLORIDE REQUIRED FOR ISOTONICITY (G/100 ML)
90	10	5.9	0.52
80	20	6.2	0.51
70	30	6.5	0.50
60	40	6.6	0.49
50	50	6.8	0.48
40	60	7.0	0.46
30	70	7.2	0.45
20	80	7.4	0.44
10	90	7.7	0.43
5	95	8.0	0.42