1. **Principle**

Pipettes are calibrated to prevent inaccurate volume dispensing of reagents and biological products. The most common method of calibration is gravimetric.

This procedure evaluates the accuracy and precision of the pipette. These values are compared to the laboratory/manufacturer’s specifications.

1. **Scope and Related Policies**
   1. Always wear protective gloves when using a non-corrosive disinfectant agent.
   2. Pipettes must be maintained as per manufacturer’s recommendations to ensure adequate volume delivery, reduction of carry-over and absence of contamination.9.1
   3. All pipettes used in the lab shall be calibrated on a semi-annual basis.
2. **Specimen – N/A**
3. **Materials**

**Equipment:** Analytical balance with four decimal places

Pipettes

**Supplies:** Distilled water

Weighing vessel

Manufacturer’s recommended tips

QCA.019F (manual or with calculations built in)

Calibration date labels

1. **Quality Control** 
   1. For multichannel pipettes, each channel must be regarded as separate. Therefore each channel must be tested five times.
   2. Accuracy is a measure or reliability.
   3. Precision is a measure or repeatability.
   4. Use same pipette tip for all deliveries during the calibration procedure.
   5. Pre-rinse pipette tip to improve uniformity and precision.

**Note:** Proper technique will optimize your pipetting performance and   
 increase the reproducibility of your results.

1. **Procedure**

|  |  |
| --- | --- |
| * 1. Prepare for calibration | * + 1. Equilibrate all testing material to room temperature |
| * + 1. Record type of pipette and serial number on QCA.019. Record weight of the container being used and volume being measured on QCA.019F. |
| * + 1. Clean and lubricate pipette(s) to be calibrated as per manufacturer’s instructions |
| * + 1. Turn on balance. Add weighing vessel. Tare to zero. |
| * 1. Measure volume | * + 1. Adjust volume to selected setting on pipette. |
| * + 1. Place tip on pipette. Withdraw and dispense water into weighing vessel. |
| * + 1. Read and record the weight on QCA.019F. Repeat 5 times. |
| * 1. Perform calculations | * + 1. Calculate mean (average) weight   = sum of weights /number of weighings |
| * + 1. Calculate mean (average) volume   = mean weight x Z value\*  \*Z Value = 1.0035 for distilled water at room temperature |
| * + 1. Calculate standard deviation (SD)   = √Ʃ(volume-mean volume)2/n-1  where n=number of volume values |
| * + 1. Calculate inaccuracy (%)   = (mean volume – nominal volume)/nominal volume |
| * + 1. Calculate imprecision (CV%)   = SD/mean weight x 100 |
| * 1. Determine acceptability (see Procedural Notes 8.1 and 8.2) | * + 1. If results are within acceptable range interpret as PASS |
| * + 1. Label pipette with dated calibration label |
| * + 1. If results are not within acceptable range, interpret as FAIL and send out for service |

1. **Reporting**
   1. Supervisor or designate must review record of calibration and initial that the review has been performed.
   2. File records for retention period.
2. **Procedural Notes**
   1. To determine PASS or FAIL use the following criteria:

Inaccuracy limits: 100-1000 µL ± 3%

Imprecision limits: ± 0.6%

If inaccuracy or imprecision calculations are within acceptable limits, the result is PASS. If inaccuracy or imprecision calculations exceed acceptable limits, the result is FAIL.

* 1. QCA.019F is available in two formats – manual and with calculations built in. The manual form can be used if no online option is available. Calculations will need to be done manually.

QCA.019F (with calculations built in) must be used online and the calculations will appear when the weights are recorded into the worksheet. This worksheet will also automatically assess and document PASS or FAIL. Once the information is complete, the worksheet should be printed or saved and reviewed by Supervisory staff.

1. **References**
   1. Standards for Hospital Transfusion Services v3 February 2011. Canadian Society for Transfusion Medicine.
   2. IQMH Accreditation Requirements and Guidance Information, December 2013, Version 6; IV
   3. ASTM International (1997) Standard Specification for Piston- or Plunger- Operated Volumetric Apparatus. ASTM E1154. ASTM International, West Conshohoken, Pennsylvania.
   4. ISO 8655-2:2002, Piston-operatedVolumetric Apparatus, Part 2: Piston Pipettes, 2002, International Organization for Standardization (Geneva, Switzerland).
   5. ISO 8655-6:2002, Piston-operated Volumetric Apparatus, Part 6: Gravimetric Methods for the Determination of Measurement Error, 2002, International Organization for Standardization (Geneva, Switzerland).
   6. NCCLS. Determining Performance of Volumetric Equipment: Proposed Guideline. NCCLS, Wayne,Pennsylvania, 1984
2. **Revision History - N/A**