SOP

HOW TO USE OSMOMETER

Department of Physiology
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Standard Operating Procedure (SOP) Use of Osmometer (Osmo1™)

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1. Purpose

To demonstrate the measurement of osmolality using plasma, serum, and urine samples in a practical laboratory setting.

2. Principles of Measurement

The osmometer measures osmolality using the principle of freezing point depression. When solutes are dissolved in a solvent, the freezing point decreases in proportion to the number of osmotically active particles.

The instrument supercools the sample and induces crystallization. The equilibrium freezing point is measured and converted to osmolality (mOsm/kg H_2O).

3. Definitions

Osmolality: Number of osmoles of solute per kilogram of solvent (mOsm/kg H_2O). This is the parameter measured.

Osmolarity: Number of osmoles per liter of solution (mOsm/L). This is temperature-dependent and not directly measured.

Osmolality is preferred in biological fluids because it is independent of temperature.

4. Scope

This SOP applies to demonstrators conducting physiology practical sessions using the Osmo1™ Single-Sample Micro-Osmometer.

5. Responsibilities

Demonstrator:
- Perform calibration and testing
- Ensure proper sample handling
- Maintain instrument cleanliness

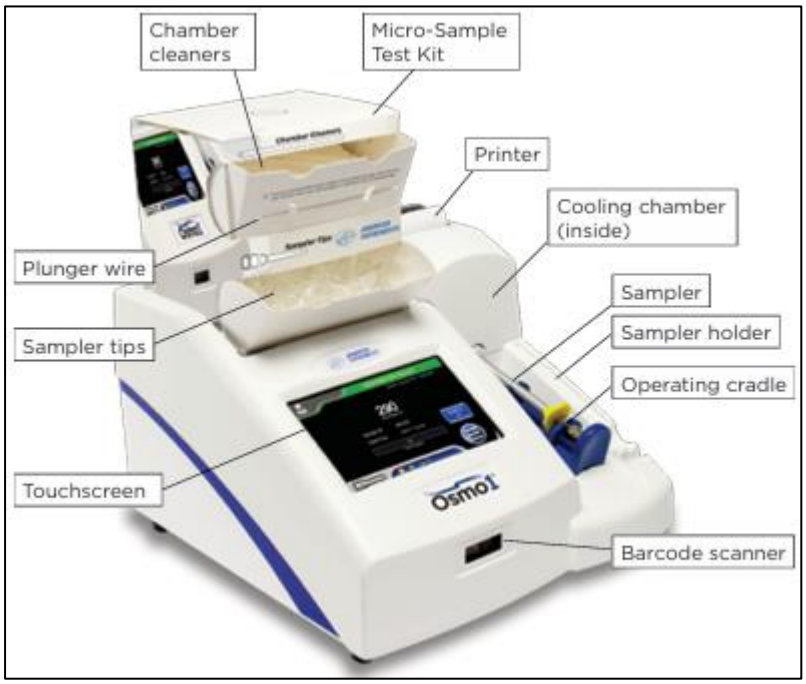
Supervisor:
- Ensure SOP compliance
- Oversee quality control

6. Safety Precautions

• Handle all biological samples as potentially infectious.
• Wear appropriate PPE (gloves, lab coat).
• Avoid contact with internal components.
• Dispose of waste according to biosafety guidelines.

7. Equipment and Materials

• Osmo1™ Osmometer
• Sampling tips
• Chamber cleaners
• Calibration standards
• Plasma, serum, urine samples



8. Calibration and Quality Control

• Perform daily quality control using at least two control levels (low and high).
• Include a mid-range control (~300 mOsm/kg) to represent physiological samples.
• Acceptable deviation: ±2–5 mOsm/kg from expected value.

• Calibration is performed using 3-point standards:
 - 50 mOsm/kg
 - 850 mOsm/kg
 - 2000 mOsm/kg

Note:
Physiological samples typically fall within:
- Plasma: 275–295 mOsm/kg
- Urine: highly variable

• Recalibrate if:
  - QC results fall outside acceptable limits
  - After maintenance
  - After significant temperature changes

9. Sample Handling and Preparation

• Use plasma, serum, or urine samples free from visible contamination.
• Avoid hemolyzed or lipemic samples where possible.
• Analyze samples promptly or store at 2–8°C if delayed.
• Prevent evaporation by keeping samples sealed.
• Mix samples gently before testing.

Pre-analytical considerations:
• Evaporation increases osmolality artificially.
• Contamination alters results.
• Particulates may cause premature freezing.

10. Procedure

1. Turn on the instrument using the power switch.

The home screen should look like this

Status Indicator

2. Ensure Micro-Sample Test Kit is installed.

3. Log in if required. (if status indicator is orange)

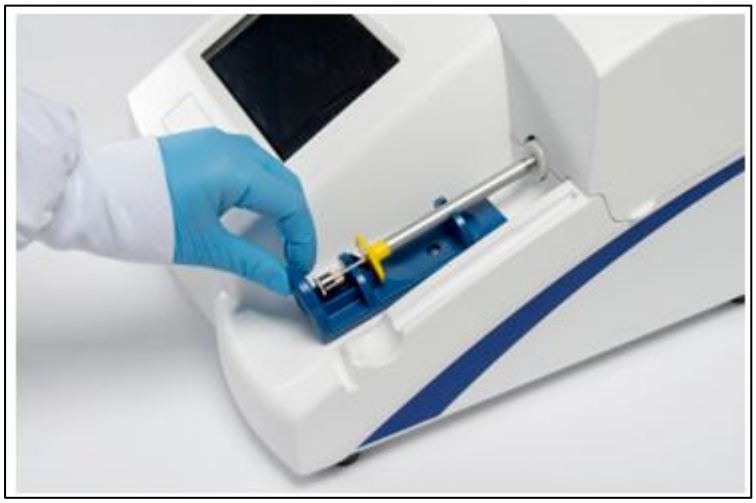
4. Place a new sampler tip on the sampler

5. Load 20 µL sample (acceptable variation ±1 µL). Use a calibrated sampler or micropipette to ensure accuracy.

6. Wipe the tip with a clean lint-free non-ionic paper before inserting into sample port

7. Insert into sample port.

8. Start test using operating cradle.



9. Record results. (Can be printed as well)

Figure 21: Testing complete with result (and error message in red)

10. Withdraw the operating cradle and remove the sampler from the cradle.
11. Discard the sampler tip.
12. Wipe the plunger tip with a soft, non-lint, non-ionic paper, being careful not to dislodge the Teflon® tip.
13. Insert a clean, dry chamber cleaner into the sample port until you feel a positive stop. Rotate four or five times in one direction while applying forward pressure.

14. Withdraw the cleaner and use the other end to clean the probe again in the same manner.
15. After cleaning, inspect the cleaner for puncture marks to confirm proper cleaning.
16. If testing continues immediately, the cleaner may remain temporarily in the port.
17. If testing is complete:
• Remove the cleaner
• Ensure the chamber is clean and dry before shutdown

For accuracy verification:
• Perform measurements in duplicate where possible.
• Accept results if variation between replicates is ≤2–3 mOsm/kg.

11. Data Interpretation

Reference ranges:
• Plasma: 275–295 mOsm/kg H_2O
• Urine: 50–1200 mOsm/kg H_2O

Results should be interpreted in clinical or physiological context.

12. Interfering Substances

Certain substances may significantly affect measured osmolality:

• Ethanol, methanol, isopropanol
• Mannitol

• Radiocontrast agents
• Glycols

These should be considered when interpreting results.

13. Environmental Conditions

• Operate within 18–35°C.
• Avoid airflow or drafts near the instrument.
• Maintain stable laboratory humidity.

Environmental instability may affect measurement accuracy.

14. Cleaning and Maintenance

• Use chamber cleaner after each sample.

• Clean solenoid periodically.
• Replace consumables regularly.

15. Analytical Performance

• Resolution: 1 mOsm/kg
• Accuracy:
- ±2 mOsm/kg (0–400 mOsm/kg)
- ±0.5% (400–1500 mOsm/kg)
- ±1% (1500–2000 mOsm/kg)

• Repeatability:
- SD ≤2 mOsm/kg (low range)
- CV ≤0.5–1% (higher range)

16. Troubleshooting

• Out of range → Check sample.
• Sample not freezing → Clean probe.
• Errors → Refer to manual.

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