Standard Operating Procedure (SOP) Template Physical and Chemical Property Testing Protocols

> This SOP defines **physical and chemical property testing protocols**, detailing the standardized procedures for accurately evaluating the physical characteristics and chemical compositions of materials. It covers sample preparation, testing methods, instrumentation calibration, data collection, analysis, quality control measures, and reporting. The goal is to ensure consistent, reliable, and reproducible results that meet industry and regulatory standards for product development, quality assurance, and compliance purposes.

1. Purpose

To outline the procedures for testing and evaluating the physical and chemical properties of materials in a consistent and standardized manner.

2. Scope

This SOP applies to all laboratory personnel involved in the physical and chemical testing of raw materials, intermediates, and finished products.

3. Responsibilities

- **Laboratory Technicians:** Perform all testing procedures as outlined.
- **Supervisors/Managers:** Ensure compliance and oversee documentation.
- **Quality Assurance:** Review results and ensure protocol adherence.

4. Definitions

- **Physical properties:** Characteristics such as appearance, color, odor, melting point, boiling point, density, viscosity, etc.
- **Chemical properties:** Composition, reactivity, pH, chemical stability, element and compound identification, etc.

5. Materials and Equipment

- Analytical balances
- Calibrated pipettes and volumetric flasks
- pH meters and conductivity meters
- Spectroscopy instruments (e.g., UV-Vis, FTIR, NMR)
- Chromatography systems (e.g., HPLC, GC)
- Standard reference materials and reagents
- PPE: Gloves, lab coats, safety goggles
- Other test-specific equipment as needed

6. Procedure

1. **Sample Preparation**
    - Assign unique sample identifiers.
    - Ensure cleanliness of sample containers and instruments.
    - Document sample receipt, condition, and storage requirements.
2. **Instrumentation Calibration**
    - Calibrate all equipment according to manufacturer's instructions and at regular intervals.
    - Document all calibration activities and maintain calibration logs.
3. **Testing Methods**
    - Select validated methods (e.g., ASTM, ISO, in-house protocols).
    - Record details for each test: method reference, equipment used, and conditions.
    - Conduct physical property tests (e.g., melting point, density, viscosity).
    - Conduct chemical property tests (e.g., pH measurement, spectroscopy, chromatography).

4. **Data Collection and Analysis**
    - Record all raw data immediately in lab notebooks or electronic systems.
    - Calculate results, including averages, deviations, and error analysis where applicable.
    - Review data for consistency and validity.
5. **Quality Control**
    - Run control samples and blanks as required.
    - Compare results to standard/reference materials.
    - Investigate and document any non-conformances.
6. **Reporting**
    - Compile test results with supporting data, calibration records, and observations.
    - Complete laboratory reports including test description, results, conclusions, and analyst signatures.
    - Submit reports for supervisory review and archiving.

7. Documentation and Records

- Maintain all records (sample logs, calibration logs, raw data, reports) in accordance with laboratory data integrity policies.
- Retain all documentation for the required retention period.

8. Safety and Environmental Considerations

- Follow all laboratory safety protocols and Material Safety Data Sheets (MSDS) for chemicals handled.
- Dispose of all chemical and physical waste according to local regulations.
- Report any safety incidents or spills immediately to the supervisor.

9. References

- Relevant ASTM, ISO, or internal method procedures as applicable
- Manufacturer instructions for instrumentation
- Laboratory Quality Manual

10. Revision History

Version	Date	Description	Author
1.0	2024-06-01	Initial issue	[Author Name]