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Derivatives and Physical-Constant Confirmation

Experiment 4 - Practical Notes

Name: _____ Roll no.: _____ Date: _____

Aim

To prepare an appropriate assigned derivative and confirm a candidate with its measured melting or boiling behaviour.

Principle

A derivative converts a functional group into a recognisable product with useful physical properties. Purity, heating rate, pressure and polymorphism can affect a physical constant, so a matching value supports identity only when the chemical evidence is also consistent.

Requirements

- Assigned compound, teacher-selected derivative reaction and prepared reagents.
- Suitable purification apparatus, dry capillary or approved boiling-point setup, calibrated instrument and authentic comparison where available.

Procedure

1. Choose the derivative

Use the candidate functional group to select the laboratory reaction: carbonyl hydrazone, assigned ester/amide, phenol ester or another validated derivative. Not every unknown needs the same reagent.

2. React under the assigned method

Follow the teacher-approved microscale quantities, temperature and reaction interval. Record the actual reagents and amounts rather than using an unrelated recipe.

3. Isolate and purify

Collect the product using the prescribed filtration/extraction, then wash and recrystallise if appropriate. Dry it to the defined condition before thermal measurement.

4. Measure melting range

Pack a short even column of dry solid in the capillary. Use the instrument's approved heating programme, reducing the rate near the expected range; record onset and complete melting.

5. Measure boiling behaviour

For a liquid, use the approved micro boiling-point or distillation setup operated by the instructor. Record atmospheric pressure and do not heat a closed system.

6. Confirm with controls

Compare the original and derivative physical data with the teacher's verified values. If appropriate, an authentic mixed-melting comparison should remain narrow rather than show a substantial depression.

Observations and Record

Record	Entry
Candidate / derivative name / reaction	_____
Amounts / isolated dry mass	_____
Melting onset / clear point or boiling point / pressure	_____
Authentic comparison / conclusion	_____

Worked Example

The numbers below are illustrative; enter your own observations in the record.

- If theoretical derivative mass is 0.500 g and dry isolated mass is 0.350 g, isolated yield = 0.350/0.500 × 100 = 70.0%. Purity is not established by yield alone.

Result

Record the observed outcome and calculated value, with units. State whether the stated laboratory specification was met; do not copy the worked example as your result.

Precautions

- Use instructor-assigned quantities and prepared test reagents in the designated laboratory; wear eye protection and use the required fume hood.
- Do not taste unknowns, smell containers directly, burn unknown halogenated material or heat sealed vessels.
- Use fresh separate portions for independent tests. A single colour reaction does not establish molecular identity.

Viva Questions and Answers

1. Why dry the solid?

Residual solvent may broaden or depress the melting range.

2. Why heat slowly near melting?

It reduces thermal lag and improves the recorded onset/clear point.

3. Does an unchanged mixed-melting range prove identity by itself?

It supports identity, but the full chemical and physical pattern is still required.

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