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Semester 3 - Practical Notes

Pharmaceutical Organic Chemistry II

Complete Subject Manual

20 practicals and activities. Use the PDF bookmarks to move between practicals. Page numbers restart within each practical; the page counts below exclude the promotion pages.

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Recrystallization of an Organic Compound

Practical 01 | Pharmaceutical Organic Chemistry II

Aim

To study Recrystallization of an Organic Compound, and interpret the recorded observations.

Principle

- Recrystallization uses a suitable difference between hot and cold solubility to separate crystals from soluble impurities.
- The property is obtained from a defined observable under controlled conditions.
- Replicate measurements, instrument checks and consistent units are needed before comparison.

Materials and Apparatus

- Assigned impure solid, selected recrystallization solvent, heating bath and filtration apparatus.
- Assigned test material and calibration or comparison material.
- The apparatus specified for this property, a balance or volumetric equipment where relevant, and a record sheet.

Method

1. Select the assigned solvent and document its hot/cold solubility behaviour.
2. Dissolve the material in the required minimum hot solvent under supervision.
3. Remove insoluble matter by the assigned hot-filtration arrangement if necessary.
4. Allow the solution to cool as directed so crystals form.
5. Separate crystals, wash with the specified cold solvent and dry appropriately.
6. Record mass and purity observations before and after purification.

Observation Record

Complete this record using actual laboratory findings or the provided teaching data.

Observation / parameter	Record / finding
Starting mass	_____
Hot-solution appearance	_____
Crystal appearance	_____
Dry recovered mass	_____
Melting range	_____

Calculations and Interpretation

- Percentage recovery = dry recrystallized mass / initial impure mass $\times$ 100.

Result

Record the actual finding, calculated value with units where relevant, and a conclusion supported by the observations.

Finding: _____

Conclusion: _____

Precautions

- Keep temperature and test conditions consistent across comparative readings.
- Record raw readings before rounding calculated values.
- Do not compare results obtained with different methods as if they were interchangeable.

Viva Questions

1. Why avoid excessive solvent?

Too much solvent can retain more product in solution after cooling and reduce recovery.

2. Why control the test conditions?

A change in conditions may alter the measured property independently of the intended variable.

3. Why retain replicate readings?

They show repeatability and help identify an anomalous measurement.

Steam Distillation of a Volatile Compound

Practical 02 | Pharmaceutical Organic Chemistry II

Aim

To study Steam Distillation of a Volatile Compound, and interpret the recorded observations.

Principle

- For substantially immiscible liquids, the total vapour pressure is the sum of the component vapour pressures; this permits co-distillation below the normal boiling point of the higher-boiling component.
- The property is obtained from a defined observable under controlled conditions.
- Replicate measurements, instrument checks and consistent units are needed before comparison.

Materials and Apparatus

- Instructor-selected volatile material, steam-distillation apparatus, condenser and receiver.
- Assigned test material and calibration or comparison material.
- The apparatus specified for this property, a balance or volumetric equipment where relevant, and a record sheet.

Method

1. Identify the assigned volatile material and its compatibility with the demonstration.
2. Check the assembled steam-distillation path and condenser arrangement with the instructor.
3. Observe steam introduction and collection of the co-distillate under the approved conditions.
4. Record the collection interval and the appearance of the receiver contents.
5. Separate and identify the recovered phase using the assigned method.
6. Calculate recovery and explain the role of the two vapour-pressure contributions.

Observation Record

Complete this record using actual laboratory findings or the provided teaching data.

Observation / parameter	Record / finding
Feed identity	_____
Distillate volume	_____
Separated target mass	_____
Distillation behaviour	_____
Recovery	_____

Calculations and Interpretation

- Percentage recovery = recovered target mass / target mass initially present $\times$ 100.

Result

Record the actual finding, calculated value with units where relevant, and a conclusion supported by the observations.

Finding: _____

Conclusion: _____

Precautions

- Keep temperature and test conditions consistent across comparative readings.
- Record raw readings before rounding calculated values.
- Do not compare results obtained with different methods as if they were interchangeable.

Viva Questions

1. Why control the test conditions?

A change in conditions may alter the measured property independently of the intended variable.

2. Why retain replicate readings?

They show repeatability and help identify an anomalous measurement.

Determination of Acid Value of an Oil

Practical 03 | Pharmaceutical Organic Chemistry II

Aim

To determine Acid Value of an Oil, and interpret the recorded observations.

Principle

- The acid value is the mass of potassium hydroxide, in mg, required to neutralize free acids in 1 g of oil.
- A standardized titrant reacts with the analyte according to a defined stoichiometric relationship.
- The calculation must distinguish direct titration from a blank-corrected or back-titration procedure.

Materials and Apparatus

- Assigned oil, specified standardized reagents, blank reagents and oil-value glassware.
- Assigned test material, standardized titrant, specified solvent and indicator or endpoint detector.
- Burette, pipette, volumetric flask, conical flask and analytical balance.

Method

1. Identify the analyte form, the reaction and the endpoint specified for the exercise.
2. Document titrant concentration or factor and prepare a reagent blank where the method requires one.
3. Measure the prescribed test portion and dissolve or treat it by the assigned analytical method.
4. Titrate to the specified endpoint while recording initial and final burette readings.
5. Repeat the determination with independently measured portions and retain all readings.
6. Apply blank, dilution and stoichiometric corrections before reporting the result.

Observation Record

Complete this record using actual laboratory findings or the provided teaching data.

Observation / parameter	Record / finding
Oil mass	_____
Titrant concentration	_____
Blank volume	_____
Test volumes	_____
Calculated oil value	_____

Calculations and Interpretation

- Acid value = $(V - B) \times N \times 56.1 / W$, in mg KOH/g.
- V and B are test and blank volumes in mL; N is titrant normality; W is oil mass in g.

Worked Illustration

Illustration: W = 2.00 g, V - B = 1.00 mL and N = 0.100 eq/L give acid value = $1.00 \times 0.100 \times 56.1 / 2.00 = 2.81$ mg KOH/g.

The values in this illustration are for calculation practice.

Result

Record the actual finding, calculated value with units where relevant, and a conclusion supported by the observations.

Finding: _____

Conclusion: _____

Precautions

- Condition volumetric apparatus and avoid burette-tip air bubbles.
- Use the endpoint and solvent assigned to the analyte; do not transfer a factor from another salt or hydrate.
- Keep direct and back-titration signs consistent and report concordance.

Viva Questions

1. Why standardize a titrant?

Its actual concentration may differ from its nominal preparation concentration.

2. Why perform a reagent blank?

It measures reagent or solvent consumption unrelated to the analyte.

Determination of Saponification Value of an Oil

Practical 04 | Pharmaceutical Organic Chemistry II

Aim

To determine Saponification Value of an Oil, and interpret the recorded observations.

Principle

- Saponification consumes alkali in ester hydrolysis and neutralization of free acids; a reagent blank establishes the initial alkali contribution.
- A standardized titrant reacts with the analyte according to a defined stoichiometric relationship.
- The calculation must distinguish direct titration from a blank-corrected or back-titration procedure.

Materials and Apparatus

- Assigned oil, specified standardized reagents, blank reagents and oil-value glassware.
- Assigned test material, standardized titrant, specified solvent and indicator or endpoint detector.
- Burette, pipette, volumetric flask, conical flask and analytical balance.

Method

1. Identify the analyte form, the reaction and the endpoint specified for the exercise.
2. Document titrant concentration or factor and prepare a reagent blank where the method requires one.
3. Measure the prescribed test portion and dissolve or treat it by the assigned analytical method.
4. Titrate to the specified endpoint while recording initial and final burette readings.
5. Repeat the determination with independently measured portions and retain all readings.
6. Apply blank, dilution and stoichiometric corrections before reporting the result.

Observation Record

Complete this record using actual laboratory findings or the provided teaching data.

Observation / parameter	Record / finding
Oil mass	_____
Titrant concentration	_____
Blank volume	_____
Test volumes	_____
Calculated oil value	_____

Calculations and Interpretation

- Saponification value = $(B - S) \times N \times 56.1 / W$, in mg KOH/g.
- B and S are blank and test acid-titration volumes in mL; W is oil mass in g.

Worked Illustration

Illustration: $B - S = 7.00$ mL, $N = 0.500$ eq/L and $W = 1.00$ g give 196.35 mg KOH/g.

The values in this illustration are for calculation practice.

Result

Record the actual finding, calculated value with units where relevant, and a conclusion supported by the observations.

Finding: _____

Conclusion: _____

Precautions

- Condition volumetric apparatus and avoid burette-tip air bubbles.
- Use the endpoint and solvent assigned to the analyte; do not transfer a factor from another salt or hydrate.
- Keep direct and back-titration signs consistent and report concordance.

Viva Questions

1. Why standardize a titrant?

Its actual concentration may differ from its nominal preparation concentration.

2. Why perform a reagent blank?

It measures reagent or solvent consumption unrelated to the analyte.

Determination of Iodine Value of an Oil

Practical 05 | Pharmaceutical Organic Chemistry II

Aim

To determine Iodine Value of an Oil, and interpret the recorded observations.

Principle

- The iodine value expresses halogen uptake as grams of iodine equivalent per 100 g of oil and is an index of unsaturation.
- A standardized titrant reacts with the analyte according to a defined stoichiometric relationship.
- The calculation must distinguish direct titration from a blank-corrected or back-titration procedure.

Materials and Apparatus

- Assigned oil, specified standardized reagents, blank reagents and oil-value glassware.
- Assigned test material, standardized titrant, specified solvent and indicator or endpoint detector.
- Burette, pipette, volumetric flask, conical flask and analytical balance.

Method

1. Identify the analyte form, the reaction and the endpoint specified for the exercise.
2. Document titrant concentration or factor and prepare a reagent blank where the method requires one.
3. Measure the prescribed test portion and dissolve or treat it by the assigned analytical method.
4. Titrate to the specified endpoint while recording initial and final burette readings.
5. Repeat the determination with independently measured portions and retain all readings.
6. Apply blank, dilution and stoichiometric corrections before reporting the result.

Observation Record

Complete this record using actual laboratory findings or the provided teaching data.

Observation / parameter	Record / finding
Oil mass	_____
Titrant concentration	_____
Blank volume	_____
Test volumes	_____
Calculated oil value	_____

Calculations and Interpretation

- Iodine value = $(B - S) \times N \times 12.69 / W$, in g iodine/100 g oil.
- Use the assigned iodometric method, thiosulfate normality and its prescribed blank; W is oil mass in g.

Worked Illustration

Illustration: $B - S = 4.00$ mL, $N = 0.100$ eq/L and $W = 0.500$ g give 10.15 g iodine/100 g oil.

The values in this illustration are for calculation practice.

Result

Record the actual finding, calculated value with units where relevant, and a conclusion supported by the observations.

Finding: _____

Conclusion: _____

Precautions

- Condition volumetric apparatus and avoid burette-tip air bubbles.
- Use the endpoint and solvent assigned to the analyte; do not transfer a factor from another salt or hydrate.
- Keep direct and back-titration signs consistent and report concordance.

Viva Questions

1. Why standardize a titrant?

Its actual concentration may differ from its nominal preparation concentration.

2. Why perform a reagent blank?

It measures reagent or solvent consumption unrelated to the analyte.

Preparation of Benzanilide by Acylation

Practical 06 | Pharmaceutical Organic Chemistry II

Aim

To prepare Benzanilide by Acylation, and interpret the recorded observations.

Principle

- Aniline undergoes benzylation to form the amide benzanilide. The aromatic amine is the nucleophile and the benzoyl group is introduced by the assigned acylating reagent.
- A chemical transformation changes selected functional groups while retaining or constructing the required molecular skeleton.
- Product identity and purity require analytical evidence; appearance alone cannot establish either.
- Reaction record: draw starting material and product structures, mark the functional-group change, and retain the assigned stoichiometry.
- Characterization record: compare the assigned melting range, TLC or spectral evidence. A narrow melting interval can support purity but cannot alone establish complete identity.

Materials and Apparatus

- Aniline and the instructor-selected benzoylating reagent.
- Assigned starting materials and instructor-selected reagents.
- Balance, reaction glassware, stirring/heating arrangement, condenser where required, filtration equipment and identity/purity test apparatus.

Method

1. Write the assigned reaction scheme and balance the transformation before calculating reagent requirements.
2. Identify the limiting reactant and document the approved reaction scale, solvent and conditions.
3. Observe the instructor-directed reaction sequence and record changes without substituting reagents or conditions.
4. Complete the prescribed work-up to separate the product from reaction liquids and by-products.
5. Purify the product by the assigned method, dry it appropriately and determine the recovered mass.
6. Record the assigned identity and purity observations and compare them with the expected product.

Observation Record

Complete this record using actual laboratory findings or the provided teaching data.

Observation / parameter	Record / finding
Starting-material amounts	_____
Limiting reactant	_____
Reaction observations	_____
Dry product mass	_____
Identity and purity observations	_____

Calculations and Interpretation

- Theoretical product mass = limiting-reactant amount (mol) $\times$ product stoichiometric ratio $\times$ product molar mass.
- Percentage yield = dry product mass / theoretical product mass $\times$ 100.

Worked Illustration

Illustration: a theoretical product mass of 2.00 g and dry recovery of 1.50 g give 75.0% yield.

The values in this illustration are for calculation practice.

Result

Record the actual finding, calculated value with units where relevant, and a conclusion supported by the observations.

Finding: _____

Conclusion: _____

Precautions

- Use the approved reaction conditions and suitable ventilation.
- Keep product, starting material and waste streams separately labelled.
- Calculate yield from dry product and the limiting reactant; never use wet mass as pure-product mass.

Viva Questions

1. What is the limiting reactant?

The reactant whose available amount permits the smallest theoretical amount of product.

2. Does a high yield establish purity?

No. Residual solvent, impurities and unreacted material can increase recovered mass.

Preparation of Phenyl Benzoate by Acylation

Practical 07 | Pharmaceutical Organic Chemistry II

Aim

To prepare Phenyl Benzoate by Acylation, and interpret the recorded observations.

Principle

- Phenol is converted to the benzoate ester by O-acylation. The nucleophilic oxygen becomes part of the ester linkage.
- A chemical transformation changes selected functional groups while retaining or constructing the required molecular skeleton.
- Product identity and purity require analytical evidence; appearance alone cannot establish either.
- Reaction record: draw starting material and product structures, mark the functional-group change, and retain the assigned stoichiometry.
- Characterization record: compare the assigned melting range, TLC or spectral evidence. A narrow melting interval can support purity but cannot alone establish complete identity.

Materials and Apparatus

- Phenol and the instructor-selected benzoylating reagent.
- Assigned starting materials and instructor-selected reagents.
- Balance, reaction glassware, stirring/heating arrangement, condenser where required, filtration equipment and identity/purity test apparatus.

Method

1. Write the assigned reaction scheme and balance the transformation before calculating reagent requirements.
2. Identify the limiting reactant and document the approved reaction scale, solvent and conditions.
3. Observe the instructor-directed reaction sequence and record changes without substituting reagents or conditions.
4. Complete the prescribed work-up to separate the product from reaction liquids and by-products.
5. Purify the product by the assigned method, dry it appropriately and determine the recovered mass.
6. Record the assigned identity and purity observations and compare them with the expected product.

Observation Record

Complete this record using actual laboratory findings or the provided teaching data.

Observation / parameter	Record / finding
Starting-material amounts	_____
Limiting reactant	_____
Reaction observations	_____
Dry product mass	_____
Identity and purity observations	_____

Calculations and Interpretation

- Theoretical product mass = limiting-reactant amount (mol) $\times$ product stoichiometric ratio $\times$ product molar mass.
- Percentage yield = dry product mass / theoretical product mass $\times$ 100.

Worked Illustration

Illustration: a theoretical product mass of 2.00 g and dry recovery of 1.50 g give 75.0% yield.

The values in this illustration are for calculation practice.

Result

Record the actual finding, calculated value with units where relevant, and a conclusion supported by the observations.

Finding: _____

Conclusion: _____

Precautions

- Use the approved reaction conditions and suitable ventilation.
- Keep product, starting material and waste streams separately labelled.
- Calculate yield from dry product and the limiting reactant; never use wet mass as pure-product mass.

Viva Questions

1. What is the limiting reactant?

The reactant whose available amount permits the smallest theoretical amount of product.

2. Does a high yield establish purity?

No. Residual solvent, impurities and unreacted material can increase recovered mass.

Preparation of Acetanilide by Acylation

Practical 08 | Pharmaceutical Organic Chemistry II

Aim

To prepare Acetanilide by Acylation, and interpret the recorded observations.

Principle

- Acetylation of aniline converts the amino group to an acetamide group. This changes the functional-group behaviour without removing the aromatic ring.
- A chemical transformation changes selected functional groups while retaining or constructing the required molecular skeleton.
- Product identity and purity require analytical evidence; appearance alone cannot establish either.
- Reaction record: draw starting material and product structures, mark the functional-group change, and retain the assigned stoichiometry.
- Characterization record: compare the assigned melting range, TLC or spectral evidence. A narrow melting interval can support purity but cannot alone establish complete identity.

Materials and Apparatus

- Aniline and the assigned acetylating reagent.
- Assigned starting materials and instructor-selected reagents.
- Balance, reaction glassware, stirring/heating arrangement, condenser where required, filtration equipment and identity/purity test apparatus.

Method

1. Write the assigned reaction scheme and balance the transformation before calculating reagent requirements.
2. Identify the limiting reactant and document the approved reaction scale, solvent and conditions.
3. Observe the instructor-directed reaction sequence and record changes without substituting reagents or conditions.
4. Complete the prescribed work-up to separate the product from reaction liquids and by-products.
5. Purify the product by the assigned method, dry it appropriately and determine the recovered mass.
6. Record the assigned identity and purity observations and compare them with the expected product.

Observation Record

Complete this record using actual laboratory findings or the provided teaching data.

Observation / parameter	Record / finding
Starting-material amounts	_____
Limiting reactant	_____
Reaction observations	_____
Dry product mass	_____
Identity and purity observations	_____

Calculations and Interpretation

- Theoretical product mass = limiting-reactant amount (mol) $\times$ product stoichiometric ratio $\times$ product molar mass.
- Percentage yield = dry product mass / theoretical product mass $\times$ 100.

Worked Illustration

Illustration: a theoretical product mass of 2.00 g and dry recovery of 1.50 g give 75.0% yield.

The values in this illustration are for calculation practice.

Result

Record the actual finding, calculated value with units where relevant, and a conclusion supported by the observations.

Finding: _____

Conclusion: _____

Precautions

- Use the approved reaction conditions and suitable ventilation.
- Keep product, starting material and waste streams separately labelled.
- Calculate yield from dry product and the limiting reactant; never use wet mass as pure-product mass.

Viva Questions

1. What is the limiting reactant?

The reactant whose available amount permits the smallest theoretical amount of product.

2. Does a high yield establish purity?

No. Residual solvent, impurities and unreacted material can increase recovered mass.

Preparation of 2,4,6-Tribromoaniline

Practical 09 | Pharmaceutical Organic Chemistry II

Aim

To prepare 2,4,6-Tribromoaniline, and interpret the recorded observations.

Principle

- The amino group strongly activates aniline toward electrophilic aromatic substitution and directs substitution to ortho and para positions.
- A chemical transformation changes selected functional groups while retaining or constructing the required molecular skeleton.
- Product identity and purity require analytical evidence; appearance alone cannot establish either.
- Reaction record: draw starting material and product structures, mark the functional-group change, and retain the assigned stoichiometry.
- Characterization record: compare the assigned melting range, TLC or spectral evidence. A narrow melting interval can support purity but cannot alone establish complete identity.

Materials and Apparatus

- Instructor-demonstrated aromatic bromination materials.
- Assigned starting materials and instructor-selected reagents.
- Balance, reaction glassware, stirring/heating arrangement, condenser where required, filtration equipment and identity/purity test apparatus.

Method

1. Write the assigned reaction scheme and balance the transformation before calculating reagent requirements.
2. Identify the limiting reactant and document the approved reaction scale, solvent and conditions.
3. Observe the instructor-directed reaction sequence and record changes without substituting reagents or conditions.
4. Complete the prescribed work-up to separate the product from reaction liquids and by-products.
5. Purify the product by the assigned method, dry it appropriately and determine the recovered mass.
6. Record the assigned identity and purity observations and compare them with the expected product.

Observation Record

Complete this record using actual laboratory findings or the provided teaching data.

Observation / parameter	Record / finding
Starting-material amounts	_____
Limiting reactant	_____
Reaction observations	_____
Dry product mass	_____
Identity and purity observations	_____

Calculations and Interpretation

- Theoretical product mass = limiting-reactant amount (mol) $\times$ product stoichiometric ratio $\times$ product molar mass.
- Percentage yield = dry product mass / theoretical product mass $\times$ 100.

Worked Illustration

Illustration: a theoretical product mass of 2.00 g and dry recovery of 1.50 g give 75.0% yield.

The values in this illustration are for calculation practice.

Result

Record the actual finding, calculated value with units where relevant, and a conclusion supported by the observations.

Finding: _____

Conclusion: _____

Precautions

- Use the approved reaction conditions and suitable ventilation.
- Keep product, starting material and waste streams separately labelled.
- Calculate yield from dry product and the limiting reactant; never use wet mass as pure-product mass.

Viva Questions

1. What is the limiting reactant?

The reactant whose available amount permits the smallest theoretical amount of product.

2. Does a high yield establish purity?

No. Residual solvent, impurities and unreacted material can increase recovered mass.

Preparation of Para-Bromoacetanilide

Practical 10 | Pharmaceutical Organic Chemistry II

Aim

To prepare Para-Bromoacetanilide, and interpret the recorded observations.

Principle

- Protection of the amino group as an acetamide moderates its activating effect. Bromination of acetanilide can favour the para product under the assigned conditions.
- A chemical transformation changes selected functional groups while retaining or constructing the required molecular skeleton.
- Product identity and purity require analytical evidence; appearance alone cannot establish either.
- Reaction record: draw starting material and product structures, mark the functional-group change, and retain the assigned stoichiometry.
- Characterization record: compare the assigned melting range, TLC or spectral evidence. A narrow melting interval can support purity but cannot alone establish complete identity.

Materials and Apparatus

- Acetanilide and instructor-selected bromination reagents.
- Assigned starting materials and instructor-selected reagents.
- Balance, reaction glassware, stirring/heating arrangement, condenser where required, filtration equipment and identity/purity test apparatus.

Method

1. Write the assigned reaction scheme and balance the transformation before calculating reagent requirements.
2. Identify the limiting reactant and document the approved reaction scale, solvent and conditions.
3. Observe the instructor-directed reaction sequence and record changes without substituting reagents or conditions.
4. Complete the prescribed work-up to separate the product from reaction liquids and by-products.
5. Purify the product by the assigned method, dry it appropriately and determine the recovered mass.
6. Record the assigned identity and purity observations and compare them with the expected product.

Observation Record

Complete this record using actual laboratory findings or the provided teaching data.

Observation / parameter	Record / finding
Starting-material amounts	_____
Limiting reactant	_____
Reaction observations	_____
Dry product mass	_____
Identity and purity observations	_____

Calculations and Interpretation

- Theoretical product mass = limiting-reactant amount (mol) $\times$ product stoichiometric ratio $\times$ product molar mass.
- Percentage yield = dry product mass / theoretical product mass $\times$ 100.

Worked Illustration

Illustration: a theoretical product mass of 2.00 g and dry recovery of 1.50 g give 75.0% yield.

The values in this illustration are for calculation practice.

Result

Record the actual finding, calculated value with units where relevant, and a conclusion supported by the observations.

Finding: _____

Conclusion: _____

Precautions

- Use the approved reaction conditions and suitable ventilation.
- Keep product, starting material and waste streams separately labelled.
- Calculate yield from dry product and the limiting reactant; never use wet mass as pure-product mass.

Viva Questions

1. What is the limiting reactant?

The reactant whose available amount permits the smallest theoretical amount of product.

2. Does a high yield establish purity?

No. Residual solvent, impurities and unreacted material can increase recovered mass.

Preparation of 5-Nitrosalicylic Acid

Practical 11 | Pharmaceutical Organic Chemistry II

Aim

To prepare 5-Nitrosalicylic Acid, and interpret the recorded observations.

Principle

- Electrophilic aromatic nitration introduces a nitro group. The directing effects of the hydroxy and carboxyl substituents must be considered when identifying the product.
- A chemical transformation changes selected functional groups while retaining or constructing the required molecular skeleton.
- Product identity and purity require analytical evidence; appearance alone cannot establish either.
- Reaction record: draw starting material and product structures, mark the functional-group change, and retain the assigned stoichiometry.
- Characterization record: compare the assigned melting range, TLC or spectral evidence. A narrow melting interval can support purity but cannot alone establish complete identity.

Materials and Apparatus

- Salicylic acid and the instructor-demonstrated nitration system.
- Assigned starting materials and instructor-selected reagents.
- Balance, reaction glassware, stirring/heating arrangement, condenser where required, filtration equipment and identity/purity test apparatus.

Method

1. Write the assigned reaction scheme and balance the transformation before calculating reagent requirements.
2. Identify the limiting reactant and document the approved reaction scale, solvent and conditions.
3. Observe the instructor-directed reaction sequence and record changes without substituting reagents or conditions.
4. Complete the prescribed work-up to separate the product from reaction liquids and by-products.
5. Purify the product by the assigned method, dry it appropriately and determine the recovered mass.
6. Record the assigned identity and purity observations and compare them with the expected product.

Observation Record

Complete this record using actual laboratory findings or the provided teaching data.

Observation / parameter	Record / finding
Starting-material amounts	_____
Limiting reactant	_____
Reaction observations	_____
Dry product mass	_____
Identity and purity observations	_____

Calculations and Interpretation

- Theoretical product mass = limiting-reactant amount (mol) $\times$ product stoichiometric ratio $\times$ product molar mass.
- Percentage yield = dry product mass / theoretical product mass $\times$ 100.

Worked Illustration

Illustration: a theoretical product mass of 2.00 g and dry recovery of 1.50 g give 75.0% yield.

The values in this illustration are for calculation practice.

Result

Record the actual finding, calculated value with units where relevant, and a conclusion supported by the observations.

Finding: _____

Conclusion: _____

Precautions

- Use the approved reaction conditions and suitable ventilation.
- Keep product, starting material and waste streams separately labelled.
- Calculate yield from dry product and the limiting reactant; never use wet mass as pure-product mass.

Viva Questions

1. What is the limiting reactant?

The reactant whose available amount permits the smallest theoretical amount of product.

2. Does a high yield establish purity?

No. Residual solvent, impurities and unreacted material can increase recovered mass.

Preparation of Meta-Dinitrobenzene

Practical 12 | Pharmaceutical Organic Chemistry II

Aim

To prepare Meta-Dinitrobenzene, and interpret the recorded observations.

Principle

- A nitro substituent deactivates the aromatic ring and directs further electrophilic substitution mainly to a meta position.
- A chemical transformation changes selected functional groups while retaining or constructing the required molecular skeleton.
- Product identity and purity require analytical evidence; appearance alone cannot establish either.
- Reaction record: draw starting material and product structures, mark the functional-group change, and retain the assigned stoichiometry.
- Characterization record: compare the assigned melting range, TLC or spectral evidence. A narrow melting interval can support purity but cannot alone establish complete identity.

Materials and Apparatus

- Nitrobenzene and the instructor-demonstrated nitration system.
- Assigned starting materials and instructor-selected reagents.
- Balance, reaction glassware, stirring/heating arrangement, condenser where required, filtration equipment and identity/purity test apparatus.

Method

1. Write the assigned reaction scheme and balance the transformation before calculating reagent requirements.
2. Identify the limiting reactant and document the approved reaction scale, solvent and conditions.
3. Observe the instructor-directed reaction sequence and record changes without substituting reagents or conditions.
4. Complete the prescribed work-up to separate the product from reaction liquids and by-products.
5. Purify the product by the assigned method, dry it appropriately and determine the recovered mass.
6. Record the assigned identity and purity observations and compare them with the expected product.

Observation Record

Complete this record using actual laboratory findings or the provided teaching data.

Observation / parameter	Record / finding
Starting-material amounts	_____
Limiting reactant	_____
Reaction observations	_____
Dry product mass	_____
Identity and purity observations	_____

Calculations and Interpretation

- Theoretical product mass = limiting-reactant amount (mol) $\times$ product stoichiometric ratio $\times$ product molar mass.
- Percentage yield = dry product mass / theoretical product mass $\times$ 100.

Worked Illustration

Illustration: a theoretical product mass of 2.00 g and dry recovery of 1.50 g give 75.0% yield.

The values in this illustration are for calculation practice.

Result

Record the actual finding, calculated value with units where relevant, and a conclusion supported by the observations.

Finding: _____

Conclusion: _____

Precautions

- Use the approved reaction conditions and suitable ventilation.
- Keep product, starting material and waste streams separately labelled.
- Calculate yield from dry product and the limiting reactant; never use wet mass as pure-product mass.

Viva Questions

1. What is the limiting reactant?

The reactant whose available amount permits the smallest theoretical amount of product.

2. Does a high yield establish purity?

No. Residual solvent, impurities and unreacted material can increase recovered mass.

Preparation of Benzoic Acid by Oxidation

Practical 13 | Pharmaceutical Organic Chemistry II

Aim

To prepare Benzoic Acid by Oxidation, and interpret the recorded observations.

Principle

- Oxidation of the assigned benzyl starting material converts the benzylic carbon to a carboxyl group. Product identification must distinguish the acid from unchanged starting material.
- A chemical transformation changes selected functional groups while retaining or constructing the required molecular skeleton.
- Product identity and purity require analytical evidence; appearance alone cannot establish either.
- Reaction record: draw starting material and product structures, mark the functional-group change, and retain the assigned stoichiometry.
- Characterization record: compare the assigned melting range, TLC or spectral evidence. A narrow melting interval can support purity but cannot alone establish complete identity.

Materials and Apparatus

- Assigned benzyl starting material and oxidation reagents.
- Assigned starting materials and instructor-selected reagents.
- Balance, reaction glassware, stirring/heating arrangement, condenser where required, filtration equipment and identity/purity test apparatus.

Method

1. Write the assigned reaction scheme and balance the transformation before calculating reagent requirements.
2. Identify the limiting reactant and document the approved reaction scale, solvent and conditions.
3. Observe the instructor-directed reaction sequence and record changes without substituting reagents or conditions.
4. Complete the prescribed work-up to separate the product from reaction liquids and by-products.
5. Purify the product by the assigned method, dry it appropriately and determine the recovered mass.
6. Record the assigned identity and purity observations and compare them with the expected product.

Observation Record

Complete this record using actual laboratory findings or the provided teaching data.

Observation / parameter	Record / finding
Starting-material amounts	_____
Limiting reactant	_____
Reaction observations	_____
Dry product mass	_____
Identity and purity observations	_____

Calculations and Interpretation

- Theoretical product mass = limiting-reactant amount (mol) $\times$ product stoichiometric ratio $\times$ product molar mass.
- Percentage yield = dry product mass / theoretical product mass $\times$ 100.

Worked Illustration

Illustration: a theoretical product mass of 2.00 g and dry recovery of 1.50 g give 75.0% yield.

The values in this illustration are for calculation practice.

Result

Record the actual finding, calculated value with units where relevant, and a conclusion supported by the observations.

Finding: _____

Conclusion: _____

Precautions

- Use the approved reaction conditions and suitable ventilation.
- Keep product, starting material and waste streams separately labelled.
- Calculate yield from dry product and the limiting reactant; never use wet mass as pure-product mass.

Viva Questions

1. What is the limiting reactant?

The reactant whose available amount permits the smallest theoretical amount of product.

2. Does a high yield establish purity?

No. Residual solvent, impurities and unreacted material can increase recovered mass.

Preparation of Benzoic Acid by Ester Hydrolysis

Practical 14 | Pharmaceutical Organic Chemistry II

Aim

To prepare Benzoic Acid by Ester Hydrolysis, and interpret the recorded observations.

Principle

- Hydrolysis breaks an alkyl benzoate ester into a benzoic-acid component and an alcohol; the isolation conditions determine whether the acid or a benzoate salt is recovered.
- A chemical transformation changes selected functional groups while retaining or constructing the required molecular skeleton.
- Product identity and purity require analytical evidence; appearance alone cannot establish either.
- Reaction record: draw starting material and product structures, mark the functional-group change, and retain the assigned stoichiometry.
- Characterization record: compare the assigned melting range, TLC or spectral evidence. A narrow melting interval can support purity but cannot alone establish complete identity.

Materials and Apparatus

- Assigned alkyl benzoate and hydrolysis reagents.
- Assigned starting materials and instructor-selected reagents.
- Balance, reaction glassware, stirring/heating arrangement, condenser where required, filtration equipment and identity/purity test apparatus.

Method

- Write the assigned reaction scheme and balance the transformation before calculating reagent requirements.
- Identify the limiting reactant and document the approved reaction scale, solvent and conditions.
- Observe the instructor-directed reaction sequence and record changes without substituting reagents or conditions.
- Complete the prescribed work-up to separate the product from reaction liquids and by-products.
- Purify the product by the assigned method, dry it appropriately and determine the recovered mass.
- Record the assigned identity and purity observations and compare them with the expected product.

Observation Record

Complete this record using actual laboratory findings or the provided teaching data.

Observation / parameter	Record / finding
Starting-material amounts	_____
Limiting reactant	_____
Reaction observations	_____
Dry product mass	_____
Identity and purity observations	_____

Calculations and Interpretation

- Theoretical product mass = limiting-reactant amount (mol) $\times$ product stoichiometric ratio $\times$ product molar mass.
- Percentage yield = dry product mass / theoretical product mass $\times$ 100.

Worked Illustration

Illustration: a theoretical product mass of 2.00 g and dry recovery of 1.50 g give 75.0% yield.

The values in this illustration are for calculation practice.

Result

Record the actual finding, calculated value with units where relevant, and a conclusion supported by the observations.

Finding: _____

Conclusion: _____

Precautions

- Use the approved reaction conditions and suitable ventilation.
- Keep product, starting material and waste streams separately labelled.
- Calculate yield from dry product and the limiting reactant; never use wet mass as pure-product mass.

Viva Questions

1. What is the limiting reactant?

The reactant whose available amount permits the smallest theoretical amount of product.

2. Does a high yield establish purity?

No. Residual solvent, impurities and unreacted material can increase recovered mass.

Preparation of Salicylic Acid by Ester Hydrolysis

Practical 15 | Pharmaceutical Organic Chemistry II

Aim

To prepare Salicylic Acid by Ester Hydrolysis, and interpret the recorded observations.

Principle

- Hydrolysis of an alkyl salicylate removes the ester alkyl group while retaining the phenolic group and aromatic carboxyl functionality.
- A chemical transformation changes selected functional groups while retaining or constructing the required molecular skeleton.
- Product identity and purity require analytical evidence; appearance alone cannot establish either.
- Reaction record: draw starting material and product structures, mark the functional-group change, and retain the assigned stoichiometry.
- Characterization record: compare the assigned melting range, TLC or spectral evidence. A narrow melting interval can support purity but cannot alone establish complete identity.

Materials and Apparatus

- Assigned alkyl salicylate and hydrolysis reagents.
- Assigned starting materials and instructor-selected reagents.
- Balance, reaction glassware, stirring/heating arrangement, condenser where required, filtration equipment and identity/purity test apparatus.

Method

1. Write the assigned reaction scheme and balance the transformation before calculating reagent requirements.
2. Identify the limiting reactant and document the approved reaction scale, solvent and conditions.
3. Observe the instructor-directed reaction sequence and record changes without substituting reagents or conditions.
4. Complete the prescribed work-up to separate the product from reaction liquids and by-products.
5. Purify the product by the assigned method, dry it appropriately and determine the recovered mass.
6. Record the assigned identity and purity observations and compare them with the expected product.

Observation Record

Complete this record using actual laboratory findings or the provided teaching data.

Observation / parameter	Record / finding
Starting-material amounts	_____
Limiting reactant	_____
Reaction observations	_____
Dry product mass	_____
Identity and purity observations	_____

Calculations and Interpretation

- Theoretical product mass = limiting-reactant amount (mol) $\times$ product stoichiometric ratio $\times$ product molar mass.
- Percentage yield = dry product mass / theoretical product mass $\times$ 100.

Worked Illustration

Illustration: a theoretical product mass of 2.00 g and dry recovery of 1.50 g give 75.0% yield.

The values in this illustration are for calculation practice.

Result

Record the actual finding, calculated value with units where relevant, and a conclusion supported by the observations.

Finding: _____

Conclusion: _____

Precautions

- Use the approved reaction conditions and suitable ventilation.
- Keep product, starting material and waste streams separately labelled.
- Calculate yield from dry product and the limiting reactant; never use wet mass as pure-product mass.

Viva Questions

1. What is the limiting reactant?

The reactant whose available amount permits the smallest theoretical amount of product.

2. Does a high yield establish purity?

No. Residual solvent, impurities and unreacted material can increase recovered mass.

Preparation of 1-Phenylazo-2-Naphthol

Practical 16 | Pharmaceutical Organic Chemistry II

Aim

To prepare 1-Phenylazo-2-Naphthol, and interpret the recorded observations.

Principle

- The assigned aromatic diazonium intermediate couples with an activated naphthol ring to create an azo linkage and an extended chromophore.
- A chemical transformation changes selected functional groups while retaining or constructing the required molecular skeleton.
- Product identity and purity require analytical evidence; appearance alone cannot establish either.
- Reaction record: draw starting material and product structures, mark the functional-group change, and retain the assigned stoichiometry.
- Characterization record: compare the assigned melting range, TLC or spectral evidence. A narrow melting interval can support purity but cannot alone establish complete identity.

Materials and Apparatus

- Instructor-demonstrated aniline-derived diazonium and naphthol coupling materials.
- Assigned starting materials and instructor-selected reagents.
- Balance, reaction glassware, stirring/heating arrangement, condenser where required, filtration equipment and identity/purity test apparatus.

Method

1. Write the assigned reaction scheme and balance the transformation before calculating reagent requirements.
2. Identify the limiting reactant and document the approved reaction scale, solvent and conditions.
3. Observe the instructor-directed reaction sequence and record changes without substituting reagents or conditions.
4. Complete the prescribed work-up to separate the product from reaction liquids and by-products.
5. Purify the product by the assigned method, dry it appropriately and determine the recovered mass.
6. Record the assigned identity and purity observations and compare them with the expected product.

Observation Record

Complete this record using actual laboratory findings or the provided teaching data.

Observation / parameter	Record / finding
Starting-material amounts	_____
Limiting reactant	_____
Reaction observations	_____
Dry product mass	_____
Identity and purity observations	_____

Calculations and Interpretation

- Theoretical product mass = limiting-reactant amount (mol) $\times$ product stoichiometric ratio $\times$ product molar mass.
- Percentage yield = dry product mass / theoretical product mass $\times$ 100.

Worked Illustration

Illustration: a theoretical product mass of 2.00 g and dry recovery of 1.50 g give 75.0% yield.

The values in this illustration are for calculation practice.

Result

Record the actual finding, calculated value with units where relevant, and a conclusion supported by the observations.

Finding: _____

Conclusion: _____

Precautions

- Use the approved reaction conditions and suitable ventilation.
- Keep product, starting material and waste streams separately labelled.
- Calculate yield from dry product and the limiting reactant; never use wet mass as pure-product mass.

Viva Questions

1. What is the limiting reactant?

The reactant whose available amount permits the smallest theoretical amount of product.

2. Does a high yield establish purity?

No. Residual solvent, impurities and unreacted material can increase recovered mass.

Preparation of Benzil from Benzoin

Practical 17 | Pharmaceutical Organic Chemistry II

Aim

To prepare Benzil from Benzoin, and interpret the recorded observations.

Principle

- Oxidation converts the secondary alcohol group of benzoin to a second carbonyl, producing the adjacent diketone benzil.
- A chemical transformation changes selected functional groups while retaining or constructing the required molecular skeleton.
- Product identity and purity require analytical evidence; appearance alone cannot establish either.
- Reaction record: draw starting material and product structures, mark the functional-group change, and retain the assigned stoichiometry.
- Characterization record: compare the assigned melting range, TLC or spectral evidence. A narrow melting interval can support purity but cannot alone establish complete identity.

Materials and Apparatus

- Benzoin and the assigned oxidation system.
- Assigned starting materials and instructor-selected reagents.
- Balance, reaction glassware, stirring/heating arrangement, condenser where required, filtration equipment and identity/purity test apparatus.

Method

1. Write the assigned reaction scheme and balance the transformation before calculating reagent requirements.
2. Identify the limiting reactant and document the approved reaction scale, solvent and conditions.
3. Observe the instructor-directed reaction sequence and record changes without substituting reagents or conditions.
4. Complete the prescribed work-up to separate the product from reaction liquids and by-products.
5. Purify the product by the assigned method, dry it appropriately and determine the recovered mass.
6. Record the assigned identity and purity observations and compare them with the expected product.

Observation Record

Complete this record using actual laboratory findings or the provided teaching data.

Observation / parameter	Record / finding
Starting-material amounts	_____
Limiting reactant	_____
Reaction observations	_____
Dry product mass	_____
Identity and purity observations	_____

Calculations and Interpretation

- Theoretical product mass = limiting-reactant amount (mol) $\times$ product stoichiometric ratio $\times$ product molar mass.
- Percentage yield = dry product mass / theoretical product mass $\times$ 100.

Worked Illustration

Illustration: a theoretical product mass of 2.00 g and dry recovery of 1.50 g give 75.0% yield.

The values in this illustration are for calculation practice.

Result

Record the actual finding, calculated value with units where relevant, and a conclusion supported by the observations.

Finding: _____

Conclusion: _____

Precautions

- Use the approved reaction conditions and suitable ventilation.
- Keep product, starting material and waste streams separately labelled.
- Calculate yield from dry product and the limiting reactant; never use wet mass as pure-product mass.

Viva Questions

1. What is the limiting reactant?

The reactant whose available amount permits the smallest theoretical amount of product.

2. Does a high yield establish purity?

No. Residual solvent, impurities and unreacted material can increase recovered mass.

Preparation of Dibenzalacetone by Claisen-Schmidt Condensation

Practical 18 | Pharmaceutical Organic Chemistry II

Aim

To prepare Dibenzalacetone by Claisen-Schmidt Condensation, and interpret the recorded observations.

Principle

- A crossed aldol condensation followed by dehydration links benzaldehyde-derived units to acetone and forms a conjugated product.
- A chemical transformation changes selected functional groups while retaining or constructing the required molecular skeleton.
- Product identity and purity require analytical evidence; appearance alone cannot establish either.
- Reaction record: draw starting material and product structures, mark the functional-group change, and retain the assigned stoichiometry.
- Characterization record: compare the assigned melting range, TLC or spectral evidence. A narrow melting interval can support purity but cannot alone establish complete identity.

Materials and Apparatus

- Benzaldehyde, acetone and the assigned condensation reagents.
- Assigned starting materials and instructor-selected reagents.
- Balance, reaction glassware, stirring/heating arrangement, condenser where required, filtration equipment and identity/purity test apparatus.

Method

1. Write the assigned reaction scheme and balance the transformation before calculating reagent requirements.
2. Identify the limiting reactant and document the approved reaction scale, solvent and conditions.
3. Observe the instructor-directed reaction sequence and record changes without substituting reagents or conditions.
4. Complete the prescribed work-up to separate the product from reaction liquids and by-products.
5. Purify the product by the assigned method, dry it appropriately and determine the recovered mass.
6. Record the assigned identity and purity observations and compare them with the expected product.

Observation Record

Complete this record using actual laboratory findings or the provided teaching data.

Observation / parameter	Record / finding
Starting-material amounts	_____
Limiting reactant	_____
Reaction observations	_____
Dry product mass	_____
Identity and purity observations	_____

Calculations and Interpretation

- Theoretical product mass = limiting-reactant amount (mol) $\times$ product stoichiometric ratio $\times$ product molar mass.
- Percentage yield = dry product mass / theoretical product mass $\times$ 100.

Worked Illustration

Illustration: a theoretical product mass of 2.00 g and dry recovery of 1.50 g give 75.0% yield.

The values in this illustration are for calculation practice.

Result

Record the actual finding, calculated value with units where relevant, and a conclusion supported by the observations.

Finding: _____

Conclusion: _____

Precautions

- Use the approved reaction conditions and suitable ventilation.
- Keep product, starting material and waste streams separately labelled.
- Calculate yield from dry product and the limiting reactant; never use wet mass as pure-product mass.

Viva Questions

1. What is the limiting reactant?

The reactant whose available amount permits the smallest theoretical amount of product.

2. Does a high yield establish purity?

No. Residual solvent, impurities and unreacted material can increase recovered mass.

Preparation of Cinnamic Acid by Perkin Reaction

Practical 19 | Pharmaceutical Organic Chemistry II

Aim

To prepare Cinnamic Acid by Perkin Reaction, and interpret the recorded observations.

Principle

- The assigned aromatic aldehyde undergoes the Perkin condensation to form an unsaturated aromatic carboxylic acid after work-up.
- A chemical transformation changes selected functional groups while retaining or constructing the required molecular skeleton.
- Product identity and purity require analytical evidence; appearance alone cannot establish either.
- Reaction record: draw starting material and product structures, mark the functional-group change, and retain the assigned stoichiometry.
- Characterization record: compare the assigned melting range, TLC or spectral evidence. A narrow melting interval can support purity but cannot alone establish complete identity.

Materials and Apparatus

- Benzaldehyde and the instructor-selected Perkin reaction system.
- Assigned starting materials and instructor-selected reagents.
- Balance, reaction glassware, stirring/heating arrangement, condenser where required, filtration equipment and identity/purity test apparatus.

Method

1. Write the assigned reaction scheme and balance the transformation before calculating reagent requirements.
2. Identify the limiting reactant and document the approved reaction scale, solvent and conditions.
3. Observe the instructor-directed reaction sequence and record changes without substituting reagents or conditions.
4. Complete the prescribed work-up to separate the product from reaction liquids and by-products.
5. Purify the product by the assigned method, dry it appropriately and determine the recovered mass.
6. Record the assigned identity and purity observations and compare them with the expected product.

Observation Record

Complete this record using actual laboratory findings or the provided teaching data.

Observation / parameter	Record / finding
Starting-material amounts	_____
Limiting reactant	_____
Reaction observations	_____
Dry product mass	_____
Identity and purity observations	_____

Calculations and Interpretation

- Theoretical product mass = limiting-reactant amount (mol) $\times$ product stoichiometric ratio $\times$ product molar mass.
- Percentage yield = dry product mass / theoretical product mass $\times$ 100.

Worked Illustration

Illustration: a theoretical product mass of 2.00 g and dry recovery of 1.50 g give 75.0% yield.

The values in this illustration are for calculation practice.

Result

Record the actual finding, calculated value with units where relevant, and a conclusion supported by the observations.

Finding: _____

Conclusion: _____

Precautions

- Use the approved reaction conditions and suitable ventilation.
- Keep product, starting material and waste streams separately labelled.
- Calculate yield from dry product and the limiting reactant; never use wet mass as pure-product mass.

Viva Questions

1. What is the limiting reactant?

The reactant whose available amount permits the smallest theoretical amount of product.

2. Does a high yield establish purity?

No. Residual solvent, impurities and unreacted material can increase recovered mass.

Preparation of Para-Iodobenzoic Acid

Practical 20 | Pharmaceutical Organic Chemistry II

Aim

To prepare Para-Iodobenzoic Acid, and interpret the recorded observations.

Principle

- Replacement of the amino group of para-aminobenzoic acid through the assigned diazonium substitution route introduces iodine while retaining the carboxyl group.
- A chemical transformation changes selected functional groups while retaining or constructing the required molecular skeleton.
- Product identity and purity require analytical evidence; appearance alone cannot establish either.
- Reaction record: draw starting material and product structures, mark the functional-group change, and retain the assigned stoichiometry.
- Characterization record: compare the assigned melting range, TLC or spectral evidence. A narrow melting interval can support purity but cannot alone establish complete identity.

Materials and Apparatus

- Instructor-demonstrated para-aminobenzoic-acid substitution materials.
- Assigned starting materials and instructor-selected reagents.
- Balance, reaction glassware, stirring/heating arrangement, condenser where required, filtration equipment and identity/purity test apparatus.

Method

1. Write the assigned reaction scheme and balance the transformation before calculating reagent requirements.
2. Identify the limiting reactant and document the approved reaction scale, solvent and conditions.
3. Observe the instructor-directed reaction sequence and record changes without substituting reagents or conditions.
4. Complete the prescribed work-up to separate the product from reaction liquids and by-products.
5. Purify the product by the assigned method, dry it appropriately and determine the recovered mass.
6. Record the assigned identity and purity observations and compare them with the expected product.

Observation Record

Complete this record using actual laboratory findings or the provided teaching data.

Observation / parameter	Record / finding
Starting-material amounts	_____
Limiting reactant	_____
Reaction observations	_____
Dry product mass	_____
Identity and purity observations	_____

Calculations and Interpretation

- Theoretical product mass = limiting-reactant amount (mol) $\times$ product stoichiometric ratio $\times$ product molar mass.
- Percentage yield = dry product mass / theoretical product mass $\times$ 100.

Worked Illustration

Illustration: a theoretical product mass of 2.00 g and dry recovery of 1.50 g give 75.0% yield.

The values in this illustration are for calculation practice.

Result

Record the actual finding, calculated value with units where relevant, and a conclusion supported by the observations.

Finding: _____

Conclusion: _____

Precautions

- Use the approved reaction conditions and suitable ventilation.
- Keep product, starting material and waste streams separately labelled.
- Calculate yield from dry product and the limiting reactant; never use wet mass as pure-product mass.

Viva Questions

1. What is the limiting reactant?

The reactant whose available amount permits the smallest theoretical amount of product.

2. Does a high yield establish purity?

No. Residual solvent, impurities and unreacted material can increase recovered mass.

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