

B.Pharm Practical Notes

Semester 06

FirstHope

40 practical topics and guides, arranged by subject.

Medicinal Chemistry III

15 topics

Pharmacology III

15 topics

Herbal Drug Technology

9 topics

Industrial Training

1 guide

How to Use These Notes

- Read the aim and principle before the practical.
- Record the actual findings or the provided simulation data.
- Use the calculations with the correct units and stated model.
- Review the precautions and viva questions after completing the record.

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Preparation of Sulphanilamide

Practical 01 | Medicinal Chemistry III

Aim

To prepare Sulphanilamide, and interpret the recorded observations.

Principle

- The sulphonamide group and para amino group define the sulphanilamide scaffold. A protected aniline route illustrates why functional-group protection can be needed before introducing the sulphonamide 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.
- Identify the protection, functional-group conversion and deprotection stages in the assigned reaction scheme.
- 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 protected aromatic intermediate and instructor-demonstrated sulphonamide route.
- 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
Assigned route	_____
Limiting-reactant calculation	_____
Process observations	_____
Dry recovery	_____
Identity/purity evidence	_____

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. Why inspect the final molecular structure?

The intended connectivity and substituent positions distinguish the product from related intermediates or isomers.

2. What is the limiting reactant?

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

3. Does a high yield establish purity?

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

Preparation of 7-Hydroxy-4-Methylcoumarin

Practical 02 | Medicinal Chemistry III

Aim

To prepare 7-Hydroxy-4-Methylcoumarin, and interpret the recorded observations.

Principle

- A Pechmann-type condensation of a suitable phenol with a beta-ketoester can construct the coumarin ring. Substituent positions must be checked on the final structure.
- 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.
- Trace ring construction and identify the lactone carbonyl, 7-hydroxy group and 4-methyl group.
- 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 phenolic precursor, beta-ketoester and approved condensation 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
Assigned route	_____
Limiting-reactant calculation	_____
Process observations	_____
Dry recovery	_____
Identity/purity evidence	_____

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. Why inspect the final molecular structure?

The intended connectivity and substituent positions distinguish the product from related intermediates or isomers.

2. What is the limiting reactant?

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

3. Does a high yield establish purity?

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

Preparation of Chlorobutanol

Practical 03 | Medicinal Chemistry III

Aim

To prepare Chlorobutanol, and interpret the recorded observations.

Principle

- The assigned acetone/chloroform transformation forms a tertiary alcohol bearing a trichloromethyl group. Product form and residual reagents matter when interpreting recovery.
- 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.
- Compare the ketone starting functionality with the tertiary alcohol in the product; record the exact product form.
- 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 chlorobutanol reaction 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
Assigned route	_____
Limiting-reactant calculation	_____
Process observations	_____
Dry recovery	_____
Identity/purity evidence	_____

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. Why inspect the final molecular structure?

The intended connectivity and substituent positions distinguish the product from related intermediates or isomers.

2. What is the limiting reactant?

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

3. Does a high yield establish purity?

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

Preparation of Triphenylimidazole

Practical 04 | Medicinal Chemistry III

Aim

To prepare Triphenylimidazole, and interpret the recorded observations.

Principle

- A multicomponent condensation using an assigned diketone, aldehyde and nitrogen source constructs an imidazole ring carrying phenyl substituents.
- 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.
- Identify the two ring nitrogens and distinguish the imidazole product from imidazoline or imidazolidine.
- 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 diketone/aldehyde precursors and approved nitrogen-source 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
Assigned route	_____
Limiting-reactant calculation	_____
Process observations	_____
Dry recovery	_____
Identity/purity evidence	_____

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. Why inspect the final molecular structure?

The intended connectivity and substituent positions distinguish the product from related intermediates or isomers.

2. What is the limiting reactant?

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

3. Does a high yield establish purity?

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

Preparation of Tolbutamide

Practical 05 | Medicinal Chemistry III

Aim

To prepare Tolbutamide, and interpret the recorded observations.

Principle

- Tolbutamide contains a sulphonylurea linkage. Structural study distinguishes the sulphonylurea nitrogen substitution from an ordinary sulphonamide.
- 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.
- Trace the sulphonylurea linkage and the aromatic and alkyl substituents on the assigned scheme.
- 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 tolbutamide teaching intermediates and assigned product-identity data.
- 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
Assigned route	_____
Limiting-reactant calculation	_____
Process observations	_____
Dry recovery	_____
Identity/purity evidence	_____

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. Why inspect the final molecular structure?

The intended connectivity and substituent positions distinguish the product from related intermediates or isomers.

2. What is the limiting reactant?

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

3. Does a high yield establish purity?

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

Preparation of Hexamine

Practical 06 | Medicinal Chemistry III

Aim

To prepare Hexamine, and interpret the recorded observations.

Principle

- Hexamine is a cage-like nitrogen-containing compound formed in the assigned formaldehyde/ammonia condensation. Its identity is different from the individual starting substances.
- 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.
- Balance the assigned overall equation and inspect the cage connectivity in the product structure.
- 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 formaldehyde/ammonia teaching system and identity records.
- 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
Assigned route	_____
Limiting-reactant calculation	_____
Process observations	_____
Dry recovery	_____
Identity/purity evidence	_____

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. Why inspect the final molecular structure?

The intended connectivity and substituent positions distinguish the product from related intermediates or isomers.

2. What is the limiting reactant?

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

3. Does a high yield establish purity?

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

Assay of Isonicotinic Acid Hydrazide

Practical 07 | Medicinal Chemistry III

Aim

To assay Isonicotinic Acid Hydrazide, and interpret the recorded observations.

Principle

- Isoniazid is an isonicotinic-acid hydrazide. The assigned assay may use its defined redox or other analytical response; calculate with the exact reaction and validated method factor.
- 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 isoniazid, reference or standardized analytical reagents and completed/observed assay readings.
- 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 exact analyte form, assay method and reporting basis assigned to the exercise.
2. Record the standardized reagent factor or the reference-standard potency used.
3. Prepare the measured test portion and comparison/blank according to that method.
4. Obtain replicate endpoint or instrumental responses and retain the raw readings.
5. Apply reaction stoichiometry, reference potency and dilution corrections as applicable.
6. Report content on the specified mass or potency basis and compare only with the assigned criterion.

Observation Record

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

Observation / parameter	Record / finding
Analyte form	_____
Test portion	_____
Method and reference/factor	_____
Raw assay response	_____
Dilution	_____
Assay result	_____

Calculations and Interpretation

- Titrimetric method: $\text{analyte mass} = \text{corrected volume} \times \text{verified method factor} \times \text{dilution correction}$.
- Instrumental method: obtain concentration from the valid reference calibration and correct for preparation/dilution.
- Assay (%) = $\text{measured analyte amount} / \text{nominal analyte amount} \times 100$ on equivalent units and form.

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 is the analyte form part of the calculation?

Salt, hydrate and declared potency conventions can change the factor and reporting basis.

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.

Assay of Chloroquine

Practical 08 | Medicinal Chemistry III

Aim

To assay Chloroquine, and interpret the recorded observations.

Principle

- Basic sites and the declared chloroquine salt determine the analytical preparation and reporting basis. A factor for the free base cannot be silently transferred to a salt.
- 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 chloroquine form, method reagents/reference and assay 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. Identify the exact analyte form, assay method and reporting basis assigned to the exercise.
2. Record the standardized reagent factor or the reference-standard potency used.
3. Prepare the measured test portion and comparison/blank according to that method.
4. Obtain replicate endpoint or instrumental responses and retain the raw readings.
5. Apply reaction stoichiometry, reference potency and dilution corrections as applicable.
6. Report content on the specified mass or potency basis and compare only with the assigned criterion.

Observation Record

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

Observation / parameter	Record / finding
Analyte form	_____
Test portion	_____
Method and reference/factor	_____
Raw assay response	_____
Dilution	_____
Assay result	_____

Calculations and Interpretation

- Titrimetric method: $\text{analyte mass} = \text{corrected volume} \times \text{verified method factor} \times \text{dilution correction}$.
- Instrumental method: obtain concentration from the valid reference calibration and correct for preparation/dilution.
- Assay (%) = $\text{measured analyte amount} / \text{nominal analyte amount} \times 100$ on equivalent units and form.

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 is the analyte form part of the calculation?

Salt, hydrate and declared potency conventions can change the factor and reporting basis.

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.

Assay of Metronidazole

Practical 09 | Medicinal Chemistry III

Aim

To assay Metronidazole, and interpret the recorded observations.

Principle

- Metronidazole assay measures the defined analyte under the assigned validated method. Metronidazole and metronidazole benzoate are different reporting bases.
- 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 metronidazole form, analytical reference/reagents and assay readings.
- 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 exact analyte form, assay method and reporting basis assigned to the exercise.
2. Record the standardized reagent factor or the reference-standard potency used.
3. Prepare the measured test portion and comparison/blank according to that method.
4. Obtain replicate endpoint or instrumental responses and retain the raw readings.
5. Apply reaction stoichiometry, reference potency and dilution corrections as applicable.
6. Report content on the specified mass or potency basis and compare only with the assigned criterion.

Observation Record

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

Observation / parameter	Record / finding
Analyte form	_____
Test portion	_____
Method and reference/factor	_____
Raw assay response	_____
Dilution	_____
Assay result	_____

Calculations and Interpretation

- Titrimetric method: $\text{analyte mass} = \text{corrected volume} \times \text{verified method factor} \times \text{dilution correction}$.
- Instrumental method: obtain concentration from the valid reference calibration and correct for preparation/dilution.
- Assay (%) = $\text{measured analyte amount} / \text{nominal analyte amount} \times 100$ on equivalent units and form.

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 is the analyte form part of the calculation?

Salt, hydrate and declared potency conventions can change the factor and reporting basis.

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.

Assay of Dapsone

Practical 10 | Medicinal Chemistry III

Aim

To assay Dapsone, and interpret the recorded observations.

Principle

- Dapsone contains two primary aromatic amino groups and a sulphone linkage. The stoichiometry of the assigned assay must reflect the actual analytical reaction.
- 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 dapsone, standardized analytical system or reference and assay 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. Identify the exact analyte form, assay method and reporting basis assigned to the exercise.
2. Record the standardized reagent factor or the reference-standard potency used.
3. Prepare the measured test portion and comparison/blank according to that method.
4. Obtain replicate endpoint or instrumental responses and retain the raw readings.
5. Apply reaction stoichiometry, reference potency and dilution corrections as applicable.
6. Report content on the specified mass or potency basis and compare only with the assigned criterion.

Observation Record

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

Observation / parameter	Record / finding
Analyte form	_____
Test portion	_____
Method and reference/factor	_____
Raw assay response	_____
Dilution	_____
Assay result	_____

Calculations and Interpretation

- Titrimetric method: $\text{analyte mass} = \text{corrected volume} \times \text{verified method factor} \times \text{dilution correction}$.
- Instrumental method: obtain concentration from the valid reference calibration and correct for preparation/dilution.
- Assay (%) = $\text{measured analyte amount} / \text{nominal analyte amount} \times 100$ on equivalent units and form.

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 is the analyte form part of the calculation?

Salt, hydrate and declared potency conventions can change the factor and reporting basis.

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.

Assay of Chlorpheniramine Maleate

Practical 11 | Medicinal Chemistry III

Aim

To assay Chlorpheniramine Maleate, and interpret the recorded observations.

Principle

- The assay distinguishes the active base from its maleate salt and follows the method-specified endpoint or instrumental response. Salt stoichiometry changes the mass factor.
- 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 chlorpheniramine maleate, method reagents/reference and assay 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. Identify the exact analyte form, assay method and reporting basis assigned to the exercise.
2. Record the standardized reagent factor or the reference-standard potency used.
3. Prepare the measured test portion and comparison/blank according to that method.
4. Obtain replicate endpoint or instrumental responses and retain the raw readings.
5. Apply reaction stoichiometry, reference potency and dilution corrections as applicable.
6. Report content on the specified mass or potency basis and compare only with the assigned criterion.

Observation Record

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

Observation / parameter	Record / finding
Analyte form	_____
Test portion	_____
Method and reference/factor	_____
Raw assay response	_____
Dilution	_____
Assay result	_____

Calculations and Interpretation

- Titrimetric method: $\text{analyte mass} = \text{corrected volume} \times \text{verified method factor} \times \text{dilution correction}$.
- Instrumental method: obtain concentration from the valid reference calibration and correct for preparation/dilution.
- Assay (%) = $\text{measured analyte amount} / \text{nominal analyte amount} \times 100$ on equivalent units and form.

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 is the analyte form part of the calculation?

Salt, hydrate and declared potency conventions can change the factor and reporting basis.

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.

Assay of Benzylpenicillin

Practical 12 | Medicinal Chemistry III

Aim

To assay Benzylpenicillin, and interpret the recorded observations.

Principle

- The beta-lactam structure is susceptible to degradation. The declared salt/form and the method-specific potency or mass basis must be retained throughout the assay.
- 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 benzylpenicillin form, reference/reagents and the selected validated analytical records.
- 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 exact analyte form, assay method and reporting basis assigned to the exercise.
2. Record the standardized reagent factor or the reference-standard potency used.
3. Prepare the measured test portion and comparison/blank according to that method.
4. Obtain replicate endpoint or instrumental responses and retain the raw readings.
5. Apply reaction stoichiometry, reference potency and dilution corrections as applicable.
6. Report content on the specified mass or potency basis and compare only with the assigned criterion.

Observation Record

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

Observation / parameter	Record / finding
Analyte form	_____
Test portion	_____
Method and reference/factor	_____
Raw assay response	_____
Dilution	_____
Assay result	_____

Calculations and Interpretation

- Titrimetric method: $\text{analyte mass} = \text{corrected volume} \times \text{verified method factor} \times \text{dilution correction}$.
- Instrumental method: obtain concentration from the valid reference calibration and correct for preparation/dilution.
- Assay (%) = $\text{measured analyte amount} / \text{nominal analyte amount} \times 100$ on equivalent units and form.

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 is the analyte form part of the calculation?

Salt, hydrate and declared potency conventions can change the factor and reporting basis.

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.

Microwave-Assisted Synthesis of an Assigned Intermediate

Practical 13 | Medicinal Chemistry III

Aim

To study Microwave-Assisted Synthesis of an Assigned Intermediate, and interpret the recorded observations.

Principle

- Microwave-assisted synthesis couples electromagnetic energy to the reaction system. Heating behaviour depends on the material and apparatus; a shorter heating time does not alone prove higher purity or yield.
- 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.
- Use a purpose-built laboratory system and its rated operating arrangement.
- The reaction temperature and pressure record are more informative than a nominal power setting alone.
- 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-selected reaction, rated laboratory microwave system and completed comparison records.
- 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 identify the limiting reactant.
2. Review the instrument-rated vessel, reaction scale and operating limits with the instructor.
3. Observe the trained microwave demonstration and record its monitored conditions.
4. Review the assigned work-up and purification stages.
5. Calculate dry yield and compare identity/purity with the conventional teaching record.
6. Discuss differences in energy coupling, process time and analytical outcome.

Observation Record

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

Observation / parameter	Record / finding
Assigned reaction	_____
Instrument settings	_____
Reaction time	_____
Temperature/pressure record	_____
Yield and purity comparison	_____

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.

Drawing Drug Structures and Reactions in ChemDraw

Practical 14 | Medicinal Chemistry III

Aim

To study Drawing Drug Structures and Reactions in ChemDraw, and interpret the recorded observations.

Principle

- Chemical drawing software must preserve connectivity, bond order, stereochemistry and formal charge. A tidy drawing can still be chemically wrong.
- Choose the calculation or statistical model appropriate to the data structure and assumptions.
- Units, paired or independent observations, and the direction of the measured effect must be explicit.

Materials and Apparatus

- ChemDraw or equivalent drawing software, assigned drug list and verified structural information.
- Instructor-provided dataset and the stated study/model assumptions.
- Calculator or spreadsheet/statistical software and a record sheet.

Method

1. Enter the assigned structure with the correct ring and bond connectivity.
2. Check valence, aromaticity, formal charge and the exact salt or hydrate convention.
3. Add required wedge/dash bonds and verify the stereochemical meaning.
4. Arrange reaction arrows, reagents and products without overlapping labels.
5. Use the software check tools, then inspect the structure independently.
6. Export a clear figure and retain the editable file with an informative name.

Observation Record

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

Observation / parameter	Record / finding
Drug name	_____
Connectivity	_____
Charge and salt form	_____
Stereochemistry	_____
Reaction annotations	_____
Export quality	_____

Calculations and Interpretation

- For a neutral compound, verify the molecular formula and molar mass generated by the software.
- For salts, document whether the displayed mass refers to the base, salt or entire drawn composition.

Result

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

Finding: _____

Conclusion: _____

Precautions

- Do not interchange paired and independent analyses.
- Keep unit conversions explicit and round at the final reporting stage.
- A model estimate or p-value does not by itself establish a causal or clinical conclusion.

Viva Questions

1. Does a software structure check establish the intended drug identity?

No. A valence-valid structure can still have the wrong connectivity, isomer or salt form.

2. Why state assumptions?

An equation or test can give a misleading answer when its underlying assumptions do not hold.

3. Why keep intermediate calculations?

They make the result reproducible and expose unit or transcription errors.

Physicochemical Descriptors and Lipinski Rule of Five

Practical 15 | Medicinal Chemistry III

Aim

To study Physicochemical Descriptors and Lipinski Rule of Five, and interpret the recorded observations.

Principle

- Drug-design software estimates descriptors for a specific drawn structure. The rule of five is a screening heuristic for oral absorption/permeability tendencies, not proof of efficacy or bioavailability.
- Choose the calculation or statistical model appropriate to the data structure and assumptions.
- Units, paired or independent observations, and the direction of the measured effect must be explicit.
- LogP describes neutral-species partitioning; logD is pH-dependent total-species distribution.
- cLogP is a calculated prediction. State the model rather than reporting it as a measured value.
- Molar refractivity is an additional descriptor and is not one of the four rule-of-five thresholds.

Materials and Apparatus

- Assigned drug structures, descriptor software and a spreadsheet for consistent comparisons.
- Instructor-provided dataset and the stated study/model assumptions.
- Calculator or spreadsheet/statistical software and a record sheet.

Method

1. Choose a consistent structural convention for each assigned drug.
2. Check connectivity, charges, stereochemistry and whether counterions are included.
3. Record software/version and the descriptor model used.
4. Calculate molar mass, logP/cLogP, molar refractivity and donor/acceptor counts.
5. Compare the results with the stated rule-of-five thresholds.
6. Explain exceptions and distinguish a screening flag from an experimental conclusion.

Observation Record

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

Observation / parameter	Record / finding
Drug/form	_____
Molar mass	_____
LogP or cLogP	_____
Molar refractivity	_____
H-bond donors	_____
H-bond acceptors	_____
Rule violations	_____

Calculations and Interpretation

- Common screening thresholds: molar mass not above 500 g/mol; H-bond donors not above 5; acceptors not above 10; cLogP not above 5.
- Count violated thresholds consistently; values are screening descriptors rather than acceptance specifications.

Result

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

Finding: _____

Conclusion: _____

Precautions

- Do not interchange paired and independent analyses.
- Keep unit conversions explicit and round at the final reporting stage.
- A model estimate or p-value does not by itself establish a causal or clinical conclusion.

Viva Questions

1. Can a compound outside the rule of five be a useful drug?

Yes. The rules are empirical screening guidance and have exceptions, including mechanisms or delivery routes outside their intended context.

2. Why state assumptions?

An equation or test can give a misleading answer when its underlying assumptions do not hold.

3. Why keep intermediate calculations?

They make the result reproducible and expose unit or transcription errors.

Study of Dose Calculations for Experimental Data

Practical 01 | Pharmacology III

Aim

To study Dose Calculations for Experimental Data, and interpret the recorded observations.

Principle

- This exercise is dimensional arithmetic using an instructor-supplied experimental label. A concentration in mass/volume must not be confused with a dose in mass/body mass.
- This exercise uses a software/video simulation or an instructor-provided dataset.
- A response depends on the model, intervention, controls and observation period; comparisons must use the same endpoint.
- Record only supplied observations. Distinguish illustrative or simulated values from results obtained in an actual study.

Materials and Apparatus

- Assigned software/video, prepared teaching records and completed control/test data.
- Assigned pharmacology simulation/video and completed observation dataset.
- Computer, graphing or calculation software and a structured record sheet.

Method

1. Identify the simulated preparation, control group and response being measured.
2. Record the model settings and treatment labels supplied in the exercise.
3. Review the baseline or control trace before comparing the intervention traces.
4. Read the stated response endpoint using the same definition for every group.
5. Tabulate the completed simulation observations and calculate the assigned comparison.
6. Explain the mechanism, control response and any limitation of the model.

Observation Record

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

Observation / parameter	Record / finding
Model label	_____
Given dose unit	_____
Given body mass	_____
Required amount	_____
Supplied concentration	_____
Calculated volume	_____

Calculations and Interpretation

- Required amount = given dose per kg × supplied body mass in kg.
- For the stated data exercise: volume = required amount/supplied concentration.
- Convert g to kg before multiplication; these calculations do not select a clinical dose.

Result

Report the supplied simulated response, its defined comparison and the mechanism supported by the model. Label the observations as simulated.

Finding: _____

Conclusion: _____

Precautions

- Keep software units, treatment labels and endpoint definitions consistent.
- Use supplied simulation data and distinguish an illustration from an observed outcome.
- A model demonstrates an experimental principle; it does not establish an individual patient treatment.

Viva Questions

1. Why use a control response?

It separates the intervention effect from baseline variation in the simulated model.

2. Why define the endpoint before comparison?

Changing the endpoint after reviewing results can bias the interpretation.

Study of Mast-Cell Stabilization Activity

Practical 02 | Pharmacology III

Aim

To study Mast-Cell Stabilization Activity, and interpret the recorded observations.

Principle

- The completed teaching images or counts compare intact and degranulated cells. The effect is interpreted relative to the defined challenge and controls.
- This exercise uses a software/video simulation or an instructor-provided dataset.
- A response depends on the model, intervention, controls and observation period; comparisons must use the same endpoint.
- Record only supplied observations. Distinguish illustrative or simulated values from results obtained in an actual study.

Materials and Apparatus

- Assigned software/video, prepared teaching records and completed control/test data.
- Assigned pharmacology simulation/video and completed observation dataset.
- Computer, graphing or calculation software and a structured record sheet.

Method

1. Identify the simulated preparation, control group and response being measured.
2. Record the model settings and treatment labels supplied in the exercise.
3. Review the baseline or control trace before comparing the intervention traces.
4. Read the stated response endpoint using the same definition for every group.
5. Tabulate the completed simulation observations and calculate the assigned comparison.
6. Explain the mechanism, control response and any limitation of the model.

Observation Record

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

Observation / parameter	Record / finding
Group	_____
Cells counted	_____
Intact cells	_____
Degranulated cells	_____
Control status	_____

Calculations and Interpretation

- Intact cells (%) = $\text{intact count} / \text{total counted} \times 100$.
- Degranulated cells (%) = $\text{degranulated count} / \text{total counted} \times 100$.
- State the group and denominator used in each comparison.

Result

Report the supplied simulated response, its defined comparison and the mechanism supported by the model. Label the observations as simulated.

Finding: _____

Conclusion: _____

Precautions

- Keep software units, treatment labels and endpoint definitions consistent.
- Use supplied simulation data and distinguish an illustration from an observed outcome.
- A model demonstrates an experimental principle; it does not establish an individual patient treatment.

Viva Questions

1. Why use a control response?

It separates the intervention effect from baseline variation in the simulated model.

2. Why define the endpoint before comparison?

Changing the endpoint after reviewing results can bias the interpretation.

Study of Anti-Ulcer Activity in SHAY and NSAID Models

Practical 03 | Pharmacology III

Aim

To study Anti-Ulcer Activity in SHAY and NSAID Models, and interpret the recorded observations.

Principle

- The two simulations represent different ulcer-related mechanisms. The endpoint may include a defined ulcer score or gastric-fluid measure; model-specific scoring systems are not interchangeable.
- This exercise uses a software/video simulation or an instructor-provided dataset.
- A response depends on the model, intervention, controls and observation period; comparisons must use the same endpoint.
- Record only supplied observations. Distinguish illustrative or simulated values from results obtained in an actual study.

Materials and Apparatus

- Assigned software/video, prepared teaching records and completed control/test data.
- Assigned pharmacology simulation/video and completed observation dataset.
- Computer, graphing or calculation software and a structured record sheet.

Method

1. Identify the simulated preparation, control group and response being measured.
2. Record the model settings and treatment labels supplied in the exercise.
3. Review the baseline or control trace before comparing the intervention traces.
4. Read the stated response endpoint using the same definition for every group.
5. Tabulate the completed simulation observations and calculate the assigned comparison.
6. Explain the mechanism, control response and any limitation of the model.

Observation Record

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

Observation / parameter	Record / finding
Model	_____
Control score	_____
Test score	_____
Scoring definition	_____
Supplied gastric measures	_____

Calculations and Interpretation

- For a nonzero control ulcer index: inhibition (%) = (control index - test index)/control index × 100.
- Use the exact scoring definition supplied for each model.

Result

Report the supplied simulated response, its defined comparison and the mechanism supported by the model. Label the observations as simulated.

Finding: _____

Conclusion: _____

Precautions

- Keep software units, treatment labels and endpoint definitions consistent.
- Use supplied simulation data and distinguish an illustration from an observed outcome.
- A model demonstrates an experimental principle; it does not establish an individual patient treatment.

Viva Questions

1. Why use a control response?

It separates the intervention effect from baseline variation in the simulated model.

2. Why define the endpoint before comparison?

Changing the endpoint after reviewing results can bias the interpretation.

Study of Drug Effects on Gastrointestinal Motility

Practical 04 | Pharmacology III

Aim

To study Drug Effects on Gastrointestinal Motility, and interpret the recorded observations.

Principle

- The simulation follows a marker over a defined intestinal length or compares another stated motility endpoint. A fractional transit measure needs both distances.
- This exercise uses a software/video simulation or an instructor-provided dataset.
- A response depends on the model, intervention, controls and observation period; comparisons must use the same endpoint.
- Record only supplied observations. Distinguish illustrative or simulated values from results obtained in an actual study.

Materials and Apparatus

- Assigned software/video, prepared teaching records and completed control/test data.
- Assigned pharmacology simulation/video and completed observation dataset.
- Computer, graphing or calculation software and a structured record sheet.

Method

1. Identify the simulated preparation, control group and response being measured.
2. Record the model settings and treatment labels supplied in the exercise.
3. Review the baseline or control trace before comparing the intervention traces.
4. Read the stated response endpoint using the same definition for every group.
5. Tabulate the completed simulation observations and calculate the assigned comparison.
6. Explain the mechanism, control response and any limitation of the model.

Observation Record

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

Observation / parameter	Record / finding
Treatment	_____
Observation interval	_____
Marker distance	_____
Total segment length	_____
Transit measure	_____

Calculations and Interpretation

- Transit (%) = marker distance/total measured intestinal length × 100.
- Keep the observation interval and model comparable across groups.

Result

Report the supplied simulated response, its defined comparison and the mechanism supported by the model. Label the observations as simulated.

Finding: _____

Conclusion: _____

Precautions

- Keep software units, treatment labels and endpoint definitions consistent.
- Use supplied simulation data and distinguish an illustration from an observed outcome.
- A model demonstrates an experimental principle; it does not establish an individual patient treatment.

Viva Questions

1. Why use a control response?

It separates the intervention effect from baseline variation in the simulated model.

2. Why define the endpoint before comparison?

Changing the endpoint after reviewing results can bias the interpretation.

Study of Agonist and Antagonist Effects on Guinea Pig Ileum

Practical 05 | Pharmacology III

Aim

To study Agonist and Antagonist Effects on Guinea Pig Ileum, and interpret the recorded observations.

Principle

- Agonists produce graded responses in the simulation. Competitive antagonism may shift the curve, while a reduction in maximum response requires broader interpretation.
- This exercise uses a software/video simulation or an instructor-provided dataset.
- A response depends on the model, intervention, controls and observation period; comparisons must use the same endpoint.
- Record only supplied observations. Distinguish illustrative or simulated values from results obtained in an actual study.

Materials and Apparatus

- Assigned software/video, prepared teaching records and completed control/test data.
- Assigned pharmacology simulation/video and completed observation dataset.
- Computer, graphing or calculation software and a structured record sheet.

Method

1. Identify the simulated preparation, control group and response being measured.
2. Record the model settings and treatment labels supplied in the exercise.
3. Review the baseline or control trace before comparing the intervention traces.
4. Read the stated response endpoint using the same definition for every group.
5. Tabulate the completed simulation observations and calculate the assigned comparison.
6. Explain the mechanism, control response and any limitation of the model.

Observation Record

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

Observation / parameter	Record / finding
Agonist concentration	_____
Control response	_____
Antagonist condition	_____
Curve position	_____
Maximum	_____

Calculations and Interpretation

- Dose ratio = EC_{50} with antagonist/ EC_{50} without antagonist when both values are estimable.
- Compare maximum response independently of the EC_{50} shift.

Result

Report the supplied simulated response, its defined comparison and the mechanism supported by the model. Label the observations as simulated.

Finding: _____

Conclusion: _____

Precautions

- Keep software units, treatment labels and endpoint definitions consistent.
- Use supplied simulation data and distinguish an illustration from an observed outcome.
- A model demonstrates an experimental principle; it does not establish an individual patient treatment.

Viva Questions

1. Why use a control response?

It separates the intervention effect from baseline variation in the simulated model.

2. Why define the endpoint before comparison?

Changing the endpoint after reviewing results can bias the interpretation.

Study of Serum Biochemistry with a Semi-Autoanalyzer

Practical 06 | Pharmacology III

Aim

To study Serum Biochemistry with a Semi-Autoanalyzer, and interpret the recorded observations.

Principle

- The analyzer measures a method-dependent optical reaction. Calibration, reagent blank and quality-control records are necessary before a numerical serum result can be interpreted.
- This exercise uses a software/video simulation or an instructor-provided dataset.
- A response depends on the model, intervention, controls and observation period; comparisons must use the same endpoint.
- Record only supplied observations. Distinguish illustrative or simulated values from results obtained in an actual study.

Materials and Apparatus

- Assigned software/video, prepared teaching records and completed control/test data.
- Assigned pharmacology simulation/video and completed observation dataset.
- Computer, graphing or calculation software and a structured record sheet.

Method

1. Identify the simulated preparation, control group and response being measured.
2. Record the model settings and treatment labels supplied in the exercise.
3. Review the baseline or control trace before comparing the intervention traces.
4. Read the stated response endpoint using the same definition for every group.
5. Tabulate the completed simulation observations and calculate the assigned comparison.
6. Explain the mechanism, control response and any limitation of the model.

Observation Record

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

Observation / parameter	Record / finding
Analyte	_____
Method/wavelength	_____
Standard response	_____
Test response	_____
Quality control	_____
Calculated result	_____

Calculations and Interpretation

- For a valid blank-corrected single-standard proportional method: test concentration = test response/standard response × standard concentration.
- Use the method-specific calibration when a single-standard relationship is inappropriate.

Result

Report the supplied simulated response, its defined comparison and the mechanism supported by the model. Label the observations as simulated.

Finding: _____

Conclusion: _____

Precautions

- Keep software units, treatment labels and endpoint definitions consistent.
- Use supplied simulation data and distinguish an illustration from an observed outcome.
- A model demonstrates an experimental principle; it does not establish an individual patient treatment.

Viva Questions

1. Why use a control response?

It separates the intervention effect from baseline variation in the simulated model.

2. Why define the endpoint before comparison?

Changing the endpoint after reviewing results can bias the interpretation.

Study of Saline Purgative Effect on Frog Intestine

Practical 07 | Pharmacology III

Aim

To study Saline Purgative Effect on Frog Intestine, and interpret the recorded observations.

Principle

- The supplied model illustrates osmotic movement associated with a poorly absorbed solute. Water movement, net fluid change and motility are distinct endpoints.
- This exercise uses a software/video simulation or an instructor-provided dataset.
- A response depends on the model, intervention, controls and observation period; comparisons must use the same endpoint.
- Record only supplied observations. Distinguish illustrative or simulated values from results obtained in an actual study.

Materials and Apparatus

- Assigned software/video, prepared teaching records and completed control/test data.
- Assigned pharmacology simulation/video and completed observation dataset.
- Computer, graphing or calculation software and a structured record sheet.

Method

1. Identify the simulated preparation, control group and response being measured.
2. Record the model settings and treatment labels supplied in the exercise.
3. Review the baseline or control trace before comparing the intervention traces.
4. Read the stated response endpoint using the same definition for every group.
5. Tabulate the completed simulation observations and calculate the assigned comparison.
6. Explain the mechanism, control response and any limitation of the model.

Observation Record

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

Observation / parameter	Record / finding
Model condition	_____
Initial fluid measure	_____
Final fluid measure	_____
Time	_____
Control change	_____

Calculations and Interpretation

- Net fluid change = final measured fluid quantity - initial quantity.
- Compare with the control over the same observation interval.

Result

Report the supplied simulated response, its defined comparison and the mechanism supported by the model. Label the observations as simulated.

Finding: _____

Conclusion: _____

Precautions

- Keep software units, treatment labels and endpoint definitions consistent.
- Use supplied simulation data and distinguish an illustration from an observed outcome.
- A model demonstrates an experimental principle; it does not establish an individual patient treatment.

Viva Questions

1. Why use a control response?

It separates the intervention effect from baseline variation in the simulated model.

2. Why define the endpoint before comparison?

Changing the endpoint after reviewing results can bias the interpretation.

Study of Insulin Hypoglycemic Effect in a Rabbit Model

Practical 08 | Pharmacology III

Aim

To study Insulin Hypoglycemic Effect in a Rabbit Model, and interpret the recorded observations.

Principle

- Insulin can lower the supplied model blood-glucose values. Time course and baseline values are essential to comparison; the simulation does not establish a treatment schedule.
- This exercise uses a software/video simulation or an instructor-provided dataset.
- A response depends on the model, intervention, controls and observation period; comparisons must use the same endpoint.
- Record only supplied observations. Distinguish illustrative or simulated values from results obtained in an actual study.

Materials and Apparatus

- Assigned software/video, prepared teaching records and completed control/test data.
- Assigned pharmacology simulation/video and completed observation dataset.
- Computer, graphing or calculation software and a structured record sheet.

Method

1. Identify the simulated preparation, control group and response being measured.
2. Record the model settings and treatment labels supplied in the exercise.
3. Review the baseline or control trace before comparing the intervention traces.
4. Read the stated response endpoint using the same definition for every group.
5. Tabulate the completed simulation observations and calculate the assigned comparison.
6. Explain the mechanism, control response and any limitation of the model.

Observation Record

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

Observation / parameter	Record / finding
Group	_____
Baseline glucose	_____
Time after model intervention	_____
Glucose value	_____
Percentage change	_____

Calculations and Interpretation

- Decrease (%) = (baseline glucose - later glucose)/baseline glucose × 100.
- Preserve the supplied glucose units and time points.

Result

Report the supplied simulated response, its defined comparison and the mechanism supported by the model. Label the observations as simulated.

Finding: _____

Conclusion: _____

Precautions

- Keep software units, treatment labels and endpoint definitions consistent.
- Use supplied simulation data and distinguish an illustration from an observed outcome.
- A model demonstrates an experimental principle; it does not establish an individual patient treatment.

Viva Questions

1. Why use a control response?

It separates the intervention effect from baseline variation in the simulated model.

2. Why define the endpoint before comparison?

Changing the endpoint after reviewing results can bias the interpretation.

Study of Rabbit Pyrogen Test - Historical Data Interpretation

Practical 09 | Pharmacology III

Aim

To study Rabbit Pyrogen Test - Historical Data Interpretation, and interpret the recorded observations.

Principle

- The historical model examines a temperature response to a defined test preparation. Pyrogen testing and sterility testing evaluate different properties.
- This exercise uses a software/video simulation or an instructor-provided dataset.
- A response depends on the model, intervention, controls and observation period; comparisons must use the same endpoint.
- Record only supplied observations. Distinguish illustrative or simulated values from results obtained in an actual study.

Materials and Apparatus

- Assigned software/video, prepared teaching records and completed control/test data.
- Assigned pharmacology simulation/video and completed observation dataset.
- Computer, graphing or calculation software and a structured record sheet.

Method

1. Identify the simulated preparation, control group and response being measured.
2. Record the model settings and treatment labels supplied in the exercise.
3. Review the baseline or control trace before comparing the intervention traces.
4. Read the stated response endpoint using the same definition for every group.
5. Tabulate the completed simulation observations and calculate the assigned comparison.
6. Explain the mechanism, control response and any limitation of the model.

Observation Record

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

Observation / parameter	Record / finding
Record label	_____
Baseline temperature	_____
Post-test readings	_____
Maximum rise	_____
Method rule	_____

Calculations and Interpretation

- Maximum rise = highest relevant post-test temperature - the method-defined baseline.
- Apply the supplied method's individual and total-rise rule; do not invent a universal pass limit.

Result

Report the supplied simulated response, its defined comparison and the mechanism supported by the model. Label the observations as simulated.

Finding: _____

Conclusion: _____

Precautions

- Keep software units, treatment labels and endpoint definitions consistent.
- Use supplied simulation data and distinguish an illustration from an observed outcome.
- A model demonstrates an experimental principle; it does not establish an individual patient treatment.

Viva Questions

1. Why use a control response?

It separates the intervention effect from baseline variation in the simulated model.

2. Why define the endpoint before comparison?

Changing the endpoint after reviewing results can bias the interpretation.

Study of Acute Oral Toxicity from a Provided Dataset

Practical 10 | Pharmacology III

Aim

To study Acute Oral Toxicity from a Provided Dataset, and interpret the recorded observations.

Principle

- LD50 is a model estimate of a dose associated with mortality in half a population under stated conditions. A limit-test or toxicity-class result need not supply a precise LD50.
- This exercise uses a software/video simulation or an instructor-provided dataset.
- A response depends on the model, intervention, controls and observation period; comparisons must use the same endpoint.
- Record only supplied observations. Distinguish illustrative or simulated values from results obtained in an actual study.

Materials and Apparatus

- Assigned software/video, prepared teaching records and completed control/test data.
- Assigned pharmacology simulation/video and completed observation dataset.
- Computer, graphing or calculation software and a structured record sheet.

Method

1. Identify the simulated preparation, control group and response being measured.
2. Record the model settings and treatment labels supplied in the exercise.
3. Review the baseline or control trace before comparing the intervention traces.
4. Read the stated response endpoint using the same definition for every group.
5. Tabulate the completed simulation observations and calculate the assigned comparison.
6. Explain the mechanism, control response and any limitation of the model.

Observation Record

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

Observation / parameter	Record / finding
Provided dose labels	_____
Number represented	_____
Observed outcomes	_____
Model/assumption	_____
Estimate or class	_____

Calculations and Interpretation

- Outcome proportion = relevant outcome count/number represented.
- Estimate LD50 only by the appropriate fitted model for the supplied data; report uncertainty and do not infer it from a single group.

Result

Report the supplied simulated response, its defined comparison and the mechanism supported by the model. Label the observations as simulated.

Finding: _____

Conclusion: _____

Precautions

- Keep software units, treatment labels and endpoint definitions consistent.
- Use supplied simulation data and distinguish an illustration from an observed outcome.
- A model demonstrates an experimental principle; it does not establish an individual patient treatment.

Viva Questions

1. Why use a control response?

It separates the intervention effect from baseline variation in the simulated model.

2. Why define the endpoint before comparison?

Changing the endpoint after reviewing results can bias the interpretation.

Study of Skin Irritation and Corrosion - Dataset Interpretation

Practical 11 | Pharmacology III

Aim

To study Skin Irritation and Corrosion - Dataset Interpretation, and interpret the recorded observations.

Principle

- Irritation and corrosion describe different severity/reversibility concepts. Completed scores must be interpreted using the specified test and observation times.
- This exercise uses a software/video simulation or an instructor-provided dataset.
- A response depends on the model, intervention, controls and observation period; comparisons must use the same endpoint.
- Record only supplied observations. Distinguish illustrative or simulated values from results obtained in an actual study.

Materials and Apparatus

- Assigned software/video, prepared teaching records and completed control/test data.
- Assigned pharmacology simulation/video and completed observation dataset.
- Computer, graphing or calculation software and a structured record sheet.

Method

1. Identify the simulated preparation, control group and response being measured.
2. Record the model settings and treatment labels supplied in the exercise.
3. Review the baseline or control trace before comparing the intervention traces.
4. Read the stated response endpoint using the same definition for every group.
5. Tabulate the completed simulation observations and calculate the assigned comparison.
6. Explain the mechanism, control response and any limitation of the model.

Observation Record

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

Observation / parameter	Record / finding
Method label	_____
Observation time	_____
Supplied scores	_____
Reversibility evidence	_____
Method classification	_____

Calculations and Interpretation

- Calculate a summary score only where the supplied test method specifies it.
- Do not replace the method's classification rules with an unvalidated average.

Result

Report the supplied simulated response, its defined comparison and the mechanism supported by the model. Label the observations as simulated.

Finding: _____

Conclusion: _____

Precautions

- Keep software units, treatment labels and endpoint definitions consistent.
- Use supplied simulation data and distinguish an illustration from an observed outcome.
- A model demonstrates an experimental principle; it does not establish an individual patient treatment.

Viva Questions

1. Why use a control response?

It separates the intervention effect from baseline variation in the simulated model.

2. Why define the endpoint before comparison?

Changing the endpoint after reviewing results can bias the interpretation.

Study of Eye Irritation and Corrosion - Dataset Interpretation

Practical 12 | Pharmacology III

Aim

To study Eye Irritation and Corrosion - Dataset Interpretation, and interpret the recorded observations.

Principle

- Eye-response data can include corneal, iris and conjunctival observations. The timing and reversibility of effects matter to the method-specific classification.
- This exercise uses a software/video simulation or an instructor-provided dataset.
- A response depends on the model, intervention, controls and observation period; comparisons must use the same endpoint.
- Record only supplied observations. Distinguish illustrative or simulated values from results obtained in an actual study.

Materials and Apparatus

- Assigned software/video, prepared teaching records and completed control/test data.
- Assigned pharmacology simulation/video and completed observation dataset.
- Computer, graphing or calculation software and a structured record sheet.

Method

1. Identify the simulated preparation, control group and response being measured.
2. Record the model settings and treatment labels supplied in the exercise.
3. Review the baseline or control trace before comparing the intervention traces.
4. Read the stated response endpoint using the same definition for every group.
5. Tabulate the completed simulation observations and calculate the assigned comparison.
6. Explain the mechanism, control response and any limitation of the model.

Observation Record

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

Observation / parameter	Record / finding
Observation time	_____
Corneal score	_____
Iris score	_____
Conjunctival scores	_____
Reversibility/classification	_____

Calculations and Interpretation

- Use the scoring and classification rules supplied for the dataset.
- Keep separate tissue endpoints separate unless the stated method directs their combination.

Result

Report the supplied simulated response, its defined comparison and the mechanism supported by the model. Label the observations as simulated.

Finding: _____

Conclusion: _____

Precautions

- Keep software units, treatment labels and endpoint definitions consistent.
- Use supplied simulation data and distinguish an illustration from an observed outcome.
- A model demonstrates an experimental principle; it does not establish an individual patient treatment.

Viva Questions

1. Why use a control response?

It separates the intervention effect from baseline variation in the simulated model.

2. Why define the endpoint before comparison?

Changing the endpoint after reviewing results can bias the interpretation.

Pharmacokinetic Parameters from a Given Dataset

Practical 13 | Pharmacology III

Aim

To study Pharmacokinetic Parameters from a Given Dataset, and interpret the recorded observations.

Principle

- Time-concentration data support pharmacokinetic calculations only within the stated route and model. The one-compartment IV-bolus first-order model differs from oral absorption and multicompartment models.
- Choose the calculation or statistical model appropriate to the data structure and assumptions.
- Units, paired or independent observations, and the direction of the measured effect must be explicit.

Materials and Apparatus

- Provided concentration-time data, dose and route information, calculation/plotting software.
- Instructor-provided dataset and the stated study/model assumptions.
- Calculator or spreadsheet/statistical software and a record sheet.

Method

1. Confirm the route, dose, units and model assumptions stated with the data.
2. Plot concentration against time and inspect the proposed elimination interval.
3. For an appropriate log-linear interval, fit $\ln(\text{concentration})$ against time and obtain the elimination slope.
4. Calculate half-life and integrate the area under the curve with the chosen method.
5. Calculate clearance and apparent distribution measures only with the necessary route/model information.
6. Report parameters with units, assumptions and any extrapolated AUC portion.

Observation Record

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

Observation / parameter	Record / finding
Time	_____
Concentration	_____
Log concentration	_____
AUC intervals	_____
Model parameters	_____

Calculations and Interpretation

- For log-linear elimination: $\ln(C) = \ln(C_0) - kt$; half-life = $0.693/k$.
- Trapezoidal AUC interval = $(C_i + C_{i+1})/2 \times (t_{i+1} - t_i)$.
- When justified by terminal first-order data: residual AUC = C_{last}/k .
- After an IV dose, clearance = dose/AUC to infinity; for an oral dose without known bioavailability the result is CL/F .
- For the stated one-compartment IV-bolus model, $V = \text{dose}/C_0$ and clearance = kV .

Worked Illustration

Illustration: a valid elimination slope of -0.20 per hour gives $k = 0.20$ per hour and half-life = 3.47 hours.

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

- Do not interchange paired and independent analyses.
- Keep unit conversions explicit and round at the final reporting stage.
- A model estimate or p-value does not by itself establish a causal or clinical conclusion.

Viva Questions

1. Why is oral dose/AUC called CL/F when F is unknown?

The observed exposure includes incomplete bioavailability, so clearance and bioavailability cannot be separated from that expression alone.

2. Why state assumptions?

An equation or test can give a misleading answer when its underlying assumptions do not hold.

Student t Test and One-Way ANOVA

Practical 14 | Pharmacology III

Aim

To study Student t Test and One-Way ANOVA, and interpret the recorded observations.

Principle

- A t test examines a defined mean comparison, while one-way ANOVA examines a mean difference across independent groups under its model. Paired and independent data require different analyses.
- Choose the calculation or statistical model appropriate to the data structure and assumptions.
- Units, paired or independent observations, and the direction of the measured effect must be explicit.
- Standard independent-group ANOVA assumes independent errors and an appropriate common-variance/normal-error model; use a suitable alternative when those conditions are unsuitable.
- An omnibus ANOVA result does not identify which individual groups differ. Any follow-up comparisons need the planned multiplicity approach.

Materials and Apparatus

- Provided grouped or paired dataset and statistical software.
- Instructor-provided dataset and the stated study/model assumptions.
- Calculator or spreadsheet/statistical software and a record sheet.

Method

1. Identify whether observations are paired or independent and define the comparison.
2. Check missing values, distributions and the relevant model assumptions.
3. Summarize each group with its size, mean and standard deviation.
4. Use an appropriate t test for two-group/paired data or an appropriate ANOVA for the stated multiple-group design.
5. Record the statistic, degrees of freedom, p-value and the estimated difference or group means.
6. Interpret against the pre-specified significance level and distinguish statistical significance from effect size.

Observation Record

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

Observation / parameter	Record / finding
Data structure	_____
Group size	_____
Mean and variability	_____
Test statistic	_____
Degrees of freedom	_____
p-value and effect	_____

Calculations and Interpretation

- Independent unequal-variance comparison: $t = (\text{mean1} - \text{mean2}) / \sqrt{s_1^2/n_1 + s_2^2/n_2}$, with Welch-Satterthwaite degrees of freedom.
- Paired comparison: $t = \text{mean difference} / (\text{SD of differences} / \sqrt{n})$; degrees of freedom = $n - 1$.
- One-way ANOVA: $F = \text{mean square between groups} / \text{mean square within groups}$.

Result

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

Finding: _____

Conclusion: _____

Precautions

- Do not interchange paired and independent analyses.
- Keep unit conversions explicit and round at the final reporting stage.
- A model estimate or p-value does not by itself establish a causal or clinical conclusion.

Viva Questions

1. Why is repeatedly using unadjusted t tests across many groups problematic?

It can inflate the chance of false positive conclusions across the collection of comparisons.

2. Why state assumptions?

An equation or test can give a misleading answer when its underlying assumptions do not hold.

3. Why keep intermediate calculations?

They make the result reproducible and expose unit or transcription errors.

Chi-Square and Wilcoxon Signed-Rank Tests

Practical 15 | Pharmacology III

Aim

To study Chi-Square and Wilcoxon Signed-Rank Tests, and interpret the recorded observations.

Principle

- A chi-square independence test analyzes categorical counts. A Wilcoxon signed-rank test uses ranks of paired differences and requires the appropriate paired-data and symmetry assumptions for a location-shift interpretation.
- Choose the calculation or statistical model appropriate to the data structure and assumptions.
- Units, paired or independent observations, and the direction of the measured effect must be explicit.

Materials and Apparatus

- Provided contingency table or paired measurements and statistical software.
- Instructor-provided dataset and the stated study/model assumptions.
- Calculator or spreadsheet/statistical software and a record sheet.

Method

1. Choose the test from the data structure and the stated question.
2. For chi-square, construct the count table and calculate expected counts under independence.
3. Check expected-count adequacy and consider a suitable exact alternative where needed.
4. For signed ranks, compute paired differences, handle zeros by the specified convention and rank nonzero absolute differences with averaged ties.
5. Calculate the statistic or obtain it with verified software settings and record the exact/asymptotic approach.
6. Report the result and the assumptions supporting the interpretation.

Observation Record

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

Observation / parameter	Record / finding
Observed/expected counts	_____
Paired differences	_____
Ranks and ties	_____
Statistic	_____
Degrees of freedom or method	_____
p-value	_____

Calculations and Interpretation

- Expected cell count = row total × column total/grand total.
- Chi-square = $\sum[(\text{observed} - \text{expected})^2 / \text{expected}]$; table degrees of freedom = (rows - 1)(columns - 1).
- Wilcoxon: sum ranks separately for positive and negative nonzero differences; state the statistic convention used by the software.

Result

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

Finding: _____

Conclusion: _____

Precautions

- Do not interchange paired and independent analyses.
- Keep unit conversions explicit and round at the final reporting stage.
- A model estimate or p-value does not by itself establish a causal or clinical conclusion.

Viva Questions

1. Is the Wilcoxon signed-rank test the same as the rank-sum test?

No. Signed ranks analyze paired differences; rank-sum methods compare independent groups.

2. Why state assumptions?

An equation or test can give a misleading answer when its underlying assumptions do not hold.

3. Why keep intermediate calculations?

They make the result reproducible and expose unit or transcription errors.

Study of Preliminary Phytochemical Screening

Practical 01 | Herbal Drug Technology

Aim

To study Preliminary Phytochemical Screening, and interpret the recorded observations.

Principle

- Preliminary reactions suggest chemical classes such as alkaloids, phenolics, glycosides or saponins. Matrix interference and reagent controls prevent a class reaction from being mistaken for a confirmed individual compound.
- The property is obtained from a defined observable under controlled conditions.
- Replicate measurements, instrument checks and consistent units are needed before comparison.
- Record the material identity, extract/ingredient strength and the method used so the result remains traceable.
- Use the assigned product or material specification; general chemical-class findings alone do not establish clinical effectiveness.

Materials and Apparatus

- Prepared crude-drug extracts and completed or instructor-demonstrated class-test records.
- 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 measured property, units and controlled variables before setting up the apparatus.
2. Check the instrument, zero or calibration and record the relevant operating conditions.
3. Prepare a representative measured portion without changing its intended composition.
4. Obtain the readings specified for the property and repeat under the same conditions.
5. Calculate the required property, including corrections stated for the apparatus or method.
6. Summarize the replicate results and explain the effect of the variable studied.

Observation Record

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

Observation / parameter	Record / finding
Extract identity	_____
Chemical class	_____
Test and control	_____
Observed reaction	_____
Supported interpretation	_____

Calculations and Interpretation

- Record qualitative class findings with controls; no universal numerical concentration follows from a colour or precipitate.

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.

Study of Alcohol Content of Asava and Arista

Practical 02 | Herbal Drug Technology

Aim

To study Alcohol Content of Asava and Arista, and interpret the recorded observations.

Principle

- The alcohol determination must distinguish the alcoholic fraction from dissolved sugars and other constituents. A method suitable for a purified/distilled fraction cannot be applied directly to an uncorrected sugary matrix.
- The property is obtained from a defined observable under controlled conditions.
- Replicate measurements, instrument checks and consistent units are needed before comparison.
- Record the material identity, extract/ingredient strength and the method used so the result remains traceable.
- Use the assigned product or material specification; general chemical-class findings alone do not establish clinical effectiveness.

Materials and Apparatus

- Assigned finished products, instructor-prepared analytical fractions and method-specific density or instrumental calibration.
- 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 measured property, units and controlled variables before setting up the apparatus.
2. Check the instrument, zero or calibration and record the relevant operating conditions.
3. Prepare a representative measured portion without changing its intended composition.
4. Obtain the readings specified for the property and repeat under the same conditions.
5. Calculate the required property, including corrections stated for the apparatus or method.
6. Summarize the replicate results and explain the effect of the variable studied.

Observation Record

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

Observation / parameter	Record / finding
Product	_____
Method	_____
Temperature	_____
Calibration response	_____
Dilution	_____
Alcohol reporting basis	_____

Calculations and Interpretation

- Read the alcohol content from the applicable calibrated method.
- Report the stated volume/volume or mass basis and correct for the preparation steps.

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.

Study of Evaluation of Natural-Origin Excipients

Practical 03 | Herbal Drug Technology

Aim

To study Evaluation of Natural-Origin Excipients, and interpret the recorded observations.

Principle

- Natural gums, mucilages and other excipients are evaluated for identity, moisture behaviour, viscosity, swelling and functional performance. Their natural origin does not alone establish consistency or suitability.
- The property is obtained from a defined observable under controlled conditions.
- Replicate measurements, instrument checks and consistent units are needed before comparison.
- Record the material identity, extract/ingredient strength and the method used so the result remains traceable.
- Use the assigned product or material specification; general chemical-class findings alone do not establish clinical effectiveness.

Materials and Apparatus

- Assigned natural excipients and approved identity/functional test 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. Identify the measured property, units and controlled variables before setting up the apparatus.
2. Check the instrument, zero or calibration and record the relevant operating conditions.
3. Prepare a representative measured portion without changing its intended composition.
4. Obtain the readings specified for the property and repeat under the same conditions.
5. Calculate the required property, including corrections stated for the apparatus or method.
6. Summarize the replicate results and explain the effect of the variable studied.

Observation Record

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

Observation / parameter	Record / finding
Excipient	_____
Identity observation	_____
Moisture result	_____
Swelling/viscosity	_____
Function comparison	_____

Calculations and Interpretation

- Report the property-specific equation, method and units.
- Compare function under the same concentration, temperature and measurement conditions.

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.

Study of Herbal-Extract Cosmetic Creams, Lotions and Shampoos

Practical 04 | Herbal Drug Technology

Aim

To study Herbal-Extract Cosmetic Creams, Lotions and Shampoos, and interpret the recorded observations.

Principle

- A standardized prepared extract must remain compatible with the cosmetic vehicle. Creams/lotions emphasize emulsion and consistency properties; shampoos also emphasize surfactant performance and foam behaviour.
- A dosage form combines an active ingredient with excipients selected for processing, stability and performance.
- Preparation and evaluation are linked: changes in composition or process can alter the product quality attributes.
- Record the material identity, extract/ingredient strength and the method used so the result remains traceable.
- Use the assigned product or material specification; general chemical-class findings alone do not establish clinical effectiveness.

Materials and Apparatus

- Approved extract and laboratory formulae, mixing equipment and evaluation apparatus.
- Assigned active ingredient, excipients and the instructor-approved master formula.
- Balance, mixing/preparation equipment, packaging materials and the assigned evaluation apparatus.

Method

1. Read the master formula and identify the purpose of each ingredient.
2. Calculate the quantities for the assigned laboratory batch and check ingredient identity.
3. Follow the specified order of addition and preparation process, recording actual quantities and process observations.
4. Measure the yield or finished quantity and package the laboratory preparation as specified.
5. Evaluate the product attributes listed for this dosage form with documented methods.
6. Compare the observations with the assigned specification and explain any difference.

Observation Record

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

Observation / parameter	Record / finding
Formulation type	_____
Extract basis	_____
Ingredient roles	_____
pH/consistency	_____
Separation or foam	_____
Stability observations	_____

Calculations and Interpretation

- Batch scale factor = required quantity/master quantity.
- Extract-marker concentration follows the standardized extract strength and actual amount incorporated.

Result

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

Finding: _____

Conclusion: _____

Precautions

- Record changes in process or composition; do not conceal a deviation.
- Use the specification assigned to the exact product and dosage form.
- A teaching batch is for laboratory evaluation and is not released for patient use.

Viva Questions

1. Why identify excipient functions?

Each excipient can influence processing, stability, release or acceptability.

2. Why is appearance alone insufficient for evaluation?

It does not establish content, performance, stability or microbiological quality.

Study of Herbal-Extract Syrups, Mixtures and Tablets

Practical 05 | Herbal Drug Technology

Aim

To study Herbal-Extract Syrups, Mixtures and Tablets, and interpret the recorded observations.

Principle

- The extract strength and vehicle/dosage form determine the declared content and performance tests. A homogeneous liquid differs from a redispersible mixture or a compressed tablet.
- A dosage form combines an active ingredient with excipients selected for processing, stability and performance.
- Preparation and evaluation are linked: changes in composition or process can alter the product quality attributes.
- Record the material identity, extract/ingredient strength and the method used so the result remains traceable.
- Use the assigned product or material specification; general chemical-class findings alone do not establish clinical effectiveness.

Materials and Apparatus

- Prepared standardized extract, approved oral laboratory formulae and assigned evaluation equipment.
- Assigned active ingredient, excipients and the instructor-approved master formula.
- Balance, mixing/preparation equipment, packaging materials and the assigned evaluation apparatus.

Method

1. Read the master formula and identify the purpose of each ingredient.
2. Calculate the quantities for the assigned laboratory batch and check ingredient identity.
3. Follow the specified order of addition and preparation process, recording actual quantities and process observations.
4. Measure the yield or finished quantity and package the laboratory preparation as specified.
5. Evaluate the product attributes listed for this dosage form with documented methods.
6. Compare the observations with the assigned specification and explain any difference.

Observation Record

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

Observation / parameter	Record / finding
Dosage form	_____
Extract marker basis	_____
Batch record	_____
Uniformity	_____
Assay	_____
Release or redispersion	_____

Calculations and Interpretation

- Declared marker amount = extract amount incorporated × verified marker fraction.
- Correct the measured result for preparation and dilution before comparing with the declared basis.

Result

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

Finding: _____

Conclusion: _____

Precautions

- Record changes in process or composition; do not conceal a deviation.
- Use the specification assigned to the exact product and dosage form.
- A teaching batch is for laboratory evaluation and is not released for patient use.

Viva Questions

1. Why identify excipient functions?

Each excipient can influence processing, stability, release or acceptability.

2. Why is appearance alone insufficient for evaluation?

It does not establish content, performance, stability or microbiological quality.

Study of Monograph Analysis of an Herbal Drug

Practical 06 | Herbal Drug Technology

Aim

To study Monograph Analysis of an Herbal Drug, and interpret the recorded observations.

Principle

- A monograph specifies identity, quality tests and applicable limits for a defined drug material. The plant part, processing state and edition are integral to the comparison.
- The property is obtained from a defined observable under controlled conditions.
- Replicate measurements, instrument checks and consistent units are needed before comparison.
- Record the material identity, extract/ingredient strength and the method used so the result remains traceable.
- Use the assigned product or material specification; general chemical-class findings alone do not establish clinical effectiveness.

Materials and Apparatus

- Authenticated herbal material, assigned current monograph and completed or observed test records.
- 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 measured property, units and controlled variables before setting up the apparatus.
2. Check the instrument, zero or calibration and record the relevant operating conditions.
3. Prepare a representative measured portion without changing its intended composition.
4. Obtain the readings specified for the property and repeat under the same conditions.
5. Calculate the required property, including corrections stated for the apparatus or method.
6. Summarize the replicate results and explain the effect of the variable studied.

Observation Record

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

Observation / parameter	Record / finding
Drug/plant part	_____
Monograph edition	_____
Identity test	_____
Quality measure	_____
Assigned criterion	_____
Conclusion	_____

Calculations and Interpretation

- Use each monograph-specified calculation and reporting basis.
- Compare only the tests completed for the defined material.

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.

Study of Aldehyde Content in an Assigned Herbal Material

Practical 07 | Herbal Drug Technology

Aim

To study Aldehyde Content in an Assigned Herbal Material, and interpret the recorded observations.

Principle

- An assigned aldehyde assay measures a defined reactive fraction or analyte. The reaction stoichiometry and reporting basis must be verified for the method and material.
- The property is obtained from a defined observable under controlled conditions.
- Replicate measurements, instrument checks and consistent units are needed before comparison.
- Record the material identity, extract/ingredient strength and the method used so the result remains traceable.
- Use the assigned product or material specification; general chemical-class findings alone do not establish clinical effectiveness.

Materials and Apparatus

- Prepared teaching analytical portion, assigned assay system and blank/reference records.
- 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 measured property, units and controlled variables before setting up the apparatus.
2. Check the instrument, zero or calibration and record the relevant operating conditions.
3. Prepare a representative measured portion without changing its intended composition.
4. Obtain the readings specified for the property and repeat under the same conditions.
5. Calculate the required property, including corrections stated for the apparatus or method.
6. Summarize the replicate results and explain the effect of the variable studied.

Observation Record

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

Observation / parameter	Record / finding
Material	_____
Assay reaction	_____
Blank/test response	_____
Factor/calibration	_____
Aldehyde result	_____

Calculations and Interpretation

- For a validated titrimetric assay: analyte amount = corrected volume × exact method factor.
- For an instrumental assay, use the reference calibration and documented dilution.

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.

Study of Phenol Content in an Assigned Herbal Material

Practical 08 | Herbal Drug Technology

Aim

To study Phenol Content in an Assigned Herbal Material, and interpret the recorded observations.

Principle

- A phenol-related assay can report a defined analyte or a total response in reference-standard equivalents. An equivalents result is not automatically the mass of every phenolic constituent.
- The property is obtained from a defined observable under controlled conditions.
- Replicate measurements, instrument checks and consistent units are needed before comparison.
- Record the material identity, extract/ingredient strength and the method used so the result remains traceable.
- Use the assigned product or material specification; general chemical-class findings alone do not establish clinical effectiveness.

Materials and Apparatus

- Prepared teaching extract, assigned phenol assay reagents/reference and completed readings.
- 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 measured property, units and controlled variables before setting up the apparatus.
2. Check the instrument, zero or calibration and record the relevant operating conditions.
3. Prepare a representative measured portion without changing its intended composition.
4. Obtain the readings specified for the property and repeat under the same conditions.
5. Calculate the required property, including corrections stated for the apparatus or method.
6. Summarize the replicate results and explain the effect of the variable studied.

Observation Record

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

Observation / parameter	Record / finding
Material	_____
Reference identity	_____
Blank/test response	_____
Calibration	_____
Reporting equivalents	_____

Calculations and Interpretation

- Obtain concentration from the valid standard-response relationship.
- State whether the result is a specific analyte quantity or reference-equivalent total response.

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.

Study of Total Alkaloids in an Assigned Herbal Material

Practical 09 | Herbal Drug Technology

Aim

To study Total Alkaloids in an Assigned Herbal Material, and interpret the recorded observations.

Principle

- The total-alkaloid result is method-defined and may be reported as a reference alkaloid or dry fraction basis. A recovered fraction can include impurities unless the assigned assay establishes its content.
- The property is obtained from a defined observable under controlled conditions.
- Replicate measurements, instrument checks and consistent units are needed before comparison.
- Record the material identity, extract/ingredient strength and the method used so the result remains traceable.
- Use the assigned product or material specification; general chemical-class findings alone do not establish clinical effectiveness.

Materials and Apparatus

- Instructor-prepared teaching analytical fractions, method-specific standard and completed assay records.
- 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 measured property, units and controlled variables before setting up the apparatus.
2. Check the instrument, zero or calibration and record the relevant operating conditions.
3. Prepare a representative measured portion without changing its intended composition.
4. Obtain the readings specified for the property and repeat under the same conditions.
5. Calculate the required property, including corrections stated for the apparatus or method.
6. Summarize the replicate results and explain the effect of the variable studied.

Observation Record

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

Observation / parameter	Record / finding
Material	_____
Prepared fraction	_____
Method basis	_____
Blank/test response	_____
Reference factor	_____
Total-alkaloid result	_____

Calculations and Interpretation

- Calculate using the exact method/reference convention supplied.
- Report the defined alkaloid-equivalent or fraction basis; do not label an unverified fraction as pure active compound.

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.

Industrial Training - Observation and Report Guide

Guide 01 | Industrial Training

Aim

To document the training and explain the functions and coordination of the establishment in a properly arranged report.

Principle

- The activity covers an industrial establishment or an approved research laboratory. The report explains its sections, functioning, products or research activities, approvals and coordination, using observations from the actual training.
- A training or project report links the stated objective to documented activity, observations and conclusions.
- Report only work actually completed and protect confidential institutional and patient information.
- Industrial training may take place at the end of Semester 5.

Materials and Apparatus

- Approved itinerary or training plan, site supervisor, permitted process diagrams and a dated activity log.
- Supervisor-approved plan, institutional instructions, observation log and permitted supporting records.
- Report-writing software and a dated activity log.

Method

1. Confirm the approved establishment, supervisor and scope of the training.
2. Prepare a department-wise observation sheet before attending.
3. Record the role of each section and how materials, information or work move between departments.
4. Identify the product range or research areas and the approvals explained by the host.
5. Document examples of quality checks, interdisciplinary coordination and contribution to society where observed.
6. Write a structured report and have factual or confidential material checked before submission.

Industry Observation Areas

Material receipt and stores

Observe receipt, identification, quarantine/release status and storage controls without reproducing confidential inventory data.

Production and packaging

Trace the broad sequence from approved materials through processing, in-process checks, packaging and reconciliation.

Quality control and quality assurance

Distinguish testing activities from quality-system oversight. Record the demonstrations of documentation, deviations, change control or release explained by the host.

Utilities and support

Identify the purpose of water, air-handling, maintenance, safety and waste-management services actually shown.

Products and approvals

Describe the permitted product categories, dosage forms and approvals named by the host. Preserve the exact approved scope rather than inferring unobserved capabilities.

Research Laboratory Observation Areas

Departments and coordination

Describe each department visited and the movement of research questions, specimens or analytical information between them.

Research contribution

Record the research themes, services, training or public benefits explained by the host. Separate completed achievements from future plans.

Report Arrangement

Opening pages

Title, student and institution details, establishment, visit/training dates, acknowledgement and contents.

Main report

Introduction, objectives, establishment overview, department-wise observations, permitted process flow, approvals explained and learning outcomes.

Closing pages

Discussion of coordination, conclusion, permitted annexures and the attendance or host confirmation requested by the institution.

Submission Check

Final review

Use actual observations, consistent dates and clearly labelled figures. Exclude trade secrets and restricted documents. Check the institution's required format and copies.

Observation Record

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

Observation / parameter	Record / finding
Date	_____
Section visited	_____
Function observed	_____
Permitted evidence	_____
Learning outcome	_____

Calculations and Interpretation

- Summarize the actual dates and activities. The supplied course description does not prescribe a 45-day or 150-hour duration for this activity.

Result

Present the completed activity log, learning outcomes and report prepared from actual work, with the required supervisor confirmation.

Finding: _____

Conclusion: _____

Precautions

- Use actual attendance and findings rather than invented completion records.
- Obtain permission for institutional material and remove identifying patient details.
- Verify the submission requirements in the supplied course instructions and the institution.

Viva Questions

1. How does a site report differ from a general description of an industry?

It records the departments actually visited and ties each explanation to dated observations from that establishment.

2. What makes a report reproducible?

A clear objective, documented method, traceable observations and a conclusion supported by those observations.

3. Why distinguish observation from interpretation?

The reader needs to know which statements are directly recorded and which are reasoned explanations.

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