

B.Pharm Practical Notes

Semester 04

FirstHope

58 practical topics and guides, arranged by subject.

Medicinal Chemistry I

16 topics

Physical Pharmaceutics II

11 topics

Pharmacology I

15 topics

Pharmacognosy and Phytochemistry I

16 topics

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 Pyrazole Ring

Practical 01 | Medicinal Chemistry I

Aim

To prepare Pyrazole Ring, and interpret the recorded observations.

Principle

- Pyrazoles are five-membered aromatic rings with adjacent nitrogen atoms. Identify the exact assigned derivative before drawing a reaction; the ring is not described correctly by placing its nitrogens at positions 1 and 3.
- A chemical transformation changes selected functional groups while retaining or constructing the required molecular skeleton.
- Product identity and purity require analytical evidence; appearance alone cannot establish either.
- Reaction record: draw starting material and product structures, mark the functional-group change, and retain the assigned stoichiometry.
- Characterization record: compare the assigned melting range, TLC or spectral evidence. A narrow melting interval can support purity but cannot alone establish complete identity.

Materials and Apparatus

- Instructor-selected precursor system and demonstrated pyrazole derivative.
- 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 derivative	_____
Reaction scheme	_____
Limiting-reactant record	_____
Dry recovery	_____
Identity/purity observations	_____

Calculations and Interpretation

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

Worked Illustration

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

The values in this illustration are for calculation practice.

Result

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

Finding: _____

Conclusion: _____

Precautions

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

Viva Questions

1. What is the limiting reactant?

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

2. Does a high yield establish purity?

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

Preparation of Oxazole Ring

Practical 02 | Medicinal Chemistry I

Aim

To prepare Oxazole Ring, and interpret the recorded observations.

Principle

- Oxazole is a five-membered aromatic ring containing oxygen at position 1 and nitrogen at position 3. Ring-forming chemistry must be tied to the exact assigned derivative.
- A chemical transformation changes selected functional groups while retaining or constructing the required molecular skeleton.
- Product identity and purity require analytical evidence; appearance alone cannot establish either.
- Reaction record: draw starting material and product structures, mark the functional-group change, and retain the assigned stoichiometry.
- Characterization record: compare the assigned melting range, TLC or spectral evidence. A narrow melting interval can support purity but cannot alone establish complete identity.

Materials and Apparatus

- Instructor-selected oxygen/nitrogen precursor 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 derivative	_____
Reaction scheme	_____
Limiting-reactant record	_____
Dry recovery	_____
Identity/purity observations	_____

Calculations and Interpretation

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

Worked Illustration

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

The values in this illustration are for calculation practice.

Result

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

Finding: _____

Conclusion: _____

Precautions

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

Viva Questions

1. What is the limiting reactant?

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

2. Does a high yield establish purity?

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

Preparation of Benzimidazole

Practical 03 | Medicinal Chemistry I

Aim

To prepare Benzimidazole, and interpret the recorded observations.

Principle

- Benzimidazole formation constructs an imidazole ring fused to benzene. The assigned condensation/cyclization connects an ortho-diamino aromatic system to a suitable carbon source.
- A chemical transformation changes selected functional groups while retaining or constructing the required molecular skeleton.
- Product identity and purity require analytical evidence; appearance alone cannot establish either.
- Reaction record: draw starting material and product structures, mark the functional-group change, and retain the assigned stoichiometry.
- Characterization record: compare the assigned melting range, TLC or spectral evidence. A narrow melting interval can support purity but cannot alone establish complete identity.

Materials and Apparatus

- Assigned ortho-diamino starting material and carbon-source reagent.
- Assigned starting materials and instructor-selected reagents.
- Balance, reaction glassware, stirring/heating arrangement, condenser where required, filtration equipment and identity/purity test apparatus.

Method

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

Observation Record

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

Observation / parameter	Record / finding
Assigned derivative	_____
Reaction scheme	_____
Limiting-reactant record	_____
Dry recovery	_____
Identity/purity observations	_____

Calculations and Interpretation

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

Worked Illustration

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

The values in this illustration are for calculation practice.

Result

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

Finding: _____

Conclusion: _____

Precautions

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

Viva Questions

1. What is the limiting reactant?

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

2. Does a high yield establish purity?

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

Preparation of Benzotriazole

Practical 04 | Medicinal Chemistry I

Aim

To prepare Benzotriazole, and interpret the recorded observations.

Principle

- Benzotriazole contains a fused three-nitrogen heterocycle. The assigned ring-forming demonstration must be interpreted by tracking the nitrogen atoms and the aromatic skeleton.
- A chemical transformation changes selected functional groups while retaining or constructing the required molecular skeleton.
- Product identity and purity require analytical evidence; appearance alone cannot establish either.
- Reaction record: draw starting material and product structures, mark the functional-group change, and retain the assigned stoichiometry.
- Characterization record: compare the assigned melting range, TLC or spectral evidence. A narrow melting interval can support purity but cannot alone establish complete identity.

Materials and Apparatus

- Instructor-demonstrated benzotriazole ring-forming 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 derivative	_____
Reaction scheme	_____
Limiting-reactant record	_____
Dry recovery	_____
Identity/purity observations	_____

Calculations and Interpretation

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

Worked Illustration

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

The values in this illustration are for calculation practice.

Result

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

Finding: _____

Conclusion: _____

Precautions

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

Viva Questions

1. What is the limiting reactant?

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

2. Does a high yield establish purity?

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

Preparation of 2,3-Diphenylquinoxaline

Practical 05 | Medicinal Chemistry I

Aim

To prepare 2,3-Diphenylquinoxaline, and interpret the recorded observations.

Principle

- Condensation of an ortho-diamine with an adjacent diketone constructs the quinoxaline ring. The phenyl substituents originate from the assigned diketone.
- A chemical transformation changes selected functional groups while retaining or constructing the required molecular skeleton.
- Product identity and purity require analytical evidence; appearance alone cannot establish either.
- Reaction record: draw starting material and product structures, mark the functional-group change, and retain the assigned stoichiometry.
- Characterization record: compare the assigned melting range, TLC or spectral evidence. A narrow melting interval can support purity but cannot alone establish complete identity.

Materials and Apparatus

- Assigned aromatic ortho-diamine and diphenyl diketone.
- 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 derivative	_____
Reaction scheme	_____
Limiting-reactant record	_____
Dry recovery	_____
Identity/purity observations	_____

Calculations and Interpretation

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

Worked Illustration

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

The values in this illustration are for calculation practice.

Result

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

Finding: _____

Conclusion: _____

Precautions

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

Viva Questions

1. What is the limiting reactant?

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

2. Does a high yield establish purity?

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

Preparation of Benzocaine

Practical 06 | Medicinal Chemistry I

Aim

To prepare Benzocaine, and interpret the recorded observations.

Principle

- Benzocaine is ethyl para-aminobenzoate. The assigned ester-forming route retains the para amino group and introduces the ethyl ester functionality.
- A chemical transformation changes selected functional groups while retaining or constructing the required molecular skeleton.
- Product identity and purity require analytical evidence; appearance alone cannot establish either.
- Reaction record: draw starting material and product structures, mark the functional-group change, and retain the assigned stoichiometry.
- Characterization record: compare the assigned melting range, TLC or spectral evidence. A narrow melting interval can support purity but cannot alone establish complete identity.

Materials and Apparatus

- Assigned para-aminobenzoic-acid/ester-forming demonstration 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 derivative	_____
Reaction scheme	_____
Limiting-reactant record	_____
Dry recovery	_____
Identity/purity observations	_____

Calculations and Interpretation

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

Worked Illustration

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

The values in this illustration are for calculation practice.

Result

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

Finding: _____

Conclusion: _____

Precautions

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

Viva Questions

1. What is the limiting reactant?

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

2. Does a high yield establish purity?

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

Preparation of Phenytoin

Practical 07 | Medicinal Chemistry I

Aim

To prepare Phenytoin, and interpret the recorded observations.

Principle

- Phenytoin has a substituted hydantoin ring. The assigned ring-forming sequence is interpreted by tracking carbonyl and nitrogen functionality into that ring.
- A chemical transformation changes selected functional groups while retaining or constructing the required molecular skeleton.
- Product identity and purity require analytical evidence; appearance alone cannot establish either.
- Reaction record: draw starting material and product structures, mark the functional-group change, and retain the assigned stoichiometry.
- Characterization record: compare the assigned melting range, TLC or spectral evidence. A narrow melting interval can support purity but cannot alone establish complete identity.

Materials and Apparatus

- Instructor-demonstrated hydantoin-forming precursor 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 derivative	_____
Reaction scheme	_____
Limiting-reactant record	_____
Dry recovery	_____
Identity/purity observations	_____

Calculations and Interpretation

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

Worked Illustration

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

The values in this illustration are for calculation practice.

Result

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

Finding: _____

Conclusion: _____

Precautions

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

Viva Questions

1. What is the limiting reactant?

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

2. Does a high yield establish purity?

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

Preparation of Phenothiazine

Practical 08 | Medicinal Chemistry I

Aim

To prepare Phenothiazine, and interpret the recorded observations.

Principle

- Phenothiazine is a tricyclic nitrogen/sulfur heterocycle. Distinguish the parent ring system from medicinal derivatives bearing side chains or additional 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.
- 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 phenothiazine ring-system 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 derivative	_____
Reaction scheme	_____
Limiting-reactant record	_____
Dry recovery	_____
Identity/purity observations	_____

Calculations and Interpretation

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

Worked Illustration

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

The values in this illustration are for calculation practice.

Result

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

Finding: _____

Conclusion: _____

Precautions

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

Viva Questions

1. What is the limiting reactant?

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

2. Does a high yield establish purity?

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

Preparation of Barbiturate Ring System

Practical 09 | Medicinal Chemistry I

Aim

To prepare Barbiturate Ring System, and interpret the recorded observations.

Principle

- The barbiturate nucleus is a pyrimidine-trione system. Structural study must distinguish the parent scaffold from a specific substituted medicinal compound.
- A chemical transformation changes selected functional groups while retaining or constructing the required molecular skeleton.
- Product identity and purity require analytical evidence; appearance alone cannot establish either.
- Reaction record: draw starting material and product structures, mark the functional-group change, and retain the assigned stoichiometry.
- Characterization record: compare the assigned melting range, TLC or spectral evidence. A narrow melting interval can support purity but cannot alone establish complete identity.

Materials and Apparatus

- Assigned structure model and instructor-demonstrated ring-forming teaching material.
- 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 derivative	_____
Reaction scheme	_____
Limiting-reactant record	_____
Dry recovery	_____
Identity/purity observations	_____

Calculations and Interpretation

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

Worked Illustration

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

The values in this illustration are for calculation practice.

Result

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

Finding: _____

Conclusion: _____

Precautions

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

Viva Questions

1. What is the limiting reactant?

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

2. Does a high yield establish purity?

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

Assay of Chlorpromazine

Practical 10 | Medicinal Chemistry I

Aim

To assay Chlorpromazine, and interpret the recorded observations.

Principle

- Basic functionality permits a suitable assigned nonaqueous acid-base assay; the salt form and specified endpoint determine the calculation basis.
- A standardized titrant reacts with the analyte according to a defined stoichiometric relationship.
- The calculation must distinguish direct titration from a blank-corrected or back-titration procedure.

Materials and Apparatus

- Assigned chlorpromazine form, standardized assay titrant and specified solvent/endpoint system.
- Assigned test material, standardized titrant, specified solvent and indicator or endpoint detector.
- Burette, pipette, volumetric flask, conical flask and analytical balance.

Method

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

Observation Record

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

Observation / parameter	Record / finding
Analyte form	_____
Test mass	_____
Blank reading	_____
Test reading	_____
Method factor	_____
Assay percentage	_____

Calculations and Interpretation

- Method-corrected analyte mass = corrected titrant volume × verified analyte factor × dilution correction.
- Assay (%) = method-corrected analyte mass/test-portion mass × 100.
- Use the exact salt/hydrate and reaction factor assigned to this assay.

Result

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

Finding: _____

Conclusion: _____

Precautions

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

Viva Questions

1. Why standardize a titrant?

Its actual concentration may differ from its nominal preparation concentration.

2. Why perform a reagent blank?

It measures reagent or solvent consumption unrelated to the analyte.

Assay of Phenobarbitone

Practical 11 | Medicinal Chemistry I

Aim

To assay Phenobarbitone, and interpret the recorded observations.

Principle

- The acidic barbiturate functionality permits the assigned alkalimetric assay. Solvent conditions affect endpoint behaviour and must follow the selected method.
- A standardized titrant reacts with the analyte according to a defined stoichiometric relationship.
- The calculation must distinguish direct titration from a blank-corrected or back-titration procedure.

Materials and Apparatus

- Assigned phenobarbitone, standardized alkali and specified solvent/endpoint system.
- Assigned test material, standardized titrant, specified solvent and indicator or endpoint detector.
- Burette, pipette, volumetric flask, conical flask and analytical balance.

Method

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

Observation Record

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

Observation / parameter	Record / finding
Analyte form	_____
Test mass	_____
Blank reading	_____
Test reading	_____
Method factor	_____
Assay percentage	_____

Calculations and Interpretation

- Method-corrected analyte mass = corrected titrant volume × verified analyte factor × dilution correction.
- Assay (%) = method-corrected analyte mass/test-portion mass × 100.
- Use the exact salt/hydrate and reaction factor assigned to this assay.

Result

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

Finding: _____

Conclusion: _____

Precautions

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

Viva Questions

1. Why standardize a titrant?

Its actual concentration may differ from its nominal preparation concentration.

2. Why perform a reagent blank?

It measures reagent or solvent consumption unrelated to the analyte.

Assay of Atropine

Practical 12 | Medicinal Chemistry I

Aim

To assay Atropine, and interpret the recorded observations.

Principle

- Atropine is a basic alkaloid; an assigned acid-base assay must distinguish free base from a salt, hydrate and the declared reporting basis.
- A standardized titrant reacts with the analyte according to a defined stoichiometric relationship.
- The calculation must distinguish direct titration from a blank-corrected or back-titration procedure.

Materials and Apparatus

- Prepared atropine teaching portion or completed titration data and the assigned standardized assay system.
- Assigned test material, standardized titrant, specified solvent and indicator or endpoint detector.
- Burette, pipette, volumetric flask, conical flask and analytical balance.

Method

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

Observation Record

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

Observation / parameter	Record / finding
Analyte form	_____
Test mass	_____
Blank reading	_____
Test reading	_____
Method factor	_____
Assay percentage	_____

Calculations and Interpretation

- Method-corrected analyte mass = corrected titrant volume × verified analyte factor × dilution correction.
- Assay (%) = method-corrected analyte mass/test-portion mass × 100.
- Use the exact salt/hydrate and reaction factor assigned to this assay.

Result

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

Finding: _____

Conclusion: _____

Precautions

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

Viva Questions

1. Why standardize a titrant?

Its actual concentration may differ from its nominal preparation concentration.

2. Why perform a reagent blank?

It measures reagent or solvent consumption unrelated to the analyte.

Assay of Ibuprofen

Practical 13 | Medicinal Chemistry I

Aim

To assay Ibuprofen, and interpret the recorded observations.

Principle

- The carboxylic acid group participates in neutralization. The assay must correct for blank/dilution and report the specified analyte basis.
- A standardized titrant reacts with the analyte according to a defined stoichiometric relationship.
- The calculation must distinguish direct titration from a blank-corrected or back-titration procedure.

Materials and Apparatus

- Assigned ibuprofen, standardized alkali and the specified analytical solvent.
- Assigned test material, standardized titrant, specified solvent and indicator or endpoint detector.
- Burette, pipette, volumetric flask, conical flask and analytical balance.

Method

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

Observation Record

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

Observation / parameter	Record / finding
Analyte form	_____
Test mass	_____
Blank reading	_____
Test reading	_____
Method factor	_____
Assay percentage	_____

Calculations and Interpretation

- Method-corrected analyte mass = corrected titrant volume × verified analyte factor × dilution correction.
- Assay (%) = method-corrected analyte mass/test-portion mass × 100.
- Use the exact salt/hydrate and reaction factor assigned to this assay.

Result

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

Finding: _____

Conclusion: _____

Precautions

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

Viva Questions

1. Why standardize a titrant?

Its actual concentration may differ from its nominal preparation concentration.

2. Why perform a reagent blank?

It measures reagent or solvent consumption unrelated to the analyte.

Assay of Aspirin

Practical 14 | Medicinal Chemistry I

Aim

To assay Aspirin, and interpret the recorded observations.

Principle

- Aspirin can be assayed by an assigned hydrolysis/back-titration method. Hydrolysis changes total alkali consumption, so direct and hydrolytic factors are not interchangeable.
- A standardized titrant reacts with the analyte according to a defined stoichiometric relationship.
- The calculation must distinguish direct titration from a blank-corrected or back-titration procedure.

Materials and Apparatus

- Assigned aspirin, standardized assay solutions and the specified hydrolysis/blank system.
- Assigned test material, standardized titrant, specified solvent and indicator or endpoint detector.
- Burette, pipette, volumetric flask, conical flask and analytical balance.

Method

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

Observation Record

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

Observation / parameter	Record / finding
Analyte form	_____
Test mass	_____
Blank reading	_____
Test reading	_____
Method factor	_____
Assay percentage	_____

Calculations and Interpretation

- Method-corrected analyte mass = corrected titrant volume × verified analyte factor × dilution correction.
- Assay (%) = method-corrected analyte mass/test-portion mass × 100.
- Use the exact salt/hydrate and reaction factor assigned to this assay.

Result

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

Finding: _____

Conclusion: _____

Precautions

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

Viva Questions

1. Why standardize a titrant?

Its actual concentration may differ from its nominal preparation concentration.

2. Why perform a reagent blank?

It measures reagent or solvent consumption unrelated to the analyte.

Assay of Furosemide

Practical 15 | Medicinal Chemistry I

Aim

To assay Furosemide, and interpret the recorded observations.

Principle

- The assigned assay measures the acidic drug under suitable solvent and endpoint conditions; water solubility alone does not define the titration medium.
- A standardized titrant reacts with the analyte according to a defined stoichiometric relationship.
- The calculation must distinguish direct titration from a blank-corrected or back-titration procedure.

Materials and Apparatus

- Assigned furosemide, standardized assay titrant and specified solvent system.
- Assigned test material, standardized titrant, specified solvent and indicator or endpoint detector.
- Burette, pipette, volumetric flask, conical flask and analytical balance.

Method

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

Observation Record

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

Observation / parameter	Record / finding
Analyte form	_____
Test mass	_____
Blank reading	_____
Test reading	_____
Method factor	_____
Assay percentage	_____

Calculations and Interpretation

- Method-corrected analyte mass = corrected titrant volume × verified analyte factor × dilution correction.
- Assay (%) = method-corrected analyte mass/test-portion mass × 100.
- Use the exact salt/hydrate and reaction factor assigned to this assay.

Result

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

Finding: _____

Conclusion: _____

Precautions

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

Viva Questions

1. Why standardize a titrant?

Its actual concentration may differ from its nominal preparation concentration.

2. Why perform a reagent blank?

It measures reagent or solvent consumption unrelated to the analyte.

Partition Coefficient of Two Assigned Drugs

Practical 16 | Medicinal Chemistry I

Aim

To study Partition Coefficient of Two Assigned Drugs, and interpret the recorded observations.

Principle

- Compare distribution in two immiscible phases at a stated pH and temperature. Intrinsic neutral-species partitioning differs from total-species distribution when a drug ionizes.
- 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

- Two instructor-selected drugs, prepared equilibrium phase solutions and assigned concentration assays.
- 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	_____
Organic/aqueous concentrations	_____
pH	_____
Temperature	_____
Replicate ratios	_____

Calculations and Interpretation

- $D = \text{total organic-phase concentration} / \text{total aqueous-phase concentration}$.
- For neutral-species partitioning, P uses the same molecular species in both phases; $\log P = \log_{10}(P)$.
- Compare the two drugs only under equivalent phase 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.

Determination of Particle Size by Sieving

Practical 01 | Physical Pharmaceutics II

Aim

To determine Particle Size by Sieving, and interpret the recorded observations.

Principle

- A sieve stack divides a powder by aperture-related fractions and provides a mass-weighted size distribution.
- 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

- Sieve stack, sieve shaker, balance and assigned powder.
- 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. Weigh the assigned powder and record the sieve apertures.
2. Arrange the stack in the stated descending-aperture order with a receiving pan.
3. Run the assigned sieving demonstration and record its duration and conditions.
4. Weigh each retained fraction and check total recovered mass.
5. Calculate percentage retained and cumulative retained or passing values.
6. Plot the size-distribution result with its mass-weighted basis stated.

Observation Record

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

Observation / parameter	Record / finding
Sieve aperture	_____
Retained mass	_____
Percent retained	_____
Cumulative passing	_____

Calculations and Interpretation

- Percent retained = retained mass/total recovered mass × 100.
- Use the stated fraction-size convention when calculating a mean size.

Worked Illustration

Illustration: a fraction of 8.0 g from 40.0 g total recovered powder represents 20.0% retained.

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

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

Viva Questions

1. Why control the test conditions?

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

2. Why retain replicate readings?

They show repeatability and help identify an anomalous measurement.

Determination of Particle Size by Microscopy

Practical 02 | Physical Pharmaceutics II

Aim

To determine Particle Size by Microscopy, and interpret the recorded observations.

Principle

- Microscopy measures selected projected dimensions of individual particles. The resulting number-weighted distribution differs from a mass-weighted sieve distribution.
- 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

- Prepared particle mounts, microscope and calibrated micrometer.
- 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. Calibrate the ocular scale against the stage micrometer for the selected objective.
2. Observe representative fields of the prepared particle mount.
3. Define the dimension being measured and measure particles without selecting only large or clear examples.
4. Convert ocular divisions to micrometres with the correct calibration.
5. Group sizes into the assigned intervals and calculate the number-weighted distribution.
6. Report the dimension definition, counting basis and distribution summary.

Observation Record

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

Observation / parameter	Record / finding
Calibration	_____
Particle dimension	_____
Count per size band	_____
Mean size	_____

Calculations and Interpretation

- $\text{Size} = \text{ocular divisions} \times \text{calibration (micrometres/division)}$.
- $\text{Number mean size} = \frac{\sum(n_i \times d_i)}{\sum(n_i)}$.

Worked Illustration

Illustration: calibration of 2.5 micrometres/division and an object length of 8 divisions give 20 micrometres.

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

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

Viva Questions

1. Why control the test conditions?

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

2. Why retain replicate readings?

They show repeatability and help identify an anomalous measurement.

Determination of Bulk Density, True Density and Porosity

Practical 03 | Physical Pharmaceutics II

Aim

To determine Bulk Density, True Density and Porosity, and interpret the recorded observations.

Principle

- Bulk density includes interparticle void space; true density refers to the material itself under the stated measurement method.
- 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 powder, graduated cylinder and approved true-density method or 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
Powder mass	_____
Bulk volume	_____
True volume/density	_____
Porosity	_____

Calculations and Interpretation

- Bulk density = mass/bulk volume.
- True density = mass/true material volume.
- Interparticle porosity = $1 - \text{bulk density/true density}$; multiply by 100 for percentage.

Worked Illustration

Illustration: 25.0 g in a 50.0 mL bulk volume has bulk density 0.500 g/mL. If true density is 1.25 g/mL, calculated interparticle porosity is 60.0%.

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

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

Viva Questions

1. Why control the test conditions?

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

2. Why retain replicate readings?

They show repeatability and help identify an anomalous measurement.

Determination of Angle of Repose and Lubricant Effect

Practical 04 | Physical Pharmaceutics II

Aim

To determine Angle of Repose and Lubricant Effect, and interpret the recorded observations.

Principle

- The angle formed by a powder heap is a method-dependent indicator of flow behaviour. Lubricant identity and concentration can change interparticle interactions.
- 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 powder/lubricant comparisons and fixed-height or assigned cone 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. Record the powder condition and lubricant identity/concentration.
2. Set the assigned funnel/cone apparatus without changing its geometry between comparisons.
3. Form the heap by the specified procedure and measure height and base radius.
4. Repeat with a fresh representative portion.
5. Calculate the angle from $\arctan(\text{height}/\text{radius})$.
6. Compare preparations and explain why the method and powder history affect the result.

Observation Record

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

Observation / parameter	Record / finding
Powder/lubricant condition	_____
Cone height h	_____
Cone radius r	_____
Replicates	_____

Calculations and Interpretation

- $\tan(\theta) = h/r$; $\theta = \arctan(h/r)$.
- Compare preparations using the same cone-building method.

Worked Illustration

Illustration: a heap 3.0 cm high with 5.0 cm radius gives $\theta = \arctan(3/5) = 31.0$ degrees.

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

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

Viva Questions

1. Why control the test conditions?

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

2. Why retain replicate readings?

They show repeatability and help identify an anomalous measurement.

Determination of Liquid Viscosity by Ostwald Viscometer

Practical 05 | Physical Pharmaceutics II

Aim

To determine Liquid Viscosity by Ostwald Viscometer, and interpret the recorded observations.

Principle

- For suitable Newtonian liquids in the same viscometer, flow time and density support a viscosity comparison at constant temperature.
- 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

- Ostwald viscometer, reference liquid, test liquid, timer and temperature control.
- 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. Check that the assigned liquid is suitable for the comparison method and record temperature.
2. Measure the densities of the reference and test liquids or use the approved values.
3. Measure reference-liquid flow time between the stated marks.
4. Measure test-liquid flow time in the same viscometer at the same temperature.
5. Repeat readings and calculate the viscosity ratio from density and time.
6. Report viscosity with the reference value and controlled temperature.

Observation Record

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

Observation / parameter	Record / finding
Temperature	_____
Reference/test density	_____
Reference/test flow time	_____

Calculations and Interpretation

- $\eta_{\text{test}}/\eta_{\text{reference}} = (\rho_{\text{test}} \times t_{\text{test}})/(\rho_{\text{reference}} \times t_{\text{reference}})$.
- State the reference viscosity and temperature.

Worked Illustration

Illustration: $\eta_{\text{reference}} = 1.00 \text{ mPa s}$, $\rho_{\text{test}}/\rho_{\text{reference}} = 1.10$ and $t_{\text{test}}/t_{\text{reference}} = 1.50$ give $\eta_{\text{test}} = 1.65 \text{ mPa s}$.

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

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

Viva Questions

1. Why control the test conditions?

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

2. Why retain replicate readings?

They show repeatability and help identify an anomalous measurement.

Determination of Sedimentation Volume with Different Suspending Agents

Practical 06 | Physical Pharmaceutics II

Aim

To determine Sedimentation Volume with Different Suspending Agents, and interpret the recorded observations.

Principle

- The ultimate sediment volume is compared with initial suspension volume. A large sedimentation volume does not alone establish easy redispersion or product quality.
- 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

- Comparable suspensions containing different assigned suspending agents and graduated containers.
- 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. Prepare or identify the comparable assigned suspensions and record their initial volume.
2. Document the suspending-agent identity and concentration for every container.
3. Record sediment volume at the specified observation times without disturbing the sediment prematurely.
4. Assess redispersion by the assigned procedure and record it separately.
5. Calculate the volume ratio and compare at the same time point.
6. Discuss settling, sediment structure and redispersion together.

Observation Record

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

Observation / parameter	Record / finding
Agent	_____
Initial volume V_0	_____
Sediment volume V_u	_____
Time	_____
Redispersibility	_____

Calculations and Interpretation

- Sedimentation volume $F = V_u/V_0$.
- Compare like-for-like sediment readings and include redispersion observations.

Worked Illustration

Illustration: 18.0 mL final sediment in a suspension initially occupying 30.0 mL gives $F = 0.60$. Redispersion still needs separate observation.

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

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

Viva Questions

1. Why control the test conditions?

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

2. Why retain replicate readings?

They show repeatability and help identify an anomalous measurement.

Determination of Sedimentation Volume at Different Agent Concentrations

Practical 07 | Physical Pharmaceutics II

Aim

To determine Sedimentation Volume at Different Agent Concentrations, and interpret the recorded observations.

Principle

- Changing the concentration of one suspending agent can alter viscosity, particle settling and sediment structure.
- 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

- Same drug dispersion and graded concentrations of one assigned suspending agent.
- 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. Prepare or identify the comparable assigned suspensions and record their initial volume.
2. Document the suspending-agent identity and concentration for every container.
3. Record sediment volume at the specified observation times without disturbing the sediment prematurely.
4. Assess redispersion by the assigned procedure and record it separately.
5. Calculate the volume ratio and compare at the same time point.
6. Discuss settling, sediment structure and redispersion together.

Observation Record

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

Observation / parameter	Record / finding
Agent concentration	_____
Time	_____
V ₀	_____
V _u	_____
Redispersion observations	_____

Calculations and Interpretation

- $F = V_u/V_0$.
- Plot F against the agent concentration at the same observation time.

Worked Illustration

Illustration: 18.0 mL final sediment in a suspension initially occupying 30.0 mL gives $F = 0.60$. Redispersion still needs separate observation.

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

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

Viva Questions

1. Why control the test conditions?

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

2. Why retain replicate readings?

They show repeatability and help identify an anomalous measurement.

Determination of Semisolid Viscosity by Brookfield Viscometer

Practical 08 | Physical Pharmaceutics II

Aim

To determine Semisolid Viscosity by Brookfield Viscometer, and interpret the recorded observations.

Principle

- A rotational viscometer reports an apparent viscosity linked to spindle, speed, temperature and measurement history. Non-Newtonian semisolids need these conditions stated.
- 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 semisolid, Brookfield-type viscometer and specified spindle.
- 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. Record the semisolid preparation and measurement temperature.
2. Select the assigned spindle and speed and check the instrument's valid torque range.
3. Position the spindle as specified and avoid entrained bubbles.
4. Obtain repeatable readings after the defined measurement history.
5. Record apparent viscosity together with spindle, speed, temperature and torque.
6. Compare readings only under stated equivalent conditions or explain the shear dependence.

Observation Record

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

Observation / parameter	Record / finding
Spindle	_____
Speed	_____
Temperature	_____
Torque validity	_____
Apparent viscosity	_____

Calculations and Interpretation

- Apply the instrument-approved spindle/speed factor or displayed result.
- Report apparent viscosity with spindle, speed and temperature; it is not necessarily one universal material constant.

Result

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

Finding: _____

Conclusion: _____

Precautions

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

Viva Questions

1. Why control the test conditions?

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

2. Why retain replicate readings?

They show repeatability and help identify an anomalous measurement.

Determination of First-Order Reaction Rate Constant

Practical 09 | Physical Pharmaceutics II

Aim

To determine First-Order Reaction Rate Constant, and interpret the recorded observations.

Principle

- For a first-order process, the concentration declines exponentially and a logarithmic concentration-time plot is linear within the model range.
- 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 time-concentration data or supervised reaction-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 measured concentration and time units in the assigned data.
2. Tabulate concentration with time and check the initial concentration.
3. Calculate natural logarithms and plot $\ln(\text{concentration})$ against time.
4. Fit the suitable model interval and record the slope.
5. Obtain k as the negative slope and calculate the half-life.
6. Inspect departures from linearity before accepting the first-order model.

Observation Record

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

Observation / parameter	Record / finding
Time t	_____
Initial concentration C ₀	_____
Concentration C _t	_____
ln(C _t)	_____
Fitted slope	_____

Calculations and Interpretation

- $\ln(C_t) = \ln(C_0) - kt$.
- $k = \ln(C_0/C_t)/t$; fitted $\ln(C_t)$ -versus-time slope = $-k$.
- Half-life = $0.693/k$ for the first-order model.

Worked Illustration

Illustration: C₀ = 10.0 mg/L and C_t = 5.00 mg/L after 2.00 hours give $k = \ln(2)/2 = 0.347$ per hour and half-life = 2.00 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

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

Viva Questions

1. Why control the test conditions?

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

2. Why retain replicate readings?

They show repeatability and help identify an anomalous measurement.

Determination of Second-Order Reaction Rate Constant

Practical 10 | Physical Pharmaceutics II

Aim

To determine Second-Order Reaction Rate Constant, and interpret the recorded observations.

Principle

- For the stated single-reactant second-order model, reciprocal concentration increases linearly with time. Other second-order stoichiometries need their own integrated equation.
- 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 concentration-time data and calculation software.
- 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 whether the supplied data fit the stated single-reactant second-order model.
2. Tabulate time, concentration and reciprocal concentration.
3. Plot reciprocal concentration against time.
4. Fit the appropriate interval and obtain k from its slope.
5. Calculate half-life with the initial concentration and retained units.
6. State the model rather than transferring the equation to a different stoichiometry.

Observation Record

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

Observation / parameter	Record / finding
Time t	_____
C ₀	_____
C _t	_____
1/C _t	_____
Fitted slope	_____

Calculations and Interpretation

- $1/C_t = 1/C_0 + kt$.
- $k = (1/C_t - 1/C_0)/t$ for this model.
- Half-life = $1/(kC_0)$.

Worked Illustration

Illustration for the stated model: C₀ = 1.00 mol/L, C_t = 0.500 mol/L at 10.0 min give k = 0.100 L/(mol min) and half-life = 10.0 min.

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

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

Viva Questions

1. Why control the test conditions?

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

2. Why retain replicate readings?

They show repeatability and help identify an anomalous measurement.

Determination of Accelerated Stability Studies

Practical 11 | Physical Pharmaceutics II

Aim

To determine Accelerated Stability Studies, and interpret the recorded observations.

Principle

- Temperature-dependent rate data can be examined with the Arrhenius model when the degradation mechanism and physical state remain comparable.
- 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 stability time/concentration records at several temperatures.
- 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. Review concentration-time records at the assigned temperatures.
2. Use the appropriate kinetic model to estimate a rate constant at each temperature.
3. Convert all temperatures to kelvin.
4. Plot $\ln(\text{rate constant})$ against reciprocal absolute temperature.
5. Interpret the fitted slope and any extrapolated rate only if the mechanism remains comparable.
6. Report model assumptions and distinguish a classroom estimate from a justified product shelf life.

Observation Record

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

Observation / parameter	Record / finding
Temperature in kelvin	_____
Concentration-time readings	_____
Rate constant	_____
Arrhenius plot	_____

Calculations and Interpretation

- $\ln(k) = \ln(A) - E_a/(RT)$.
- Slope of $\ln(k)$ versus $1/T = -E_a/R$.
- For first-order loss, $t_{90} = -\ln(0.90)/k$; extrapolation is conditional and does not itself authorize a shelf life.

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 Introduction to Experimental Pharmacology

Practical 01 | Pharmacology I

Aim

To study Introduction to Experimental Pharmacology, and interpret the recorded observations.

Principle

- Experimental pharmacology relates a controlled intervention to a defined biological response. The teaching exercise uses software/video observations.
- 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.

Materials and Apparatus

- Assigned model/video and labelled completed pharmacology observations.
- 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
Study aim	_____
Model	_____
Control	_____
Intervention	_____
Response endpoint	_____

Calculations and Interpretation

- Identify the independent variable, dependent response and controlled conditions.

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 Instruments in Experimental Pharmacology

Practical 02 | Pharmacology I

Aim

To study Instruments in Experimental Pharmacology, and interpret the recorded observations.

Principle

- An organ-bath model, force transducer, recording system and behavioural apparatus measure different response types.
- 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.

Materials and Apparatus

- Assigned model/video and labelled completed pharmacology observations.
- 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
Instrument	_____
Measured signal	_____
Calibration role	_____
Model application	_____

Calculations and Interpretation

- Prepare an instrument-to-response comparison; do not convert unlike signals into a single potency estimate.

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 Common Laboratory Animals

Practical 03 | Pharmacology I

Aim

To study Common Laboratory Animals, and interpret the recorded observations.

Principle

- Species, strain and biological characteristics affect model suitability and interpretation; the exercise uses teaching images and model records.
- 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.

Materials and Apparatus

- Assigned model/video and labelled completed pharmacology observations.
- 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
Species/model	_____
Relevant characteristics	_____
Experimental application	_____
Model limitation	_____

Calculations and Interpretation

- Use a structured comparison of the assigned species rather than a numerical calculation.

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 Laboratory Animal Care and Welfare

Practical 04 | Pharmacology I

Aim

To study Laboratory Animal Care and Welfare, and interpret the recorded observations.

Principle

- Replacement, reduction and refinement guide the teaching discussion of animal care. Housing, enrichment, monitoring and institutional oversight are part of model quality.
- 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.

Materials and Apparatus

- Assigned model/video and labelled completed pharmacology observations.
- 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
Care provision	_____
Purpose	_____
Observation record	_____
Welfare-monitoring point	_____

Calculations and Interpretation

- Explain the care provision and its effect on welfare and data quality.

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 Common Laboratory Techniques - Simulation

Practical 05 | Pharmacology I

Aim

To study Common Laboratory Techniques - Simulation, and interpret the recorded observations.

Principle

- Serum is obtained after clotting; plasma is obtained with an appropriate anticoagulant. Blood collection, anaesthesia and euthanasia are studied through the assigned simulation/video.
- 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.

Materials and Apparatus

- Assigned model/video and labelled completed pharmacology observations.
- 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
Technique	_____
Purpose	_____
Serum/plasma distinction	_____
Observation	_____
Oversight point	_____

Calculations and Interpretation

- Prepare a technique-purpose comparison; no live-animal intervention is performed in this exercise.

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 Routes of Drug Administration - Simulation

Practical 06 | Pharmacology I

Aim

To study Routes of Drug Administration - Simulation, and interpret the recorded observations.

Principle

- The administration route influences absorption, onset and first-pass exposure. The demonstration compares route-labelled response profiles.
- 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.

Materials and Apparatus

- Assigned model/video and labelled completed pharmacology observations.
- 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
Route label	_____
Onset	_____
Response profile	_____
Model limitation	_____

Calculations and Interpretation

- Compare onset and response using the supplied time scale; do not infer a patient dose from the 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 Enzyme Induction and Phenobarbitone Sleeping Time

Practical 07 | Pharmacology I

Aim

To study Enzyme Induction and Phenobarbitone Sleeping Time, and interpret the recorded observations.

Principle

- Increased drug-metabolizing capacity may shorten a model sleeping-time endpoint; the interpretation also depends on model and baseline 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.

Materials and Apparatus

- Assigned model/video and labelled completed pharmacology observations.
- 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	_____
Latency	_____
Sleeping time	_____
Control comparison	_____

Calculations and Interpretation

- Percentage change = (treated time - control time)/control time × 100.
- A shorter sleeping-time endpoint alone is not a direct enzyme-activity measurement.

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 Drugs and Frog Oesophageal Ciliary Motility

Practical 08 | Pharmacology I

Aim

To study Drugs and Frog Oesophageal Ciliary Motility, and interpret the recorded observations.

Principle

- The supplied simulation compares ciliary movement or transport before and after labelled interventions.
- 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.

Materials and Apparatus

- Assigned model/video and labelled completed pharmacology observations.
- 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
Control movement	_____
Intervention label	_____
Movement/transport endpoint	_____
Reversibility	_____

Calculations and Interpretation

- Use the same movement or transport metric for baseline and test comparisons.

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 Drugs and Rabbit Eye Responses

Practical 09 | Pharmacology I

Aim

To study Drugs and Rabbit Eye Responses, and interpret the recorded observations.

Principle

- The demonstration compares pupil and other labelled ocular response endpoints. Autonomic receptor effects must be interpreted with the control eye/model record.
- 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.

Materials and Apparatus

- Assigned model/video and labelled completed pharmacology observations.
- 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 label	_____
Pupil response	_____
Time	_____
Other assigned ocular endpoint	_____

Calculations and Interpretation

- Record change from the model baseline; distinguish pupil changes from unrelated ocular endpoints.

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 Skeletal Muscle Relaxants by Rota-Rod Model

Practical 10 | Pharmacology I

Aim

To study Skeletal Muscle Relaxants by Rota-Rod Model, and interpret the recorded observations.

Principle

- Time on a rotating-rod simulation reflects motor coordination/performance and can be influenced by sedation as well as muscle relaxation.
- 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.

Materials and Apparatus

- Assigned model/video and labelled completed pharmacology observations.
- 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
Control latency	_____
Test latency	_____
Trial number	_____
Associated model behaviour	_____

Calculations and Interpretation

- Percentage reduction in latency = $(\text{control} - \text{test}) / \text{control} \times 100$, where the control latency is nonzero.

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 Locomotor Activity by Actophotometer Model

Practical 11 | Pharmacology I

Aim

To study Locomotor Activity by Actophotometer Model, and interpret the recorded observations.

Principle

- Beam interruptions provide a model activity count. Sedation, stimulation and motor impairment can all alter counts.
- 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.

Materials and Apparatus

- Assigned model/video and labelled completed pharmacology observations.
- 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
Baseline count	_____
Treatment label	_____
Observation interval	_____
Activity count	_____

Calculations and Interpretation

- Compare counts per equal observation interval.
- Percentage change = $(\text{test count} - \text{control count}) / \text{control count} \times 100$.

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 Anticonvulsant Activity: MES and PTZ Models

Practical 12 | Pharmacology I

Aim

To study Anticonvulsant Activity: MES and PTZ Models, and interpret the recorded observations.

Principle

- The two simulated models use different seizure endpoints. Their response patterns must be interpreted separately.
- 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.

Materials and Apparatus

- Assigned model/video and labelled completed pharmacology observations.
- 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 endpoint	_____
Test endpoint	_____
Protection criterion	_____

Calculations and Interpretation

- Calculate protection percentage from the assigned qualifying responses.
- Do not pool different seizure-model definitions as one endpoint.

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 Stereotypy and Anti-Catatonic Activity

Practical 13 | Pharmacology I

Aim

To study Stereotypy and Anti-Catatonic Activity, and interpret the recorded observations.

Principle

- Repetitive-behaviour scores and posture-retention endpoints measure different behaviours; changes in general movement can confound both.
- 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.

Materials and Apparatus

- Assigned model/video and labelled completed pharmacology observations.
- 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	_____
Stereotypy score	_____
Posture-retention time	_____
Motor observation	_____

Calculations and Interpretation

- Analyze each assigned behavioural endpoint separately and retain the scoring scale.

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 Anxiolytic Activity in Behavioural Models

Practical 14 | Pharmacology I

Aim

To study Anxiolytic Activity in Behavioural Models, and interpret the recorded observations.

Principle

- Anxiety-related model choices must be interpreted alongside locomotor activity. Increased exploration does not alone establish an anxiolytic mechanism.
- 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.

Materials and Apparatus

- Assigned model/video and labelled completed pharmacology observations.
- 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 zone/choice	_____
Time spent	_____
Entries	_____
Movement control	_____

Calculations and Interpretation

- Percentage open/target-zone time = target-zone time/total scored time × 100, when that metric is assigned.

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 Local Anaesthetic Methods - Simulation

Practical 15 | Pharmacology I

Aim

To study Local Anaesthetic Methods - Simulation, and interpret the recorded observations.

Principle

- Local anaesthetics reversibly reduce conduction in the model endpoint. Onset and duration are distinct measures.
- 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.

Materials and Apparatus

- Assigned model/video and labelled completed pharmacology observations.
- 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 method	_____
Control response	_____
Onset	_____
Duration	_____
Recovery	_____

Calculations and Interpretation

- Compare onset and duration on the same model time scale; preserve the criterion for loss and return of the response.

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.

Chemical Identification of Tragacanth

Practical 01 | Pharmacognosy and Phytochemistry I

Aim

To identify Tragacanth, and interpret the recorded observations.

Principle

- Tragacanth is a plant gum rich in polysaccharide fractions; swelling and mucilage behaviour support its identification.
- Crude-drug identity is established through a combination of macroscopic, microscopic and chemical characteristics.
- A chemical class test is supportive and does not alone distinguish all adulterants or substitute materials.

Materials and Apparatus

- Authenticated tragacanth, assigned comparison material and class-test demonstrations.
- Authenticated drug material, a prepared comparison specimen or atlas, and assigned test reagents.
- Hand lens, microscope with prepared sections or powder mounts, glassware and a record sheet.

Method

1. Record the drug name, plant part or material type and the condition of the provided specimen.
2. Examine the macroscopic characters without tasting the material.
3. Study assigned prepared sections or powder mounts and sketch distinguishing structures.
4. Observe the assigned class test with the necessary positive or reagent comparison.
5. Combine the visible, microscopic and chemical evidence rather than relying on one feature.
6. Write a reasoned identification statement and document differences from the authenticated comparison.

Observation Record

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

Observation / parameter	Record / finding
Appearance	_____
Swelling/mucilage behaviour	_____
Assigned carbohydrate test	_____
Comparison	_____

Calculations and Interpretation

- Qualitative identity exercises usually require a structured comparison rather than a numerical calculation.

Result

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

Finding: _____

Conclusion: _____

Precautions

- Use an authenticated comparison and retain the specimen identity.
- Do not taste crude drugs or infer a clinical dose from an identification test.
- Distinguish a characteristic finding from a feature that can vary with processing or age.

Viva Questions

1. Why combine several identification features?

One character may be shared by unrelated materials or altered by processing.

2. Does a class test establish drug purity?

No. It indicates a chemical group and must be combined with other evidence.

Chemical Identification of Acacia

Practical 02 | Pharmacognosy and Phytochemistry I

Aim

To identify Acacia, and interpret the recorded observations.

Principle

- Acacia is a plant gum with water-dispersion and carbohydrate characteristics that are compared with authenticated material.
- Crude-drug identity is established through a combination of macroscopic, microscopic and chemical characteristics.
- A chemical class test is supportive and does not alone distinguish all adulterants or substitute materials.

Materials and Apparatus

- Authenticated acacia, assigned comparison material and class-test demonstrations.
- Authenticated drug material, a prepared comparison specimen or atlas, and assigned test reagents.
- Hand lens, microscope with prepared sections or powder mounts, glassware and a record sheet.

Method

1. Record the drug name, plant part or material type and the condition of the provided specimen.
2. Examine the macroscopic characters without tasting the material.
3. Study assigned prepared sections or powder mounts and sketch distinguishing structures.
4. Observe the assigned class test with the necessary positive or reagent comparison.
5. Combine the visible, microscopic and chemical evidence rather than relying on one feature.
6. Write a reasoned identification statement and document differences from the authenticated comparison.

Observation Record

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

Observation / parameter	Record / finding
Appearance	_____
Dispersion behaviour	_____
Assigned carbohydrate test	_____
Comparison	_____

Calculations and Interpretation

- Qualitative identity exercises usually require a structured comparison rather than a numerical calculation.

Result

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

Finding: _____

Conclusion: _____

Precautions

- Use an authenticated comparison and retain the specimen identity.
- Do not taste crude drugs or infer a clinical dose from an identification test.
- Distinguish a characteristic finding from a feature that can vary with processing or age.

Viva Questions

1. Why combine several identification features?

One character may be shared by unrelated materials or altered by processing.

2. Does a class test establish drug purity?

No. It indicates a chemical group and must be combined with other evidence.

Chemical Identification of Gelatin

Practical 03 | Pharmacognosy and Phytochemistry I

Aim

To identify Gelatin, and interpret the recorded observations.

Principle

- Gelatin is derived from collagen and exhibits protein-related chemical-test behaviour rather than the polysaccharide behaviour of plant gums.
- Crude-drug identity is established through a combination of macroscopic, microscopic and chemical characteristics.
- A chemical class test is supportive and does not alone distinguish all adulterants or substitute materials.

Materials and Apparatus

- Authenticated gelatin, assigned comparison material and class-test demonstrations.
- Authenticated drug material, a prepared comparison specimen or atlas, and assigned test reagents.
- Hand lens, microscope with prepared sections or powder mounts, glassware and a record sheet.

Method

1. Record the drug name, plant part or material type and the condition of the provided specimen.
2. Examine the macroscopic characters without tasting the material.
3. Study assigned prepared sections or powder mounts and sketch distinguishing structures.
4. Observe the assigned class test with the necessary positive or reagent comparison.
5. Combine the visible, microscopic and chemical evidence rather than relying on one feature.
6. Write a reasoned identification statement and document differences from the authenticated comparison.

Observation Record

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

Observation / parameter	Record / finding
Appearance	_____
Assigned protein test	_____
Gel behaviour	_____
Comparison	_____

Calculations and Interpretation

- Qualitative identity exercises usually require a structured comparison rather than a numerical calculation.

Result

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

Finding: _____

Conclusion: _____

Precautions

- Use an authenticated comparison and retain the specimen identity.
- Do not taste crude drugs or infer a clinical dose from an identification test.
- Distinguish a characteristic finding from a feature that can vary with processing or age.

Viva Questions

1. Why combine several identification features?

One character may be shared by unrelated materials or altered by processing.

2. Does a class test establish drug purity?

No. It indicates a chemical group and must be combined with other evidence.

Chemical Identification of Starch

Practical 04 | Pharmacognosy and Phytochemistry I

Aim

To identify Starch, and interpret the recorded observations.

Principle

- Starch granule morphology and the assigned iodine reaction support identification; botanical source can affect granule appearance.
- Crude-drug identity is established through a combination of macroscopic, microscopic and chemical characteristics.
- A chemical class test is supportive and does not alone distinguish all adulterants or substitute materials.

Materials and Apparatus

- Authenticated starch, assigned comparison material and class-test demonstrations.
- Authenticated drug material, a prepared comparison specimen or atlas, and assigned test reagents.
- Hand lens, microscope with prepared sections or powder mounts, glassware and a record sheet.

Method

1. Record the drug name, plant part or material type and the condition of the provided specimen.
2. Examine the macroscopic characters without tasting the material.
3. Study assigned prepared sections or powder mounts and sketch distinguishing structures.
4. Observe the assigned class test with the necessary positive or reagent comparison.
5. Combine the visible, microscopic and chemical evidence rather than relying on one feature.
6. Write a reasoned identification statement and document differences from the authenticated comparison.

Observation Record

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

Observation / parameter	Record / finding
Granule appearance	_____
Hilum/striations where visible	_____
Iodine observation	_____
Comparison	_____

Calculations and Interpretation

- Qualitative identity exercises usually require a structured comparison rather than a numerical calculation.

Result

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

Finding: _____

Conclusion: _____

Precautions

- Use an authenticated comparison and retain the specimen identity.
- Do not taste crude drugs or infer a clinical dose from an identification test.
- Distinguish a characteristic finding from a feature that can vary with processing or age.

Viva Questions

1. Why combine several identification features?

One character may be shared by unrelated materials or altered by processing.

2. Does a class test establish drug purity?

No. It indicates a chemical group and must be combined with other evidence.

Chemical Identification of Honey

Practical 05 | Pharmacognosy and Phytochemistry I

Aim

To identify Honey, and interpret the recorded observations.

Principle

- Honey contains sugars, including reducing sugars. Supportive sugar tests must be distinguished from a complete authenticity assessment.
- Crude-drug identity is established through a combination of macroscopic, microscopic and chemical characteristics.
- A chemical class test is supportive and does not alone distinguish all adulterants or substitute materials.

Materials and Apparatus

- Authenticated honey, assigned comparison material and class-test demonstrations.
- Authenticated drug material, a prepared comparison specimen or atlas, and assigned test reagents.
- Hand lens, microscope with prepared sections or powder mounts, glassware and a record sheet.

Method

1. Record the drug name, plant part or material type and the condition of the provided specimen.
2. Examine the macroscopic characters without tasting the material.
3. Study assigned prepared sections or powder mounts and sketch distinguishing structures.
4. Observe the assigned class test with the necessary positive or reagent comparison.
5. Combine the visible, microscopic and chemical evidence rather than relying on one feature.
6. Write a reasoned identification statement and document differences from the authenticated comparison.

Observation Record

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

Observation / parameter	Record / finding
Appearance	_____
Assigned sugar test	_____
Control observation	_____
Identity evidence	_____

Calculations and Interpretation

- Qualitative identity exercises usually require a structured comparison rather than a numerical calculation.

Result

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

Finding: _____

Conclusion: _____

Precautions

- Use an authenticated comparison and retain the specimen identity.
- Do not taste crude drugs or infer a clinical dose from an identification test.
- Distinguish a characteristic finding from a feature that can vary with processing or age.

Viva Questions

1. Why combine several identification features?

One character may be shared by unrelated materials or altered by processing.

2. Does a class test establish drug purity?

No. It indicates a chemical group and must be combined with other evidence.

Chemical Identification of Castor Oil

Practical 06 | Pharmacognosy and Phytochemistry I

Aim

To identify Castor Oil, and interpret the recorded observations.

Principle

- Castor oil is a fixed oil whose properties reflect its glyceride composition, including ricinoleic-acid-derived components.
- Crude-drug identity is established through a combination of macroscopic, microscopic and chemical characteristics.
- A chemical class test is supportive and does not alone distinguish all adulterants or substitute materials.

Materials and Apparatus

- Authenticated castor oil, assigned comparison material and class-test demonstrations.
- Authenticated drug material, a prepared comparison specimen or atlas, and assigned test reagents.
- Hand lens, microscope with prepared sections or powder mounts, glassware and a record sheet.

Method

1. Record the drug name, plant part or material type and the condition of the provided specimen.
2. Examine the macroscopic characters without tasting the material.
3. Study assigned prepared sections or powder mounts and sketch distinguishing structures.
4. Observe the assigned class test with the necessary positive or reagent comparison.
5. Combine the visible, microscopic and chemical evidence rather than relying on one feature.
6. Write a reasoned identification statement and document differences from the authenticated comparison.

Observation Record

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

Observation / parameter	Record / finding
Appearance	_____
Assigned fixed-oil test	_____
Comparison behaviour	_____
Identity evidence	_____

Calculations and Interpretation

- Qualitative identity exercises usually require a structured comparison rather than a numerical calculation.

Result

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

Finding: _____

Conclusion: _____

Precautions

- Use an authenticated comparison and retain the specimen identity.
- Do not taste crude drugs or infer a clinical dose from an identification test.
- Distinguish a characteristic finding from a feature that can vary with processing or age.

Viva Questions

1. Why combine several identification features?

One character may be shared by unrelated materials or altered by processing.

2. Does a class test establish drug purity?

No. It indicates a chemical group and must be combined with other evidence.

Chemical Identification of Agar

Practical 07 | Pharmacognosy and Phytochemistry I

Aim

To identify Agar, and interpret the recorded observations.

Principle

- Agar is a seaweed-derived polysaccharide material with gel-forming behaviour; assigned tests distinguish its material characteristics.
- Crude-drug identity is established through a combination of macroscopic, microscopic and chemical characteristics.
- A chemical class test is supportive and does not alone distinguish all adulterants or substitute materials.

Materials and Apparatus

- Authenticated agar, assigned comparison material and class-test demonstrations.
- Authenticated drug material, a prepared comparison specimen or atlas, and assigned test reagents.
- Hand lens, microscope with prepared sections or powder mounts, glassware and a record sheet.

Method

1. Record the drug name, plant part or material type and the condition of the provided specimen.
2. Examine the macroscopic characters without tasting the material.
3. Study assigned prepared sections or powder mounts and sketch distinguishing structures.
4. Observe the assigned class test with the necessary positive or reagent comparison.
5. Combine the visible, microscopic and chemical evidence rather than relying on one feature.
6. Write a reasoned identification statement and document differences from the authenticated comparison.

Observation Record

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

Observation / parameter	Record / finding
Appearance	_____
Gel/dispersion behaviour	_____
Assigned carbohydrate test	_____
Comparison	_____

Calculations and Interpretation

- Qualitative identity exercises usually require a structured comparison rather than a numerical calculation.

Result

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

Finding: _____

Conclusion: _____

Precautions

- Use an authenticated comparison and retain the specimen identity.
- Do not taste crude drugs or infer a clinical dose from an identification test.
- Distinguish a characteristic finding from a feature that can vary with processing or age.

Viva Questions

1. Why combine several identification features?

One character may be shared by unrelated materials or altered by processing.

2. Does a class test establish drug purity?

No. It indicates a chemical group and must be combined with other evidence.

Determination of Stomatal Number and Stomatal Index

Practical 08 | Pharmacognosy and Phytochemistry I

Aim

To determine Stomatal Number and Stomatal Index, and interpret the recorded observations.

Principle

- Stomatal number is a count per area; stomatal index expresses stomata as a fraction of stomata plus ordinary epidermal cells in the same field.
- 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

- Prepared epidermal mounts and calibrated field-area record.
- 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. Calibrate the area represented by a microscope field.
2. Observe the assigned prepared epidermal mounts and use one consistent edge-counting convention.
3. Count stomata and ordinary epidermal cells in the same defined fields.
4. Repeat over the assigned representative fields.
5. Calculate stomata per area and the stomatal index separately.
6. Report the leaf surface, field area and counting convention.

Observation Record

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

Observation / parameter	Record / finding
Field area	_____
Stomata S	_____
Epidermal cells E	_____
Repeated fields	_____

Calculations and Interpretation

- Stomatal number = stomata counted/area examined.
- Stomatal index = $S/(S + E) \times 100$; define the counting convention consistently.

Worked Illustration

Illustration: 20 stomata and 80 ordinary epidermal cells in the same field give a stomatal index of $20/(20 + 80) \times 100 = 20.0\%$.

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

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

Viva Questions

1. Why control the test conditions?

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

2. Why retain replicate readings?

They show repeatability and help identify an anomalous measurement.

Determination of Vein-Islet, Vein-Termination and Palisade Measurements

Practical 09 | Pharmacognosy and Phytochemistry I

Aim

To determine Vein-Islet, Vein-Termination and Palisade Measurements, and interpret the recorded observations.

Principle

- Vein-islet and termination counts use a defined leaf area; palisade ratio relates underlying palisade cells to the selected epidermal-cell area.
- 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

- Prepared cleared-leaf/palisade teaching mounts and calibrated viewing area.
- 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
Area	_____
Vein islets	_____
Vein terminations	_____
Epidermal cells	_____
Underlying palisade cells	_____

Calculations and Interpretation

- Vein-islet number = islets counted/area examined.
- Vein-termination number = terminations counted/area examined.
- Palisade ratio = palisade-cell count associated with the selected epidermal cells/number of those epidermal cells, using the assigned convention.

Result

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

Finding: _____

Conclusion: _____

Precautions

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

Viva Questions

1. Why control the test conditions?

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

2. Why retain replicate readings?

They show repeatability and help identify an anomalous measurement.

Determination of Starch-Grain and Calcium-Oxalate Crystal Size

Practical 10 | Pharmacognosy and Phytochemistry I

Aim

To determine Starch-Grain and Calcium-Oxalate Crystal Size, and interpret the recorded observations.

Principle

- An ocular scale has no fixed length until calibrated against a stage micrometer for the selected objective.
- 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

- Prepared starch/crystal mounts and stage/ocular micrometers.
- 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. Calibrate the ocular micrometer for the chosen objective.
2. Identify the prepared starch grains and crystals using the assigned comparison material.
3. Record the specific dimension and ocular divisions for each object.
4. Convert readings to micrometres using that objective's calibration.
5. Repeat across representative objects rather than choosing only extremes.
6. Present mean/range and state the object type and measured dimension.

Observation Record

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

Observation / parameter	Record / finding
Objective	_____
Calibration	_____
Object dimension in divisions	_____
Calculated micrometres	_____

Calculations and Interpretation

- Calibration = known stage-micrometer length/corresponding ocular divisions.
- Object size = ocular divisions × calibration.

Result

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

Finding: _____

Conclusion: _____

Precautions

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

Viva Questions

1. Why control the test conditions?

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

2. Why retain replicate readings?

They show repeatability and help identify an anomalous measurement.

Determination of Fibre Length and Width

Practical 11 | Pharmacognosy and Phytochemistry I

Aim

To determine Fibre Length and Width, and interpret the recorded observations.

Principle

- Micrometric measurements distinguish longitudinal length from transverse width and require a suitable calibrated objective for each.
- 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

- Prepared fibre mounts and calibrated microscope.
- 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. Calibrate the objective used for the longitudinal and transverse measurements.
2. Identify fibres in the prepared mount.
3. Record the endpoints used for fibre length and width.
4. Measure representative fibres without confusing folded or broken objects with intact fibres.
5. Convert divisions to micrometres and summarize the readings.
6. State the preparation and measurement limitations.

Observation Record

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

Observation / parameter	Record / finding
Fibre identity	_____
Length divisions	_____
Width divisions	_____
Calibration	_____
Replicates	_____

Calculations and Interpretation

- Length or width in micrometres = measured divisions $\times$ applicable calibration.
- Report the range and mean for the assigned number of fibres.

Result

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

Finding: _____

Conclusion: _____

Precautions

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

Viva Questions

1. Why control the test conditions?

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

2. Why retain replicate readings?

They show repeatability and help identify an anomalous measurement.

Determination of Starch-Grain Number by Lycopodium Method

Practical 12 | Pharmacognosy and Phytochemistry I

Aim

To determine Starch-Grain Number by Lycopodium Method, and interpret the recorded observations.

Principle

- A known spore-count standard allows a ratio estimate of test particles in a uniformly represented teaching mixture.
- The property is obtained from a defined observable under controlled conditions.
- Replicate measurements, instrument checks and consistent units are needed before comparison.

Materials and Apparatus

- Instructor-prepared counting mounts, known lycopodium standard and microscope.
- 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. Review the known standard mass and its stated spores-per-gram value.
2. Identify the test mass and the instructor-prepared mixture/mount.
3. Count test grains and standard spores in representative comparable fields.
4. Retain repeated counts and check whether the preparation supports a ratio estimate.
5. Apply the count-ratio and mass correction in the stated equation.
6. Report the estimated number per gram and the standard/counting basis.

Observation Record

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

Observation / parameter	Record / finding
Test mass w	_____
Standard mass l	_____
Spores per gram S	_____
Grain count n	_____
Spore count s	_____

Calculations and Interpretation

- Estimated grains per g = $(n/s) \times (l \times S)/w$.
- Use consistent mass units, representative fields and the assigned standard count.

Result

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

Finding: _____

Conclusion: _____

Precautions

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

Viva Questions

1. Why control the test conditions?

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

2. Why retain replicate readings?

They show repeatability and help identify an anomalous measurement.

Determination of Ash Values of Crude Drugs

Practical 13 | Pharmacognosy and Phytochemistry I

Aim

To determine Ash Values of Crude Drugs, and interpret the recorded observations.

Principle

- Total ash, acid-insoluble ash and water-soluble ash describe different residues. Each result must state the exact ash test and mass basis.
- 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 drug, weighed crucible and completed ashing/residue records or supervised 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
Drug mass	_____
Crucible tare	_____
Total residue	_____
Specified insoluble residue	_____
Ash basis	_____

Calculations and Interpretation

- Ash (%) = specified residue mass/test-material mass $\times$ 100.
- For water-soluble ash, use the defined difference between total ash and water-insoluble residue.

Worked Illustration

Illustration: 0.100 g of the specified ash residue from 2.00 g material gives 5.00% ash on that stated test basis.

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

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

Viva Questions

1. Why control the test conditions?

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

2. Why retain replicate readings?

They show repeatability and help identify an anomalous measurement.

Determination of Extractive Values of Crude Drugs

Practical 14 | Pharmacognosy and Phytochemistry I

Aim

To determine Extractive Values of Crude Drugs, and interpret the recorded observations.

Principle

- An extractive value measures residue obtained under a specified solvent/extraction method. It is not automatically the percentage of one active constituent.
- 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 drug, specified extraction system and weighed residue 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 mass	_____
Total extract volume	_____
Aliquot volume	_____
Dry residue mass	_____
Solvent	_____

Calculations and Interpretation

- Extractive (%) = dry aliquot residue × (total extract volume/aliquot volume) / test-material mass × 100.
- State any prescribed moisture correction.

Worked Illustration

Illustration: 0.0500 g residue from a 10.0 mL aliquot of a 100 mL extract made from 5.00 g material gives 10.0% extractive.

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

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

Viva Questions

1. Why control the test conditions?

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

2. Why retain replicate readings?

They show repeatability and help identify an anomalous measurement.

Determination of Moisture Content of Crude Drugs

Practical 15 | Pharmacognosy and Phytochemistry I

Aim

To determine Moisture Content of Crude Drugs, and interpret the recorded observations.

Principle

- Water-specific methods and loss on drying are different measurements. Volatile oils can contribute to a drying loss in some crude drugs.
- 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 drug and the specified moisture or drying method.
- 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
Initial mass	_____
Final mass or water reading	_____
Method	_____
Reporting basis	_____

Calculations and Interpretation

- For the assigned LOD method: $\text{loss (\%)} = \text{mass loss}/\text{initial material mass} \times 100$.
- Use a water-specific equation only for the stated water-specific method.

Result

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

Finding: _____

Conclusion: _____

Precautions

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

Viva Questions

1. Why control the test conditions?

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

2. Why retain replicate readings?

They show repeatability and help identify an anomalous measurement.

Determination of Swelling Index and Foaming Index

Practical 16 | Pharmacognosy and Phytochemistry I

Aim

To determine Swelling Index and Foaming Index, and interpret the recorded observations.

Principle

- Swelling index describes the occupied volume of swollen material per unit mass. Foaming index uses a specified dilution series and persistent-foam endpoint.
- 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

- Completed swelling-volume and foaming-dilution teaching 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 mass	_____
Swollen volume	_____
Dilution aliquot a	_____
Foam endpoint	_____
Replicates	_____

Calculations and Interpretation

- Swelling index = occupied swollen-material volume in mL/material mass in g.
- For the standard foaming-index dilution basis: foaming index = $1000/a$, where a is the qualifying decoction aliquot in mL.
- Use the prescribed endpoint and state when the result lies outside the dilution range.

Worked Illustration

Illustration: 1.00 g material occupying 12.0 mL after the assigned swelling test gives 12.0 mL/g. A qualifying foaming aliquot a = 5.0 mL gives a foaming index of 200 on the standard dilution basis.

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

- 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.

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