

Year 2 - Practical Notes

Pharmacology

18 complete practical and activity notes. The page counts below exclude the promotion page. Use the PDF bookmarks to move between practicals. Experiment activities use software simulations.

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Introduction to Experimental Pharmacology

Experiment 1 - Practical Notes

Name: _____ Roll no.: _____ Date: _____

Aim

To understand and record the stated experimental-pharmacology concept.

Principle

Experimental pharmacology studies relationships between a drug, its concentration or exposure and a measured response.

Key Points

- Define hypothesis, control, comparator, endpoint and independent/dependent variables.
- Distinguish efficacy from potency and graded from quantal responses.
- Use only software simulations for the syllabus experiment activities.

Activity Procedure

1. Plan

Write a hypothesis for a virtual drug-response experiment.

2. Define variables

Identify the software input, measured endpoint and relevant control.

3. Observe

Read a supplied concentration-response dataset and identify the trend.

4. Interpret

State the conclusion and limitations without claiming a live experiment was performed.

Record and Observations

Field	Teaching record
Model / instrument / route	_____
Endpoint / units	_____
Relevant control	_____
Interpretation / limitation	_____

Result

The concept was explained and the teaching record completed. Key finding: _____. Limitation: _____.

Viva Questions and Answers

1. What is potency?

The concentration or dose needed to produce a defined effect.

2. What is efficacy?

The maximum effect achievable in the stated system.

3. Why include a control?

It provides a basis for interpreting the drug-associated change.

Laboratory Animal Models - Conceptual Study

Experiment 2 - Practical Notes

Name: _____ Roll no.: _____ Date: _____

Aim

To understand and record the stated experimental-pharmacology concept.

Principle

Species and model characteristics affect the interpretation of experimental results; this activity uses pictures and virtual records.

Key Points

- Identify mouse, rat, guinea pig and rabbit from teaching images.
- Record species, model objective and limits of extrapolation to humans.
- No animals are used for these student experiment activities.

Activity Procedure

1. Identify

Label the four species in the supplied picture set.

2. Compare

Discuss size, general biological characteristics and model selection at a conceptual level.

3. Review ethics

Identify why alternatives, welfare and experimental validity matter.

4. Record

Complete a comparison chart and explain a model limitation.

Record and Observations

Field	Teaching record
Model / instrument / route	_____
Endpoint / units	_____
Relevant control	_____
Interpretation / limitation	_____

Result

The concept was explained and the teaching record completed. Key finding: _____. Limitation: _____.

Viva Questions and Answers

1. Does a model predict every human response?

No; species and experimental conditions affect transferability.

2. Why choose a model carefully?

Its measurable endpoint must fit the scientific question.

3. What material is used here?

Images, software and supplied records.

Instruments Used in Experimental Pharmacology

Experiment 3 - Practical Notes

Name: _____ Roll no.: _____ Date: _____

Aim

To understand and record the stated experimental-pharmacology concept.

Principle

An instrument measures a defined endpoint and requires calibration and an appropriate study design.

Key Points

- Identify analgesiometer, electroconvulsimeter, rotarod, actophotometer, elevated plus maze and organ-bath recording system.
- Match latency, activity count, behaviour time and tissue-response recordings to their instruments.
- Read only teaching displays and simulated traces.

Activity Procedure

1. Identify

Inspect photographs or software diagrams of each instrument.

2. Match endpoint

State what each instrument measures and the units or scoring system.

3. Check calibration

List a relevant calibration or data-quality check for the virtual setup.

4. Interpret

Read a supplied output and distinguish the signal from a confounder.

Record and Observations

Field	Teaching record
Model / instrument / route	_____
Endpoint / units	_____
Relevant control	_____
Interpretation / limitation	_____

Result

The concept was explained and the teaching record completed. Key finding: _____. Limitation: _____.

Viva Questions and Answers

1. What does an actophotometer record?

Activity-related counts in its defined detection system.

2. What does rotarod latency describe?

Time before falling from the virtual rotating platform.

3. Why state units?

A response cannot be compared reliably without its measurement scale.

Routes of Drug Administration - Conceptual Study

Experiment 4 - Practical Notes

Name: _____ Roll no.: _____ Date: _____

Aim

To understand and record the stated experimental-pharmacology concept.

Principle

Administration route affects onset, absorption, systemic availability and local exposure.

Key Points

- Compare oral, intravenous, intramuscular, subcutaneous, topical and inhaled routes.
- Intravenous administration avoids an absorption step; other routes have route-dependent absorption.
- Use diagrams and software; no administration is performed.

Activity Procedure

1. Classify

Group routes as enteral, parenteral or other appropriate categories.

2. Compare

Describe onset, first-pass considerations and local/systemic purpose.

3. Read virtual record

Identify the route label in a supplied simulation.

4. Discuss limits

Explain why the same nominal amount can produce different exposure by different routes.

Record and Observations

Field	Teaching record
Model / instrument / route	_____
Endpoint / units	_____
Relevant control	_____
Interpretation / limitation	_____

Result

The concept was explained and the teaching record completed. Key finding: _____. Limitation: _____.

Viva Questions and Answers

1. What is first-pass metabolism?

Presystemic metabolism that can reduce systemic availability after some routes.

2. Does topical always mean local only?

No; systemic absorption depends on the product and application.

3. Why must the route be recorded?

It is essential to interpret exposure and response.

In Vivo In Vitro and Ex Vivo Studies

Experiment 5 - Practical Notes

Name: _____ Roll no.: _____ Date: _____

Aim

To understand and record the stated experimental-pharmacology concept.

Principle

These terms describe whether a study examines a whole living system, an artificial laboratory system or tissue removed from an organism.

Key Points

- In vivo: whole-system context.
- In vitro: controlled external system such as a cell or biochemical assay.
- Ex vivo: removed tissue studied outside its source organism.
- This practical class uses virtual representations rather than live systems.

Activity Procedure

1. Classify

Sort supplied study descriptions into the three categories.

2. Compare

List advantages and limitations of each context.

3. Identify variables

Discuss exposure, metabolism and endpoint differences.

4. Conclude

Choose which conceptual design addresses a given teaching question.

Record and Observations

Field	Teaching record
Model / instrument / route	_____
Endpoint / units	_____
Relevant control	_____
Interpretation / limitation	_____

Result

The concept was explained and the teaching record completed. Key finding: _____. Limitation: _____.

Viva Questions and Answers

1. Why can an isolated-tissue result differ from a whole system?

Metabolism, distribution and regulatory feedback may be absent.

2. Is a computer model itself in vivo?

No; it simulates selected features of a model.

3. Why define the study context?

It limits the conclusions that can be drawn.

Blood Collection in Experimental Models - Conceptual Record

Experiment 6 - Practical Notes

Name: _____ Roll no.: _____ Date: _____

Aim

To understand and record the stated experimental-pharmacology concept.

Principle

A collection method is selected according to the scientific endpoint, material required and authorised professional protocol.

Key Points

- Distinguish venous, arterial and capillary material conceptually.
- Match anticoagulant, collection time and handling to the planned assay.
- Use diagrams and supplied virtual collection records only.
- This activity does not include animal restraint, puncture or collection.

Activity Procedure

1. Review scenario

Read the fictional test request and required specimen type.

2. Review virtual record

Identify collection category, labelled tube, time and handling details.

3. Assess quality

Identify missing labels, clotting, haemolysis or timing problems in the supplied record.

4. Report

Explain whether the fictional material is suitable for the stated measurement.

Record and Observations

Field	Teaching record
Model / instrument / route	_____
Endpoint / units	_____
Relevant control	_____
Interpretation / limitation	_____

Result

The concept was explained and the teaching record completed. Key finding: _____. Limitation: _____.

Viva Questions and Answers

1. Why record collection time?

Drug concentration and physiological values may change with time.

2. Why identify anticoagulant?

It can affect specimen suitability and assay results.

3. What is the student activity?

Assessment of images and virtual records, without collection.

Local Anaesthetic Effect on the Eye - Simulation

Experiment 7 - Practical Notes

Name: _____ Roll no.: _____ Date: _____

Aim

To interpret a virtual local-anaesthetic response.

Principle

A local anaesthetic reduces sensory nerve conduction through sodium-channel effects. A virtual corneal-response model represents local loss of sensation without demonstrating a pupil effect.

Hypothetical Dataset

These original figures illustrate analysis only. They are not live observations or dosing instructions.

Virtual record	Response score
Baseline	3
After treatment	1
Recovery record	3

Requirements

- Institution-approved pharmacology simulation such as ExPharm
- Predefined virtual control and treatment records
- Worksheet or spreadsheet for graphing and calculation

Procedure

1. Open the exercise

Select the named virtual model and read its endpoint and default settings.

2. Review controls

Record the baseline, vehicle/control and comparator entries supplied by the software.

3. Run the simulation

Use the instructor-assigned virtual treatment option; record the output and units.

4. Compare

Compare the defined endpoint between control and treatment; repeat a virtual run only if the exercise requires it.

5. Analyse

Use the supplied calculation or response trend and state possible confounders.

6. Record

Save the virtual results and write an interpretation that identifies them as simulated.

Interpretation Guide

A reduced corneal-response score supports the simulated local sensory effect. Distinguish this endpoint from pupil diameter or systemic sedation.

Observations and Record

Group / run	Endpoint: Corneal-response score	Student record
Control	Baseline response	_____
Treatment	Assigned local anaesthetic	_____
Software / setting	Assigned virtual exercise	_____

Worked Example

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

- Report the ordered score change; an ordinal score is not a linear measure of nerve activity.

Result

In the software exercise, _____ changed from _____ to _____. The result _____ supports the stated model effect. Confounders/limits: _____.

Precautions

- Use software only; no live animal, tissue collection or drug administration is performed.
- Do not alter safety or validity settings to make a desired result.
- A virtual output demonstrates the model's programmed response and is not a patient treatment recommendation.

Viva Questions and Answers

1. What is the primary mechanism?

Reduced voltage-gated sodium-channel function in the model.

2. Does loss of response prove mydriasis?

No; sensory response and pupil diameter are different endpoints.

3. Why identify the data as simulated?

It prevents a programmed result from being represented as a real experimental observation.

Mydriatic Effect on the Eye - Simulation

Experiment 8 - Practical Notes

Name: _____ Roll no.: _____ Date: _____

Aim

To interpret simulated pupil enlargement.

Principle

An antimuscarinic example such as atropine reduces parasympathetic constrictor action. Mydriasis describes enlargement of the pupil; mechanism depends on the drug class.

Hypothetical Dataset

These original figures illustrate analysis only. They are not live observations or dosing instructions.

Virtual record	Diameter, mm
Baseline	3.0
Treatment	5.0

Requirements

- Institution-approved pharmacology simulation such as ExPharm
- Predefined virtual control and treatment records
- Worksheet or spreadsheet for graphing and calculation

Procedure

1. Open the exercise

Select the named virtual model and read its endpoint and default settings.

2. Review controls

Record the baseline, vehicle/control and comparator entries supplied by the software.

3. Run the simulation

Use the instructor-assigned virtual treatment option; record the output and units.

4. Compare

Compare the defined endpoint between control and treatment; repeat a virtual run only if the exercise requires it.

5. Analyse

Use the supplied calculation or response trend and state possible confounders.

6. Record

Save the virtual results and write an interpretation that identifies them as simulated.

Interpretation Guide

The hypothetical diameter increases. Record lighting and the selected mechanism; not every mydriatic has the same accommodation effect.

Observations and Record

Group / run	Endpoint: Pupil diameter, mm	Student record
Control	Matched baseline	_____
Treatment	Assigned mydriatic	_____
Software / setting	Assigned virtual exercise	_____

Worked Example

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

- Change = $5.0 - 3.0 = 2.0$ mm.
- Percentage increase = $2.0 / 3.0 \times 100 = 66.7\%$.

Result

In the software exercise, _____ changed from _____ to _____. The result _____ supports the stated model effect. Confounders/limits: _____.

Precautions

- Use software only; no live animal, tissue collection or drug administration is performed.
- Do not alter safety or validity settings to make a desired result.
- A virtual output demonstrates the model's programmed response and is not a patient treatment recommendation.

Viva Questions and Answers

1. What is mydriasis?

Pupil dilation.

2. Why match lighting?

Pupil size changes with illumination even without a drug effect.

3. Why identify the data as simulated?

It prevents a programmed result from being represented as a real experimental observation.

Miotic Effect on the Eye - Simulation

Experiment 9 - Practical Notes

Name: _____ Roll no.: _____ Date: _____

Aim

To interpret simulated pupil constriction.

Principle

A muscarinic agonist example such as pilocarpine increases sphincter-pupillae activity in the model, reducing pupil diameter.

Hypothetical Dataset

These original figures illustrate analysis only. They are not live observations or dosing instructions.

Virtual record	Diameter, mm
Baseline	4.0
Treatment	2.0

Requirements

- Institution-approved pharmacology simulation such as ExPharm
- Predefined virtual control and treatment records
- Worksheet or spreadsheet for graphing and calculation

Procedure

1. Open the exercise

Select the named virtual model and read its endpoint and default settings.

2. Review controls

Record the baseline, vehicle/control and comparator entries supplied by the software.

3. Run the simulation

Use the instructor-assigned virtual treatment option; record the output and units.

4. Compare

Compare the defined endpoint between control and treatment; repeat a virtual run only if the exercise requires it.

5. Analyse

Use the supplied calculation or response trend and state possible confounders.

6. Record

Save the virtual results and write an interpretation that identifies them as simulated.

Interpretation Guide

A decrease in diameter supports the simulated miotic response; lighting and baseline measurements must be comparable.

Observations and Record

Group / run	Endpoint: Pupil diameter, mm	Student record
Control	Matched baseline	_____
Treatment	Assigned miotic	_____
Software / setting	Assigned virtual exercise	_____

Worked Example

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

- Change = $2.0 - 4.0 = -2.0$ mm.
- Percentage reduction = $(4.0 - 2.0) / 4.0 \times 100 = 50\%$.

Result

In the software exercise, _____ changed from _____ to _____. The result _____ supports the stated model effect. Confounders/limits: _____.

Precautions

- Use software only; no live animal, tissue collection or drug administration is performed.
- Do not alter safety or validity settings to make a desired result.
- A virtual output demonstrates the model's programmed response and is not a patient treatment recommendation.

Viva Questions and Answers

1. What is miosis?

Pupil constriction.

2. What class is pilocarpine?

A muscarinic receptor agonist.

3. Why identify the data as simulated?

It prevents a programmed result from being represented as a real experimental observation.

Analgesic Effect by Analgesiometer - Simulation

Experiment 10 - Practical Notes

Name: _____ Roll no.: _____ Date: _____

Aim

To compare virtual response latency before and after an analgesic.

Principle

An analgesic model may increase the latency to a defined virtual nociceptive response. Latency can also change with sedation or motor impairment.

Hypothetical Dataset

These original figures illustrate analysis only. They are not live observations or dosing instructions.

Virtual record	Latency, s
Baseline	4.0
Treatment	7.0

Requirements

- Institution-approved pharmacology simulation such as ExPharm
- Predefined virtual control and treatment records
- Worksheet or spreadsheet for graphing and calculation

Procedure

1. Open the exercise

Select the named virtual model and read its endpoint and default settings.

2. Review controls

Record the baseline, vehicle/control and comparator entries supplied by the software.

3. Run the simulation

Use the instructor-assigned virtual treatment option; record the output and units.

4. Compare

Compare the defined endpoint between control and treatment; repeat a virtual run only if the exercise requires it.

5. Analyse

Use the supplied calculation or response trend and state possible confounders.

6. Record

Save the virtual results and write an interpretation that identifies them as simulated.

Interpretation Guide

Increased virtual latency is consistent with the chosen model response; the programmed stopping rules remain enabled and confounders must be considered.

Observations and Record

Group / run	Endpoint: Latency, seconds	Student record
Control	Pretreatment latency	_____
Treatment	Assigned analgesic	_____
Software / setting	Assigned virtual exercise	_____

Worked Example

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

- Increase = $7.0 - 4.0 = 3.0$ s.
- Percentage increase = $3.0 / 4.0 \times 100 = 75\%$.

Result

In the software exercise, _____ changed from _____ to _____. The result _____ supports the stated model effect. Confounders/limits: _____.

Precautions

- Use software only; no live animal, tissue collection or drug administration is performed.
- Do not alter safety or validity settings to make a desired result.
- A virtual output demonstrates the model's programmed response and is not a patient treatment recommendation.

Viva Questions and Answers

1. What is latency?

Elapsed time to the defined response.

2. Why consider motor impairment?

A delayed response can arise without selective analgesia.

3. Why identify the data as simulated?

It prevents a programmed result from being represented as a real experimental observation.

Analgesic Activity by Writhing Model - Simulation

Experiment 11 - Practical Notes

Name: _____ Roll no.: _____ Date: _____

Aim

To calculate inhibition of a virtual writhing count.

Principle

A virtual peripheral analgesia model compares the number of programmed writhing responses in control and treatment records.

Hypothetical Dataset

These original figures illustrate analysis only. They are not live observations or dosing instructions.

Virtual record	Count
Control	40
Treatment	18

Requirements

- Institution-approved pharmacology simulation such as ExPharm
- Predefined virtual control and treatment records
- Worksheet or spreadsheet for graphing and calculation

Procedure

1. Open the exercise

Select the named virtual model and read its endpoint and default settings.

2. Review controls

Record the baseline, vehicle/control and comparator entries supplied by the software.

3. Run the simulation

Use the instructor-assigned virtual treatment option; record the output and units.

4. Compare

Compare the defined endpoint between control and treatment; repeat a virtual run only if the exercise requires it.

5. Analyse

Use the supplied calculation or response trend and state possible confounders.

6. Record

Save the virtual results and write an interpretation that identifies them as simulated.

Interpretation Guide

A lower simulated count supports activity in this model; nonspecific behavioural suppression can confound interpretation.

Observations and Record

Group / run	Endpoint: Writhing count	Student record
Control	Control count	_____
Treatment	Assigned analgesic	_____
Software / setting	Assigned virtual exercise	_____

Worked Example

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

- Inhibition (%) = (control - treatment) / control × 100.
- (40 - 18) / 40 × 100 = 55%.

Result

In the software exercise, _____ changed from _____ to _____. The result _____ supports the stated model effect. Confounders/limits: _____.

Precautions

- Use software only; no live animal, tissue collection or drug administration is performed.
- Do not alter safety or validity settings to make a desired result.
- A virtual output demonstrates the model's programmed response and is not a patient treatment recommendation.

Viva Questions and Answers

1. What is the control denominator?

The control-group count.

2. Does one model establish clinical analgesic efficacy?

No; it demonstrates a limited model endpoint.

3. Why identify the data as simulated?

It prevents a programmed result from being represented as a real experimental observation.

Anticonvulsant Effect in Electroconvulsive Model - Simulation

Experiment 12 - Practical Notes

Name: _____ Roll no.: _____ Date: _____

Aim

To assess a software anticonvulsant endpoint.

Principle

The virtual maximal-electroshock model represents a defined seizure pattern. Protection against the specified endpoint is assessed from software records, without inducing seizures.

Hypothetical Dataset

These original figures illustrate analysis only. They are not live observations or dosing instructions.

Virtual group	Protected	Total
Control	0	5
Treatment	4	5

Requirements

- Institution-approved pharmacology simulation such as ExPharm
- Predefined virtual control and treatment records
- Worksheet or spreadsheet for graphing and calculation

Procedure

1. Open the exercise

Select the named virtual model and read its endpoint and default settings.

2. Review controls

Record the baseline, vehicle/control and comparator entries supplied by the software.

3. Run the simulation

Use the instructor-assigned virtual treatment option; record the output and units.

4. Compare

Compare the defined endpoint between control and treatment; repeat a virtual run only if the exercise requires it.

5. Analyse

Use the supplied calculation or response trend and state possible confounders.

6. Record

Save the virtual results and write an interpretation that identifies them as simulated.

Interpretation Guide

State the endpoint, such as absence of the assigned tonic-extension pattern. Results depend on the model and do not represent all seizure types.

Observations and Record

Group / run	Endpoint: Protected / total virtual records	Student record
Control	Unprotected model record	_____
Treatment	Assigned anticonvulsant such as phenytoin	_____
Software / setting	Assigned virtual exercise	_____

Worked Example

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

- Protection (%) = protected records / total records $\times$ 100.
- Treatment: $4 / 5 \times 100 = 80\%$.

Result

In the software exercise, _____ changed from _____ to _____. The result _____ supports the stated model effect. Confounders/limits: _____.

Precautions

- Use software only; no live animal, tissue collection or drug administration is performed.
- Do not alter safety or validity settings to make a desired result.
- A virtual output demonstrates the model's programmed response and is not a patient treatment recommendation.

Viva Questions and Answers

1. Why define protection?

Different studies may score different seizure endpoints.

2. What is done in class?

Only the approved simulation and record analysis.

3. Why identify the data as simulated?

It prevents a programmed result from being represented as a real experimental observation.

Muscle-Relaxant Effect by Rotarod - Simulation

Experiment 13 - Practical Notes

Name: _____ Roll no.: _____ Date: _____

Aim

To assess a virtual coordination/relaxant response.

Principle

The rotarod model measures motor performance. A centrally acting relaxant or sedative can reduce latency to a programmed fall.

Hypothetical Dataset

These original figures illustrate analysis only. They are not live observations or dosing instructions.

Virtual record	Latency, s
Baseline	90
Treatment	45

Requirements

- Institution-approved pharmacology simulation such as ExPharm
- Predefined virtual control and treatment records
- Worksheet or spreadsheet for graphing and calculation

Procedure

1. Open the exercise

Select the named virtual model and read its endpoint and default settings.

2. Review controls

Record the baseline, vehicle/control and comparator entries supplied by the software.

3. Run the simulation

Use the instructor-assigned virtual treatment option; record the output and units.

4. Compare

Compare the defined endpoint between control and treatment; repeat a virtual run only if the exercise requires it.

5. Analyse

Use the supplied calculation or response trend and state possible confounders.

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6. Record

Save the virtual results and write an interpretation that identifies them as simulated.

Interpretation Guide

Reduced performance is compatible with the selected model effect but can reflect sedation, coordination changes or other motor influences.

Observations and Record

Group / run	Endpoint: Fall latency, seconds	Student record
Control	Baseline performance	_____
Treatment	Assigned relaxant such as diazepam	_____
Software / setting	Assigned virtual exercise	_____

Worked Example

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

- Reduction = $90 - 45 = 45$ s; percentage reduction = 50%.

Result

In the software exercise, _____ changed from _____ to _____. The result _____ supports the stated model effect. Confounders/limits: _____.

Precautions

- Use software only; no live animal, tissue collection or drug administration is performed.
- Do not alter safety or validity settings to make a desired result.
- A virtual output demonstrates the model's programmed response and is not a patient treatment recommendation.

Viva Questions and Answers

1. Does rotarod measure analgesia directly?

No; it measures a motor-performance endpoint.

2. Why compare baseline performance?

Initial capability influences the observed change.

3. Why identify the data as simulated?

It prevents a programmed result from being represented as a real experimental observation.

Central Activity by Actophotometer - Simulation

Experiment 14 - Practical Notes

Name: _____ Roll no.: _____ Date: _____

Aim

To compare virtual locomotor activity counts.

Principle

An actophotometer records activity-related detections. A depressant example reduces counts, whereas stimulant effects and contextual factors can increase them.

Hypothetical Dataset

These original figures illustrate analysis only. They are not live observations or dosing instructions.

Virtual record	Counts
Control	240
Treatment	120

Requirements

- Institution-approved pharmacology simulation such as ExPharm
- Predefined virtual control and treatment records
- Worksheet or spreadsheet for graphing and calculation

Procedure

1. Open the exercise

Select the named virtual model and read its endpoint and default settings.

2. Review controls

Record the baseline, vehicle/control and comparator entries supplied by the software.

3. Run the simulation

Use the instructor-assigned virtual treatment option; record the output and units.

4. Compare

Compare the defined endpoint between control and treatment; repeat a virtual run only if the exercise requires it.

5. Analyse

Use the supplied calculation or response trend and state possible confounders.

6. Record

Save the virtual results and write an interpretation that identifies them as simulated.

Interpretation Guide

The interval must be identical for comparison. Counts are instrument-defined activity signals, not a direct measure of mood or consciousness.

Observations and Record

Group / run	Endpoint: Activity counts / defined interval	Student record
Control	Control interval	_____
Treatment	Assigned CNS-active drug	_____
Software / setting	Assigned virtual exercise	_____

Worked Example

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

- Reduction (%) = $(240 - 120) / 240 \times 100 = 50\%$.

Result

In the software exercise, _____ changed from _____ to _____. The result _____ supports the stated model effect. Confounders/limits: _____.

Precautions

- Use software only; no live animal, tissue collection or drug administration is performed.
- Do not alter safety or validity settings to make a desired result.
- A virtual output demonstrates the model's programmed response and is not a patient treatment recommendation.

Viva Questions and Answers

1. Why match observation intervals?

A longer interval can produce more counts without a stronger drug effect.

2. What may confound activity?

Sedation, motor impairment, novelty and the model settings.

3. Why identify the data as simulated?

It prevents a programmed result from being represented as a real experimental observation.

Anxiolytic Effect in Elevated Plus Maze - Simulation

Experiment 15 - Practical Notes

Name: _____ Roll no.: _____ Date: _____

Aim

To interpret virtual open-arm behaviour.

Principle

The model compares approach and avoidance in open and enclosed arms. An anxiolytic example may increase open-arm exploration, but motor effects influence the endpoint.

Hypothetical Dataset

These original figures illustrate analysis only. They are not live observations or dosing instructions.

Virtual record	Open-arm time, s	Total time, s
Control	30	300
Treatment	90	300

Requirements

- Institution-approved pharmacology simulation such as ExPharm
- Predefined virtual control and treatment records
- Worksheet or spreadsheet for graphing and calculation

Procedure

1. Open the exercise

Select the named virtual model and read its endpoint and default settings.

2. Review controls

Record the baseline, vehicle/control and comparator entries supplied by the software.

3. Run the simulation

Use the instructor-assigned virtual treatment option; record the output and units.

4. Compare

Compare the defined endpoint between control and treatment; repeat a virtual run only if the exercise requires it.

5. Analyse

Use the supplied calculation or response trend and state possible confounders.

6. Record

Save the virtual results and write an interpretation that identifies them as simulated.

Interpretation Guide

Use open-arm entries, total activity and time together; a change in one behaviour is not a clinical anxiety diagnosis.

Observations and Record

Group / run	Endpoint: Open-arm time, seconds	Student record
Control	Control behaviour	_____
Treatment	Assigned anxiolytic	_____
Software / setting	Assigned virtual exercise	_____

Worked Example

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

- Open-arm time (%) = open-arm time / total observation time × 100.
- Control 10%; treatment 30%; difference = 20 percentage points.

Result

In the software exercise, _____ changed from _____ to _____. The result _____ supports the stated model effect. Confounders/limits: _____.

Precautions

- Use software only; no live animal, tissue collection or drug administration is performed.
- Do not alter safety or validity settings to make a desired result.
- A virtual output demonstrates the model's programmed response and is not a patient treatment recommendation.

Viva Questions and Answers

1. Why record total activity?

Motor suppression or stimulation can change arm-entry patterns.

2. What is a percentage point?

The arithmetic difference between two percentages.

3. Why identify the data as simulated?

It prevents a programmed result from being represented as a real experimental observation.

Drug Effects on Isolated Heart - Simulation

Experiment 16 - Practical Notes

Name: _____ Roll no.: _____ Date: _____

Aim

To compare at least two virtual drug effects on cardiac recordings.

Principle

A virtual isolated-heart trace separates rate and contraction-amplitude responses. Adrenergic and muscarinic examples can produce different effects.

Hypothetical Dataset

These original figures illustrate analysis only. They are not live observations or dosing instructions.

Virtual option	Rate, beats/min	Relative amplitude
Baseline	60	1.00
Adrenaline	80	1.30
Acetylcholine	45	0.80

Requirements

- Institution-approved pharmacology simulation such as ExPharm
- Predefined virtual control and treatment records
- Worksheet or spreadsheet for graphing and calculation

Procedure

1. Open the exercise

Select the named virtual model and read its endpoint and default settings.

2. Review controls

Record the baseline, vehicle/control and comparator entries supplied by the software.

3. Run the simulation

Use the instructor-assigned virtual treatment option; record the output and units.

4. Compare

Compare the defined endpoint between control and treatment; repeat a virtual run only if the exercise requires it.

5. Analyse

Use the supplied calculation or response trend and state possible confounders.

Pharmacology

6. Record

Save the virtual results and write an interpretation that identifies them as simulated.

Interpretation Guide

The two programmed responses illustrate positive versus negative chronotropic tendencies; baseline recovery and receptor context must be considered.

Observations and Record

Group / run	Endpoint: Rate / relative contraction amplitude	Student record
Control	Baseline trace	_____
Treatment	Adrenaline and acetylcholine virtual options	_____
Software / setting	Assigned virtual exercise	_____

Worked Example

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

- Adrenaline rate change: +20 beats/min; acetylcholine: -15 beats/min in this hypothetical record.
- Compare relative amplitudes separately from rate.

Result

In the software exercise, _____ changed from _____ to _____. The result _____ supports the stated model effect. Confounders/limits: _____.

Precautions

- Use software only; no live animal, tissue collection or drug administration is performed.
- Do not alter safety or validity settings to make a desired result.
- A virtual output demonstrates the model's programmed response and is not a patient treatment recommendation.

Viva Questions and Answers

1. What is chronotropy?

An effect on heart rate.

2. What is inotropy?

An effect on contractile force, represented by an assigned trace endpoint here.

3. Why identify the data as simulated?

It prevents a programmed result from being represented as a real experimental observation.

Drug Effects on Ciliary Motility - Simulation

Experiment 17 - Practical Notes

Name: _____ Roll no.: _____ Date: _____

Aim

To compare a virtual ciliary-movement endpoint.

Principle

The software represents coordinated ciliary motion as a defined transport or movement measurement. The selected agent and model determine the programmed response.

Hypothetical Dataset

These original figures illustrate analysis only. They are not live observations or dosing instructions.

Virtual record	Distance, mm	Time, s
Control	10	5
Treatment	10	8

Requirements

- Institution-approved pharmacology simulation such as ExPharm
- Predefined virtual control and treatment records
- Worksheet or spreadsheet for graphing and calculation

Procedure

1. Open the exercise

Select the named virtual model and read its endpoint and default settings.

2. Review controls

Record the baseline, vehicle/control and comparator entries supplied by the software.

3. Run the simulation

Use the instructor-assigned virtual treatment option; record the output and units.

4. Compare

Compare the defined endpoint between control and treatment; repeat a virtual run only if the exercise requires it.

5. Analyse

Use the supplied calculation or response trend and state possible confounders.

6. Record

Save the virtual results and write an interpretation that identifies them as simulated.

Interpretation Guide

Longer time over the same distance indicates slower transport. Do not infer a receptor mechanism until the software's selected agent and model are identified.

Observations and Record

Group / run	Endpoint: Transport time over fixed virtual distance	Student record
Control	Control movement	_____
Treatment	Teacher-assigned virtual test agent	_____
Software / setting	Assigned virtual exercise	_____

Worked Example

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

- Speed = distance / time. Control = 2.0 mm/s; treatment = 1.25 mm/s.
- Percentage speed reduction = $(2.0 - 1.25) / 2.0 \times 100 = 37.5\%$.

Result

In the software exercise, _____ changed from _____ to _____. The result _____ supports the stated model effect. Confounders/limits: _____.

Precautions

- Use software only; no live animal, tissue collection or drug administration is performed.
- Do not alter safety or validity settings to make a desired result.
- A virtual output demonstrates the model's programmed response and is not a patient treatment recommendation.

Viva Questions and Answers

1. Why keep distance constant?

Time comparisons require the same travel distance.

2. Is slower transport the same as fewer cilia?

No; the endpoint reflects movement or transport, not a structural count.

3. Why identify the data as simulated?

It prevents a programmed result from being represented as a real experimental observation.

Pyrogen Test by Rabbit-Method Record - Simulation

Experiment 18 - Practical Notes

Name: _____ Roll no.: _____ Date: _____

Aim

To interpret supplied virtual temperature records for a traditional pyrogen-test topic.

Principle

A traditional rabbit-method record evaluates temperature changes under a prescribed compendial scheme. This educational activity analyses software data; no rabbit, injection or pyrogen exposure is used.

Hypothetical Dataset

These original figures illustrate analysis only. They are not live observations or dosing instructions.

Virtual record	Baseline, degrees C	Maximum, degrees C
A	38.5	38.8
B	38.6	39.0
C	38.4	38.6

Requirements

- Institution-approved pharmacology simulation such as ExPharm
- Predefined virtual control and treatment records
- Worksheet or spreadsheet for graphing and calculation

Procedure

1. Open the exercise

Select the named virtual model and read its endpoint and default settings.

2. Review controls

Record the baseline, vehicle/control and comparator entries supplied by the software.

3. Run the simulation

Use the instructor-assigned virtual treatment option; record the output and units.

4. Compare

Compare the defined endpoint between control and treatment; repeat a virtual run only if the exercise requires it.

5. Analyse

Use the supplied calculation or response trend and state possible confounders.

6. Record

Save the virtual results and write an interpretation that identifies them as simulated.

Interpretation Guide

Record baseline suitability, maximum changes and the exact assigned decision rule. Distinguish this historical biological response method from validated bacterial-endotoxin or other authorised methods.

Observations and Record

Group / run	Endpoint: Maximum temperature rise, degrees C	Student record
Control	Virtual baseline temperatures	_____
Treatment	Supplied post-test temperature records	_____
Software / setting	Assigned virtual exercise	_____

Worked Example

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

- Individual rises: 0.3, 0.4 and 0.2 degrees C. Sum = 0.9 degrees C.
- Compare with the teacher-provided current method decision rule; these data alone do not define a universal acceptance limit.

Result

In the software exercise, _____ changed from _____ to _____. The result _____ supports the stated model effect. Confounders/limits: _____.

Precautions

- Use software only; no live animal, tissue collection or drug administration is performed.
- Do not alter safety or validity settings to make a desired result.
- A virtual output demonstrates the model's programmed response and is not a patient treatment recommendation.

Viva Questions and Answers

1. What is the measured endpoint?

The specified temperature rise in a virtual record.

2. Why not apply an invented limit?

The exact method, product and current compendial decision scheme govern interpretation.

3. Why identify the data as simulated?

It prevents a programmed result from being represented as a real experimental observation.

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