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Semester 2 - Practical Notes

Human Anatomy, Physiology and Pathophysiology II

Complete Subject Manual

15 practical files and activities. Use the PDF bookmarks to navigate. Page numbers restart within each practical; content page counts below exclude promotion pages.

Contents

No.	Practical	Content pages
1	Study of the Nervous System	2
2	Study of the Respiratory System	2
3	Study of the Gastrointestinal System	2
4	Study of the Reproductive System	2
5	Demonstration of a General Neurological Examination	2
6	Demonstration of Olfactory Nerve Function	2
7	Examination of Different Taste Modalities	2
8	Demonstration of Visual Acuity	2
9	Demonstration of Reflex Activity	2
10	Recording of Body Temperature	2
11	Determination of Tidal Volume and Vital Capacity	2
12	Recording of Body Mass Index	2
13	Family Planning Devices and Pregnancy Diagnosis Tests	2
14	Case Studies in Pathophysiology	4
15	Hands-on Training in Adult Cardiopulmonary Resuscitation	2

Study of the Nervous System

Experiment 1 - Practical Notes

Name: _____ Roll no.: _____ Date: _____

Aim

To identify the major structures on an approved anatomical model and relate each structure to its physiological function.

Principle

The central nervous system consists of brain and spinal cord. Peripheral nerves carry sensory input and motor output; autonomic pathways regulate visceral activity. Integration, conduction and responses depend on specialised neural structures.

Requirements

- Labelled and unlabelled teaching models or preserved institutional specimens; atlas supplied by the instructor.
- Pointer, notebook and a blank labelled-sketch sheet.

Procedure

1. Orient the model

Identify anterior/posterior and right/left using anatomical orientation. Record the organ system and the plane of the model.

2. Identify structures

Locate the structures in the table without reading the label first; then check your identification with the instructor.

3. Trace the pathway

Trace a simple sensory signal from a peripheral receptor through a sensory nerve to the spinal cord or brain, then trace the appropriate motor pathway to an effector.

4. Relate structure and function

Explain the function of each identified part and one consequence of disturbed function. Separate an observed structural feature from an inferred physiological effect.

5. Draw and label

Prepare a simple labelled sketch showing the pathway or relationships. Label arrows consistently and record one structure you initially confused.

Observations and Record

Structure	Identification cue	Function
Cerebrum	Paired hemispheres and cerebral cortex	Conscious sensation, voluntary movement and higher functions
Cerebellum	Posterior structure behind brainstem	Coordination, balance and motor learning
Brainstem	Midbrain, pons and medulla	Conduction and important automatic functions
Spinal cord	Continuation within vertebral canal	Conduction and spinal integration
Dorsal and ventral roots	Posterior sensory and anterior motor roots	Routes into and out of the cord
Peripheral / autonomic nerves	Nerves outside CNS	Somatic or visceral communication

Worked Example

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

- Complete a recall check: cover the model labels and identify five structures. Record the number correctly located and explain the correction for any error; this is a classroom learning record.

Result

Record the identified structures, the traced pathway and the completed labelled sketch.

Precautions

- Use models and institution-approved teaching specimens; do not undertake dissection independently.
- Handle specimens as directed by the laboratory and avoid confusing the viewer's right with anatomical right.

Viva Questions and Answers

1. Which root carries sensory fibres?

The dorsal root.

2. Is the cerebellum the primary initiator of voluntary movement?

No. It helps coordinate and adjust movement.

3. What distinguishes CNS from PNS?

CNS is brain and spinal cord; PNS includes nerves and ganglia outside them.

Study of the Respiratory System

Experiment 2 - Practical Notes

Name: _____ Roll no.: _____ Date: _____

Aim

To identify the major structures on an approved anatomical model and relate each structure to its physiological function.

Principle

Airways conduct and condition air; respiratory bronchioles and alveoli participate in gas exchange. Pressure changes produced by the diaphragm and chest wall move air, while diffusion moves gases across the alveolar-capillary interface.

Requirements

- Labelled and unlabelled teaching models or preserved institutional specimens; atlas supplied by the instructor.
- Pointer, notebook and a blank labelled-sketch sheet.

Procedure

1. Orient the model

Identify anterior/posterior and right/left using anatomical orientation. Record the organ system and the plane of the model.

2. Identify structures

Locate the structures in the table without reading the label first; then check your identification with the instructor.

3. Trace the pathway

Trace air from the nasal cavity through pharynx, larynx, trachea, main bronchi, smaller bronchi, bronchioles and alveoli. Distinguish this airflow route from the pulmonary blood-flow route.

4. Relate structure and function

Explain the function of each identified part and one consequence of disturbed function. Separate an observed structural feature from an inferred physiological effect.

5. Draw and label

Prepare a simple labelled sketch showing the pathway or relationships. Label arrows consistently and record one structure you initially confused.

Observations and Record

Structure	Identification cue	Function
Nasal cavity	Upper entry with internal passages	Filters, warms and humidifies air
Larynx / trachea	Airway below pharynx; cartilaginous support	Air conduction and voice / airway protection
Bronchi and bronchioles	Progressively branching airways	Distribute air; small-airway resistance
Alveoli	Terminal thin-walled air spaces	Gas exchange
Pleura	Membranes around lungs	Permits movement with mechanical coupling
Diaphragm	Muscle below thorax	Main inspiratory muscle

Worked Example

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

- Complete a recall check: cover the model labels and identify five structures. Record the number correctly located and explain the correction for any error; this is a classroom learning record.

Result

Record the identified structures, the traced pathway and the completed labelled sketch.

Precautions

- Use models and institution-approved teaching specimens; do not undertake dissection independently.
- Handle specimens as directed by the laboratory and avoid confusing the viewer's right with anatomical right.

Viva Questions and Answers

1. Why is alveolar surface thin?

A short diffusion distance facilitates gas exchange.

2. What happens to thoracic volume in quiet inspiration?

It increases as the diaphragm contracts.

3. Do all bronchioles exchange gases?

No. Conducting bronchioles differ from the respiratory region.

Study of the Gastrointestinal System

Experiment 3 - Practical Notes

Name: _____ Roll no.: _____ Date: _____

Aim

To identify the major structures on an approved anatomical model and relate each structure to its physiological function.

Principle

The gastrointestinal tract performs propulsion, digestion, absorption and elimination. Accessory organs supply bile and digestive secretions; different segments have different absorptive and protective specialisations.

Requirements

- Labelled and unlabelled teaching models or preserved institutional specimens; atlas supplied by the instructor.
- Pointer, notebook and a blank labelled-sketch sheet.

Procedure

1. Orient the model

Identify anterior/posterior and right/left using anatomical orientation. Record the organ system and the plane of the model.

2. Identify structures

Locate the structures in the table without reading the label first; then check your identification with the instructor.

3. Trace the pathway

Trace ingested material from mouth to pharynx, oesophagus, stomach, duodenum, jejunum, ileum, colon, rectum and anus. Separately trace bile from liver through the biliary pathway into duodenum.

4. Relate structure and function

Explain the function of each identified part and one consequence of disturbed function. Separate an observed structural feature from an inferred physiological effect.

5. Draw and label

Prepare a simple labelled sketch showing the pathway or relationships. Label arrows consistently and record one structure you initially confused.

Observations and Record

Structure	Identification cue	Function
Stomach	Expanded segment after oesophagus	Mixing, acid secretion and early protein digestion
Small intestine	Duodenum, jejunum and ileum	Major digestion and nutrient absorption
Colon	Larger distal intestinal segment	Water/electrolyte handling and stool formation
Liver	Large upper-abdominal organ	Bile production and metabolic processing
Gallbladder	Sac below liver	Stores and concentrates bile
Pancreas	Gland near duodenum	Digestive enzymes/bicarbonate; endocrine function

Worked Example

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

- Complete a recall check: cover the model labels and identify five structures. Record the number correctly located and explain the correction for any error; this is a classroom learning record.

Result

Record the identified structures, the traced pathway and the completed labelled sketch.

Precautions

- Use models and institution-approved teaching specimens; do not undertake dissection independently.
- Handle specimens as directed by the laboratory and avoid confusing the viewer's right with anatomical right.

Viva Questions and Answers

1. Where does most nutrient absorption occur?

In the small intestine.

2. Does the gallbladder produce bile?

No. The liver produces it; the gallbladder stores and concentrates it.

3. Why distinguish endocrine and exocrine pancreas?

Hormones enter blood, while digestive secretions enter ducts leading to the intestine.

Study of the Reproductive System

Experiment 4 - Practical Notes

Name: _____ Roll no.: _____ Date: _____

Aim

To identify the major structures on an approved anatomical model and relate each structure to its physiological function.

Principle

Reproductive structures support gamete production, hormone secretion, transport and, in the uterine system, implantation and pregnancy. Structure and function must be discussed respectfully using anatomical terminology.

Requirements

- Labelled and unlabelled teaching models or preserved institutional specimens; atlas supplied by the instructor.
- Pointer, notebook and a blank labelled-sketch sheet.

Procedure

1. Orient the model

Identify anterior/posterior and right/left using anatomical orientation. Record the organ system and the plane of the model.

2. Identify structures

Locate the structures in the table without reading the label first; then check your identification with the instructor.

3. Trace the pathway

Trace sperm from seminiferous tubules through epididymis and ductus deferens towards the urethra. On the second model trace an oocyte from ovary through uterine tube towards uterus; distinguish fertilisation from implantation.

4. Relate structure and function

Explain the function of each identified part and one consequence of disturbed function. Separate an observed structural feature from an inferred physiological effect.

5. Draw and label

Prepare a simple labelled sketch showing the pathway or relationships. Label arrows consistently and record one structure you initially confused.

Observations and Record

Structure	Identification cue	Function
Testis / epididymis	Gonad and associated coiled duct	Sperm production / maturation and storage
Ductus deferens / accessory glands	Transport duct and glands	Transport and seminal-fluid contribution
Ovary	Gonad near uterine tube	Oocyte development and hormone secretion
Uterine tube	Tube between ovarian region and uterus	Transport; common site of fertilisation
Uterus / endometrium	Muscular organ and inner lining	Implantation and pregnancy support
Cervix / vagina	Lower uterine opening and canal	Communication and reproductive functions

Worked Example

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

- Complete a recall check: cover the model labels and identify five structures. Record the number correctly located and explain the correction for any error; this is a classroom learning record.

Result

Record the identified structures, the traced pathway and the completed labelled sketch.

Precautions

- Use models and institution-approved teaching specimens; do not undertake dissection independently.
- Handle specimens as directed by the laboratory and avoid confusing the viewer's right with anatomical right.

Viva Questions and Answers

1. Is fertilisation the same as implantation?

No. Fertilisation combines gametes; implantation is attachment in the endometrium.

2. Where do sperm mature?

Primarily in the epididymis.

3. Does ovulation guarantee pregnancy?

No. Fertilisation, transport and implantation must also occur.

Demonstration of a General Neurological Examination

Experiment 5 - Practical Notes

Name: _____ Roll no.: _____ Date: _____

Aim

To observe an instructor-led neurological examination and organise findings by functional domain.

Principle

A neurological examination evaluates mental status, cranial nerve function, motor function, sensation, coordination, reflexes and gait. Symmetry, the pattern of findings and the history guide interpretation; a classroom demonstration does not establish a diagnosis.

Requirements

- Consenting volunteer or teaching video; instructor; examination chart.
- Penlight, reflex hammer, safe sensory materials and suitable walking space.

Procedure

1. Prepare

Explain the demonstration, obtain consent and provide privacy. Check whether pain, injury or mobility limitations require a modified activity.

2. Mental status and cranial nerves

Observe alertness, orientation and communication. The instructor demonstrates pupil responses, eye movements, facial movements, hearing and other appropriate cranial functions.

3. Motor and sensation

Observe posture, bulk and voluntary movement. Compare sides with the instructor's selected strength and gentle sensory checks; record stimulus and body site.

4. Coordination and gait

Observe finger-to-target movement and ordinary gait as appropriate. Use support and omit balance challenges when unsafe.

5. Reflexes

Observe the instructor eliciting a tendon reflex with the limb relaxed. Record the tendon and bilateral response; do not use painful techniques.

6. Document

Group actual findings by domain and note any limitations. Escalate an unexpected symptom to the instructor rather than assigning a disease label.

Observations and Record

Domain	Observed task	Finding / side / limitation
Mental status / cranial nerves	_____	_____
Motor / sensory	_____	_____
Coordination / gait	_____	_____
Reflexes	_____	_____

Worked Example

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

- A record saying “right and left finger-to-target tasks completed smoothly” is an observation. “All neurological disease excluded” is an unsupported conclusion.

Result

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

Precautions

- Do not perform painful stimulation, invasive testing or forceful neck movement.
- Respect refusal or discomfort and record an omitted task instead of inventing a result.

Viva Questions and Answers

1. Why compare sides?

Asymmetry may help localise a functional disturbance.

2. Why record the task used?

The finding is meaningful only with its method and conditions.

3. Does a normal demonstration exclude all neurological disease?

No. Clinical interpretation requires a complete assessment.

Demonstration of Olfactory Nerve Function

Experiment 6 - Practical Notes

Name: _____ Roll no.: _____ Date: _____

Aim

To demonstrate non-irritant odour recognition for each nostril separately.

Principle

Olfactory receptor input travels through the olfactory pathway associated with cranial nerve I. Irritant vapours can stimulate trigeminal pathways and are unsuitable for an isolated smell-recognition demonstration.

Requirements

- Consenting volunteer, instructor and separate containers with familiar non-irritant odours such as vanilla or coffee.
- Odour-free control, disposable materials and recording sheet.

Procedure

1. Screen

Ask about current congestion, allergy, recent infection and willingness to participate. Avoid any material to which the volunteer is sensitive.

2. Explain

Allow normal comfortable breathing. Ask the volunteer to close the eyes and gently occlude one nostril without pressure.

3. Present

Hold the selected container at an appropriate distance; avoid touching the nose. Ask whether an odour is noticed, then whether it can be identified.

4. Compare

Repeat with the other nostril and a different familiar odour, allowing recovery between presentations. Include an odour-free comparison.

5. Record

Document detection, recognition and the nostril tested. Congestion, attention and unfamiliarity are possible limitations.

Observations and Record

Odour / control	Right nostril: detected / named	Left nostril: detected / named
_____	_____	_____
_____	_____	_____

Worked Example

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

- Detected but not named means detection was present but recognition was uncertain. Do not record anosmia from that single observation.

Result

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

Precautions

- Do not use ammonia, strong acids, solvents or irritant perfumes.
- Keep containers separate and clean; do not repeatedly expose a volunteer who reports discomfort.

Viva Questions and Answers

1. Which cranial nerve is chiefly tested?

Cranial nerve I.

2. Why avoid ammonia?

Its irritant effect may stimulate the trigeminal system.

3. Why test each nostril separately?

It allows right-left comparison rather than relying on a combined response.

Examination of Different Taste Modalities

Experiment 7 - Practical Notes

Name: _____ Roll no.: _____ Date: _____

Aim

To compare recognition of sweet, salty, sour, bitter and umami using teacher-approved food-grade solutions.

Principle

Taste receptor cells respond to several chemical modalities. Receptors are distributed across taste-bearing regions; there is no strict map in which each taste is confined to a single exclusive tongue zone. Smell, temperature and texture also influence flavour.

Requirements

- Instructor-prepared food-grade taste solutions and water; allergy information and voluntary participation.
- Individual disposable applicators/cups, coded containers and record sheet.

Procedure

1. Prepare

Explain the activity and screen for food allergies, oral lesions and unwillingness to taste. Offer a recorded-data alternative.

2. Code the solutions

The instructor codes low-intensity sweet, salty, sour, bitter and umami solutions. Laboratory chemicals are never tasted.

3. Present individually

Apply a teacher-approved small quantity using a clean individual applicator or cup. Ask the participant to identify the modality without showing the code.

4. Rinse and repeat

Rinse with water and allow a rest interval before the next solution. Use a fresh applicator and randomise presentation order.

5. Record

Record the perceived modality, confidence and any limitation; reveal the code after the observations are complete.

6. Discuss

Distinguish taste from flavour and avoid concluding a cranial-nerve lesion from a classroom recognition error.

Observations and Record

Coded solution	Reported modality	Assigned modality / notes
A	_____	_____
B	_____	_____
C	_____	_____
D	_____	_____
E	_____	_____

Worked Example

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

- If four of five coded modalities are identified, recognition accuracy in this activity is 4/5 × 100 = 80%. It is not a validated clinical taste score.

Result

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

Precautions

- Use only instructor-approved food-grade materials with individual utensils; participants may decline.
- Do not use concentrated quinine, corrosive solutions or unknown chemicals for tasting.

Viva Questions and Answers

1. Why is a strict tongue map misleading?

Several taste modalities can be detected across multiple taste-bearing regions.

2. How is flavour broader than taste?

It includes smell, texture, temperature and other sensory input.

3. Why rinse between solutions?

It reduces carryover and adaptation.

Demonstration of Visual Acuity

Experiment 8 - Practical Notes

Name: _____ Roll no.: _____ Date: _____

Aim

To measure and record distance visual acuity using the assigned calibrated chart.

Principle

A visual-acuity chart tests recognition of standard optotypes at a defined viewing distance. In Snellen notation the numerator is the test distance and the denominator is the distance at which the recorded optotype subtends its standard angle.

Requirements

- Calibrated Snellen or approved distance chart, correctly measured viewing distance, adequate lighting.
- Clean occluder, record sheet and the volunteer's usual distance spectacles if applicable.

Procedure

1. Set the chart

Use the chart's specified distance, commonly 6 m for a metric Snellen chart. Do not use a scaled printout at an arbitrary distance.

2. Explain and position

Obtain consent, place the volunteer at the measured position and record whether correction is worn.

3. Test one eye

Cover the other eye without pressure and read from larger to smaller lines. Apply the chart's prescribed pass/error rule.

4. Test the second eye

Repeat under identical conditions, cleaning the occluder as required. Record each eye separately.

5. Document

Enter right-eye and left-eye acuity, test distance, chart and correction status. Instructor-led pinhole testing may be recorded separately if indicated.

6. Interpret

Explain the notation without turning a screening result into a diagnosis. Refer unexpected impairment to the appropriate clinician.

Observations and Record

Eye	Without / with correction	Acuity and chart rule
Right	_____	_____
Left	_____	_____

Worked Example

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

- A 6/12 result means that at 6 m the participant resolves an optotype intended to be resolved at 12 m under the chart standard. It does not mean “50% eyesight.”

Result

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

Precautions

- Do not press on the covered eye or allow peeking.
- Keep lighting, distance and correction status consistent and allow an accessible alternative chart when needed.

Viva Questions and Answers

1. Why record correction?

Spectacles may change measured acuity.

2. What does 6/6 signify?

Resolution of the specified standard optotype at 6 m under the testing conditions.

3. Does acuity assess every visual function?

No. It does not fully measure fields, contrast, colour vision or ocular health.

Demonstration of Reflex Activity

Experiment 9 - Practical Notes

Name: _____ Roll no.: _____ Date: _____

Aim

To observe a tendon reflex and describe the reflex arc.

Principle

A stretch reflex involves a receptor, sensory afferent, central connection, motor efferent and responding muscle. For the patellar reflex, stretch of quadriceps activates a spinal response commonly associated with L2-L4 segments.

Requirements

- Instructor, consenting volunteer or demonstration video, reflex hammer and suitable seating.
- Recording sheet with right-left comparison.

Procedure

1. Position

Seat the volunteer safely with the limb relaxed and supported. Explain the demonstration and omit an injured or painful limb.

2. Locate

The instructor identifies the patellar tendon below the patella and checks the limb position.

3. Elicit

The instructor applies an appropriate brief tendon tap. Observe quadriceps contraction and lower-leg movement.

4. Compare

Repeat appropriately on the other side under similar relaxation conditions. If a reinforcement manoeuvre is used, record it.

5. Describe the arc

Identify muscle spindle input, sensory nerve, spinal integration and motor output to quadriceps.

6. Record

Write the actual response and limitations; use the instructor's grading system only when taught.

Observations and Record

Tendon / side	Position and manoeuvre	Observed response
Patellar, right	_____	_____
Patellar, left	_____	_____

Worked Example

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

- A response changing after better relaxation shows that testing conditions matter. A single reduced response is not a disease diagnosis.

Result

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

Precautions

- Do not strike bone repeatedly or use force on an injured tendon.
- Keep the volunteer supported and leave clinical grading and interpretation to the instructor.

Viva Questions and Answers

1. What receptor starts the stretch reflex?

A muscle spindle.

2. Why relax the limb?

Voluntary contraction can alter or obscure the response.

3. Is every reflex arc monosynaptic?

No. Reflexes differ; the central excitatory component of the stretch reflex is a classic monosynaptic example.

Recording of Body Temperature

Experiment 10 - Practical Notes

Name: _____ Roll no.: _____ Date: _____

Aim

To measure body temperature by the assigned non-invasive route and document the conditions.

Principle

Temperature devices measure through a route-specific technique. Oral, axillary, tympanic and forehead readings are not interchangeable; time, recent activity and device positioning affect interpretation.

Requirements

- Approved digital thermometer, compatible disposable cover and manufacturer instructions.
- Consenting volunteer or simulation, cleaning materials and record sheet.

Procedure

1. Prepare

Check device function and the selected route. Explain the procedure and use the compatible disposable cover.

2. Check influences

Record recent exercise, bathing or hot/cold intake when relevant. For oral measurement, observe the waiting interval specified by the device/laboratory.

3. Measure

Position the device using its route-specific instructions and wait for its defined completion signal. Avoid oral measurement when contraindicated.

4. Record

Document value, °C or °F, route, time and device. Repeat only when an identified problem justifies it.

5. Clean

Dispose of the cover and clean the device according to instructions before reuse.

6. Interpret

Compare with the clinical/laboratory standard for that route; do not automatically add or subtract a fixed value to convert between routes.

Observations and Record

Date / time	Route and device	Temperature / relevant condition
_____	_____	_____

Worked Example

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

- Conversion: °F = (°C × 9/5) + 32. Therefore 37.0°C = 98.6°F. This converts units, not measurement routes.

Result

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

Precautions

- Use a non-invasive method selected by the instructor; do not perform rectal measurement in this class activity.
- Avoid mercury thermometers and follow device-specific infection-control instructions.

Viva Questions and Answers

1. Why state the route?

Expected values and measurement technique depend on the route.

2. Is 37°C a compulsory value for everyone?

No. Normal temperature varies with person, route and time.

3. Does a unit conversion correct poor technique?

No. It only changes the numerical unit.

Determination of Tidal Volume and Vital Capacity

Experiment 11 - Practical Notes

Name: _____ Roll no.: _____ Date: _____

Aim

To measure resting tidal volume and slow vital capacity with an approved spirometer or supplied trace.

Principle

Tidal volume is the volume of a quiet breath. Vital capacity is the maximal volume moved between maximal inspiration and maximal expiration; VC = IRV + tidal volume + ERV. Simple spirometry does not directly measure residual volume.

Requirements

- Instructor-operated calibrated spirometer, manufacturer-approved filter/mouthpiece and recording software or supplied traces.
- Consenting suitable volunteer, chair, nose clip when prescribed and record sheet.

Procedure

1. Check suitability

The trained operator reviews suitability and relevant precautions before testing. Use supplied traces when the participant is unsuitable or declines.

2. Set up

Verify the device checks, units, calibration-verification status and infection-control setup. Fit the assigned mouthpiece and explain a comfortable sealed lip position.

3. Quiet breathing

Allow stable normal breaths and record several tidal excursions without coaching deeper breaths. Calculate the average of valid resting breaths.

4. Slow vital capacity

The instructor coaches a complete comfortable maximal inspiration and slow maximal expiration according to the spirometer protocol, or the corresponding permitted sequence. Record an acceptable trace.

5. Repeat appropriately

Obtain repeat traces with recovery under the trained operator. Follow the device and laboratory acceptability/repeatability criteria rather than forcing a dizzy participant to continue.

6. Report

Record valid tidal volumes, selected slow VC, method and any correction supplied by the instrument. Do not call slow VC FVC or infer residual volume from it.

Observations and Record

Trace	Volume / units	Quality / observation
Quiet breath 1 / 2 / 3	_____	_____
Slow VC attempts	_____	_____
Selected valid VC	_____	_____

Worked Example

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

- Resting breaths 0.45, 0.50 and 0.55 L give a mean tidal volume of 0.50 L.
- Illustrative components IRV 2.5 L, tidal volume 0.5 L and ERV 1.0 L give VC = 4.0 L. These are assumed teaching values, not a universal normal.

Result

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

Precautions

- Testing is supervised; stop on chest pain, marked breathlessness, dizziness or participant request.
- Use the approved individual mouthpiece/filter and operator infection-control procedure.
- Clinical interpretation needs age, height and appropriate prediction standards; simple spirometry cannot measure TLC or residual volume directly.

Viva Questions and Answers

1. What distinguishes VC from tidal volume?

VC spans maximal inspiration to maximal expiration; tidal volume is a quiet breath.

2. Can ordinary spirometry measure residual volume?

No.

3. Why inspect the trace?

Leaks, incomplete effort and unstable breathing can invalidate a volume reading.

Recording of Body Mass Index

Experiment 12 - Practical Notes

Name: _____ Roll no.: _____ Date: _____

Aim

To measure height and body mass and calculate BMI with the appropriate interpretation.

Principle

BMI = mass in kilograms divided by height in metres squared. It is a screening index and does not directly measure body fat, distribution of fat or nutritional status. Adult categories do not substitute for age-specific paediatric assessment.

Requirements

- Calibrated weighing scale, stadiometer, consenting participant and calculator.
- Record sheet and private measurement area.

Procedure

1. Prepare

Explain the activity and check zero/calibration of the equipment. Respect privacy and voluntary participation.

2. Measure mass

Use the laboratory technique with light clothing and no shoes when appropriate; record kg and relevant conditions.

3. Measure height

Position correctly at the stadiometer, without shoes when appropriate, and record metres rather than substituting centimetres in the formula.

4. Calculate

Square height in metres and divide kg by that value. Retain adequate precision in intermediate calculations.

5. Interpret

For adults, commonly used categories include underweight below 18.5, overweight from 25 and obesity from 30 kg/m^2; risk thresholds may differ by population. Children require age- and sex-specific assessment.

6. Record limits

Discuss body composition, pregnancy and other circumstances in which BMI alone can be misleading. Avoid stigmatising language.

Observations and Record

Mass (kg)	Height (m)	BMI (kg/m^2) / context
_____	_____	_____

Worked Example

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

- Mass 62.0 kg and height 1.60 m: BMI = 62.0 / 1.60^2 = 62.0 / 2.56 = 24.22 kg/m^2.
- Using 160 instead of 1.60 produces a unit error; convert centimetres to metres first.

Result

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

Precautions

- Do not diagnose a person from one BMI number.
- Record pregnancy or other relevant context and use age-appropriate standards.

Viva Questions and Answers

1. Why square height in metres?

That is the dimensional definition of the BMI index.

2. Does BMI directly measure adipose tissue?

No.

3. Can adult BMI categories classify children?

No. Children need age- and sex-specific assessment.

Family Planning Devices and Pregnancy Diagnosis Tests

Experiment 13 - Practical Notes

Name: _____ Roll no.: _____ Date: _____

Aim

To identify common family-planning methods on teaching models and interpret an hCG test using supplied controls.

Principle

Contraceptive methods differ in their mechanisms, use requirements and suitability. A urine pregnancy test detects human chorionic gonadotropin by a method-specific immunoassay; it indicates detection above the test threshold and does not establish pregnancy location or viability.

Requirements

- Teaching condom and intrauterine-device models, contraceptive product information supplied by the instructor.
- Approved hCG test kit, synthetic positive/negative urine controls, timer and disposal materials.

Procedure

1. Classify methods

Compare barrier, intrauterine, hormonal and fertility-awareness approaches with the model table. Record who provides or inserts the method and what counselling is needed.

2. Demonstrate models

The instructor demonstrates device identity and the relevant teaching model. Intrauterine-device insertion is not practised on a person.

3. Read the test instructions

Check expiry, control requirements, specimen type, input quantity and reading time for the exact hCG kit.

4. Run controls

Apply the supplied synthetic controls as directed. Start the timer and read only within the prescribed window.

5. Interpret lines

For the assigned line-format kit, a valid control line with a test line indicates positive; a control line alone indicates negative. Absence of the control line is invalid, even if a test line appears.

6. Discuss limitations

An early or dilute specimen may be negative before sufficient hCG is detectable. A positive result cannot exclude ectopic pregnancy; worrying symptoms need clinical assessment.

Observations and Record

Method / test	Mechanism or reading	Key point
Condom	Barrier	Can reduce STI transmission when used correctly
Copper IUD	Local effect impairing fertilisation	Inserted and managed by a trained clinician
Hormonal methods	Method-dependent ovulation/cervical-mucus effects	Suitability and use differ by product
hCG control and test lines	_____	Record valid / invalid and reading time

Worked Example

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

- A teaching device with both control and test lines inside the reading window is positive. A late evaporation mark outside that window is not interpreted as a valid test line.

Result

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

Precautions

- Use synthetic controls and demonstration models; protect privacy.
- Do not imply that contraceptive tablets protect against STIs or that hCG testing determines the location of a pregnancy.

Viva Questions and Answers

1. Why require a control line?

It demonstrates proper test migration/reagent function for that device.

2. Why can an early test be negative?

Urinary hCG may be below the detection threshold.

3. Which listed method can also reduce STI transmission?

Correctly used condoms.

Case Studies in Pathophysiology

Experiment 14 - Practical Notes

Name: _____ Roll no.: _____ Date: _____

Aim

To connect the mechanisms of nine syllabus-listed conditions with case findings, appropriate clinical assessment and prevention.

Principle

A case analysis links symptoms, mechanism, evidence and the clinician's assessment. The examples below are fictional teaching cases; they do not replace clinical evaluation.

Requirements

- Instructor-provided fictional case files, relevant teaching test reports and a case-record sheet.

Procedure

1. Extract findings

Identify the main symptoms, duration, risk factors and relevant medicines without using real patient identifiers.

2. Explain the mechanism

Connect the organ disturbance to the recorded findings and identify at least one plausible alternative.

3. Review evidence

Interpret only the results actually supplied and distinguish confirmed findings from assumptions.

4. Record the care role

Describe referral, prevention, adherence support and warning signs without writing an individual prescription.

Case Files

Inflammatory bowel disease

- A fictional young adult has recurrent bloody diarrhoea, urgency and weight loss. The teaching report describes continuous colonic mucosal inflammation.
- Mechanism: Abnormal immune-mediated intestinal inflammation can injure the mucosa. Ulcerative colitis is predominantly continuous colonic disease; Crohn disease may be patchy, transmural and affect other GI sites.
- Assessment and pharmacy role: Review stool investigations and endoscopy/biopsy findings supplied in the case. Distinguish IBD from functional IBS; rule-out infection is important. Heavy bleeding or severe systemic illness needs urgent review.

Peptic ulcer

- A fictional adult with epigastric pain reports regular NSAID use. The case contains an endoscopy result showing a gastric ulcer.
- Mechanism: Mucosal protective mechanisms are overcome by acid-related injury; NSAIDs and Helicobacter pylori are important causes. Food-related pain patterns alone are not sufficiently specific to identify an ulcer.
- Assessment and pharmacy role: Review prescribed H. pylori testing and medicine history. Haematemesis, black tarry stool, collapse or sudden severe abdominal pain are urgent warning signs; discuss cause-directed care without choosing a personal prescription.

Jaundice

- A fictional adult has yellow sclerae, dark urine and pale stool. The supplied record shows bilirubin fractionation and liver-associated tests.
- Mechanism: Jaundice is a sign of excess bilirubin, with pre-hepatic, hepatic or post-hepatic causes. Conjugated bilirubin can enter urine; an unconjugated increase has different handling.
- Assessment and pharmacy role: Use total/direct bilirubin, relevant enzyme pattern and imaging/history supplied by the instructor to build a differential. Do not treat every jaundice case as viral hepatitis; fever with obstruction symptoms requires prompt assessment.

Hepatitis

- A fictional adult has fatigue and jaundice with an aminotransferase rise. The case includes the clinician's viral-serology interpretation and medicine history.
- Mechanism: Hepatocyte inflammation may arise from viruses, medicines, alcohol, autoimmune processes or other causes. Different hepatitis viruses have different transmission and chronicity patterns.
- Assessment and pharmacy role: Review cause-specific results and clinician-directed prevention. Discuss vaccination where applicable and avoidance of unnecessary hepatotoxic products. Confusion, bleeding or rapidly worsening jaundice requires urgent evaluation.

Typhoid

- A fictional patient has persistent fever, abdominal symptoms and travel/exposure history. The clinician-provided report supports enteric fever.
- Mechanism: Salmonella Typhi causes systemic infection following faecal-oral transmission. Symptoms overlap with other febrile illnesses.
- Assessment and pharmacy role: Interpret the supplied clinical laboratory report; do not use a single Widal result as definitive proof. Discuss safe water/food and clinician-guided treatment. Severe abdominal pain, bleeding or altered consciousness are urgent findings.

Asthma

- A fictional student reports episodic wheeze, night cough and symptoms after allergen exposure. The supplied assessment describes variable airflow obstruction.
- Mechanism: Airway inflammation, variable bronchoconstriction and hyperresponsiveness can limit expiratory airflow. Symptoms and objective assessment are used together.
- Assessment and pharmacy role: Review the provided lung-function information, inhaler technique and written care plan. Severe breathlessness, inability to speak normally or poor response to the prescribed reliever requires urgent help.

Tuberculosis

- A fictional adult has persistent cough, weight loss and night sweats. The teaching record contains clinician-interpreted imaging and microbiological results.
- Mechanism: Mycobacterium tuberculosis can cause pulmonary or extrapulmonary disease; latent infection differs from active disease. Airborne transmission is associated with infectious respiratory disease.
- Assessment and pharmacy role: Discuss referral, treatment adherence and the clinician's infection-prevention plan. Use provided reports only; no organism cultivation or handling is part of this case activity. Haemoptysis or serious illness needs prompt care.

Diabetes

- A fictional adult has thirst and frequent urination with elevated clinician-confirmed glucose. The record supplies HbA1c and the clinical classification.
- Mechanism: Hyperglycaemia can result from deficient insulin secretion, reduced insulin action or both. Type 1 and type 2 mechanisms differ; complications involve several organ systems.
- Assessment and pharmacy role: Explain the supporting test pattern, medicine adherence and complication-prevention checks. Marked illness with vomiting, deep breathing or altered awareness may indicate a metabolic emergency; do not make treatment changes in the exercise.

Thyroid disorders

- Compare fictional cases of weight loss with tremor and weight gain with cold intolerance. The teaching records give TSH and free T4.
- Mechanism: Primary hyperthyroidism typically increases hormone action; primary hypothyroidism reduces it. In primary disease, TSH commonly changes in the opposite direction to free T4; central disorders can differ.
- Assessment and pharmacy role: Interpret the given pattern and assay intervals rather than symptoms alone. Discuss clinician-directed assessment, medicine timing and follow-up. Severe cardiovascular or consciousness changes need urgent review.

Observations and Record

Case	Mechanism / supporting evidence	Alternative / referral point
Inflammatory bowel disease	_____	_____
Peptic ulcer	_____	_____
Jaundice	_____	_____
Hepatitis	_____	_____
Typhoid	_____	_____
Asthma	_____	_____
Tuberculosis	_____	_____
Diabetes	_____	_____
Thyroid disorders	_____	_____

Result

Complete the nine case records with a mechanism, supporting evidence and appropriate care/referral role.

Precautions

- Use fictional or de-identified teaching material. Do not disclose patient information.
- Do not infer a diagnosis from an isolated symptom or use the case activity to alter a person's medicines.

Viva Questions and Answers

1. Why is jaundice not a single disease?

It is a sign with multiple possible causes of excess bilirubin.

2. How do IBD and IBS differ?

IBD involves inflammatory disease; IBS is a disorder of gut-brain interaction without the same characteristic inflammatory lesions.

3. Why assess evidence and alternatives?

Several conditions share symptoms, so a mechanism must be supported by appropriate findings.

Hands-on Training in Adult Cardiopulmonary Resuscitation

Experiment 15 - Practical Notes

Name: _____ Roll no.: _____ Date: _____

Aim

To practise adult basic life support and AED use on a training manikin under a qualified instructor.

Principle

Early recognition, activation of emergency help, effective chest compressions and defibrillation when indicated improve the response to cardiac arrest. The adult manikin sequence below follows current basic-life-support principles; it is a supervised skills exercise.

Requirements

- Qualified CPR instructor, adult feedback manikin, AED trainer and compatible training pads.
- Firm training surface, barrier/bag-mask trainer when taught and performance checklist.

Procedure

1. Recognise and activate

Check scene safety and responsiveness. In the simulation, recognise absent or abnormal breathing, including gasping; summon help, activate the local emergency system and request an AED. A trained healthcare rescuer checks pulse and breathing together for no more than 10 seconds; a lay rescuer does not delay CPR to check a pulse.

2. Position for compressions

Place the manikin on a firm surface. Put the heel of one hand on the centre/lower half of the sternum, place the other hand over it, keep arms straight and shoulders over the hands.

3. Compress effectively

Practise 100-120 compressions per minute, at least 5 cm depth while avoiding greater than 6 cm in an average adult. Allow full recoil and minimise interruptions; use the feedback device to check performance.

4. Add breaths when trained

Before an advanced airway, trained rescuers practise 30 compressions followed by 2 breaths. Each breath is delivered over about 1 second with visible chest rise, avoiding excessive ventilation. Untrained rescuers practise compression-only CPR as instructed.

5. Use the AED trainer

Turn it on, expose the manikin chest and attach pads as illustrated by the trainer. Ensure everyone is clear during analysis and simulated shock, then resume compressions immediately as prompted.

6. Continue and review

In team practice, rotate the compressor about every 2 minutes with minimal interruption. In an actual event, continue until professional takeover, signs of normal breathing/response, exhaustion or an unsafe scene, as guided by the dispatcher/instructor.

Observations and Record

Skill	Target / record	Instructor feedback
Recognition / emergency activation	_____	_____
Rate / depth / recoil	100-120/min; 5-6 cm adult target	_____
Breaths / interruption / AED safety	_____	_____

Worked Example

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

- At 110/min, 30 compressions take about 30/110 × 60 = 16.36 seconds before breaths. Timing alone does not establish adequate depth or recoil.

Result

Record instructor-observed performance for recognition, compressions, ventilation and AED use, with the specific skill to improve.

Precautions

- Practise compressions and shocks only on the manikin/AED trainer, never on a healthy person.
- This note covers adult basic life support. Child, infant, drowning and advanced-airway protocols require their specific training.
- Do not pause compressions unnecessarily or touch the manikin during simulated AED analysis/shock.

Viva Questions and Answers

1. Is gasping normal breathing in an unresponsive adult?

No. It can be a sign of cardiac arrest.

2. Why allow recoil?

Recoil supports venous return between compressions.

3. Why resume CPR immediately after an AED shock?

Circulation may remain inadequate and compressions should not be delayed.

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