Unit 10.1 MCQs Set 1

Results

#1. Q1. Which statement best describes the role of bioethics in research methodologies for Ayurveda?

☐
(A) It is irrelevant because Ayurveda is traditional and not subject to modern standards
☐
(B) It ensures informed consent, safety, and respect for participants in line with universal ethical guidelines
☐
(C) It only covers financial disclosures by researchers
☐
(D) It is handled solely by local healers without formal oversight

Bioethics in Ayurveda-based research safeguards participants' rights and welfare by ensuring informed consent and compliance with universal ethical standards.

#2. Q2. Fundamental principles–based research in Ayurveda generally attempts to:

☐
(A) Replace classical doṣa concepts with purely biochemical terms
☐
(B) Investigate or validate classical notions (like Vāta–Pitta–Kapha) using contemporary scientific approaches
☐
(C) Dismiss any link to Caraka or Suśruta Samhitā
☐
(D) Patent well–known home remedies without scientific study

Researchers often correlate traditional concepts with modern scientific models to preserve traditional frameworks while adding empirical validation.

#3. Q3. An important aspect of food– and drug–based research in Ayurveda is:

☐
(A) Bypassing safety checks because herbs are "always safe"
☐
(B) Evaluating nutritional and therapeutic claims for authenticity and ensuring compliance with modern health regulations
☐
(C) Only focusing on consumer taste preferences
☐

(D) Relying solely on traditional anecdotal evidence without empirical testing

Modern research requires rigorous testing of safety, efficacy, and regulatory compliance, even for traditional remedies.

#4. Q4. Which is the incorrect statement about pre-clinical trials in Ayurveda?

☐
(A) They assess safety/toxicity in animal models before human trials
☐
(B) They are optional if the herb is cited in a classical text
☐
(C) They investigate pharmacological actions of extracts
☐
(D) They may explore potential mechanisms or dose ranges

Regardless of classical citations, modern regulatory standards require pre–clinical safety studies.

#5. Q5. (Fill in the blank) During clinical protocol designing in Ayurveda, _____ helps ensure each subject or group receives a defined intervention based on doṣa analysis or standard classification.

☐
(A) Random allocation of subjects
☐
(B) Blinding techniques
☐
(C) Methodology planning
☐
(D) Standardization of treatment protocols

Methodology planning defines specific procedures—including subject grouping and dosing—to ensure systematic study design.

#6. Q6. Which is not typically one of the “phases” of clinical trials for an Ayurvedic new product?

☐
(A) Phase I (safety in a small group)
☐
(B) Phase II (efficacy/dose refining)
☐
(C) Phase III (large–scale validation)
☐
(D) Phase V (immediate, indefinite marketing without supporting data)

Clinical trials are generally categorized as Phases I through IV; a “Phase V” as described does not exist.

#7. Q7. Various extraction methods are crucial because:

☐
(A) All phytoconstituents dissolve equally in water
☐
(B) Different solvents and techniques isolate specific compounds based on their polarity or volatility
☐
(C) Only hexane can extract all phytoconstituents from plants
☐
(D) Extraction methods are interchangeable regardless of chemical properties

The chemical properties of target compounds determine the optimal extraction method and solvent.

#8. Q8. Match the following extraction techniques with their descriptions: Soxhlet extraction; Maceration; Microwave-assisted extraction; Supercritical fluid extraction

☐
(A) 1–b, 2–a, 3–d, 4–c
☐
(B) 1–c, 2–a, 3–d, 4–b
☐
(C) 1–d, 2–b, 3–a, 4–c
☐
(D) 1–a, 2–c, 3–b, 4–d

Soxhlet extraction uses repeated solvent cycling in a heated chamber, maceration is simple soaking, microwave-assisted extraction uses microwave energy, and supercritical fluid extraction employs pressurized solvent conditions.

#9. Q9. (Fill in the blank) The principle of _____ guides the selection of a solvent (polar, semi-polar, or non-polar) for extracting target compounds from plants.

☐
(A) Solvent viscosity
☐
(B) Affinity index
☐
(C) Polarity
☐
(D) Molecular size

Polarity – the principle 'like dissolves like' – is key in selecting a suitable solvent for extraction.

#10. Q10. Purification of bioactive compounds through chromatography is performed because:

☐
(A) Single–step extractions yield completely pure compounds
☐
(B) Different compounds interact differently with the stationary and mobile phases, allowing effective fractionation
☐
(C) Chromatography has no role in herbal research
☐
(D) It is used only for analysis and not for purification

Chromatography separates compounds based on chemical interactions, enabling the isolation of active components from complex herbal extracts.

#11. Q11. Which approach identifies functional groups in phytochemicals by using color or precipitate formation?

☐
(A) GC–MS fragmentation
☐
(B) Simple chemical spot tests (e.g., Dragendorff's reagent for alkaloids)
☐
(C) Infrared spectroscopy
☐
(D) Thin–layer chromatography

Simple chemical spot tests are used to quickly identify the presence of specific groups, such as alkaloids, through colorimetric reactions.

#12. Q12. (Fill in the blank) In many spectroscopic methods, _____ is used to detect characteristic vibrational frequencies of functional groups in molecules.

☐
(A) UV–Vis spectroscopy
☐
(B) NMR spectroscopy
☐
(C) IR spectroscopy
☐
(D) Mass spectrometry

IR spectroscopy is the technique used to detect vibrational frequencies of chemical bonds, which helps identify functional groups.

#13. Q13. A major difference in clinical trials designed for Ayurveda is that they:

☐
(A) Observe doṣa–based subgroups and incorporate both classical and modern outcome measures
☐
(B) Use no controls or randomization
☐
(C) Rely solely on historical texts to determine outcomes
☐
(D) Ignore biochemical markers entirely

Ayurvedic clinical trials often integrate classical (doṣa-based) assessments with modern biomedical endpoints.

#14. Q14. For 'bioethics in Ayurveda research,' which statement is correct?

☐
(A) Ethical rules don't apply to herbal interventions
☐
(B) Informed consent, confidentiality, and risk–benefit analysis remain essential ethical requirements
☐
(C) Trials can bypass local ethics committees
☐
(D) Only international guidelines are followed, ignoring local oversight

Regardless of the tradition, ethical principles—such as informed consent—must be followed in all human research.

#15. Q15. If a new herbal–based formula lacks sufficient existing references, pre–clinical research should include:

☐
(A) No safety tests, based solely on its natural origin
☐
(B) Both acute and chronic toxicity studies in animal models to establish safety margins
☐
(C) Only efficacy studies without toxicity evaluation
☐
(D) Reliance exclusively on historical usage data

Rigorous pre–clinical toxicity studies are essential, even for formulations with a traditional background, to ensure safety before human trials.

#16. Q16. Match the following clinical trial phases with their descriptions: Phase I trial; Phase II trial; Phase III trial; Phase IV trial

☐

(A) 1–a, 2–b, 3–d, 4–c
☐
(B) 1–b, 2–d, 3–c, 4–a
☐
(C) 1–d, 2–c, 3–b, 4–a
☐
(D) 1–b, 2–a, 3–d, 4–c

Phase I determines safety (b), Phase II refines dosage and examines preliminary efficacy (d), Phase III confirms efficacy in a large group (c), and Phase IV involves post–marketing surveillance (a).

#17. Q17. (Fill in the blank) _____ ensures that all data from clinical or pre–clinical studies are systematically recorded, stored, and analyzed for accurate conclusions.

☐
(A) Record keeping protocols
☐
(B) Data curation
☐
(C) Data management
☐
(D) Quality control systems

Effective data management is crucial for ensuring the integrity and reproducibility of research data.

#18. Q18. If an Ayurvedic researcher conducts a ‘fundamental principle–based’ study, a suitable example is:

☐
(A) Analyzing market trends for herbal supplements
☐
(B) Investigating how a specific herb influences pitta–related inflammatory markers, correlating findings with classical texts
☐
(C) Measuring the nutritional content of an herb
☐
(D) Using only modern clinical endpoints without reference to Ayurvedic principles

A fundamental principle-based study integrates classical Ayurvedic concepts with modern measurable outcomes.

#19. Q19. Identifying active leads in a polyherbal formulation commonly employs:

☐
(A) Simple solvent extraction without further separation
☐
(B) Bioassay–guided fractionation, where each fraction is tested for bioactivity
☐
(C) Random fractionation without systematic testing
☐
(D) Direct analysis of the crude extract without separation

Bioassay-guided fractionation is the systematic process of testing separated fractions for their bioactivity to identify the active leads.

#20. Q20. Which statement is incorrect about ‘food–based research’ in Ayurveda?

☐
(A) It examines the nutraceutical aspects of herbal foods
☐
(B) It can assess health benefits through controlled dietary interventions

☐
(C) It never requires any regulatory oversight
☐
(D) It might combine classical knowledge of rasas with modern nutritional science

Food–based research is subject to regulatory oversight, especially when health claims are made.

#21. Q21. Match the following extraction techniques with their descriptions: Maceration; Percolation; Reflux extraction; Ultrasound–assisted extraction

☐
(A) 1–b, 2–a, 3–d, 4–c
☐
(B) 1–a, 2–b, 3–c, 4–d
☐
(C) 1–d, 2–c, 3–b, 4–a
☐
(D) 1–a, 2–b, 3–d, 4–c

Maceration is simple soaking (a), percolation involves continuous solvent flow (b), reflux extraction uses a boiling cycle (d), and ultrasound-assisted extraction employs ultrasonic waves (c).

#22. Q22. (Multiple–choice, Fill in the blank) The _____ approach in Ayurveda–based research focuses first on clinically observed benefits and then investigates underlying mechanisms in the lab.

☐
(A) Forward translation
☐
(B) Translational research
☐
(C) Clinical–first approach
☐
(D) Reverse pharmacology

Reverse pharmacology starts with clinical observations and then explores lab mechanisms.

#23. Q23. ‘Chromatographic purification’ is important because:

☐
(A) It eliminates all impurities in one step
☐
(B) Ayurvedic herbs contain complex mixtures; isolating active compounds clarifies which constituents exert the therapeutic effect
☐
(C) It is used only for the quantification of compounds
☐
(D) It primarily provides a fingerprint for quality control rather than for purification

Chromatography separates the complex mixtures found in herbal extracts, helping identify the active components.

#24. Q24. If a new Ayurveda formula is tested in humans without prior toxicity or regulatory clearance, it may lead to:

☐
(A) A misconception that natural products are inherently safe
☐
(B) Ethical and legal violations, potentially endangering volunteers and damaging researcher credibility
☐
(C) Rapid, unregulated market approval

☐
(D) Inconclusive results due to underpowered studies

Skipping toxicity and regulatory clearance leads to ethical and legal risks, endangering participants and compromising research credibility.

#25. Q25. Dragendorff's reagent is commonly used to detect:

☐
(A) Carbohydrates
☐
(B) Alkaloids
☐
(C) Tannins
☐
(D) Proteins

Dragendorff's reagent reacts with alkaloids to form a characteristic colored precipitate.

#26. Q26. A typical reason for measuring 'particle size' in extracts or final formulations is:

☐
(A) To determine the flavor profile of the extract
☐
(B) Because bioavailability may change if the constituents are finer or coarser, affecting dissolution and absorption
☐
(C) To assess the color uniformity of the product
☐
(D) To evaluate the extraction efficiency

Particle size influences the dissolution, absorption, and ultimately the bioavailability of the compounds.

#27. Q27. (Multiple-choice, Fill in the blank) Ayurvedic protocols for clinical studies usually integrate '_____,' a documentation method that captures each subject's doṣa constitution and imbalance.

☐
(A) A standardized laboratory test battery
☐
(B) A detailed patient history form
☐
(C) Case documentation as per classical format
☐
(D) A modern diagnostic algorithm

Classical case documentation captures specific information regarding a subject's doṣa constitution, integral to Ayurveda.

#28. Q28. One important aspect in 'food-based research' for Ayurveda is:

☐
(A) Analyzing only the flavor profiles of herbal foods
☐
(B) Investigating the synergy between traditional dietary guidelines (pathya) and measurable health benefits such as glycemic control and gut health
☐
(C) Focusing solely on calorie content
☐
(D) Evaluating packaging design for consumer appeal

Ayurvedic food research examines how traditional dietary practices influence measurable health outcomes.

#29. Q29. Which statement is not correct about polarity in extraction?

☐
(A) Polar solvents (e.g., water, methanol) dissolve polar molecules
☐
(B) Non–polar solvents (e.g., hexane) dissolve lipids and essential oils
☐
(C) Mid–polar solvents (e.g., ethyl acetate) extract certain phenolics or glycosides
☐
(D) A single solvent is always sufficient to extract all classes of phytochemicals

Due to the varying polarities of phytochemicals, no single solvent can extract all compounds efficiently.

#30. Q30. In pre–clinical safety evaluation, an LD50 test:

☐
(A) Measures the effective therapeutic dose
☐
(B) Determines the lethal dose at which 50% of test animals die, indicating the acute toxicity range
☐
(C) Calculates the average recovery time after exposure
☐
(D) Identifies the dose required for a noticeable pharmacological effect

LD50 quantifies the dose at which 50% of the test subjects succumb, indicating acute toxicity levels.

#31. Q31. Match the following clinical trial phases with their descriptions: Phase I trial; Phase II trial; Phase III trial; Phase IV trial

☐
(A) 1–a, 2–b, 3–d, 4–c
☐
(B) 1–b, 2–d, 3–c, 4–a
☐
(C) 1–d, 2–c, 3–b, 4–a
☐
(D) 1–b, 2–a, 3–d, 4–c

Phase I trials determine safety (b), Phase II trials refine dosage and assess preliminary efficacy (d), Phase III trials confirm efficacy on a large scale (c), and Phase IV involves post-marketing surveillance (a).

#32. Q32. Why randomization is crucial in Ayurvedic clinical trials.

☐
(A) There is a lack of reliable historical data
☐
(B) It minimizes selection bias, ensuring that treatment groups are comparable and results are more credible
☐
(C) It speeds up the trial process significantly
☐
(D) It is required by international regulatory bodies only

Randomization ensures that confounding variables are evenly distributed, reducing bias in trial outcomes.

#33. Q33. If an extract is fractionated by column chromatography and each fraction is tested for bioactivity, this approach is known as:

☐
(A) Simple solvent extraction
☐
(B) Bioassay–guided fractionation

☐
(C) Random fractionation without testing
☐
(D) Direct analysis of the crude extract

Bioassay-guided fractionation involves testing each fraction for bioactivity to identify the active components.

#34. Q34. GC–MS is most suitable for analyzing:

☐
(A) High molecular weight polymers
☐
(B) Volatile oils or low–boiling phytochemicals in an Ayurvedic formula
☐
(C) Non–volatile, thermally labile compounds
☐
(D) Large biomolecules like proteins

GC–MS is ideal for analyzing volatile or semi-volatile compounds such as essential oils in herbal extracts.

#35. Q35. In designing data management, the researcher ensures that:

☐
(A) Data is collected without standardization
☐
(B) Every data entry is tracked from source (lab/clinic) to final analysis for accuracy and reproducibility
☐
(C) Data is stored in multiple uncoordinated formats
☐
(D) Results are interpreted without verification

Systematic data management ensures accuracy and reproducibility in research findings.

#36. Q36. A reason to integrate classical doṣa endpoints with modern biomarkers in an Ayurvedic clinical study is:

☐
(A) It is irrelevant to modern research
☐
(B) It can demonstrate synergy between subjective traditional assessments and objective measures
☐
(C) It undermines the validity of classical methods
☐
(D) It increases the complexity without added benefit

Integrating traditional endpoints with modern biomarkers provides a comprehensive evaluation of therapeutic outcomes.

#37. Q37. (Multiple-choice, Fill in the blank) '_____ tests,' such as the $FeCl_3$ color reaction, can help reveal the presence of phenolic or polyphenolic groups in plant extracts.

☐
(A) Spectrophotometric
☐
(B) Chromatographic
☐
(C) Colorimetric
☐
(D) Electrochemical

Colorimetric tests produce observable color changes when specific functional groups, like phenols, are present.

#38. Q38. Which statement is not correct about ‘reverse pharmacology’ in Ayurveda?

☐
(A) It starts by observing traditional usage outcomes first
☐
(B) It subsequently uses laboratory research to confirm or elucidate mechanisms
☐
(C) It never requires any modern data or validation
☐
(D) It can accelerate the translation of classical experience into modern evidence

Reverse pharmacology integrates modern validation with traditional observations; it does not exclude modern data.

#39. Q39. Pre-clinical toxicity tests typically do not include:

☐
(A) Acute toxicity studies (e.g., LD50 determination)
☐
(B) Placebo–controlled evaluations
☐
(C) Observations of organ pathology and serum biochemistry post–exposure
☐
(D) Chronic ingestion studies for carcinogenic or mutagenic effects

Pre-clinical toxicity studies typically focus on dose-related toxicity and do not involve placebo-controlled designs.

#40. Q40. Match the following analytical techniques with their functions: HPLC; NMR; IR spectroscopy; GC–MS

☐
(A) 1–c, 2–d, 3–b, 4–a
☐
(B) 1–d, 2–c, 3–a, 4–b
☐
(C) 1–a, 2–b, 3–c, 4–d
☐
(D) 1–b, 2–a, 3–d, 4–c

HPLC separates components under pressure (d), NMR provides nuclear spin information (c), IR spectroscopy identifies functional groups (a), and GC–MS separates volatile compounds and analyzes fragments (b).

#41. Q41. If an herbal formula aims to reduce ‘Ama’ (toxic accumulations), a modern trial might measure:

☐
(A) Gastrointestinal transit time
☐
(B) Inflammatory or oxidative stress markers (e.g., CRP, MDA)
☐
(C) Blood pressure changes
☐
(D) Liver enzyme levels

Measuring inflammatory or oxidative stress markers can serve as a modern endpoint corresponding to the Ayurvedic concept of reducing ‘Ama.’

#42. Q42. The advantage of conducting a pilot study in a new Ayurvedic research protocol is

☐
(A) It identifies potential logistical or design flaws, allowing refinement of the main study before full launch.

☐
(B) It reduces the time of new drug launch
☐
(C) It helps in identifying the target market
☐
(D) It helps in hiding the facts

Pilot studies help detect issues early to improve the quality and efficiency of larger studies.

#43. Q43. In a controlled clinical trial, the use of a ‘placebo’ in an Ayurvedic context helps to:

☐
(A) Reduce overall study costs
☐
(B) Compare the herbal intervention against an inert substance, confirming observed effects are due to the intervention
☐
(C) Increase the complexity of blinding without added benefit
☐
(D) Allow flexible dosing adjustments during the trial

Placebo controls help to distinguish true therapeutic effects from placebo effects in clinical research.

#44. Q44. For extracting lipophilic fractions from plant material, a typical solvent is:

☐
(A) Water
☐
(B) Hexane or petroleum ether
☐
(C) Ethanol
☐
(D) Acetone

Non-polar solvents such as hexane are optimal for extracting lipophilic compounds.

#45. Q45. Which best reflects ‘clinical data management’ in an Ayurvedic trial?

☐
(A) Relying on handwritten notes without standardization
☐
(B) Using standardized case report forms (CRFs) and digital databases with validation protocols
☐
(C) Storing data in disparate, uncoordinated formats
☐
(D) Performing manual data entry without cross-checking

Robust clinical data management involves the use of standardized digital tools to ensure data integrity and reproducibility.

#46. Q46. Which statement is incorrect about functional group identification?

☐
(A) IR spectroscopy can reveal characteristic peaks for groups such as –OH and C=O
☐
(B) NMR spectroscopy can determine the environment of hydrogen or carbon nuclei in molecules
☐
(C) Spot tests (e.g., Dragendorff’s reagent) can confirm the presence of alkaloids
☐
(D) It is unnecessary to confirm the structure if the plant source is well–known

Even for well-known plants, confirming chemical structures via functional group analysis is necessary due to variability in

composition.

#47. Q47. If an Ayurvedic formula claims to reduce blood sugar, pre-clinical models might use:

☐
(A) Normoglycemic animal models
☐
(B) Diabetic animal models (e.g., streptozotocin-induced or diet-induced hyperglycemia)
☐
(C) In vitro cell culture assays only
☐
(D) Studies in healthy volunteers

Using diabetic animal models is appropriate to assess a formula's hypoglycemic effects.

#48. Q48. During a Phase II trial for an herbal pill, the main aim is:

☐
(A) Evaluating the long-term safety profile
☐
(B) Assessing efficacy in a moderate patient group and refining the dosage range
☐
(C) Comparing multiple herbal formulations simultaneously
☐
(D) Monitoring post-marketing trends

Phase II trials focus on evaluating efficacy and determining the optimal dose in a moderate-sized patient group.

#49. Q49. (Multiple-choice, Fill in the blank) A major approach called '_____ fractionation' involves repeated extraction, isolation, and testing of each fraction for its bioactivity.

☐
(A) Solvent
☐
(B) Preliminary
☐
(C) Sequential
☐
(D) Bioassay–guided

Bioassay-guided fractionation is the process where fractions are repeatedly isolated and tested for bioactivity to identify the active constituent(s).

#50. Q50. A recommended best practice for fundamental Ayurveda research is to:

☐
(A) Focus solely on traditional texts without modern validation
☐
(B) Combine classical doṣa– or guṇa–based frameworks with rigorous modern scientific validation methods
☐
(C) Rely exclusively on empirical modern techniques while ignoring classical principles
☐
(D) Use only qualitative assessments without quantitative analysis

An integrative approach that combines traditional principles with modern scientific rigor provides more robust evidence.

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