



- 8 A popular statistical tool used in screening design is:
- ANOVA
  - Full factorial design
  - Plackett–Burman design
  - Linear regression
- 9 Which of the following is a typical response (output) in microemulsion DoE studies?
- Viscosity of ink
  - Emulsion packaging material
  - Globule size, polydispersity index (PDI), % transmittance
  - Barcode scanning time
- 10 PBPK models integrate which of the following data types?
- Marketing data
  - Human anatomy, physiology, and drug properties
  - Supply chain logistics
  - Color coding of tablets
- 11 In parameter sensitivity analysis, the output is typically presented as
- Heatmaps
  - Sensitivity plots or tornado charts
  - Audio files
  - Chemical structures
- 12 A major advantage of virtual trials is
- They replace packaging design
  - They eliminate all real clinical testing
  - They reduce cost and time of development by simulating populations
  - They can be used for drug labelling
- 13 In the fed state, a high-fat meal usually
- Increases gastric pH and delays gastric emptying
  - Speeds up drug elimination
  - Has no effect on drug absorption
  - Always decreases solubility
- 14 Which medium is often used in in vitro dissolution testing to simulate gastric fluid?
- Water
  - 0.1 N HCl
  - Ethanol
  - PBS
- 15 Level A IVIVC implies:
- No correlation at all
  - A single point correlation
  - A point-to-point correlation over the entire time course
  - In vivo test only

- 16 Biowaivers are most commonly granted for:
- BCS Class I drugs
  - BCS Class II drugs
  - BCS Class IV drugs
  - Herbal drugs only
- 17 Pharmacodynamics simulation typically involves:
- Drug synthesis modelling
  - Modeling the effect of drug on the body
  - Printing of labels
  - Pharmacovigilance reports
- 18 AI-based drug discovery primarily uses
- Mechanical operations
  - Manual calculations
  - Machine learning and deep learning algorithms
  - Robotic arms only
- 19 What is a key benefit of pharmaceutical robotics?
- Manual quality inspection
  - Faster and more sterile manufacturing processes
  - Increasing marketing reach
  - Personalized patient counselling
- 20 Computational Fluid Dynamics can optimize
- Tablet shape only
  - Process scale-up, spray drying, and mixing operations
  - Only financial processes
  - Labeling accuracy

Q.2 Answer **any two** of the following three questions. (20)

- A
- What is discretization? Discuss the various discretization methods involved in computational fluid dynamics. (5)
  - Discuss the applications of artificial intelligence in pharmaceutical development. (5)
- B Write a short note on the various elements of Quality by Design. Explain CPP in detail. (10)
- C Describe various models of simulating drug absorption. Give a detailed account of the Gastroplus simulation tool. (10)

Q.3 Answer any seven of the following nine questions.

- A Describe the role of machine learning in the healthcare sector.
- B Discuss formulation development using an optimization technique
- C Give a detailed account on biowaivers.
- D Write a short note on artificial neural network for product development.
- E Discuss significance of OCT and p-gp transporters and describe any one method of their computational modeling.
- F Explain parameters that are varied in parameter sensitivity analysis.
- G Enlist screening designs. Discuss any one screening design in detail
- H Write a note on the significance of confidence regions.
- I Discuss statistical modeling and different types of models used in research and development field of pharmaceuticals

\*\*\*\*\*