

Seat No.	
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PD-30

Total No. of Pages : 10

Ph.D. Entrance Examination, 2025
CHEMICAL ENGINEERING
Sub. Code : 58750

Day and Date : Tuesday, 09-09-2025

Total Marks : 100

Time : 04.00 p.m. to 6.00 p.m.

Instructions:

1. All questions are compulsory.
2. Each question carries 2 marks.
3. Answers should be marked in the given OMR answer sheet by darkening the appropriate option.
4. Use black ball point pen only for marking the circle. Do not make any stray mark on the OMR Answer Sheet.
5. Follow the instructions given on OMR Sheet.
6. Rough work shall be done on the sheet provided at the end of question paper.
7. Only non programmable calculators are allowed.

Section - I

Research Methodology

1. Which type of research primarily focuses on generating knowledge through experiments and systematic study?
a) Applied Research b) Basic Research
c) Exploratory Research d) Diagnostic Research
2. The initial step in defining a research problem is:
a) Reviewing literature. b) Defining objectives
c) Identifying the problem d) Formulating a hypothesis
3. Which scaling technique categorizes responses in a sequence from strongly agree to strongly disagree?
a) Nominal Scale b) Interval Scale
c) Ratio Scale d) Likert Scale

4. In research, which term describes the overall strategy that a researcher employs to integrate various components of the study?
- a) Research Method
 - b) Research Hypothesis
 - c) Research Design
 - d) Data Collection
5. Which statistical test would you apply to analyze relationships between categorical variables?
- a) Chi-square Test
 - b) T-Test
 - c) ANOVA
 - d) Regression Analysis
6. The measure of how spread out a set of data values is called:
- a) Mean
 - b) Median
 - c) Dispersion
 - d) Correlation
7. A hypothesis that is not stated in terms of equality or inequality is termed:
- a) Alternative Hypothesis
 - b) Null Hypothesis
 - c) Directional Hypothesis
 - d) Non-directional Hypothesis
8. An approach where the researcher uses a smaller group to represent a larger population is called:
- a) Sampling
 - b) Experimentation
 - c) Hypothesis Testing
 - d) Case Study
9. Which term refers to the consistency of measurement results?
- a) Validity
 - b) Reliability
 - c) Accuracy
 - d) Precision
10. The procedure of examining the alignment between variables and conclusions in research is:
- a) Literature Review
 - b) Sampling
 - c) Data Analysis
 - d) Hypothesis Testing

11. A systematic review of previous work on a research problem is called a:
- a) Research Design
 - b) Hypothesis
 - c) Literature Review
 - d) Research Report
12. In hypothesis testing, a Type I error occurs when:
- a) The null hypothesis is true, but rejected
 - b) The null hypothesis is false, but accepted
 - c) There is no hypothesis
 - d) Data is unreliable
13. Which of the following is an ethical issue in research?
- a) Sampling
 - b) Plagiarism
 - c) Scaling
 - d) Validity
14. When variables cannot be directly measured, researchers use:
- a) Hypothesis
 - b) Constructs
 - c) Sampling methods
 - d) Parametric tests
15. A tool that helps ensure accuracy in data interpretation through the testing of pre-assumptions is known as:
- a) Experimental design
 - b) Hypothesis testing
 - c) Data visualization
 - d) Survey methodology
16. Which of the following research designs is used to study relationships between variables without manipulating them?
- a) Experimental
 - b) Correlational
 - c) Longitudinal
 - d) Quasi-experimental

17. The act of defining a specific research topic within broad research goals is known as:
- a) Narrowing the research
 - b) Developing a hypothesis
 - c) Conceptualizing a research design
 - d) Data analysis
18. Which statistical test compares means across multiple groups to assess variance?
- a) Regression analysis
 - b) T-test
 - c) Chi-square test
 - d) ANOVA
19. Which type of variable cannot be divided or categorized, as it represents a whole number?
- a) Continuous variable
 - b) Discrete variable
 - c) Nominal variable
 - d) Ordinal variable
20. In sampling methods, stratified sampling involves:
- a) Dividing a population into subgroups based on characteristics
 - b) Choosing a sample at random
 - c) Choosing samples that are closest in proximity
 - d) Using a fixed interval for selection
21. A comprehensive written document that includes the findings and interpretation of research is called a:
- a) Survey
 - b) Manuscript
 - c) Research report
 - d) Thesis.
22. The relationship between independent and dependent variables in quantitative research is often assessed using:
- a) Case studies
 - b) Regression analysis
 - c) Qualitative interviews
 - d) Content analysis

23. Which type of scale assigns labels without implying a specific order?
- a) Interval scale
 - b) Ordinal scale
 - c) Nominal scale
 - d) Ratio scale
24. In research methodology, 'triangulation' refers to:
- a) Conducting the study three times
 - b) Using multiple methods to collect data
 - c) Dividing the sample into three groups
 - d) Applying three different statistical tests
25. A logical structure that connects research questions, methods, and analysis is termed as:
- a) Data collection
 - b) Theoretical framework
 - c) Variable analysis
 - d) Ethical consideration

Section - II

CHEMICAL ENGINEERING CORE

1. What is the primary purpose of a shell and tube heat exchanger?
- a) To store liquids
 - b) To transfer heat between two fluids
 - c) To filter gases
 - d) To mix chemicals
2. The measure of how easily gas diffuses in a liquid is called:
- a) Permeability
 - b) Diffusivity
 - c) Conductivity
 - d) Viscosity

3. Residence time distribution (RTD) is critical in analyzing:
- a) Reactor mixing and flow patterns
 - b) Pressure drop in pipes
 - c) Filtration efficiency
 - d) Thermal expansion
4. Which model is commonly used for non-ideal flow in reactors?
- a) Continuity Model
 - b) PFR Model
 - c) Dispersion Model
 - d) Ideal Model
5. In chemical kinetics, which factor does not affect reaction rate?
- a) Temperature
 - b) Pressure
 - c) Catalyst
 - d) Color of reactant
6. The law governing the relationship between pressure, volume, and temperature in an ideal gas is:
- a) Avogadro's Law
 - b) Boyle's Law
 - c) Charles's Law
 - d) Ideal Gas Law
7. Which technique is essential for determining bubble size distribution in multiphase systems?
- a) Chromatography
 - b) Light Scattering
 - c) Electrolysis
 - d) Mass Spectrometry
8. A batch reactor is best suited for:
- a) Continuous production
 - b) Large-scale manufacturing
 - c) Chemical reactions that require varied residence times
 - d) Fast reaction rates

9. In thermodynamics, the Gibbs free energy change predicts:
- a) System equilibrium
 - b) Reaction spontaneity
 - c) Temperature changes
 - d) Pressure changes
10. The heat transfer in a stirred tank depends mainly on:
- a) Fluid velocity
 - b) Tank color
 - c) Stirrer material
 - d) Power consumption
11. Which of the following processes uses a semi-permeable membrane to separate components of a mixture?
- a) Distillation
 - b) Filtration
 - c) Reverse osmosis
 - d) Adsorption
12. The main function of a cyclone separator in a chemical plant is to:
- a) Cool down gases
 - b) Separate solids from gases
 - c) Absorb water vapor
 - d) Mix chemicals
13. What is the primary role of a catalyst in a chemical reaction?
- a) To increase the temperature
 - b) To provide a reaction surface
 - c) To decrease the activation energy
 - d) To change the products
14. The Schmidt number relates which two properties in a mass transfer system?
- a) Mass diffusivity and thermal diffusivity
 - b) Viscosity and thermal diffusivity
 - c) Viscosity and mass diffusivity
 - d) Conductivity and density

15. What kind of flow is defined by a Reynolds number below 2000?
- a) Turbulent flow
 - b) Laminar flow
 - c) Transitional flow
 - d) Compressible flow
16. In a reaction where the product is reintroduced into the reactant mixture, it is known as a:
- a) Batch process
 - b) Continuous process
 - c) Recycling process
 - d) Sequential process
17. In distillation, a column with trays provides:
- a) Increased reflux ratio
 - b) Enhanced vapor-liquid contact
 - c) Lower temperature difference
 - d) Reduced energy consumption
18. The critical pressure of a substance is the pressure at which:
- a) The substance can exist as both liquid and gas
 - b) Only liquid state exists
 - c) Only gas state exists
 - d) The pressure remains constant
19. In mass transfer, the Graetz number is related to:
- a) Heat transfer in laminar flow
 - b) Mass transfer in turbulent flow
 - c) Mass transfer in laminar flow
 - d) Heat transfer in turbulent flow
20. Which of the following refers to a system in which no energy or matter can enter or exit?
- a) Closed system
 - b) Open system
 - c) Isolated system
 - d) Cyclic system

21. In a packed bed reactor, pressure drop depends on:
- a) Fluid viscosity and flow rate
 - b) Temperature and reaction rate
 - c) Chemical composition of the fluid
 - d) Color of packing material
22. Fick's first law is applicable to:
- a) Steady-state diffusion
 - b) Unsteady-state diffusion
 - c) Heat transfer in solids
 - d) Flow through porous media
23. The Damköhler number is used to compare:
- a) Diffusion rate and convection rate
 - b) Reaction rate and diffusion rate
 - c) Heat transfer rate and mass transfer rate
 - d) Fluid velocity and pressure
24. In fluid flow, Bernoulli's equation represents the conservation of:
- a) Mass
 - b) Momentum
 - c) Energy
 - d) Volume
25. Which of the following terms describes a reaction that absorbs heat?
- a) Exothermic
 - b) Endothermic
 - c) Isothermal
 - d) Adiabatic



- Rough Work -