NCEES_Principles_and_Practice_of_Engineering_Examination

CHEMICAL

DAY	Topic/ Number of Questions	Knowledge Area	√	DAY	Topic/ Number of Questions	Knowledge Area	√
1	1. Mass/Energy Balances 12–18 A. Mass Balances 6–9	1. Mass balances with no reaction (e.g., density, composition, purge,bypass, recycle)		31	5. Fluids 10–16 B. Applications 5–8	3. Flow measurement	
2		2. Mass balances with reaction (e.g., stoichiometry, combustion, incomplete reactions, excess reactant, purge, bypass, recycle)		32	6. Mass Transfer 7–11 A. Fundamentals 3–5	1. Modes of mass transfer (e.g., diffusion, convection, mass-transfer coefficients)	
3		1. Energy balances with no reaction (e.g., sensible heat, latent heat, heat of solution)		33		2. Staged separations (e.g., theoretical stages, reflux rates, feed location, minimum reflux, minimum stages)	
4		2. Energy balances with reaction (e.g., heat of reaction/combustion and combination with sensible heat, latent heat)		34	6. Mass Transfer 7–11 B. Applications 4–6	1. Distillation (e.g., batch or continuous, trayed or packed, capacity/efficiency)	
5	2. Thermodynamics 11–17 A. Basic Thermodynamics 4–6	1. State functions (e.g., ideal gas law, nonideal gas, equations of state, compressibility)		35		2. Gas-liquid operations (e.g., absorption, stripping, scrubbing)	
6	Rest	Rest		36	Rest	Rest	
7	2. Thermodynamics 11–17 A. Basic Thermodynamics 4–6	2. First and second laws of thermodynamics (e.g., enthalpy, entropy,work, free energy, heat capacity)		37	6. Mass Transfer 7–11 B. Applications 4–6	3. Other separations (e.g., liquid-liquid, liquid-solid, gas-solid, extraction, drying, adsorption, filtration, membrane separations, crystallization)	
8		3. Power cycles (e.g., refrigeration, engines, turbines, compressors,heat recovery)		38	7. Plant Design and Operation 15–23 A. Safety, Health, and Environment 4–6	1. Hazards identification and management (e.g., chemical and reactivity hazards, process hazard analysis, independent protection layers, Safety Data Sheets, exposure limits and control)	
9	2. Thermodynamics 11–17 B. Chemical Equilibria 3–5	1. Reaction equilibria (e.g., equilibrium composition, reversible/irreversible)		39		2. Protective systems (e.g., pressure relief, inerting, discharge location, secondary containment)	
10		2. Temperature and pressure dependence (e.g., Le Chatelier Principle)		40		3. Environment (e.g., emissions evaluation, mitigation, remediation)	
11	2. Thermodynamics 11–17 C. Phase Equilibria 4–6	1. Ideal systems (e.g., Henry's Law, Raoult's Law, vapor pressure, Clausius-Clapeyron equation)		41	7. Plant Design and Operation 15–23 B. Design 7–11	1. Process design (e.g., scale-up, process or product development, process flow diagrams, P&IDs, specifications, layout and siting considerations, economics)	
12	Rest	Rest		42	Rest	Rest	
13	2. Thermodynamics 11–17 C. Phase Equilibria 4–6	2. Nonideal systems (e.g., activity coefficients, fugacity coefficients, azeotropes, immiscible/partially miscible phases)		43	7. Plant Design and Operation 15–23 B. Design 7–11	2. Materials of construction (e.g., material properties and selection, corrosion)	
14		3. Phase equilibrium applications (e.g., bubble point, dew point, flash, solubility, critical states)		44		3. Process equipment design (e.g., equipment selection, optimization, sizing)	
15	3. Heat Transfer 9–14 A. Fundamentals 5–8	1. Heat transfer with no phase change (e.g., conduction, convection, radiation, mixed modes)		45		4. Instrumentation and process control (e.g., sensors, controller actions, control valve sizing, alarms, safety instrumented systems)	
16		2. Heat transfer with phase change (e.g., vaporization, evaporation, condensation, sublimation)		46	7. Plant Design and Operation 15–23 C. Operation and Maintenance 4–6	1. Operation (e.g., procedures, startup/shutdown)	
17	3. Heat Transfer 9–14 B. Applications 4–6	1. Heat exchange equipment design (e.g., heat-transfer coefficients, fouling factors, LMTD, F-factor, equipment selection, insulation)		47		2. Process equipment and reliability (e.g., testing, maintenance, mechanical integrity, failure mechanisms)	
18	Rest	Rest		48	Rest	Rest	
19	3. Heat Transfer 9–14 B. Applications 4–6	2. Heat exchange equipment analysis (e.g., pressure drop, fouling effects, performance evaluation/NTU)		49	7. Plant Design and Operation 15–23 C. Operation and Maintenance 4–6	3. Process improvement and troubleshooting (e.g., debottlenecking, optimization)	
20	4. Chemical Reaction Engineering 6–10 A. Fundamentals 3–5	1. Rate equation (e.g., rate constant, order of reaction, temperature/ concentration/pressure dependence, Arrhenius equation)		50	Rest	Rest	
21		2. Yield and selectivity		51	Test,Review	Test,Review	
22	4. Chemical Reaction Engineering 6–10 B. Applications 3–5	1. Conversion in reactors (e.g., batch reactor, PFR, CSTR, catalytic reactors, reactors in series or parallel, recycle)		52		Test,Review	
23		2. Heat effects in reactors (e.g., endothermic, exothermic, adiabatic)		53		Test,Review	
24	Rest	Rest		54		Test,Review	
25	5. Fluids 10–16 A. Fundamentals 5–8	1. Mechanical-energy balance (e.g., Bernoulli equation, viscosity, Reynolds number)		55		Test,Review	
26		2. Incompressible flow (e.g., piping systems, porous media)		56	Rest	Rest	
27		3. Compressible flow (e.g., piping systems, sonic velocity, choked flow)		57	Exam	Exam	
28	5. Fluids 10–16 B. Applications 5–8	1. Pumps, compressors, turbines, fans, and blowers					
29		2. Mixing					
30	Rest	Rest