

National Council of Examiners for Engineering and Surveying
Principles and Practice of Engineering Examination
MINING AND MINERAL PROCESSING Specifications
EFFECTIVE Beginning with the October 2009 Examinations

	<u>Approximate Percentage of Examination</u>
I. Exploration	12.5%
A. Apply exploration methods and techniques (e.g., design and implement exploration plan)	3.75%
1. Fundamental physical and structural geology and stratigraphy	
2. Geological surveying and mapping (e.g., aerial photography, strike and dip, three-point problems)	
3. Laws and regulations governing hard-rock minerals, leasable minerals, and common variety minerals (e.g., 1872 Mining Law, Titles 30 and 43 CFR)	
B. Characterize site geologic and geotechnical conditions	3.75%
1. Hydrology/hydrogeology	
2. Sampling techniques (e.g., exploratory drilling, trenching, field samples)	
3. Analysis and interpretation (e.g., chemical and physical properties of the samples, rock mass classifications, ground stress)	
4. Modeling (e.g., geologic, digital terrain model [DTM])	
C. Estimate, characterize, and evaluate resource/reserves	5%
1. Resource/reserve classification systems	
2. Economic geology (e.g., grade distribution, cut-off grade, stripping ratios)	
3. Resource estimation techniques and interpretation (e.g., quality and quantity methodologies)	
II. Mine Planning/Operations	40%
A. Plan, design, and implement mining methods and layouts	10%
1. Surface mining methods and planning (e.g., contour strip, open pit/area, quarries, dredging)	
2. Underground mining methods and planning (e.g., block caving, cut and fill, room and pillar, shrinkage stoping, underhand and overhand stoping, longwall)	
3. Deposit access (e.g., adits, slopes, shafts, haul roads)	
B. Plan, design, select, and/or construct mine equipment, facilities, and systems	16.25%
1. Production equipment, facilities, and systems	
2. Material handling and transportation equipment, facilities, and systems	
3. Ventilation equipment, facilities, and systems	
4. Power distribution equipment, facilities, and systems (e.g., electrical, compressed air, hydraulic)	

5. Rock fragmentation equipment, facilities, and systems (e.g., cutting/ boring machines, drilling, blasting and explosives)	
6. Pumping, dewatering, and drainage equipment, facilities, and systems	
7. Communication, monitoring, and control equipment, facilities and systems	
C. Evaluate and design ground control	8.75%
1. Surface and underground ground control analysis and methods for coal, hard rock, and industrial minerals (e.g., slope stability, strata control, pillar design, shaft stability, geomechanics)	
D. Operate and manage mines and systems	5%
1. Mine surveying and mapping	
2. Resource requirements evaluation (e.g., equipment, materials, personnel, logistical support)	
3. Mine maintenance systems	
III. Mineral Processing	30%
A. Perform laboratory and pilot testing/analyses	5%
1. Lab-scale metallurgical, mineral processing, and analytical test procedures (e.g., atomic absorption, diagnostic leaching, solvent extraction, Bond work index, coal washability, physical separations)	
2. Integration of mineralogical and chemical characteristics for selection of appropriate processing techniques	
B. Design and evaluate process flowsheets	11.25%
1. Laboratory and pilot results interpretation, process flowsheet determination, and production level scale-up	
2. Hydrometallurgical principles (e.g., electrochemistry, biohydrometallurgy, leaching, solvent extraction, precipitation, crystallization)	
3. Pyrometallurgical principles (e.g., fluid bed roasting, smelting, calcination)	
4. Comminution, classification, and beneficiation principles (e.g., crushing, grinding, flotation, gravity separation)	
5. Solid/liquid separation principles (e.g., thickening, filtration)	
6. Material, water, heat, and energy balances	
C. Plan, design, select, and/or construct plant equipment, facilities, and systems	8.75%
1. Site considerations and plant layout	
2. Unit operations and equipment selection and sizing (e.g., tank sizing, pumping, piping, conveying)	
D. Operate and manage plants and facilities	5%
1. Control of plant performance to maintain product quality (e.g., operate mill or preparation plant equipment; process control systems)	
2. Maintenance of mill or preparation plant systems	
3. Resource requirements evaluation (e.g., reagents, materials, personnel, mill feed, logistical support)	

IV. Environment and Reclamation	17.5%
A. Characterize site, mining, and process environment	5%
1. Surface water, groundwater, and air characterization and contaminant transport	
2. Environmental chemistry, geochemistry, geology, and ecology	
3. Waste characterization	
4. Characterization of site conditions using field and laboratory data	
B. Plan and design to mitigate exploration, mining, and processing impacts	6.25%
1. Waste containment systems (e.g., tailings and slurry impoundments, caps, liners, leakage recovery and detection systems)	
2. Potable, process, and wastewater treatment systems	
3. Mining and processing solid waste treatment systems	
4. Pollution monitoring and prevention measures (e.g., sediment control, surface water discharge, dust, air filtration systems)	
5. Site water balance preparation	
C. Operate and manage environmental and reclamation plan	3.75%
1. Site monitoring and analysis (e.g., subsidence, ground and surface water, vibration, noise, air)	
2. Environmental planning and cost estimation	
3. Reclamation planning and cost estimation	
D. Close and reclaim the site	2.5%
1. Earthwork techniques and equipment (e.g., grading, cutting, filling, ripping)	
2. Post-mining land configuration and erosion control system design (e.g., riprap, ditches, silt fences, matting, sedimentation ponds)	
Total	100%

Notes

1. The knowledge areas specified under A, B, C, ... etc., are examples of kinds of knowledge, but they are not exclusive or exhaustive categories.
2. This exam contains 80 multiple-choice questions. Examinee works all questions.
3. This exam includes universal considerations common to each of the knowledge and skill groups. The universal considerations topics include general engineering skills, engineering economics and cost management, observance of laws and regulations, and facility construction. These universal considerations may be incorporated into any of the questions on the exam.