PE mining and mineral processing practice exam
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About NCEES
NCEES is a nonprofit organization made up of the U.S. engineering and surveying licensing boards in all 50 states, the U.S. territories, and the District of Columbia. We develop and score the exams used for engineering and surveying licensure in the United States. NCEES also promotes professional mobility through its services for licensees and its member boards.

Engineering licensure in the United States is regulated by licensing boards in each state and territory. These boards set and maintain the standards that protect the public they serve. As a result, licensing requirements and procedures vary by jurisdiction, so stay in touch with your board (ncees.org/licensing-boards).

Exam format
The PE Mining and Mineral Processing exam is computer-based. It contains 85 questions and is administered one day per year via computer at approved Pearson VUE test centers. A 9.5-hour appointment time includes a nondisclosure agreement, a tutorial, the exam, and a break. You’ll have 8.5 hours to complete the actual exam.

In addition to traditional multiple-choice questions with one correct answer, the PE Mining and Mineral Processing exam uses common alternative item types such as

• Multiple correct options—allows multiple choices to be correct
• Point and click—requires examinees to click on part of a graphic to answer
• Drag and drop—requires examinees to click on and drag items to match, sort, rank, or label
• Fill in the blank—provides a space for examinees to enter a response to the question

To familiarize yourself with the format, style, and navigation of a computer-based exam, view the demo on ncees.org/ExamPrep.

Examinee Guide
The NCEES Examinee Guide is the official guide to policies and procedures for all NCEES exams. During exam registration and again on exam day, examinees must agree to abide by the conditions in the Examinee Guide, which includes the CBT Examinee Rules and Agreement. You can download the Examinee Guide at ncees.org/exams. It is your responsibility to make sure you have the current version.

Scoring and reporting
Results for computer-based exams are typically available 7–10 days after you take the exam. You will receive an email notification from NCEES with instructions to view your results in your MyNCEES account. All results are reported as pass or fail.

Updates on exam content and procedures
Visit us at ncees.org/exams for updates on everything exam-related, including specifications, exam-day policies, scoring, and corrections to published exam preparation materials. This is also where you will register for the exam and find additional steps you should follow in your state to be approved for the exam.
1. In the cross section below, select the geologic unit that is the youngest.
2. Geological map symbols are shown below. Match the description on the right with the correct symbol on the left.

<table>
<thead>
<tr>
<th>Symbols</th>
<th>Descriptions</th>
</tr>
</thead>
<tbody>
<tr>
<td>30°</td>
<td>Syncline axis and plunge</td>
</tr>
<tr>
<td>60°</td>
<td>Strike and dip of bedding plane</td>
</tr>
<tr>
<td></td>
<td>Anticline axis and plunge</td>
</tr>
<tr>
<td></td>
<td>Joint with dip</td>
</tr>
</tbody>
</table>
7. During exploration, geotechnical information about RQD can most accurately be obtained using which of the following methods?
   - A. Rotary-percussion drilling
   - B. Rotary tricone bit drilling
   - C. Wireline diamond core drilling
   - D. Reverse circulation drilling

8. Which of the following are hydrothermal types of deposits?

   Select the three that apply.
   - A. Placer
   - B. Sedimentary exhalative
   - C. Skarn
   - D. Kimberlite
   - E. Mafic-ultramafic intrusion
   - F. Porphyry copper
14. A concrete batch plant needs to be sized to provide shotcrete and/or concrete for the construction of a new underground trona mine. The batch plant will be installed underground in a crosscut that is 15 ft wide × 120 ft wide × 16 ft high. Concrete and/or shotcrete will be installed using a shotcrete machine that has a capacity of 8 yd³/hr and a 1.1-yd³ feed hopper. Two diesel scoops with a 1-yd³ bucket will be used to haul the concrete and/or shotcrete from the batch plant to the shotcrete machine.

The cycle time is:
- Batch concrete and/or shotcrete: 4 minutes
- Haul time loaded: 12 minutes
- Haul time empty: 10 minutes
- Dump load: 2 minutes
- Pump shotcrete and/or concrete: 7 minutes

Mine management wants the batch plant sized to optimize the use of the current available equipment. The batch plant mixer capacity (yd³/batch) is 

Enter your response in the blank.

15. You are designing a uranium solution mine for in situ extraction. The target stratum is a moderately cemented sandstone 300 m thick with 100 m of overburden. The strata are level. The sandstone also contains an aquifer where the piezometric surface slopes downward 1° to the west. The piezometric surface at the easternmost boundary of the uranium resource is 200 m below the surface. Which of the following design parameters is secondary to the other three for productivity?

- A. The permeability of the overburden
- B. Annual rainfall in inches of water
- C. The hydraulic gradient of the aquifer
- D. Drawdown measured by test wells

16. When the initial shaft opening into a deposit or seam is being developed, the best type of construction is:

- A. conventional shaft construction
- B. conventional slope construction
- C. raise drilled shaft construction with shotcrete lining
- D. blind drilled shaft construction with hydrostatic, steel lining
18. Label the following areas of this coal mining system:

A. Gob
B. Mining machine
C. Self-advancing hydraulic roof supports
D. Headgate
E. Tailgate
F. Bleeder system
G. Stage loader
69. Which statement properly defines the environmental impact assessment (EIA)?

- A. The EIA is a report written by government agencies that provides guidelines for environmental protection for a proposed project.
- B. The EIA is the process of identifying possible environmental effects of a proposed activity and how those impacts can be mitigated.
- C. The EIA describes the project life-cycle assessment.
- D. The EIA provides guidelines to the public in case the project causes an environmental hazard.

70. Acid rock drainage is caused by oxidation of sulfide-bearing material usually present in the following forms.

Select the four that apply.

- A. Smithsonite
- B. Galena
- C. Hydrozincite
- D. Pyrrhotite
- E. Granite
- F. Chalcocite
- G. Sphalerite
1. This alluvial unit is the youngest because it crosscuts the youngest intrusive unit and all other tilted bedrock units.

![Diagram of geologic units](image)

THE CORRECT ANSWER IS SHOWN ABOVE.

2. 

- Strike and dip of bedding plane
- Joint with dip
- Anticline axis and plunge
- Syncline axis and plunge

THE CORRECT ANSWERS ARE SHOWN ABOVE.

3. 4 hr at 90 dB = 6/8 = 0.75 at 90 dB
   1 hr at 100 dB = 1/2 = 0.5 at 100 dB
   Total = 1.25 × the allotted time at 90 dB or 10 hr at 90 Db, so the operation is not in compliance.

THE CORRECT ANSWER IS: A
4. Forming a union for miners to advocate for the health, safety, and welfare of its members is not a right or responsibility of the miner under the Federal Mine Safety and Health Act of 1977 and the MINER Act of 2006.

THE CORRECT ANSWER IS: D

5. Using Darcy's law, $Q = -KA \left(\frac{dh}{dx}\right)$

Considering only the floor of the quarry:

\[ K = 10,000 \text{ gal/day/ft}^2 \]
\[ A = \text{40 ft} \times \text{40 ft} = \text{1,600 ft}^2 \]
\[ dh = \text{difference in elevation} = (-5 \text{ ft}) - (-15 \text{ ft}) = 10 \text{ ft} \]
\[ dx = \text{difference in lateral distance} = 100 \text{ ft} + 20 \text{ ft (to centroid of the pit)} = 120 \text{ ft} \]

Quarry floor $Q = -10,000 \text{ gal/day/ft}^2 \times \text{1,600 ft}^2 \times (10 \text{ ft} / 120 \text{ ft})$
\[ = -1,333,333 \text{ gal/day} \]
\[ = -926 \text{ gpm} \]

THE CORRECT ANSWER IS: B

6. Assume a column of rock 1 ft $\times$ 1 ft $\times$ height as measured in the sampling:

<table>
<thead>
<tr>
<th></th>
<th>$\times$</th>
<th>$\times$</th>
<th>$\times$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Roof</td>
<td>0.2</td>
<td>2.10</td>
<td>0.42</td>
</tr>
<tr>
<td>Floor</td>
<td>0.2</td>
<td>2.10</td>
<td>0.42</td>
</tr>
<tr>
<td>Mud</td>
<td>0.9</td>
<td>2.56</td>
<td>2.30</td>
</tr>
<tr>
<td>Top</td>
<td>2.1</td>
<td>2.13</td>
<td>4.47</td>
</tr>
<tr>
<td>Bottom</td>
<td>4.6</td>
<td>2.13</td>
<td>9.80</td>
</tr>
</tbody>
</table>

Grade = $9.27/17.41 = 0.5324 = 53.2\%$

THE CORRECT ANSWER IS: B

7. Wireline diamond core drilling uses a removable core barrel from inside the drill stem with a latching device. The core can be retrieved at any desired depth without removing all the drill rods and logged for RQD information.

THE CORRECT ANSWER IS: C
8.  
A. Placer–not a hydrothermal deposit; is formed by erosion and re-deposition.
B. Sedimentary exhalative–a hydrothermal deposit as it is ore formed by hot mineral-laden water vented through crust and precipitated in layered sedimentary rock.
C. Skarn–mineralization formed when hydrothermal fluids interact within sedimentary or igneous origin.
D. Kimberlite–intrusive in genesis and thus not hydrothermal.
E. Mafic-ultramafic intrusion–intrusive in genesis and thus not hydrothermal.
F. Porphyry–occurs primarily when hydrothermal fluids are driven off the cooling magma; mineralization enriched with reaction in the surrounding rock being penetrated with the fluids.

THE CORRECT ANSWERS ARE: B, C, F
13. Shovel bucket:
\[
\frac{(4,000 \text{ lb/yd}^3) \times 1.21 \times 40 \text{ yd}^3 \times 0.80}{2,000 \text{ lb/ton}} = 52.9 \text{ tons/bucket}
\]

Buckets per truck:
\[
\frac{(300 \text{ tons/truck}) \times 0.92}{(52.9 \text{ tons/bucket})} = 5.22 \text{ buckets/truck} = 6 \text{ shovel passes}
\]
6 passes \times 38 \text{ sec/pass} = 228 \text{ sec} = 3.8 \text{ min}

THE CORRECT ANSWER IS: D

14. The answer is 1 yd\(^3\), which matches the scoop bucket most closely to the shotcrete machine feed hopper capacity. This is the limiting factor in the design due to management wanting to use currently available equipment.

THE CORRECT ANSWER IS: 1

15. Annual rainfall influences aquifer recharge, hence influences secondary production.

THE CORRECT ANSWER IS: B

16. Conventional shaft construction provides the best, immediate access to the seam or deposit at the completion of excavation and construction of the shaft. The shaft is already lined and the hoisting system is in place to start work in the seam or deposit.

THE CORRECT ANSWER IS: A
18.  
A. Gob–large central area (labeled)  
B. Mining machine–narrow horizontal box near bottom left of Area C  
C. Self-advancing hydraulic roof supports–series of small vertical rectangles below gob  
D. Headgate–large vertical boxes to the right of gob and Areas C and G  
E. Tailgate–large vertical boxes to the left of gob and Area C  
F. Bleeder system–large horizontal box across top of figure  
G. Stage loader–the piece of equipment shown as a narrow vertical box to the left of lower right Area D box and below right end of Area C

THE CORRECT ANSWERS ARE SHOWN ABOVE.
66. Using normal probability density table in the *SME Mining Reference Handbook*, 99.9% probability of occurrence equates to approximately 3 standard deviations from the mean. Since there is no maximum pile volume requirement, this is a one-sided distribution problem. Calculation:

\[ \sigma = 800 \text{ tons per day} \]
\[ 3 \times \sigma = 2,400 \text{ tons} \]

Because daily volume input is equal to daily output (6,000 tons per day), only daily variation needs to be addressed in the live-load calculation.

**THE CORRECT ANSWER IS: B**

67. 10 acres \times 43,560 \text{ ft}^2/\text{acre} = 435,600 \text{ ft}^2

\[ 435,600 \text{ ft}^2 \times 0.004 \text{ gpm/ft}^2 = 1,742 \text{ gpm} \times 3.785 \text{ L/gal} = 6,595 \text{ L/min} \]

Acid need: \(2 \text{ g/L} \times 6,595 \text{ L/min/1,000 g/kg} = 13.19 \text{ kg acid/min} \)

\[3,000 \text{ gal/truck} \times 3.785 \text{ L/gal} \times 1.8144 \text{ kg/L} \times 90\% = 18,542 \text{ kg acid/truck} \]

\[ 18,542 \text{ kg acid/truck/13.19 kg acid/min} = 1,406 \text{ min/truck} \]

\[ (1,406 \text{ min/24 hr}) \left( \frac{1 \text{ hr}}{60 \text{ min}} \right) = 0.98 \text{ day} \]

**THE CORRECT ANSWER IS: B**

68. Rougher grade is an intermediate step that is not part of the final mass balance.

**THE CORRECT ANSWER IS: A**

69. The EIA is the process of identifying possible environmental effects of a proposed activity and how those impacts can be mitigated.

**THE CORRECT ANSWER IS: B**

70. Reference: Chapter 24 of the *SME Mining Reference Handbook*.

Smithsonite and hydrozincite are not correct because they are acid-neutralizing. Granite is neither acid-generating nor acid-neutralizing. The sulfide-bearing material is usually present in the form of galena, pyrrhotite, chalcocite, and sphalerite.

**THE CORRECT ANSWERS ARE: B, D, F, G**