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**NATIONAL ASSOCIATION OF STATE BOARDS OF GEOLOGY**

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**PROFESSIONAL GEOLOGISTS  
CANDIDATE HANDBOOK**

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*ASBOG does not endorse any examination preparation course, study guide, or publication.  
This candidate handbook is designed to help you prepare for the ASBOG national  
examinations.*

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## INTRODUCTION

*The National Association of State Boards of Geology (ASBOG)* is an organization through which state geology registration boards act together to coordinate and improve regulation of the practice of geology. One of ASBOG's principal duties is to develop standardized written examinations for determining qualifications of applicants seeking licensure as professional geologists. Boards of registration (licensing) are provided with uniform examinations that are valid measures of competency related to the practice of the profession. Through the test development process, public protection is enhanced and competent candidates have a greater chance of passing the examinations.

ASBOG conducts test development and validation workshops regularly using the guidelines established in the Standards for Educational and Psychological Testing (1999) published by the American Educational Research Association, the American Psychological Association and the National Council on Measurement in Education. All workshops are intended to maximize the fairness and quality of the examinations as measures of *minimum competency*. The workshops are conducted by experienced testing specialists who possess the type of expertise that is fundamental in developing programs that reflect "state-of-the-art" testing techniques.

The examinations are the result of careful preparation and validation by a council of professional geologists. They are called *Subject Matter Experts (SME)*, and together they form the *Council of Examiners (COE)*. These geologists, from throughout the nation, represent the profession in terms of geography, ethnicity, gender, and area of practice. The *SMEs* donate their time to supply the expertise essential in developing fair and impartial examinations for measuring minimum competency within the profession. By utilizing the expertise of individuals from throughout the nation, ASBOG provides uniform examinations that will apply to a wide range of geographic regions and professional practice settings.

Examinations are administered in the spring and fall of each year. Currently, ASBOG provides member boards with two multiple-choice examinations -- the *Fundamentals of Geology (FG)* and the *Practice of Geology (PG)*. Each examination is four hours in length. The *FG* and *PG* examinations have been developed to assess common knowledge and skills that are related to the practice of geology throughout the nation. Individual states may require additional testing on local geology, statutes, rules, and regulations that address state-specific issues.

The *FG* Examination emphasizes knowledge and skills that are typically acquired in an academic setting and lead to a baccalaureate degree. The *PG* Examination emphasizes skills and knowledge that are acquired or expanded in a practice or job setting.

Italicized words here and elsewhere in this document, except for the opening sentence, refer to terms listed in the Glossary (Appendix 1). Some phrases and sentences are in italics for emphasis.

We hope you find the information useful. We extend our best wishes for your success on these examinations and in your practice of geology.

## STATE LICENSING REQUIREMENTS

**Qualifications.** The primary purpose of licensure is to protect the public by evaluating the qualifications of candidates seeking licensure. While examinations offer one means of measuring the competency levels of candidates, most jurisdictions also screen candidates on the basis of education and experience requirements set forth in state laws, rules, and regulations. The requirements vary across the nation. As the examination shall be administered only to those candidates who have met the statutory and regulatory prerequisites of the state in which they are seeking licensure, it is important that you contact the state board office where you are seeking licensure to obtain information with respect to the specific requirements for that state.

**Application Procedures/Filing Deadlines.** Application forms and instructional information for the examination are available from individual state boards. You should be aware that examination requirements, filing deadlines, and fees vary from state to state. You are responsible for contacting the state board office, for this type of information. (**Note:** Some state boards utilize the service of a professional testing organization for examination administration (proctoring) purposes. You will need to confirm what entity is actually handling the administration of your examination). You are encouraged to allow sufficient time to complete the application process and assemble required data such as transcripts and letters of recommendation. The state board will notify you regarding your approval status (i.e., accept/reject).

**Examination Schedule and Administration.** The ASBOG geology examinations are given during the spring and fall of each year. Contact the state board regarding specific dates and locations. The *FG* examination (total questions = 110) is administered in a 4-hour session. The *PG* examination (total questions = 80) is also administered during a 4-hour session. The *FG* and *PG* are separate examinations and scores are reported for each. Different forms of the examinations are constructed for each administration.

The *FG* examination will start promptly at 8:00 a.m. and end at 12:00 p.m. The *PG* will start promptly at 1:00 p.m. and end at 5:00 p.m. Ample time for instructions will be allowed prior to the actual start time of each examination. Please be sure to contact your state board Examination Administrator to confirm examination location, arrival time and whether you will need an admittance pass, etc. All information will be provided by the individual Examination Administrator.

## DESCRIPTION OF EXAMINATIONS

**Examination Validity.** Testing standards require that the questions on a licensing examination represent the important tasks needed for competent practice in the profession. The relationship between the examination questions and the important tasks of a profession is established by conducting a *task analysis survey (TAS)* of the profession. The task analysis is used to determine those tasks performed by the profession that are related to public protection and the underlying knowledge and skills needed to perform those tasks. This information is then used to develop *test blueprints* (content outlines) that guide the development of job-related questions which reflect the critical aspects of the profession.

The content of the ASBOG examinations -- *Fundamentals of Geology (FG)* and *Practice of Geology (PG)* -- has been determined by a comprehensive task analysis of the work performed by licensed geologists nationwide. This ensures that the examinations reflect competencies related to public protection.

**ASBOG Test Blueprints.** Based on the analysis of the results of the *TAS*, the *COE* develops *test blueprints* that list the geologic tasks to be included in the *Fundamentals of Geology (FG)* Examination and in the *Practice of Geology (PG)* Examination. The results of the *TAS* determine the number of questions for each geologic task to be included in each examination. The *COE* reviews examination questions to verify that each question is valid for use in the examination and that it accurately reflects one or more of the tasks listed in the test blueprint. This process is used by ASBOG to verify that each question is applicable for use in the *FG* Examination and the *PG* Examination.

The *FG* and *PG* test blueprints (Appendix 2) specify the *domains/content areas* for each examination. The relative importance of different content areas can be determined by examining the test blueprints. For example, on the *FG* Test, "Field Methods & Remote Sensing" receives more total weight (29.1%) than "Mineralogy, Petrology, Petrography, & Geochemistry" (13.6%).

**Test Development/Review.** ASBOG conducts test development and review workshops regularly. The *COE* carefully reviews each question **before and after** it is used to ensure the quality and fairness of the examinations. The review process ensures that the questions remain current with changes in the profession. The content, format, and statistical performance of the questions are carefully reviewed to maintain the accuracy of the questions across time.

Sample questions for the *FG* and *PG* examinations are presented in Appendix 3. The sample questions do not make up complete examinations; however, they do represent the general content areas and formats. They are presented herein as a guide in your preparation for the examinations. The *FG* and *PG* examinations measure some of the same competencies related to the practice of geology, but construction of the questions differs between the two levels. *FG* questions are primarily to recall factual information, and the *PG* questions are focused on candidates' competencies to apply the basic principles of geology, based mainly upon work experience.

**Keyed Answer.** ASBOG examination questions have been developed by the *SMEs* selected to participate on the *COE*. Each examination question is subjected to a minimum of four peer reviews. The **first peer review** occurs during the development of the question. During the examination workshop, each question is

written by one or more members of the *COE*. Each new question is then reviewed independently by three other members of the *COE*. The purpose of the peer review process is to verify that the *keyed answer* is the one and only correct answer. This process is also used to make sure that the question is clear and is appropriate for use on the examination.

The question is then entered in draft form into the question bank and then subjected to the **second peer review** by the *COE* at a subsequent examination workshop. During this second peer review, the question is checked to verify that typographical errors were not introduced when the question was entered into the question bank, and the answer key is checked again. The question is subjected to the **third peer review** by the *COE* when it is included in the examination, which is reviewed in its entirety prior to the actual administration.

The **fourth peer review** occurs after the administration of the examination. ASBOG encourages candidates to provide comments about specific questions while taking the examinations. Candidate comments become part of the examination review process during the post-examination review workshop along with statistical information on each item in the examinations. The *COE* reviews each new questions as a part of the grading process. A question can be reviewed by the *COE* based on the comments submitted by an candidate as a part of the examination. This candidate-requested review could be for a new question or for any other question in the examination. If the *COE* deems a particular question has no correct answer (based on candidate comments, statistical information, or an evaluation of the accuracy of the question), then the item is not scored. No candidates are given credit for the item because there is no correct answer. This process enhances the fairness of the examinations because substandard items (that have no correct answers) are eliminated when calculating candidates' final scores.

**Minimum Competency.** A key issue in developing fair and impartial exams centers upon the procedures used in establishing passing scores that reflect a standard of *minimum competency*. The passing scores on the ASBOG examinations are determined using a *criterion-referenced approach*. Passing scores are adjusted (scaled) based on the average difficulty level on each exam. Thus, candidates have approximately the same chance of passing any version of the examinations. Passing scores always reflect minimum competency.

ASBOG does not use fixed-percentage passing scores such as 70 percent or 75 percent because they fail to consider the difficulty levels of the questions in an examination and their relationship to minimum competency. Similarly, ASBOG avoids "grading on the curve" because licensure is designed to ensure that practitioners possess enough knowledge to perform professional activities in a way that protects the public welfare. The key issue is whether candidates are competent to practice and not whether they are competent compared to other candidates.

**Scoring Procedures.** *Raw scores* are calculated by summing the number of correct responses for each candidate. Credit is given for correct responses while no points are received for incorrect responses. Note that only one response should be marked for each question because questions that contain two or more marked responses or all blank responses (i.e., omitted questions) are scored as incorrect responses.

The legal authority for making licensure decisions rests solely with the individual jurisdictions and not with

ASBOG. However, if a state board licenses or registers a candidate on any basis other than the candidate attaining a score equal to or greater than the cut score set by ASBOG, the state board shall notify ASBOG in writing of its decision. ASBOG provides each jurisdiction with a uniform passing score based upon the criterion-referenced procedures described above. A *scaled score* of 70 has been established as a standard of minimum competency and 100 is the highest score possible. Failing scaled scores range from 0 (no correct responses) to 69 (highest failing score).

**Candidate Comments.** ASBOG is always working to improve the quality and reliability of its examinations. Although each examination has gone through an extensive review process by *SMEs* during examination development workshops, ASBOG encourages candidates to provide comments about specific questions. *Candidate comments* become part of the examination review process during the post-examination review workshop. *Candidate comments* are anonymous and used only to improve the quality of the examination questions. Candidates are reminded that they should complete the examination first, then go back and address any questions they have concerns or comments about to ensure that they have time to complete examination.

**Examination Review and Manual Re-grade.** If a state board is not mandated by law to provide examination review services, ASBOG does not independently do so. Any request for review by a candidate shall be made directly to the Examination Administrator in writing. The Examination Administrator shall submit a written request to ASBOG within forty-five (45) calendar days after the release of the examination results **to** the Examination Administrator. The Examination Administrator will set its own deadline for receipt of such requests from its candidates in order to meet the 45-day turn-around to ASBOG. ASBOG does not allow challenges to individual examination items as part of a post-examination review process, nor does it release the answer key. The Examination Administrator shall instruct candidates that no notes shall be taken during the review process, nor are they to write on the examination review copies. Requests for a manual re-grade of a candidate's answer sheet (scantron) must also be submitted to ASBOG in writing by the Examination Administrator within the 45-calendar day time frame. The cost for a manual re-grade shall be paid by the requesting candidate or the Examination Administrator and the prescribed fee must accompany the written request. The purpose of the manual re-grade is to verify the accuracy of a candidate's machine score. *The request for a manual re-grade does not guarantee that the candidate will receive additional credit and/or a revised grade. Again, the exclusive purpose of the manual re-grade is to check the accuracy of the candidate's machine score.* ASBOG's peer review process and Task Analysis process conducted by the *SMEs* on the *COE* provide a redundant system to verify the keyed answer is the only correct answer for that question.

## TAKING THE EXAMINATIONS

**Distribution of Booklets.** Examination Administrators (proctors) will distribute test booklets and answer sheets (scantrons). Read all instructions carefully. Special attention should be given to the language on the front of the test booklet pertaining to disclosure of proprietary information.

*Copying, reproduction, taking notes, or any action taken to reveal the contents of examinations in whole or in part is unlawful. Removal of booklets from the examination room by unauthorized persons is prohibited.*

**Unlawful disclosure is extended to include the transmission of examination content in any form (verbal, written, electronic or computerized, etc.) either during or after the examination administration.**

**Answer Sheets (Scantrons).** All examinations are machine-scored. To provide proper scoring of your examination, it is imperative that you listen to the proctor's instructions and follow the instructions printed on the examination booklets and answer sheets. Use only #2 pencils or mechanical pencils with HB lead (marks in ink or felt-tip pens will not be scanned properly). The answer spaces must be completely blackened.

*Test items* (questions or problems) are generally organized with an introductory statement (the *stem*) followed by four options (choices to finish the statement in the stem or answers to the problem). In evaluating options, candidates should read all options and then select the best or most appropriate answer from the options given.

You must select one of the options given even if there might be a better response to a question that is not included among any of the options given.

No credit is given for multiple answers. If you decide to change an answer, completely erase the first answer.

Incomplete erasures and stray marks may be read as intended answers. **NOTE:** Your sketches, notes, graphical solutions and calculations are **NOT** considered to be part of your answer and are not inspected or graded. *All work, however, must be turned in with your examination booklets.*

**Figures.** The questions are drawn from an *item bank* in random order. Some questions will refer you to a numbered figure. All referenced figures are grouped together in a separate booklet and are presented in numerical order, unless otherwise noted. It may be that a later question references a figure already referenced by an earlier question. In that case, the same figure is to be used.

**Graph Paper and Scratch Paper.** Semi-log and rectilinear graph paper are provided in the back of the figure booklet for you to use if you desire. For scratch paper, use the blank pages provided in the back of the figure booklet or the blank sides of sheets in the examination booklets.

**Starting and Completing the Exam.** *Do not open the examination booklet until instructed to do so by your proctor.* Be sure to note your start/finish time on the front of your test booklets. This information has no impact on the scoring of your examination. It serves only as time analysis data evaluated by the psychometricians and *COE*. You are responsible for returning the numbered examination booklet and the figure booklet assigned to you, as well as all working papers, etc.

**References.** The *FG* and *PG* are closed-book examinations. **No references are permitted;** however, portable (battery-operated or solar- powered), silent, non-printing, non-alpha programmable calculators are allowed. Please note that calculators, or any other wireless, electronic devices, that have e-mail/Internet/text messaging capability will NOT be allowed. This applies to cellular phones as well. A protractor, straight edge, engineer's scale, and colored pencils should be brought to the examination, as they may be useful for some questions.

**Special Accommodations.** The Examination Administrator will provide reasonable accommodations to qualified applicants with disabilities. If you have a disability and require special accommodations to take the examination, contact your Examination Administrator as soon as possible and inquire about any necessary "documentation of disability" to be submitted with your application. If special accommodation is not requested in advance, the Examination Administrator cannot guarantee the availability of accommodation on site at the time of testing. Any request for modification to the examination(s) must be submitted in writing by the Examination Administrator and received by ASBOG no later than sixty (60) calendar days prior to the scheduled examination.

## Appendix 1

### Glossary

**COE.** See *Council of Examiners*.

**Candidate comments.** Written comments from a candidate who has already taken the *Fundamentals of Geology (FG)* or *Practice of Geology (PG)* examinations. Valid candidate comments are always welcome and may become a part of the examination review process during the post-examination review workshop. Candidate comments are anonymous and used only to improve the quality of the examination questions.

**Criterion-referenced approach.** Psychometric procedure used to determine passing scores that reflect a standard of minimum competency.

**Council of Examiners (COE).** ASBOG National Examination committee composed of selected individuals who are *subject matter experts (SME)* in their respective domains and who represent a cross-section of geography, gender, area of practice (specialty), experience, and ethnicity. The *COE* meets twice yearly as part of the ASBOG examination workshop, usually about three weeks after the administration of the *FG* and *PG* examinations; one of the two workshops is held as part of the ASBOG Annual Meeting each fall.

**Domains/content areas.** Specialties within a profession; for example, geophysics, hydrogeology or field methods within the geosciences.

**Examination Administrator.** The entity actually responsible for administering (proctoring) the examination. Some state boards use their own staff to proctor the examination; some have a state department of testing (bureau/agency), and some use a professional testing service. See *proctor*.

**Fundamentals of Geology (FG) Examination.** ASBOG national test with items related to knowledge and skills acquired in an academic setting that leads to a baccalaureate degree; consists of 110 questions.

**Item bank.** Test items that are stored on computer after acceptance by the *COE*.

**Keyed answer.** The one and only correct answer. A new question, developed by one or more of the members of the *COE*, is independently reviewed/critiqued by three other members. The peer review process verifies the keyed answer. The review also focuses on the quality of the item to ensure the question is clear and is appropriate for use on the examination.

**Minimum competency.** The standard used in establishing passing scores on ASBOG examinations.

**Proctor.** Individual(s) actually administering the examination(s). See *Examination Administrator*.

**Practice of Geology (PG) Examination.** ASBOG national test with items that assess skills and knowledge acquired or expanded through employment, typically after five years of work experience; consists of 80 questions.

**Raw score.** Actual, unadjusted score on an examination based on the total number of correct responses. If *subject matter experts (SME)* deem a particular question to have no correct answer (based on candidate comments, statistical information, evaluation of the accuracy of the question, etc.), then that item is not scored (i.e. the *FG* examination would be graded on the basis of 109 instead of 110 questions. Similarly, the *PG* examination would be scored on the basis of 79, not 80 questions.). No candidates are given credit for the item because there is no correct answer.

**SME.** See *subject matter expert*.

**Scaled score.** Adjusted score, based on the average difficulty level on each examination (*FG* and *PG*). A scaled score of 70 has been established as a standard of minimum competency. On all forms of the ASBOG exams, a scaled score of 70 is the minimum score required to pass and 100 is the highest score possible. Failing scaled scores range between 0 (no correct responses) and 69 (highest failing score).

**Stem.** The introductory portion of a test item that states a question or presents an incomplete statement.

**Subject matter experts (SME).** Geoscientists who serve on the ASBOG *Council of Examiners*; *SMEs* represent the profession in terms of geography, ethnicity, gender and area of practice.

**Task Analysis Survey (TAS).** A survey form prepared by the *Council of Examiners* to represent the geologic tasks performed by geologists. The list focuses on tasks that involve protection of the health, safety and welfare of the public. The survey form is mailed to licensed geologists selected at random from the lists of registered geologists provided by those states with geologist registration requirements. The current *TAS* was distributed in 21 states and nine Canadian provinces and territories. These geologists rated each task by defining the amount of time spent on that task each year, the impact of each task on protecting the health, safety and welfare of the public, and how competent a geologist should be in the task at the time of registration. Results from the *TAS* determine the number of questions for each geologic task to be included in both the *FG* and *PG* examinations. The next *TAS* is scheduled to be conducted in CY2004-2005.

**Test blueprint.** A content outline listing both the number and weight percent of geologic tasks to be included in the *FG* and *PG* examinations by individual domains.

**Test item.** Question or problem used in an examination.

## Appendix 2

### ASBOG FG and PG Test Blueprints Number and Percent of Items by Domain

CONTENT DOMAINS	FG#	FG%	PG#	PG%
A. Field Methods & Remote Sensing	32	29.1	28	35.0
B. Mineralogy, Petrology, Petrography, & Geochemistry	15	13.6	2	2.5
C. Sedimentology, Stratigraphy, & Paleontology	11	10.0	3	3.8
D. Geomorphology	7	6.4	5	6.3
E. Structural Geology & Tectonics	10	9.1	2	2.5
F. Geophysics & Seismology	4	3.6	4	5.0
G. Hydrogeology	27	24.5	20	25.0
H. Engineering Geology	3	2.7	9	11.3
I. Mineral, Petroleum, & Energy Resources	1	0.9	7	8.8
<b>TOTALS</b>	<b>110</b>	<b>100.0</b>	<b>80</b>	<b>100.0</b>

## Appendix 3

### FG Sample Questions And Answers

1. According to the Unified Soil Classification, a soil described as a GW is a (an):
  - a) well-graded gravel or gravel-sand mixture, with no or little fines
  - b) poorly graded gravel or gravel-sand mixture, with no or little fines
  - c) coarse clayey gravel
  - d) organic silt of low plasticity
  
2. Which one of the following minerals dissolves into soluble ions without residue?
  - a) kaolinite
  - b) pyrite
  - c) selenite
  - d) orthoclase
  
3. A phaneritic igneous rock composed of orthoclase, oligoclase, biotite, hornblende, and quartz is:
  - a) monzonite
  - b) syenite
  - c) latite
  - d) granodiorite
  
4. What group of commonly occurring sedimentary deposits forms by precipitation of salts from land-locked bodies of concentrated solutions or brines?
  - a) sulfuric sedimentary rocks
  - b) organic sedimentary rocks
  - c) evaporitic sedimentary rocks
  - d) phosphatic sedimentary rocks
  
5. A map at the scale of 1:24,000 compared to a map at the scale of 1:62,500 is:
  - a) a smaller scale map
  - b) a larger scale map
  - c) larger scale or smaller scale dependent upon the units of measurement
  - d) larger scale or smaller scale dependent upon the ground area shown

6. An aerial photograph taken with a camera having a focal length of 6 inches flying 10,000 feet above the datum has a scale of:
- a) 1:10,000
  - b) 1:20,000
  - c) 1 inch = 10,000 feet
  - d) Scale cannot be determined from the data given.
7. According to Darcy's Law:
- a) The velocity of flow in clay is higher than in sand.
  - b) The higher the gradient, the lower the velocity.
  - c) The water table is generally flatter in an area of high transmissivity.
  - d) Spring flow is independent of the hydraulic characteristics of the aquifer.
8. Prediction of swelling potential in soil is possible using which of the following?
- a) grain size
  - b) organic content of the soil
  - c) Atterberg limits
  - d) color
9. A pathfinder element used in exploration for gold deposits is:
- a) cobalt
  - b) selenium
  - c) arsenic
  - d) aluminum
10. Which of the following indicates the highest measurement of permeability?
- a) 1-9 millidarcy
  - b) 10-99 millidarcy
  - c) 100-999 millidarcy
  - d) 1-2 darcies
11. Black and white vertical stereo aerial photographs are taken of an area which has a variety of mass movement phenomena present. For purposes of practical geologic and geomorphic interpretation of the

- photographs, one of the principal DISADVANTAGES of a flight time close to noon (sun time) is:
- a) the film's spectral sensitivity to blue light is affected
  - b) the resolving power of the camera lens is minimized
  - c) thermal diffraction in the air distorts the image
  - d) the high sun angle minimizes shadows and modeling of the terrain
12. A site location map must include scale, orientation, title, and:
- a) topographic contours
  - b) geologic units
  - c) geographic reference
  - d) dip and strike symbols
13. Which one of the following minerals does NOT belong to the carbonate mineral group?
- a) barite
  - b) aragonite
  - c) rhodochrosite
  - d) smithsonite
14. Falling-head tests and constant-head tests are used to determine the:
- a) porosity of rock or soil
  - b) safety factors of critical reservoir levels
  - c) hydrostatic pressure on liners
  - d) permeability of rock or soil
15. The Laramide Orogeny occurred during what intervals of geologic time?
- a) Permian-Triassic
  - b) Late Precambrian-Paleozoic
  - c) Late Cretaceous-Paleocene
  - d) Pleistocene-Holocene
16. Rocks that show evidence of high ductile strain, are well-foliated, and contain porphyroclasts are referred to as:
- a) breccias

- b) mylonites
  - c) cataclasites
  - d) gouges
17. Disappearing streams are NOT typically found in:
- a) karst terrain
  - b) glacial terrain
  - c) arid regions
  - d) volcanic areas
18. The free-air and Bouguer corrections are applied to which one of the following?
- a) gravity data
  - b) gamma-gamma logs
  - c) magnetic data
  - d) refraction data
19. Which of the following testing techniques is commonly used to determine the hydraulic conductivity of a shallow, low-permeability aquifer using a single well?
- a) constant head test
  - b) slug test
  - c) constant discharge test
  - d) surge-response test
20. A dotted line on a USGS geologic map indicates a(an):
- a) igneous-metamorphic contact
  - b) facies change
  - c) concealed contact
  - d) unconformable contact
21. Perched groundwater:
- a) has the same flow characteristics as the main aquifer
  - b) occurs in areas of thick sand or sandstone formations
  - c) is separated from the regional aquifer by an underlying unsaturated zone
  - d) is generally a reliable aquifer for municipal and industrial production wells
22. Hardness in water is typically caused by the presence of:
- a) total dissolved solids
  - b) carbonate and bicarbonate
  - c) calcium and magnesium ions
  - d) suspended matter

23. Which of the following is NOT a good indicator of depositional top and bottom?
- a) flute casts
  - b) graptolite orientation
  - c) graded bedding
  - d) mud cracks
24. While preparing a geologic report, you receive useful and valid original information in the form of a letter from another geologist. With the geologist's permission, this information may:
- a) be utilized in your report and cited as a personal communication
  - b) NOT be utilized in your report because it has not been peer-reviewed
  - c) NOT be utilized in your report because it has not been formally published
  - d) be utilized in your report but not cited as to source

### Key for FG Sample Questions

1. a
2. c
3. d
4. c
5. b
6. b
7. c
8. c
9. c
10. d
11. d
12. c
13. a
14. d
15. c
16. b
17. b
18. a
19. b
20. c
21. c
22. c
23. b
24. a

## PG Sample Questions and Answers

1. Moderate exaggeration of vertical scale (up to 10X) on a geologic cross section is justified when:
  - a) it is common local practice.
  - b) it is needed to show small changes in angular relationships or units of small vertical extent.
  - c) the sections are highly speculative.
  - d) the geologic structure is primarily vertical.

2. Hot-water mineral alteration has occurred within a quartz porphyry dike associated with late phases of intrusion of a granitoid stock into Precambrian amphibolite. The mineral composition of the unaltered dike is: 15% quartz, 45% microcline, 30% oligoclase, 10% biotite.

From the below listed groups of alteration products, select the one most likely to have developed within, and surrounding, the porphyry dike.

- a) calcite, calcium-aluminum garnet, epidote.
  - b) sericite, kaolinite and montmorillonite, hematite.
  - c) andalusite, calcium-iron garnet, chlorite.
  - d) sericite, opal, andalusite, epidote.
3. In the field you are attempting to separate a 150 ft thick outcrop of lavas into individual flows. From the following features, which one will NOT be suitable to differentiate between flow events?
    - a) Thin claystone beds containing clasts of volcanic rock.
    - b) A thin unit composed of pebbles and cobbles in a matrix of clay.
    - c) A zone of porphyritic texture that grades into the lava above.
    - d) A zone that grades upward into finely crystalline and glassy texture.

4. The term "growth fault" means which of the following?
  - a) any normal fault associated with sedimentary rocks
  - b) a fault radiating from a larger fault
  - c) a fault in a sedimentary rock sequence formed contemporaneously and continuously with deposition
  - d) thrust faults whose displacement has grown through time

5. You have been asked by the owner to evaluate the feasibility of redeveloping their chemically contaminated property for a shopping mall. As a first step in your evaluation, you should:
  - a) contact the local health inspector for an opinion on the site.
  - b) review the available records of the site for information relevant to the nature and extent of contamination.
  - c) request a review of the site by the appropriate state regulator.
  - d) determine the appropriate non-residential clean-up standards for the site.

6. Which of the following geophysical methods is most likely to be successful in locating shallowly buried

- 55-gallon steel barrels in dry sand?
- ground penetrating radar
  - seismic reflection
  - seismic refraction
  - gravity
7. The proper treatment of septic tank effluent as it moves through soil after leaving the leach line system would be most likely under which one of the following sets of conditions?
- Aerobic conditions and a sufficient clearance from saturated zone ground water.
  - Septic conditions and the absence of aerobic bacteria.
  - Aerobic conditions and a phreatic surface at or above the leach line elevation.
  - Septic conditions and a phreatic surface at or above the leach line elevation.
8. Alkali-aggregate reaction is least likely to occur in portland cement concrete with aggregate composed of which one of the following?
- rhyolite
  - opal
  - chert
  - quartzite
9. Core samples from an exploration hole in an ore deposit indicate the following concentrations of copper. From the values of the percent copper given below, what is the average concentration of copper in the total cored interval?

Interval (ft)	Drilled (ft)	Recovered (ft)	Percent Copper
410-425	15	12	0.37
425-435	10	5	1.42
435-455	20	9	2.51
455-485	30	28	0.05
485-500	15	15	0.70

- 0.67 percent copper
  - 0.51 percent copper
  - 0.91 percent copper
  - 1.01 percent copper
10. Bottom-hole reservoir pressure can be derived by which of the following?
- the amount of gas recorded on the chromatograph after pulling the drill-pipe out of the hole and returning to bottom

- b) the amount of solid cuttings suspended in the drilling mud system
  - c) drill-stem test shut-in pressure measurements
  - d) the diameter of the drill hole
11. Left and right can be ambiguous terms unless the convention for their usage is understood. In the United States, with respect to terms such as the left abutment and right abutment of dams or the left bank and right bank of streams or rivers, which one of the following statements is correct?
- a) Left and right are as perceived by a person looking downstream.
  - b) Left and right are as perceived by a person looking upstream.
  - c) Left and right are as perceived by a person looking upstream for dams, but as perceived by a person looking downstream for rivers.
  - d) Left and right are as perceived by a person looking downstream for dams, but as perceived by a person looking upstream, for rivers.
12. To map regional structural features and bedrock fracture patterns in a temperate, heavily vegetated area, which technique is most effective?
- a) side looking airborne radar imagery
  - b) LANDSAT false color infrared photography
  - c) high altitude NASA vertical photography
  - d) regional gravity maps
13. You have been retained to conduct a reconnaissance survey of a number of springs for possible development as a bottled water source in an agricultural area. Your initial sampling of these springs should include which of the following parameter lists?
- a) Safe Drinking Water Act primary parameters
  - b) RCRA Appendix IX parameters
  - c) CERCLA volatile organic compounds
  - d) SDWA pesticides and herbicides, RCRA metals
14. A bottled water processor is having problems with the presence of manganese in well water which serves as the raw water source for a processing facility in an area with a subtropical climate. Which of the following rock types would be most desirable for a drilling target in order to solve the processor's problem?
- a) interlayered amphibole and plagioclase-amphibole gneiss
  - b) biotite-quartz-feldspar gneiss, with layers of biotite concentration
  - c) garnet-quartz-feldspar-chlorite schist
  - d) biotite-muscovite-quartz-orthoclase granite
15. You want to record the field location of pebble samples taken for determining regional size distribution of gravelly beds within a 10,000-square mile-area in the Great Plains Province. What is the most useful method for locating the sample sites so you can plot them for a preliminary report?
- a) GPS (global positioning system)
  - b) theodolite and tape survey
  - c) plane table and alidade mapping

- d) 1:250,000 scale topographic map
16. You have been assigned to supervise a mud rotary drilling operation and log the cuttings for a municipal well. The boring will pass through a known shallow salt water zone before entering the deeper fresh water artesian aquifer. Which of the following is appropriate?
- a) Change to an illite based mud.
  - b) Add barite to the drilling mud.
  - c) Grout surface casing past the salt zone.
  - d) Thicken the drilling mud.
17. Areas with localized alpine glaciation often are sources of moderately sorted materials. Identify the depositional environment of the deposits.
- a) terminal moraine
  - b) glaciofluvial
  - c) varves
  - d) periglacial
18. In many states, the law allows for the "severance of land" into the "surface estate" and the "mineral estate". You are evaluating the underground potential coal resources on a property slated for condemnation by the state. Where severance of the land has occurred, which statement listed below should govern your work effort?
- a) The surface estate is the superior estate and controls access to the minerals.
  - b) The mineral estate is the superior estate and controls access to the minerals.
  - c) Both estates have equal legal rights to the minerals and thus both estates control access.
  - d) The "superior" position makes no difference in conducting your studies.
19. To use historic aerial photographs to monitor slope movements of a large landslide, the photographs must be corrected for:
- a) optical scatter
  - b) radial distortion
  - c) stereoscopic error
  - d) film distortion
20. The drilling of angle holes, oriented perpendicular to the direction of river flow, in the channel section of a dam site, is generally done with the primary intention of exploring to determine:
- a) if near-vertical faults trend parallel to the channel
  - b) the thickness of the overburden
  - c) the accuracy of the geophysical surveys
  - d) if near-vertical faults trend perpendicular to the channel
21. When ordering a laboratory soil or groundwater analysis, it is advisable to request an analytical method

with a result reporting limit that is:

- a) at the currently obtainable instrument or method detection limit
- b) at the lowest limit that will meet all intended uses of the data
- c) low enough to prevent matrix interference effects
- d) at the current practical quantitative limit

22. A water sample from a domestic water-supply well has been tested for a variety of inorganic chemicals. The results are as follows:

Hardness	20 mg/l	Nitrate-N	30 mg/l
Chloride	15 mg/l	Sulfate	20 mg/l
Iron	0.1 mg/l		

There are no alternative sources of drinking water. At the concentrations given above, which chemical is of health concern according to federal drinking water standards?

- a) iron, causing hardening of the arteries
  - b) chloride, causing cardiovascular problems
  - c) nitrate, causing methemoglobinemia ("blue-baby syndrome")
  - d) sulfate, causing laxative effects
23. A monthly monitoring program of a slope observed that the rate of displacement of the slope monuments has increased in a linear fashion and that the total displacement is 0.45 ft after 36 months of observations. The results of the most recent survey, however, indicate that the rate of displacement has increased with a corresponding displacement of 0.06 ft in one month. Your response to these new data is:
- a) Not to worry. The rate of monument displacement is not important. The total amount is of concern, and 0.06 ft. is significant.
  - b) The survey schedule need not be changed; however, the last survey should be checked for accuracy.
  - c) The slope is in immediate danger of failing and all downslope residents should be immediately evacuated.
  - d) The survey schedule should be increased to better define displacement rate. Slope failure may occur.
24. You are an independent geological consultant whose client needs preliminary results in not more than one week on the potential for limestone to make portland cement. You must evaluate a 2000-acre tract in a carbonate terrane. A preferred sequence of work elements should include:
- a) Prepare a detailed geologic map, drill holes on one-acre spacing, obtain analyses from selected samples, and write a report.
  - b) Conduct a literature search, obtain Unlawful disclosure includes analyses from samples taken from area limestone quarries, conduct field reconnaissance of the client's tract, and write a report.
  - c) Conduct field reconnaissance, prepare detailed geologic map, obtain analyses from limestone outcrop samples in the area, and write a report.
  - d) Drill holes on one-acre spacing, obtain analyses from all limestone drill hole samples, construct cross-sections and write a report.

### Key for PG Sample Questions

1. b
2. b
3. c
4. c
5. b
6. a
7. a
8. d
9. c
10. c
11. a
12. a
13. a
14. d
15. a
16. c
17. b
18. d
19. b
20. a
21. b
22. c
23. d
24. b