

**NATIONAL ASSOCIATION OF
STATE BOARDS OF GEOLOGY (ASBOG®)**

**FUNDAMENTALS OF GEOLOGY (FG)
EXAMINATION**

AS AN

"ASSESSMENT EXAMINATION"

Prepared by the

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INTRODUCTION

ASBOG® is concerned primarily with the development of standardized written examinations for assessing qualifications of applicants seeking registration/licensure as professional geologists, but the data generated during this process can be of great significance to academic departments in the assessment of the quality and relevance of Geoscience curricula. An *Assessment Examination* as used in the academic setting can mean two things: an examination that must be passed by a graduating student to earn a particular degree, or an examination that is used to help evaluate various aspects of the curriculum. It is this second use of an *Assessment Examination* that ASBOG® encourages. ASBOG® has developed a two-part written examination -- the Fundamentals of Geology (FG) and the Practice of Geology (PG) -- to test the national competency of candidates who wish to become licensed professional geologists; both parts are multiple-choice examinations with four hours allotted for completion of each examination. The FG examination emphasizes knowledge and skills that are typically acquired in an academic setting and lead to a baccalaureate degree in geology. From the perspective of a university/college, the FG examination can be utilized to assess how well the geology faculty is relating an educational background in geology to students at that particular university/college.

The use of the ASBOG® FG examination as an *Assessment Examination* has been in place in Mississippi since 1999 and Georgia since 2006, both ASBOG® state Member Boards. When the examination is used in this capacity, it is administered to senior-level students majoring in geology on the university/college level. It may also be administered to graduate students majoring in geology provided that their undergraduate degrees are not in geology. All state universities in Mississippi require their students to take the examination. In Georgia, only the University of West Georgia (UWG) requires their students to take the examination.

Results obtained from administering the FG examination as an *Assessment Examination* in Mississippi and Georgia demonstrate that, in heavily-weighted areas of geologic practice such as hydrogeology, students who performed poorly in that area may have done so because they lacked that course work. It is also true that if they did poorly in that area and have already taken the course work, that some sort of improvement may be needed in the communication of hydrogeological concepts, etc., within the teaching of that particular facet of geology. *Assessment Examination* in Georgia also demonstrate that, in heavily-weighted areas of geologic practice such as economic geology and energy resources, students who performed poorly in that area did so because economic geology and energy resources is not offered as part of the curriculum. UWG recognized this and added economic geology to their curriculum starting in the Spring of 2014. Furthermore, some institutions may offer specific geologic course work once every two years and a graduating geology major may not have been afforded the opportunity to take the course because of the infrequency of its offering. Mississippi identified this situation at one of its institutions, resulting in that institution changing its scheduled offering of the course from every other year to every other semester. UWG also recognizes this problem in the field of engineering geology which is offered during the fall semester of odd-numbered years.

ASBOG® conducts a *Task Analysis Survey (TAS)* of the profession every five to eight years to maximize the relevance of the examinations for candidates seeking licensure as professional geologists. The TAS is used to verify those tasks performed by the professional related to public protection. The findings are used to develop test blueprints (test specifications, content outlines) for constructing examinations and writing

examination questions. The test blueprints list the geologic tasks and the number of questions for each geologic task to be included in both the FG and PG examinations. The examination questions are reviewed to verify that each question accurately reflects one or more of the tasks listed in the test blueprints. Statistical analyses indicated that the practice of geology for the public is remarkably consistent across the United States and Canada.

The FG and PG test blueprints specify the domains/content areas for each examination. The relative importance of different content areas can be determined by examining the following test blueprints:

Content Domains*	FG %	PG %
A. General & Field Geology	21	20
B. Mineralogy, Petrology, & Geochemistry	11	5
C. Sedimentology, Stratigraphy, & Paleontology	12	6
D. Geomorphology, Surficial Processes & Quaternary Geology	13	8
E. Structure, Tectonics, & Seismology	11	8
F. Hydrogeology	12	19
G. Engineering Geology	11	19
H. Economic Geology & Energy Resources	9	15
Totals	100	100

*ASBOG® March 2015 Summary Report

The construction of the questions differs between the FG and PG examinations. As mentioned earlier, the FG examination emphasizes knowledge and skills that are typically acquired in an academic setting that traditionally leads to a baccalaureate degree, while the PG examination emphasizes skills and knowledge acquired or expanded in a practice or job setting. Clearly, the results of the FG examination are more important measures of the success of a Geoscience curriculum than are results of the PG examination in light of requirements for state-specific licensure. Therefore, ASBOG® has focused its recent efforts on a statistical analysis of results from recent administrations of the FG examination (Spring 2008 through Fall 2015).

EXAMINATION DEVELOPMENT

Professional geologists (i.e., Subject Matter Experts (SMEs) of which the ASBOG® Council of Examiners (COE) is comprised) spend a considerable amount of time developing the FG examination as a fair measure of professional competence. During the regularly scheduled COE Workshops, the SMEs review and evaluate the difficulty levels of the examination items in relation to minimum competency. These SMEs review statistical results for each item as well as written feedback from candidates who have just taken the examination. This information is extremely valuable in evaluating the accuracy and fairness of each item in the examinations.

The development of the ASBOG® FG examination includes the following:

- Each FG examination question written by the SMEs at COE Workshops is subjected to a minimum of four peer reviews:
- The first peer review occurs during the development of the question. During the COE Workshop, one or more members of the COE write each question. Three other members of the COE then review each new question independently. The purpose of the peer review process is to verify that the keyed answer is the one and only correct answer and that the question is clear and is appropriate for use on the examination.

- All new questions that are accepted are entered into the ASBOG® Examination Item Bank and subjected to the second peer review at a subsequent COE Workshop. During this second peer review, the question is evaluated by three members (SMEs) of the COE and checked to verify that typographical errors were not introduced when the question was entered into the question (item) bank. 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 before the actual administration of the examination.
- The fourth peer review occurs after the administration of the examination. ASBOG® encourages examinees to provide comments about specific questions while taking the examinations. These comments become part of the examination review process during the post-examination COE Workshop. The COE reviews all new items and also any items that exhibit unusual statistical properties (i.e., difficult items, items with negative correlations). This review process makes it possible to improve the accuracy of the questions across time.
- Also, during the (fourth) peer review following the examination, if the SMEs deem that a particular question has “no correct answer” (based on examinee comments, statistical information, or an evaluation of the accuracy of the question), then the item is not scored. Examinees will not be given credit or penalized for an item that has been deemed to have “no correct answer.” If the SMEs deem that a particular question has two correct answers (i.e., is a double-keyed question), then examinees who select either answer will be given credit. This process enhances the fairness of the examination because substandard items (that have no correct answers) are eliminated when calculating examinee’s final scores.

SCORING PROCEDURES/PASSING SCORE

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 is 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. There is no penalty for guessing; therefore, it is to the examinee’s advantage to answer all questions in the examination.

To assure national uniformity, in terms of scoring, ASBOG® provides each jurisdiction (the state Member Boards) with a nationally-recommended passing score based upon criterion-referenced procedures that reflects minimum competency. ASBOG® does not use “fixed-percentage” passing scores because scores established in that fashion fail to consider the difficulty levels of the questions in an examination and their relationship to minimum competency; 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). However, the legal authority for making registration/licensure decisions rests solely with the individual state Member Board jurisdictions and not with ASBOG®. Examinees who fail the examination receive feedback on their performance levels for the content domain areas listed in the FG examination blueprints. A "+" indicates acceptable performance in a particular content domain, whereas a "-" shows substandard performance. The feedback is designed to assist examinees in evaluating their proficiency levels as they prepare for subsequent examinations. Use of these performance indicators are being used to help the faculty assess how well they are providing an education in geology.

Passing scores are adjusted (scaled) based on the average difficulty level of each specific examination so that examinees have approximately the same chance of passing any version of the examination. Similarly, ASBOG® avoids "grading on the curve" because registration/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 examinees are competent to practice individually, and not whether they are competent compared to other candidates.

ADDITIONAL BENEFITS FROM THE USE OF ASSESSMENT EXAMINATIONS

By requiring senior-level geology majors to take the FG as an *Assessment Examination*, they are further afforded (provided they pass the examination) the ability to become Geologists-in-Training (GIT) or Geology Interns as soon as they graduate (this is dependent on each state's specific requirements related to examinees as GITs, Geology Interns, or whatever designation is used for those in training). In states with geologist intern or training programs, this has become extremely beneficial to the students upon graduation, especially those who seek employment wherein protecting the health, safety and welfare of the public is mandated by state law.

For state boards of licensure/registration, the use of the FG Examination as an *Assessment Examination* is also beneficial. It acquaints the students with the professional licensing board; i.e., what the board does, what is public practice, etc., and answers questions such as, "Where do future professional geologists come from?", etc. They come into the practice by virtue of their majoring and graduating with a degree in geology. In the public and the private sector, it appears that many employers are now tying promotions, benchmark awards, etc., to geologists' advancement within the licensure/registration process. In those states that have licensure/registration for geologists, a significant number of employers are beginning to require that those they hire currently are, or in the process of, becoming licensed or registered. This is because as time passes, many regulatory agencies, seeing the benefit of competent professional geologists, are modifying their laws, rules, and regulations to require that geologic documents be stamped and signed by a licensed/registered Professional Geologist.

The preceding discussion is not an exhaustive research effort into the concept of what an *Assessment Examination* is, but it has identified the major benefits and reasons for using the FG as an *Assessment Examination*.

Review the ASBOG® Professional Geologists Candidate Handbook located on the ASBOG® Web site at www.asbog.org under the Candidate Resources heading on the left-hand panel.

Please contact the ASBOG® office should you have any questions, or need additional information. We are here to help!

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