ASBOG® TASK ANALYSIS 2010:

A Study of the Practice of Geology in the United States and Canada

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INTRODUCTION

The content or subject matter tested on licensing examinations is often determined through task analysis research studies. A major objective of these studies is to identify the tasks/activities performed by a profession and the knowledge necessary to perform these tasks. The task analysis results are used to create test blueprints (test specifications, content outlines) that describe those professional activities that impact public protection. The test blueprints establish the content of the examinations until there is a need to update the research to keep abreast of advances or changes in the practice of the profession.

ASBOG® conducted the Task Analysis Survey (TAS) 2010 to update the content and scope of the Fundamentals of Geology (FG) and Practice of Geology (PG) Examinations. The present TAS builds on earlier task analysis studies completed in 1995, 2000, and 2005.

PROCEDURES

The TAS 2010 Survey contained one rating scale to assess the <u>importance</u> of 43 geologic tasks in protecting the general public. The rating scale was constructed using a 4-point rating scale ranging from zero to three (0 – Not important, 1 – Somewhat important, 2 – Very important, 3 – Extremely important). The TAS 2010 Survey also addressed 13 ethical issues faced by practicing geologists. The ethics issues were rated in terms of frequency of occurrence within the profession and seriousness of the ethical issues in terms of influencing the geological/geoscience profession.

The TAS 2010 Survey was sent to random samples of 200 licensed geologists from each of the 30 ASBOG Member jurisdictions (total number = 3,994) as well as a random sample of 2,000 academicians in the USA. The TAS 2010 Survey was also administered on the Internet using SurveyMonkey to random samples of 200 geoscientists from each of the ten provinces in Canada (total number = 1,835).

A total of 2,604 were completed and returned in the USA (2,604 / 5,994 = 43% return rate). This response rate increases to 45% if the 221 undeliverable surveys are excluded from the analysis (2,604 / 5,773). Five hundred and fifteen surveys were completed in Canada (515 / 1,835 = 28% return rate). The high return rates increase the likelihood that the respondents represent professional geologists and geoscientists across the USA and Canada. A total of 239 surveys were completed and returned by academicians (239 / 2,000 = 12%).

TASK STATEMENTS - RESULTS

Statistical analyses indicated variation in the average ratings across the 43 task statements. "Interpret and analyze available geological and geophysical data, maps, sections, and reports" received the highest average rating (mean = 2.69) while "Identify and interpret fossils and fossil assemblages for age or paleoenvironmental interpretations" received the lowest average rating (0.98).

Statistical analyses were conducted to determine whether there was a consistency in the ratings made by practicing geologists and academia. The results revealed that practicing geologists and academia view the practice of the profession similarly (r = .88).

Analyses were also conducted to determine whether the ratings made by geoscientists in Canada were similar to those made by practicing geologists in the USA. There was a moderate degree of similarity in the practice of geology in the USA and Canada (r = .43). Consistent with practicing geologists in the USA and Academia, "Interpret and analyze available geological and geophysical data, maps, sections, and reports" received the highest average rating (mean = 2.57) while "Identify and interpret fossils and fossil assemblages for age or paleoenvironmental interpretations" received the lowest average rating (mean = 1.05).

The consistency in the practice of the profession in the USA was evaluated by performing reliability analyses using ratings made by geologists that practice in one of the 30 jurisdictions that participated in the present study. The results reveal an extremely high degree of consistency in ratings made across the 30 jurisdictions. The estimated reliability (Coefficient Alpha) was 0.996, where 0 indicates no consistency and 1.00 reveals perfect agreement. These findings are extremely important because they demonstrate that national exams can be fair to candidates from all regions of the country.

The ratings made by geologists practicing in one of the ASBOG® states (n = 30) were compared to those made by geologists in non-ASBOG® states. A remarkably high degree of consistency was observed (r = .99). This finding is very powerful because it demonstrates that the practice of the profession is virtually identical across the USA regardless of whether or not states are currently members of ASBOG®.

One objective of the present study was to evaluate whether geologists with different levels of experience and education viewed the profession in a similar manner. The mean values between respondents with 10 or fewer years of experience were virtually identical to those respondents with 11 or more years of experience (r = .99). This high degree of consistency was also observed between respondents with different educational backgrounds (Bachelor's Degree or lower vs. Master's Degree or higher) (r = .99).

ETHICS – RESULTS

Geologists rated the frequency and seriousness of 13 ethical issues encountered in the practice of the profession. The most frequent ethical offense was "Insufficient scope of work" whereas the least frequent ethical issue was "Retaliation against whistle blowers". The most serious ethical issue was "Misrepresentation of professional qualifications" while the least serious was "Gifts – getting and giving".

FG AND PG TEST BLUEPRINTS

The TAS 2010 Subcommittee reviewed and discussed the survey results during a workshop in April 2010. The primary goal of the workshop was to develop the FG and PG Test Blueprints. The content and scope of the FG and PG Exams will be based exclusively on the ratings made by respondents practicing in the USA. The task means for all 43 task statements were sufficiently high to justify testing all tasks in either the FG or PG Exams.

SMEs assigned each of the task statements to the FG and/or PG Exam based on their expertise. The FG Examination will test 31 tasks while the PG Examination will focus on 32 tasks. Twenty of the 43 tasks (47%) will be included in both the FG and PG Test Blueprints.

To determine the relative weight and, therefore, the number of questions necessary for each task in the examinations, the following formula was used:

Task Weight = Importance Mean

This formula places more emphasis on those tasks that are most important to public health, safety, and well-being. On the FG Exam, task weights were determined using the ratings made by practicing geologists and academia, giving equal weight to both groups. By contrast, the PG task weights were calculated using only those ratings made by practicing geologists. The relative percent of items devoted to each task was determined by dividing each task weight by the sum of all task weights and then multiplying by 100:

Task Percent = Task Weight/Sum of Task Weights x 100

Effective with the March 2011 administration of the exams, the FG Test Blueprint will be based on 140 questions (Table 1, page 4; Figure 1, page 5) while the PG Test Blueprint will contain 110 questions (Table 2, page 6; Figure 2, page 7).

ASBOG® conducted the TAS 2010 study to update the content and scope of the FG and PG Examinations. This study builds on the earlier TAS studies completed in 1995, 2000, and 2005. All four studies have demonstrated a high degree of consistency in the practice of the geological profession throughout the USA. The tasks performed by geologists in different states were rated remarkably similar in terms of importance to public protection. The TAS 2010 results provide a sound basis for developing examinations that are fair to candidates from all regions of the country.

Table 1 - ASBOG® Task Analysis 2010
FG Test Blueprint

No.	Task Statements	FG Test Blueprint
	A. General and Field Geology - 20%	
1	Plan and conduct geological investigations considering human health, safety, the environment, regulations, and Quality Assurance/Quality Control (QA/QC).	6
2	Collect, compile, and interpret historic information to plan geological investigations.	5
3	Interpret and analyze available geological and geophysical data, maps, sections, and reports.	6
4	Determine scales, distances, and elevations from imagery, surveys, maps, and GIS.	5
5	Prepare, analyze, and interpret logs, cross-sections, maps, and other graphics derived from field investigations and GIS applications.	6
	B. Mineralogy, Petrology, and Geochemistry - 11%	
7	Identify minerals and rocks and their characteristics.	5
8	Identify and interpret rock and mineral sequences, associations, and genesis.	4
9	Evaluate geochemical and isotopic data, and construct geochemical models related to rocks and minerals.	3
10	Determine type, degree, and effects of rock and mineral alteration.	4
	C. Sedimentology, Stratigraphy, and Paleontology - 12%	
12	Select and apply appropriate stratigraphic nomenclature and establish correlations.	4
13	Identify and interpret sedimentary processes and structures, depositional environments, and sediment provenance.	5
14	Identify and interpret sediment or rock sequences, positions, and ages.	5
15	Identify and interpret fossils and fossil assemblages for age or paleoenvironmental interpretations.	3
	D. Geomorhpology, Surficial Processes, and Quaternary Geology - 13%	
17	Identify, classify, and interpret landforms, surficial materials, and processes.	5
18	Determine absolute or relative age relationships of landforms, sediments, and soils.	4
19	Evaluate geomorphic processes and development of landforms, sediments, and soils, including watershed functions.	5
20	Interpret geomorphic conditions and processes based on remote sensing and GIS.	4
	E. Structure, Tectonics, and Siesmology - 11%	
22	Identify and define structural features and relations, including constructing and interpreting structural projections and statistical analyses.	4
23	Interpret deformational history through structural and tectonic analyses.	4
24	Develop and apply tectonic models to identify geologic processes and history.	3
25	Evaluate earthquake mechanisms, paleoseismic history, and hazards.	4
	F. Hydrogeology - 11%	
27	Define and characterize hydraulic properties of saturated and vadose zone flow systems.	5
29	Evaluate water resources, assess aquifer yield, and determine sustainability.	5
30	Characterize water quality and assess chemical fate and transport.	5
	G. Engineering Geology - 11%	
33	Identify and evaluate engineering and physical properties of earth materials.	5
35	Identify, map, and evaluate geologic, geomorphic, and seismic hazards.	5
36	Interpret land use and landforms using imagery, maps, records, GIS, and geological site characteristics.	5
	H. Economic Geology and Energy Resources - 11%	
39	Compile, assess, and evaluate the data necessary to explore for mineral and energy resources.	4
40	Estimate the distribution of resources based on surface and subsurface data including imagery and GIS applications.	4
41	Interpret data for economic evaluations, resource assessments, and probability of success.	4
42	Determine quantity and quality of resources and reserves from laboratory, surface, and subsurface data.	4
	Total Number of Items	**140**

Figure 1 - ASBOG® Task Analysis 2010
FG Test Blueprint - Domain Percentages

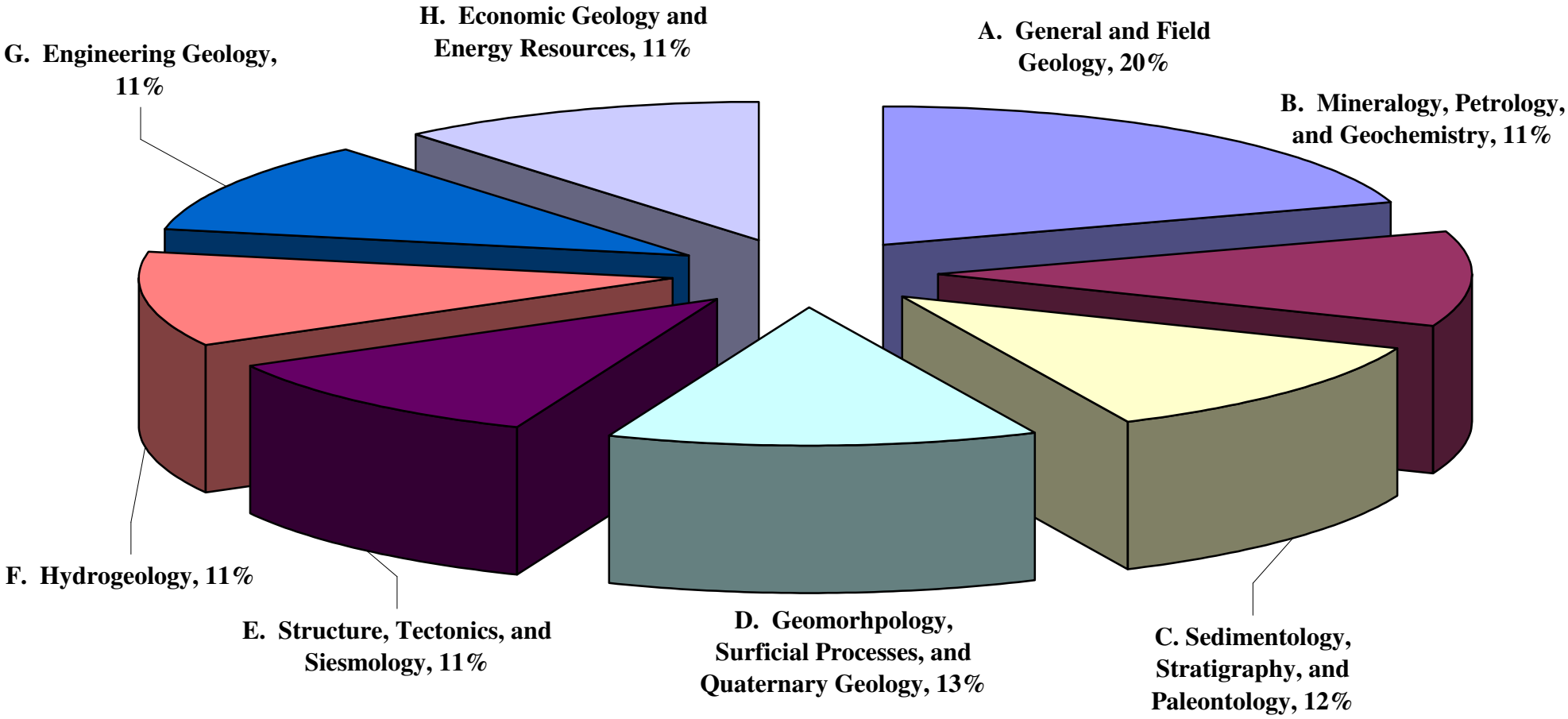

Table 2 - ASBOG® Task Analysis 2010
PG Test Blueprint

No.	Task Statements	PG Test Blueprint
	A. General and Field Geology - 21%	
1	Plan and conduct geological investigations considering human health, safety, the environment, regulations, and Quality Assurance/Quality Control (QA/QC).	5
2	Collect, compile, and interpret historic information to plan geological investigations.	4
3	Interpret and analyze available geological and geophysical data, maps, sections, and reports.	5
4	Determine scales, distances, and elevations from imagery, surveys, maps, and GIS.	4
5	Prepare, analyze, and interpret logs, cross-sections, maps, and other graphics derived from field investigations and GIS applications.	5
	B. Mineralogy, Petrology, and Geochemistry - 5%	
6	Plan and conduct mineralogic, petrologic, and geochemical investigations, including the use of modeling and geophysics.	3
9	Evaluate geochemical and isotopic data, and construct geochemical models related to rocks and minerals.	2
	C. Sedimentology, Stratigraphy, and Paleontology - 5%	
11	Plan and conduct sedimentologic, stratigraphic, or paleontologic investigations, including the use of modeling and geophysics.	3
13	Identify and interpret sedimentary processes and structures, depositional environments, and sediment provenance.	3
	D. Geomorhpology, Surficial Processes, and Quaternary Geology - 8%	
16	Plan and conduct geomorphic investigations, including the use of modeling and geophysics.	3
19	Evaluate geomorphic processes and development of landforms, sediments, and soils, including watershed functions.	3
20	Interpret geomorphic conditions and processes based on remote sensing and GIS.	3
	E. Structure, Tectonics, and Siesmology - 9%	
21	Plan and conduct structural, tectonic, or seismologic investigations, including the use of modeling and geophysics.	3
23	Interpret deformational history through structural and tectonic analyses.	2
24	Develop and apply tectonic models to identify geologic processes and history.	2
25	Evaluate earthquake mechanisms, paleoseismic history, and hazards.	3
	F. Hydrogeology - 19%	
26	Plan and conduct hydrogeological, geochemical, and environmental investigations, including the use of modeling, geophysics, and isotopic and tracer studies.	4
28	Design groundwater monitoring, observation, extraction, production, or injection wells.	4
29	Evaluate water resources, assess aquifer yield, and determine sustainability.	4
30	Characterize water quality and assess chemical fate and transport.	4
31	Manage, develop, protect, or remediate, surface water or groundwater resources.	4
	G. Engineering Geology - 17%	
32	Plan and conduct environmental and engineering geological investigations, including the use of modeling and geophysics.	4
34	Provide recommendations for engineering design, land use decisions, and watershed management.	4
35	Identify, map, and evaluate geologic, geomorphic, and seismic hazards.	4
36	Interpret land use and landforms using imagery, maps, records, GIS, and geological site characteristics.	4
37	Develop programs for hazard mitigation, and land and watershed restoration.	3
	H. Economic Geology and Energy Resources - 16%	
38	Plan and conduct mineral or energy resource exploration, evaluation, and environmental programs, including the use of modeling, geophysics, and geochemistry.	3
39	Compile, assess, and evaluate the data necessary to explore for mineral and energy resources.	3
40	Estimate the distribution of resources based on surface and subsurface data including imagery and GIS applications.	3
41	Interpret data for economic evaluations, resource assessments, and probability of success.	3
42	Determine quantity and quality of resources and reserves from laboratory, surface, and subsurface data.	3
43	Perform geological evaluations for design, abandonment, closure, and reclamation and restoration of energy development or mineral extraction operations.	3
	Total Number of Items	**110**

Figure 2 - ASBOG® Task Analysis 2010
PG Test Blueprint - Domain Percentages