

UTAH STATE UNIVERSITY
DEPARTMENT OF GEOLOGY

VALUE-ADDED ASSESSMENT FOR THE UNDERGRADUATE GEOLOGY PROGRAM

This document is designed to quantify "value-added" learning for students undertaking the sequence: Geol 3550 Sedimentation/Stratigraphy, Geol 3700 Structural Geology, Geol 4700 Field Methods, and Geol 5200 Geology Field Camp. It is administered to all students at the beginning of Geol 3550 Sed/Strat and the same questionnaire is used again at the end of Geol 5200 Geology Field Camp.

Each question requests that you honestly evaluate your own level of competence or level of knowledge regarding a skill or subject relevant to the profession of geology. For each question indicate what you know how to do or what you are reasonably familiar by placing a number from 1 to 3 in the space provided, where

- 1 = know very well, high degree of confidence;**
- 2 = know somewhat, but could use more work; and**
- 3 = have little if any exposure to this topic, little confidence.**

If you do not have any knowledge of the subject area, leave the space blank. Your answers should be based on what you honestly know, not on what you think you might be capable of doing. There is no benefit to providing a dishonest answer.

Please note: Your name is not required and there is no identification on the form. Questionnaires from before and after field camp will be compared in an attempt to document learning directly attributable to this multi-course sequence.

Read each question carefully.

1. On a topographic map, can you:

- a) distinguish a hill from a hole;
- b) determine the elevation of a hill;
- c) determine the contour interval without reference to the legend;
- d) locate a position within a quarter, quarter section;
- e) tell which direction a stream flows.

2. From a topographic map, can you:

- a) correctly determine the value of each contour line along a line of section;
- b) construct a topographic profile with no vertical exaggeration;
- c) construct a profile with a 3X vertical exaggeration;
- d) construct a profile at twice the horizontal scale of the map;
- e) correctly label all aspects of a profile.

3. On a geologic map, can you:

- a) distinguish a syncline from an anticline;
- b) determine the plunge of a fold;
- c) determine the dip for inclined strata;
- d) determine the upthrown side of a fault;
- e) determine the chronologic order of a group of geologic events.

4. In making a geologic map in the field, can you:

- a) correctly transfer geologic contacts from your field position to a base map;
- b) follow geologic contacts in the field, even in tree-covered hilly terrain;
- c) correctly plot measured strike and dip data on the map;
- d) know when to use solid, dashed and dotted contacts;
- e) make logical predictions of strata and structure in unmapped parts of an area, based on parts already mapped.

5. From a geologic map, can you do the following items in constructing a geologic cross-section:

- a) convert true dip to apparent dip to fit the section line;
- b) logically project map units from surface to subsurface;
- c) reasonably represent folded formations in the subsurface;
- d) project the crest of a plunging fold to its proper depth in the subsurface;
- e) make two intersecting cross-sections properly match at the line of intersection.
- f) determine the depth to a specific horizon

6. How many of the following common rock-forming minerals can you identify?

- a) orthoclase b) hornblende c) biotite d) plagioclase e) pyroxene

7. For how many of the following sedimentary rocks can you interpret the conditions of formation, based on composition, texture and/or internal structures?

- a) clean quartz sandstone with well-rounded grains;
- b) arkose conglomerate with angular pebbles;
- c) graywacke with graded bedding;
- d) radiolarian chert;
- e) bioclastic limestone with oolites and cross-bedding.

8. How many of the following structures can you relate to the appropriate type of stress?

- a) concentric fold; b) transposed structure; c) reverse fault; d) drag folds; e) boudinage.

9. How many of the following operations can you perform with a Brunton compass?
- a) adjust it for magnetic declination;
 - b) measure strike and dip directly on a planar surface;
 - c) measure strike and dip of inclined beds, by sighting along the edges, which are exposed 100 feet away;
 - d) measure the orientation of a lineation;
 - e) triangulate your position on a topographic map.
10. How many of the following things can you do in regard to measuring and describing a stratigraphic section in the field?
- a) recognize and describe sedimentary rock compositions, textures, and structures using proper scientific terminology;
 - b) enter descriptions and strat columns in a field notebook using proper scales, symbols and format;
 - c) determine formation thickness on a slope using the eye-height and level method;
 - d) determine thickness of beds dipping into a hill by traversing at an oblique angle to strike.
11. How many of the following do you know?
- a) the age of the Earth;
 - b) the name of the orogeny that formed the northern Rocky Mts.;
 - c) the geologic time frame for the formation of the Appalachian Mts.;
 - d) how long ago the dinosaurs became extinct;
 - e) the age of the oldest rocks in the Atlantic Ocean.
12. How many of the following do you know about large-scale internal Earth processes and the features produced by them?
- a) the parts of the Earth that comprise the lithosphere;
 - b) the rock type found at mid-ocean ridges;
 - c) the relationship between rate of plate movement and subduction angles;
 - d) the type of movement associated with transform faults;
 - e) the relationship of sediment characteristics to type of plate margin.
13. How many of the following capabilities do you have in regard to fossils?
- a) can distinguish between a pelecypod and a brachiopod;
 - b) can distinguish the major phyla of fossil corals;
 - c) can determine a formation's approximate age using a fossil assemblage;
 - d) could distinguish between Ordovician and Cretaceous rocks by the fossils in them;
 - e) could make a reasonable interpretation of paleoecologic conditions during deposition of a sedimentary rock, based on its fossil assemblage.
14. With how many of the following relationships of physics to geological phenomena are you familiar?
- a) elastic limit;
 - b) changing rheology of rock with depth;
 - c) the relation of stress to strain during plastic deformation;
 - d) the relation between dike orientation and stress direction during emplacement;
 - e) the relationship of seismic velocities to rock type and depth.
15. In using aerial photographs can you:
- a) locate your position with pin-point accuracy;
 - b) see geomorphic features in 3-D (even at the center of the photo where one photo must be turned up to attain a stereo view);
 - c) delineate different terrace levels along a river;
 - d) relate the topographic features seen on photos to topographic features on a map;
 - e) transfer geologic contacts from aerial photographs onto a topographic map.
16. In making a surficial geologic map can you:
- a) differentiate between contacts that are solid, dashed, and dotted;
 - b) devise a logical subdivision of map units;
 - c) separate surficial deposits of different ages;
 - d) compose accurate and complete map unit descriptions;
 - e) construct a chart showing the temporal correlation of map units.
17. Can you explain the difference between the following pairs of terms:
- a) till & moraine;
 - b) diamicton & till;
 - c) gravel & alluvium;
 - d) gravel & pebble;
 - e) mud & clay.
18. Can you:
- a) distinguish different mass-wasting processes such as a slide and a flow;
 - b) differentiate colluvium from till in outcrop;
 - c) differentiate a moraine from a landslide on an aerial photograph;
 - d) use relative-age criteria of surface boulders and landforms to differentiate and map deposits of different ages;
 - e) determine the relative sequence of geological events that have shaped a landscape.
19. At an exposure exhibiting superposed unconsolidated deposits can you:
- a) subdivide the section into logical units;

- b) compose a complete description of each (including grain size, rounding, sorting, nature of contacts, sedimentary structures, lithologic composition);
- c) interpret the possible history of Quaternary geologic events that gave rise to the sequence of deposits;
- d) identify a paleosol;
- e) distinguish a well-developed soil profile from a weakly developed one.

20. In a stratigraphic sequence, can you:

- a) infer temporal changes of depositional environments;
- b) determine lateral changes in depositional conditions;
- c) construct fence diagrams;
- d) plot data from spaced sections;
- e) infer sea level from sedimentary deposits

21. On graphs of data, can you:

- a) determine the causal relationships between dependent and independent variables;
- b) interpret linear, log, and natural log plots;
- c) evaluate "goodness of fit" of regressions;
- d) plot data, with error bars;
- e) determine the rates of changes in linear graphs.

22. For three-dimensional geological data, can you:

- a) plot poles and great circles for planar data;
- b) plot linear data, such as ripple crests;
- c) determine fold-axis orientations;
- d) evaluate data for preferred orientation vs. randomly distributed data;
- e) determine the angles between planes;
- f) find true dip from two apparent dips.

23. Can you infer environments of deposition for:

- a) sand waves
- b) herringbone cross-stratification
- c) hummocky stratification
- d) flaser
- e) hopper casts

24. Can you explain how/why the Earth has changed over time with respect to:

- a) atmospheric chemistry
- b) rates of weathering and erosion
- c) preservation of primary sedimentary structures
- d) genesis of various igneous and sedimentary rock types
- e) the biosphere

25. Which of the following can you do?

- a) determine strike and dip using a three-point problem
- b) construct a structure contour map
- c) determine outcrop patterns using structural contours
- d) determine the thickness of layered rocks from a map

26. Which of the following can you define or distinguish?

- a) slip versus separation
- b) plunge of a fold
- c) cleavage, foliation, and mineral lineation
- d) interlimb angle
- e) piercing point