Bloom's Dichotomous Key (BDK)[1] for Geoscience tasks or questions.

Start at Q1. See subsequent pages for notes and guidelines.

Q1. Are students recalling or recognizing the answer to this specific question?	**NO →**
Q2. Do students repeat nearly exactly what they have heard or seen in class materials (including lecture, textbook, lab, homework, clicker, etc.)?	Yes: L1
Q3. Are students demonstrating a conceptual understanding by: a. Putting a given concept or answer in their own new words; b. Representing a given concept in a new form (words, graph, etc.); c. Recognizing or matching examples to concepts; d. Attributing a stated effect (or cause) to recalled or given causes (or effects); e. Explaining a method or choice used somewhere in this test or exercise? (See Q4 if more than one appropriate method or choice is possible.)	Yes: L2

Q4. Is there potentially more than one valid solution – either involving data or not? If YES then are students …	**NO →**
Q5a. … combining diverse information or components into a bigger picture or coherent whole? Q5b. … creating something they haven't seen before (a novel hypothesis, model, communication, abstraction, etc.)?	Yes L6
Q6a. … forming or defending opinions based on diverse factors?** Q6b. … judging quality of conclusions, inferences or methodologies?	Yes L5
Q7. … being asked to compare / contrast information?	Yes L4
Q8. … generating a non-unique result without defending it NO? → Try Q9 or Q14.	Yes L3

Q9. Assuming one solution is best, are students making use of, or interpreting, data or data sets such as graphs, tables, figures, qualitative data, etc.? If YES then are students…	**NO →**
Q10a. … forming or defending opinions based on diverse aspects or types of data?** Q10b. … judging quality of conclusions, inferences or methodologies associated with the data?	Yes L5
Q11a. … using or manipulating the data set to draw conclusions about it's meaning (they may or may not have to explain the conclusion)? (Check Q12 before deciding here.) Q11b. … having to decide which pieces of the data set are important to solve the problem (e.g., picking out relevant from irrelevant information)?	Yes L4
Q12. … using the data/figure/graph etc. to calculate, determine or generate values, parameters or attributes for a specific case, model or situation?	Yes L3
Q13. … recognizing or re-describing the data (e.g. graphically, numerically, verbally) to demonstrate they understand what the data represent?	Yes L2

No multiple solutions AND no data involved. Then are students …	
Q14. … predicting the outcome or trend of a fairly simple change to a scenario they have not seen before?	Yes L3
Q15. … putting an answer or stated concept into a form that is different from what they have seen in class, text, notes, etc.? (Eg. new example, analogy, comparison, etc.)	Yes L2
NO → GO BACK through each category or refer category descriptions to see which fits the best	

Blooms Levels:
L1: Recall
L2: Comprehend
L3: Apply
L4: Analyze
L5: Evaluate
L6: Creative synthesis

****NOTE:** "*Describe or explain your thinking*" does not elevate that thinking above it's original level. Asking students to "*explain your reasoning*" should be ranked the same as if the question did NOT include "*explain …*" This can not apply to "recall" questions.

[1] Derived from "*A new tool for evaluating the cognitive difficulty of assessments*", J. Casagrand and K. Semsar, under review Sept 2014. Dept. of Integrative Physiology, U. of Colorado, Boulder.

Bloom's Dichotomous Key (BDK)[1] Notes and Guidelines

Notes and guidelines:

1. BDK is not about difficulty; it's about lower vs higher order cognitive skills.
2. Instructor should identify which questions could be memorized based on what was "done" or "read" in class, lab or readings.
3. Use instructor's solutions for guidance about expected sophistication.
4. Words used for "Bloom's Levels" have very specific meanings. Do not fall into the trap of using technical terms like "evaluate" in colloquial ways. Therefore take care with tasks that include such "Blooms" descriptors. Try rephrasing the question.
5. Always place tasks into context for the particular course and the targeted students.
6. Consider everything provided to students, including answer options. Don't judge questions without constraints imposed on answering (eg multiple choice questions).
7. Given figures or data - could the question be answered without it? If yes the question may well be L3, L2 or L1.
8. Apply the lowest-order cognitive skill needed. Eg. an 'apply' question could be LOCS if students remember the model and simply use given parameters to solve the given problem; or it could be HOCS if the model must be derived first. The context should suggest whether HOCS or LOCS are expected (H/LOCS = higher/lower order cog. skill).
9. Do not settle on the first decision without exploring further. For example, Q12 says "using … to calculate … etc." while Q13 says "re-describing….". It is easy to allow "using" when in fact all the students are doing is naming, recognizing or describing.
10. If "synthesis" is tempting, consider unique vs potentially several acceptable solutions. If unique, this is probably "recipe like" to some extent and hence not really "synthesis".
11. "*Describe or explain your thinking*" does not elevate that thinking above it's original level. Asking students to "*explain your reasoning*" should be ranked the same as if the question did NOT include "*explain …*" This can not apply to "recall" questions.
12. Note the difference between "difficulty" and "cognitive level". There can be difficult recall tasks and easy "synthesis" tasks.

Blooms Levels:

1. Recall
2. Comprehend
3. Apply
4. Analyze
5. Evaluate
6. Creative synthesis

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Bloom's Dichotomous Key for Geoscience: General flow