

name: \_\_\_\_\_

**Instructions:**

Please answer all questions in the multiple choice section (part A) and four of the five remaining questions from part B. Please indicate clearly which question you want to skip. If you answer all four questions, only the first four will count towards your score.

## A Multiple Choice Questions

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- A.1 The majority of all rocks that occur at the surface of the earth are
- intrusive igneous rocks
  - extrusive igneous rocks
  - sedimentary rocks
  - metamorphic rocks
- A.2 Grains become rounded primarily during
- weathering at outcrop
  - erosion
  - transportation
  - deposition
- A.3 Where would you find most likely Calcite in the topsoil ?
- Maine (cold, wet climate)
  - Louisiana (warm, wet climate)
  - Arizona (warm, dry climate)
- A.4 At the surface, potassium feldspar reacts with water to form clay; this is an example of
- diagenesis
  - erosion
  - metamorphism
  - weathering
- A.5 Marble and quartzite are non-foliated rocks because
- they are never found beneath fault zones or collisional mountain ranges
  - both are dominated by minerals that produce equant grains
  - both are dominated by minerals with crystalline structures that cannot be dissolved
  - regional metamorphism can break down the structures of their constituent minerals, but neither of these minerals is stable in that metamorphic environment
- A.6 Which list properly orders metamorphic rocks from lowest to highest grade?
- conglomerate, sandstone, siltstone, shale
  - shale, slate, phyllite, quartzite
  - slate, phyllite, schist, gneiss
  - gneiss, phyllite, schist, slate
- A.7 In an undisturbed sequence of sedimentary rocks, younger layers overly older layers, according to the principle of
- superposition
  - original horizontality
  - original continuity
  - uniformitarianism

- A.8 Why is radiocarbon dating only rarely applied in geological work?
- no substances of earth contain significant amounts of carbon-14
  - the half-life of carbon-14 is so long, it is effectively a stable isotope
  - the half-life of carbon-14 is so short that it can only be used to date materials that are less than 70,000 years old
- A.9 In an unweathered sample of igneous rock, the ratio of an unstable isotope to its stable daughter isotope is 1/15. If no daughters were present at the time the rock cooled below its closure temperature, and the half life of the decay is 50 Million years, how old is the rock?
- 200 million years
  - 400 million years
  - 750 million years
  - none of the above
- A.10 Sinkholes are primarily a concern for residents whose homes are constructed atop
- sandstone
  - limestone
  - shale
  - granite

## B.1 Groundwater and Sedimentary Rocks

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- a) The picture on the right shows a speleothem (cave formation). What is it, a stalactite or a stalagmite? And how can you tell? (2 points)



- b) What mineral(s) is it made of ? (2 points)
- c) How did it form ? (5 points)

- d) What type of sedimentary rock is it ? (1 points)

- clastic
- organic
- biochemical
- chemical

## B.2 Historical Geology

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a) How old is the earth - and how do we know? (4 points)

b) What makes a good index fossil and what are they good for? (4 points)

c) How did geologists define the beginning and end of geological periods? (2 points)

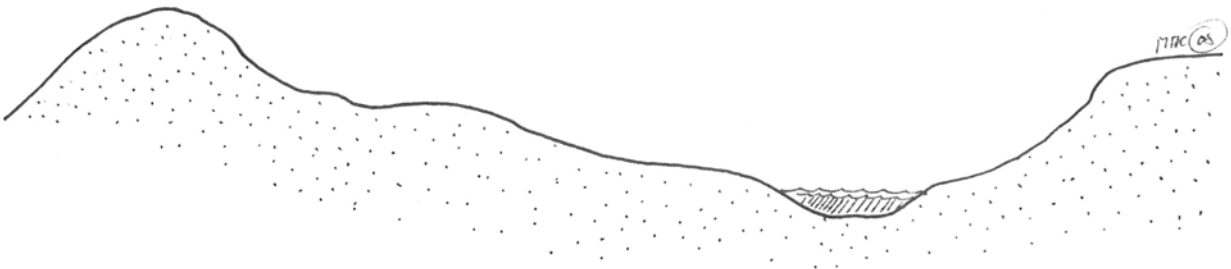
### B.3 Groundwater Resources

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- a) Which of the following rock types make good aquifers? rank the following rock types from best to worst (4 points):

rank	rock type	reasoning
	poorly sorted conglomerate	
	olian sandstone	
	shale	
	limestone	

- b) The figure below shows a cross section through an idealized hilly landscape. Please add the position of the water table and identify groundwater flow directions as well as possible recharge and discharge areas. (6 points)





## B.5 Laboratory Question

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Monitoring wells for a groundwater contamination site were drilled at three locations (from west to east A, B and C). The distance between wells A and B and, between B and C is 100 ft. The table below indicates the elevation of the ground at each well and the depth measured to the water table at each well.

location	ground elevation (ft)	depth to water table (ft)
A	90	45
B	106	68.5
C	50	20

- Draw a west to east cross-section sketch of both the ground surface and water table. Be sure to scale the axes appropriately and label the location of the three wells.
- Calculate the hydraulic gradient between locations A and C (show work).