Learning Assessment #5 – Geologic Time

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This assignment is the fifth of a series of in-class activities known as learning assessments. These assignments were used in an introductory physical geology course that is a requirement for geoscience majors but has no pre-requisites and is open to students in all faculties.

The purpose of the learning assessments is to provide students with frequent feedback on their understanding of the fundamental concepts taught in the course. The learning assessments also provide information to the instructors and teaching assistants on student learning which can be used to help direct instruction in the course.

This assignment package includes:

1. Instructions for students and assignment worksheets
2. Checklist of required elements
3. Geologic time scale (Geological Society of America, 2009. Available to the public online at http://www.geosociety.org/science/timescale/timescl.pdf)

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Learning Assessment #5: Geologic Time

Using the cross-section provided with the accompanying information, answer questions for Part 1, 2 and 3.

Rock Types

Ss (a, b and c) = sandstone Cg = conglomerate
Sh (a and b) = shale
Slt = siltstone
Lm (a and b) = limestone

Age Information

• Fossils in Ssa are lower Eocene (Ypresian) • Fossils in Lmb are Middle Pennsylvian
• Fossils in Ssc are lower Ordovician
• Zircon minerals in Ssb are 750 Ma
V = andesite
Di = diorite
M = kyanite-garnet-biotite schist Gr = granite

- Zircon in granite (Gr) is 600 Ma
- Zircon in Diorite (Di) is 260 Ma
- Biotite in Andesite (V) is 450 Ma
- Zircon in granite clasts in the conglomerate (Cgl) are 600 Ma

There are two unconformities in the sequence of rocks shown by the darker wiggly lines.

Part 1: Relative Time Sequence of Events
Place a number between 1 and 14 beside the geologic events, where the number corresponds to the correct relative timing of events with the oldest being event #1 and the youngest being event #14. (14 marks)

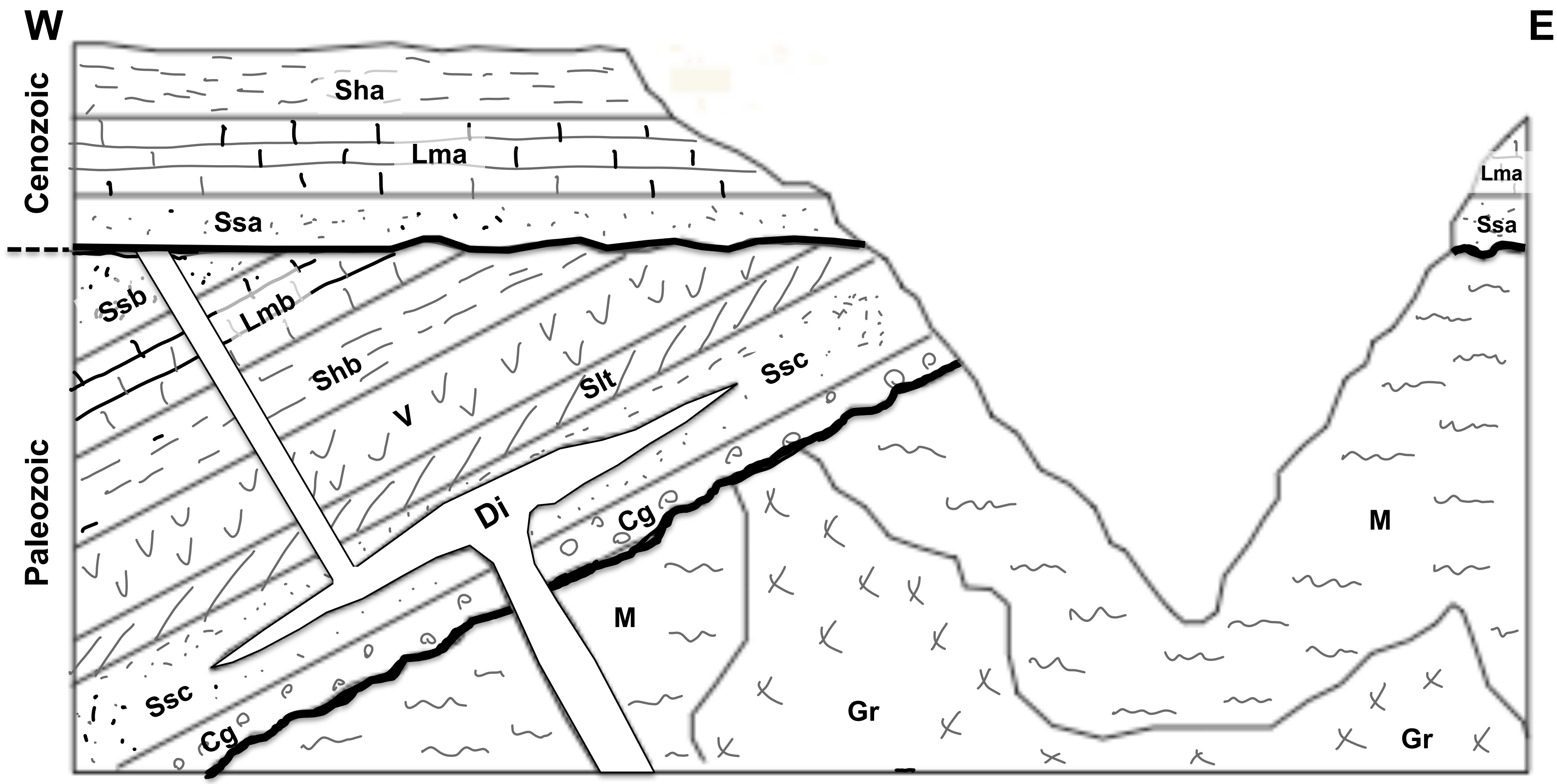
Number in the sequence of events	Geologic Event
	Formation of angular unconformity
	Formation of nonconformity
	Intrusion of Granite (Gr)
	Intrusion of Diorite (Di)
	Formation of Andesite unit
	Formation of Cg
	Formation of Ssc
	Formation of Slt
	Formation of Shb
	Formation of Lmb
	Formation of Ssb
	Formation of units Ssa, Lma and Sha
	Folding of Paleozoic and Precambrian rocks
	Formation of schist (M)

Part 2: In the table below put the numerical age bracket for the event/unit (7 marks).

Event / Unit	**Numerical Age Bracket**
Age bracket for non- conformity Maximum time gap (i.e how many years are missing) for the non-conformity	
Folding of Paleozoic rocks	
Formation of Ssb (Sandstone layer ‘b’)	

Part 3: Explain reasoning and principles you used to determine the numerical age bracket for the Ssb unit. (6 mks)

Cross-Section Diagram for Learning Assessment 5



GLGY 201 LEARNING ASSESSMENT #5 (GEO TIME) STUDENT CHECKLIST

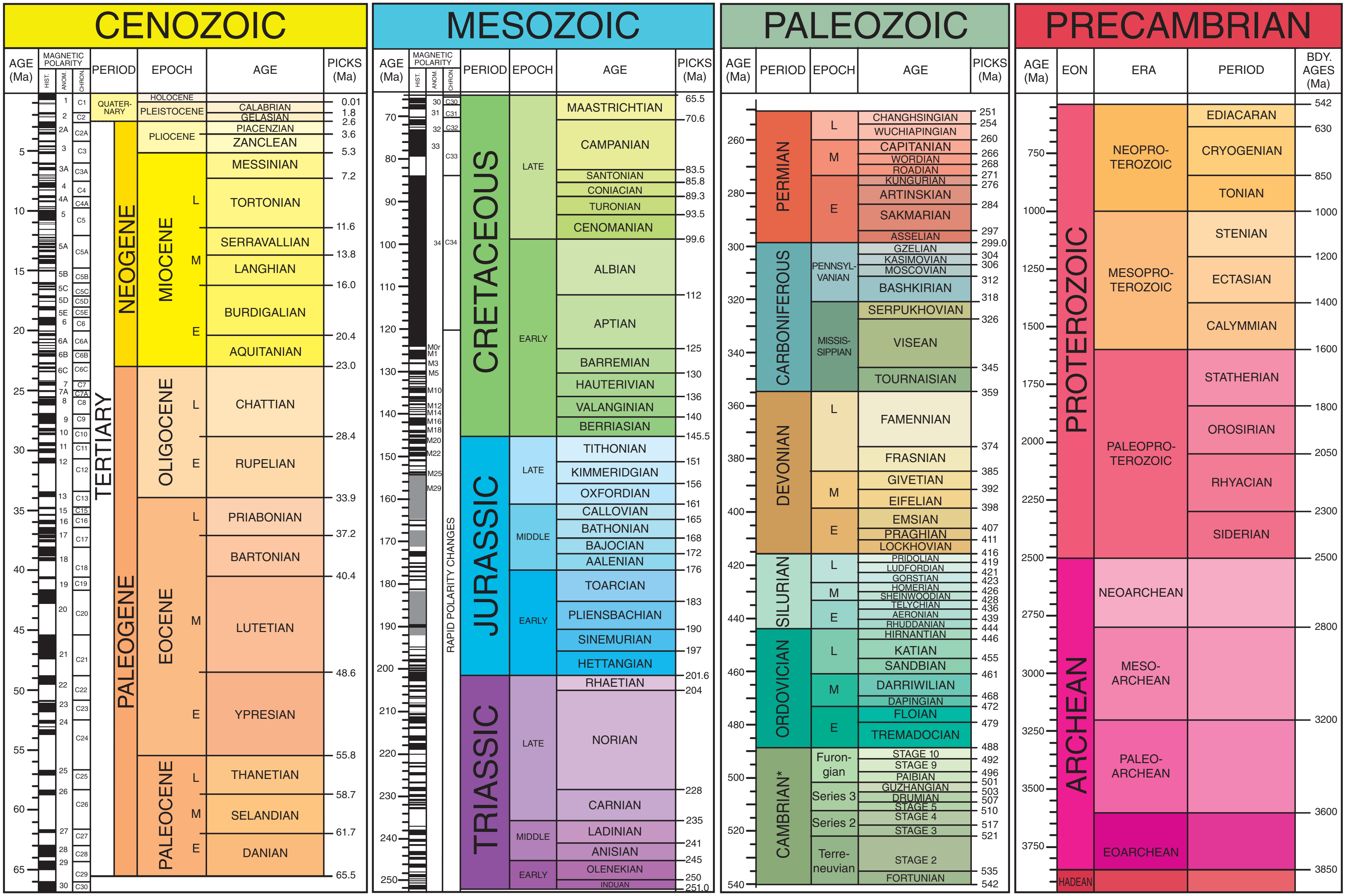
Part 1: Order of Events (Oldest #1 to Youngest #14) (14 pts)
1 pt for each event in the correct order

Part 2: Age Bracketing (7 pts)
___ Non-conformity time bracket (oldest possible age)
___ Non-conformity time bracket (youngest possible age)
___ Non-conformity time gap
___ Folding time bracket (oldest possible age)
___ Folding time bracket (youngest possible age)
___ Formation of SSb oldest possible age
___ Formation of SSB youngest possible age

Part 3: Reasoning for Age Bracket of Ssb (6 pts)
___ Age of unit that Is older than Ssb
___ Reasoning for this unit being the unit to use for oldest time bracket
___ Principle used to determine oldest age
___ Age of unit that is younger than Ssb
___ Reasoning for choosing this unit
___ Principle used to determine youngest age

Total for LEARNING ASSESSMENT #5: ______ / 27

2009 GEOLOGIC TIME SCALE



*International ages have not been fully established. These are current names as reported by the International Commission on Stratigraphy.

Walker, J.D., and Geissman, J.W., compilers, 2009, Geologic Time Scale: Geological Society of America, doi: 10.1130/2009.CTS004R2C. ©2009 The Geological Society of America.

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Sources for nomenclature and ages are primarily from Gradstein, F., Ogg, J., Smith, A., et al., 2004, A Geologic Time Scale 2004: Cambridge University Press, 589 p. Modifications to the Triassic after: Furin, S., Preto, N., Rigo, M., Roghi, G., Gianolla, P., Crowley, J.L., and Bowring, S.A., 2006, High-precision U-Pb zircon age from the Triassic of Italy: Implications for the Triassic time scale and the Carnian origin of calcareous nannoplankton and dinosaurs: Geology, v. 34, p. 1009–1012, doi: 10.1130/G22967A.1; and Kent, D.V., and Olsen, P.E., 2008, Early Jurassic magnetostratigraphy and paleolatitudes from the Hartford continental rift basin (eastern North America): Testing for polarity bias and abrupt polar wander in association with the central Atlantic magmatic province: Journal of Geophysical Research, v. 113, B06105, doi: 10.1029/2007JB005407.