

# Sequence Theory

## Sample Test # 2

Geology 364:  
Total Points 398

Name: \_\_\_\_\_

Date: \_\_\_\_\_

Time Begun: \_\_\_\_\_ Time Ended: \_\_\_\_\_

***Write Your People Soft (Not Social Security) Number  
on the Scantron Card***

### **RULES FOR ALL LECTURE TESTS**

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- ( You have a several day period in which to take this test. You may take it any time during that several day period. The days available will be announced in lecture.
- ; You may not peek at these questions in any way until just at the moment you are ready to take the test.
- ( The test will probably take more than 50 minutes, but you must take the whole test in one sitting. Pit stops are allowed. There are no time limits.
- ( You must sit and work alone while taking the test.
- ( When you sit down to take the test you may have only the following items:
  - ( The test paper and scantron card.
  - ( Any writing instruments [rulers, colored pencils, etc.] you need to write your answers.
  - ( Any refreshments you require for the duration.
- ; Once you have taken the test you are expressly forbidden talk about it in any way, shape, or form with anyone else, except me, until everyone has finished taking the test.

#### **HONOR: SCIENTIFIC AND PERSONAL**

Science and honesty must go hand in hand. Science is the search for a true understanding of the universe, not what we wish it to be, or need it to be. But the universe is complex and for all our success science has had to struggle mightily to learn what it has. Dishonesty thus is very detrimental. Not only does it deliberately lead us down the wrong path, actions taken on the basis of that false knowledge can be deadly. Besides good ideas are hard enough to discover even when struggling honestly.

Personal dishonesty is also detrimental. Dishonesty in science, when discovered, destroys a career, and ruins a reputation. And dishonesty is always discovered because science's goal is to uncover false ideas.

Because each of you take this test individually, and without supervision, whether you cheat or are honest is your very personal and private responsibility. Not cheating means no notes, and not talking with anyone until everyone has finished the test - following the spirit of the law rather than just the letter. Putting your name at the top of the test page is equivalent to signing the James Madison University Honor Pledge.

# Test Number Two

## Geology 364

### Stratigraphy and Basin Analysis

# Sequence Theory

The test is a mixture of scantron, computer graded questions, and interpreting and completing drawings. Answer True/False and Multiple Choice question on the scantron card. Answer other questions on the attached pages.

Be sure to put your social security number on the scantron card.

### RANDOM SAMPLING OF BASIC CONCEPTS:

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#### **TRUE/FALSE QUESTIONS; 2 points each, 30 points total:**

1. T/F Using the hummocky sequence to interpret rocks on the outcrop is a top-down process.
2. T/F Drawing a 3<sup>rd</sup> and 4<sup>th</sup> order relative sea level curve for Briary Gap is a bottom-up process.
3. T/F Color interpretation on the outcrop is a bottom-up process.
4. T/F Tectonic interpretations are always top-down.
5. T/F A representative autogenic processes would be eustasy.
6. T/F Delta lobe switching is an autogenic process.
7. T/F Individual storms are autogenic but climate is allogenic.
8. T/F A TST is the result of an autogenic process.
9. T/F A condensed section produced by a maximum flooding surface and one produced by a parasequence flooding surface are never the same thing.
10. T/F Backstepping is the same as a transgression.
11. T/F Retrogradation is the same as backstepping.
12. T/F A composite sequence is one composed of parasequences.
13. T/F Onlap and transgression are just two terms for the same thing.
14. T/F Progradation cannot take place during a TST.
15. T/F A ravinement surface is a type of sequence boundary.

#### **The Effects of Sediment Influx and Subsidence on Accommodation**

**TRUE/FALSE QUESTIONS; 2 points each, 14 points total:** At the back are drawings labeled **Subsidence** and **Sediment Influx**. These questions are for those drawings.

16. T/F Situation D will likely never fill the accommodation available.
17. T/F Situation E does not result in permanent sediment accumulation.
18. T/F Situation F is most likely to produce terrestrial environments.
19. T/F Situations A and E are likely to produce the same outcome.
20. T/F Situations C and F are likely to produce the same outcome.
21. T/F The TST in G is more likely to happen with E than with D.
22. T/F The TST in G is more likely to happen with A than with B.

**Sequences and Depositional Systems:**

**RIGHTS MINUS WRONGS MULTIPLE CHOICE QUESTIONS: 3 points each, 24 points total.** The table below shows a series of environments across a shelf/slope/basin system plotted against an eustatic curve. Below that is a table showing processes or environments that might be present in each stage. For each selection below *chose any and all* choices that apply.

High Stand	Low Stand	ALLUVIAL VALLEY	DELTA PLAIN	CONTINENTAL SHELF	CONTINENTAL SLOPE	SUBMARINE FAN
High Sea Level		<b>A</b>	<b>F</b>	<b>K</b>	<b>P</b>	<b>U</b>
Rising Sea Level		<b>B</b>	<b>G</b>	<b>L</b>	<b>Q</b>	<b>V</b>
Low Sea Level		<b>C</b>	<b>H</b>	<b>M</b>	<b>R</b>	<b>W</b>
Falling Sea Level		<b>D</b>	<b>I</b>	<b>N</b>	<b>S</b>	<b>X</b>
High Sea Level		<b>E</b>	<b>J</b>	<b>O</b>	<b>T</b>	<b>Y</b>

**SELECT FROM THESE**

1A Aggradation of entrenched channels	2A Condensed section	3A Rapid delta progradation
1B Along shore delta switching	2B Major shelf instability	3B Rapid entrenchment
1C Backswamp accumulation	2C Meandering channels	3C Sediment bypassing
1D Braided channels	2D Mud accumulation on shelf	
1E Channel switching	2E Rapid accumulation on slope	

**LOCATION A.** Choose any and all environments/processes that apply to this location in the table.

23. A=1A      B=1B      C=1C      D=1D      E=1E  
 24. A= 2A      B=2B      C=2C      D=2D      E=2E  
 25. A=3A      B=3B      C=3C

**LOCATION C.** Choose any and all environments/processes that apply to this location in the table.

26. A=1A      B=1B      C=1C      D=1D      E=1E  
 27. A= 2A      B=2B      C=2C      D=2D      E=2E  
 28. A=3A      B=3B      C=3C

LOCATION K. Choose any and all environments/processes that apply to this location in the table.

- |           |      |      |      |      |
|-----------|------|------|------|------|
| 29. A=1A  | B=1B | C=1C | D=1D | E=1E |
| 30. A= 2A | B=2B | C=2C | D=2D | E=2E |
| 31. A=3A  | B=3B | C=3C |      |      |

LOCATION L. Choose any and all environments/processes that apply to this location in the table.

- |           |      |      |      |      |
|-----------|------|------|------|------|
| 32. A=1A  | B=1B | C=1C | D=1D | E=1E |
| 33. A= 2A | B=2B | C=2C | D=2D | E=2E |
| 34. A=3A  | B=3B | C=3C |      |      |

LOCATION Y. Choose any and all environments/processes that apply to this location in the table.

- |           |      |      |      |      |
|-----------|------|------|------|------|
| 35. A=1A  | B=1B | C=1C | D=1D | E=1E |
| 36. A= 2A | B=2B | C=2C | D=2D | E=2E |
| 37. A=3A  | B=3B | C=3C |      |      |

**Seismic Terminations:**

**RIGHTS MINUS WRONGS, MULTIPLE CHOICE QUESTIONS; 3 points each, 24 points total:** Seismic terminations come in patterns, and a lot of patterns are recognized. The most common ones are the following:

**Toplap    Onlap    Downlap    Faultlap**

In the *drawings at the back of the test* titled *Seismic Terminations* various termination patterns are circled. Mark the terminations that fall into each category. There may be none, one, or more than one.

TOPLAP TERMINATION(S). Choose any and all of the following locations in the illustrations that match this type.

- |         |     |     |     |     |
|---------|-----|-----|-----|-----|
| 38. A=A | B=B | C=C | D=D | E=E |
| 39. A=F | B=G | C=H |     |     |

FAULT TERMINATION(S). Choose any and all of the following locations in the illustrations that match this type.

- |         |     |     |     |     |
|---------|-----|-----|-----|-----|
| 40. A=A | B=B | C=C | D=D | E=E |
| 41. A=F | B=G | C=H |     |     |

ONLAP TERMINATION(S). Choose any and all of the following locations in the illustrations that match this type.

- |         |     |     |     |     |
|---------|-----|-----|-----|-----|
| 42. A=A | B=B | C=C | D=D | E=E |
| 43. A=F | B=G | C=H |     |     |

DOWNLAP TERMINATION(S). Choose any and all of the following locations in the illustrations that match this type.

- |         |     |     |     |     |
|---------|-----|-----|-----|-----|
| 44. A=A | B=B | C=C | D=D | E=E |
| 45. A=F | B=G | C=H |     |     |

**Gamma Log Interpretation:**

**RIGHTS MINUS WRONGS - MULTIPLE CHOICE; 3 points each, 60 points total:**

*Gamma Log Interpretation drawings at the back of the test.* Identify all examples which clearly exhibit complete records that show the features below.

Aggradation. Identify all examples which clearly exhibit this feature.

46. A=A      B=B      C=C      D=D      E=E  
 47. A=F      B=G      C=H      D=I      E=J

Retrogradation. Identify all examples which clearly exhibit this feature.

48. A=A      B=B      C=C      D=D      E=E  
 49. A=F      B=G      C=H      D=I      E=J

Progradation. Identify all examples which clearly exhibit this feature.

50. A=A      B=B      C=C      D=D      E=E  
 51. A=F      B=G      C=H      D=I      E=J

Irregular. Identify all examples which clearly exhibit this feature across *at least 2 parasequences*.

52. A=A      B=B      C=C      D=D      E=E  
 53. A=F      B=G      C=H      D=I      E=J

Tidal type parasequences. Identify all records that possess this type sequence.

54. A=A      B=B      C=C      D=D      E=E  
 55. A=F      B=G      C=H      D=I      E=J

Shoreface type parasequences. Identify all records that possess this type sequence.

56. A=A      B=B      C=C      D=D      E=E  
 57. A=F      B=G      C=H      D=I      E=J

Typical TST record. Identify all examples which clearly exhibit this feature.

58. A=A      B=B      C=C      D=D      E=E  
 59. A=F      B=G      C=H      D=I      E=J

Typical HST record. Identify all examples which clearly exhibit this feature.

60. A=A      B=B      C=C      D=D      E=E  
 61. A=F      B=G      C=H      D=I      E=J

**Interpreting A Relative Sea Level Curve**

**RIGHTS MINUS WRONGS - MULTIPLE CHOICE; 8 points each, 24 points total:** *At the back* is a page with 5 strip logs at the top and a relative sea level curve at the bottom. The questions below concern identifying the correct strip log with the correct location on the curve.

LOCATION 1. Choose the strip log most likely to match this location.

62. A      B      C      D      E

LOCATION 3. Choose the strip log most likely to match this location.

63. A      B      C      D      E

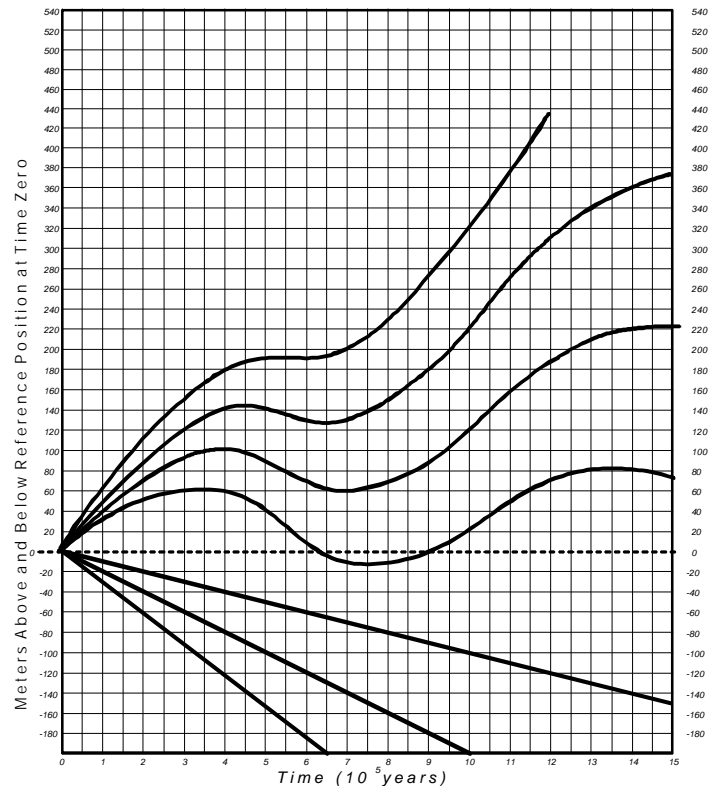
LOCATION 4. Choose the strip log most likely to match this location.

64. A      B      C      D      E

### Subsidence and Relative Sea Level Curves

**TRUE/FALSE QUESTIONS; 2 points each, 16 points total:** These questions examine the relationship between rates of tectonic subsidence, accommodation, and systems tract preservation.

- 65. T/F Low Stand Deposits become less significant as basin subsidence rates increase.
- 66. T/F Subsidence exaggerates onlap.
- 67. T/F With increasing subsidence rates the relative amount of time the HST has to be deposited increases.
- 68. T/F Incisement is likely to occur with subsidence rates of  $0 \text{ m}/10^5 \text{ years}$ ?
- 69. T/F When rates of subsidence exceed rates of eustatic fall accommodation increases.
- 70. T/F Cratons are likely to have well developed High Stand Tracts.
- 71. T/F Rift systems will not likely to posses well developed sequence deposits with all the systems tracts well represented.
- 72. T/F Parasequences will be better developed in low subsidence rates rather than high ones.



**Stratigraphic Section Interpretation**

**RIGHTS MINUS WRONGS - MULTIPLE CHOICE; 3 points each, 130 points total:** The questions below concern interpretation of sequence units in the stratigraphic strip log at the back of the test. For each feature below identify the lithofacies letters that represent that feature.

**MAXIMUM FLOODING SURFACES.** Identify by letters all lithofacies representing this feature.

- |         |      |      |      |      |
|---------|------|------|------|------|
| 73. A=A | B=B  | C=C  | D=D  | E=E  |
| 74. A=F | B=G  | C=H  | D=I  | E=J  |
| 75. A=K | B=L  | C=M  | D=N  | E=O  |
| 76. A=P | B=Q  | C=R  | D=S  | E=T  |
| 77. A=U | B=V  | C=W  | D=X  | E=Y  |
| 78. A=Z | B=AA | C=BB | D=CC | E=DD |

**LOW STAND TRACTS.** Identify by letters all lithofacies representing this feature.

- |         |      |      |      |      |
|---------|------|------|------|------|
| 79. A=A | B=B  | C=C  | D=D  | E=E  |
| 80. A=F | B=G  | C=H  | D=I  | E=J  |
| 81. A=K | B=L  | C=M  | D=N  | E=O  |
| 82. A=P | B=Q  | C=R  | D=S  | E=T  |
| 83. A=U | B=V  | C=W  | D=X  | E=Y  |
| 84. A=Z | B=AA | C=BB | D=CC | E=DD |

**TRANSGRESSIVE SYSTEMS TRACTS.** Identify by letters all lithofacies representing this feature.

- |         |      |      |      |      |
|---------|------|------|------|------|
| 85. A=A | B=B  | C=C  | D=D  | E=E  |
| 86. A=F | B=G  | C=H  | D=I  | E=J  |
| 87. A=K | B=L  | C=M  | D=N  | E=O  |
| 88. A=P | B=Q  | C=R  | D=S  | E=T  |
| 89. A=U | B=V  | C=W  | D=X  | E=Y  |
| 90. A=Z | B=AA | C=BB | D=CC | E=DD |

**HIGH STAND TRACTS.** Identify by letters all lithofacies representing this feature.

- |         |      |      |      |      |
|---------|------|------|------|------|
| 91. A=A | B=B  | C=C  | D=D  | E=E  |
| 92. A=F | B=G  | C=H  | D=I  | E=J  |
| 93. A=K | B=L  | C=M  | D=N  | E=O  |
| 94. A=P | B=Q  | C=R  | D=S  | E=T  |
| 95. A=U | B=V  | C=W  | D=X  | E=Y  |
| 96. A=Z | B=AA | C=BB | D=CC | E=DD |

**LOW STAND UNCONFORMITIES.** Identify by the letters of lithofacies both directly *above* and *below* all examples of this feature.

- |      |     |      |      |      |      |
|------|-----|------|------|------|------|
| 97.  | A=A | B=B  | C=C  | D=D  | E=E  |
| 98.  | A=F | B=G  | C=H  | D=I  | E=J  |
| 99.  | A=K | B=L  | C=M  | D=N  | E=O  |
| 100. | A=P | B=Q  | C=R  | D=S  | E=T  |
| 101. | A=U | B=V  | C=W  | D=X  | E=Y  |
| 102. | A=Z | B=AA | C=BB | D=CC | E=DD |

**RAVINEMENT SURFACES.** Identify by letters all lithofacies representing this feature.

- |      |     |      |      |      |      |
|------|-----|------|------|------|------|
| 103. | A=A | B=B  | C=C  | D=D  | E=E  |
| 104. | A=F | B=G  | C=H  | D=I  | E=J  |
| 105. | A=K | B=L  | C=M  | D=N  | E=O  |
| 106. | A=P | B=Q  | C=R  | D=S  | E=T  |
| 107. | A=U | B=V  | C=W  | D=X  | E=Y  |
| 108. | A=Z | B=AA | C=BB | D=CC | E=DD |

109. The Parasequences in lithofacies C are:  
 A = Prograding      B = Retrograding      C = Aggrading

110. The Parasequences in lithofacies M are:  
 A = Prograding      B = Retrograding      C = Aggrading

**Locating the Stratigraphic Section**

111. **Graphic Construction: 10 points.** At the back is a “Geologic Cross Section of an Idealized Seismic Stratigraphic Section.” Draw a vertical line on this cross section showing the most likely location of the strip log.

**Drawing a Relative Sea Level Curve**

112. **Graphic Construction: 30 points.** At the back is the Stratigraphic Strip Log you used for the last set of questions on Stratigraphic Section Interpretation. Only now, draw a Relative Sea Level Curve in the column provided.

**Wheeler (Chronostratigraphic) Diagrams**

113. **Graphic Construction: 30 points.** At the back is a “Geologic Cross Section of an Idealized Seismic Stratigraphic Section.” Draw a Wheeler time/space diagram for the cross section in the table below the cross section. NOTE you do not have to color code the Seismic Stratigraphic Section, but DO color code the wheeler diagram.

***Don't Forget to Write Your People Soft (not Social Security) Number On the Scantron card.***

