Name: _____

Sedimentology & Stratigraphy

LECTURE TEST #1

February 14, 2019

1. Please draw a cross-section of an active *current ripple*, showing internal features and the current direction. Label all the components. [10 points]

2. Curious features, *antidunes*. Please describe how you would recognize an antidune in a modern river. Under what conditions do they form? [5 points]

3. For the following questions, imagine a stream 5.0 meters wide, 2.0 meters deep and flowing at 25 centimeters per second. Please show your work for each section. (Please note the "useful equations" on the last page of this examination.)

   a. You drop a grain of quartz approximately 0.05 mm in diameter into this stream. How fast *would* it settle if the water was <u>not</u> moving? Since the water <u>is</u> moving, what does the grain actually do? [6 points]

   b. Is the stream flowing under *laminar* or *turbulent* conditions? Why? [4 points]

   c. Is the flow *subcritical* or *supercritical*? Why? [4 points]

   d. What is the stream flow (Q)? [4 points]

4. Why are river floodplains such excellent places to grow crops? Answer as a geologist! [5 points]

5. Please describe a *nonconformity* with a labeled diagram. [5 points]

6. Why do grains *saltate*? Why will a quartz grain saltate much higher in air than in water? At least one diagram required. [5 points]

7. This will be familiar. Fill in the seven blanks! [7 points]

TIME UNITS	**CHRONOSTRATIGRAPHIC UNITS**
Era	*Erathem*
_____	_____
_____	_____
Age	_____

LITHOLOGIC UNITS

Supergroup

_____

_____

Member

8. How do you distinguish *delta front* deposits from those of a *delta plain* or a *prodelta*? Why are delta front deposits important for oil and gas production? [10 points]

9. Please draw below in cross-section a Gilbert-Type delta controlled by purely inertial forces. Always label the parts and show sea level. [10 points]

10. Please draw a meandering stream in map-view (<u>not</u> cross-section) showing the *cut banks*, *point bars*, *natural levees*, *floodplains*, and a *crevasse splay* or two. With a line, indicate the deepest part of the channel. [10 points]

11. Define and/or describe any <u>three</u> of the following terms, using labeled diagrams where appropriate and clearly stating the significance of the term in sedimentology or stratigraphy. [15 points total]

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hydrolysis

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wadi

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graded bedding

Rotliegendes

Useful Equations

Stokes' Law of Settling:

$$\omega = \left[\frac{(\rho_s - \rho)g}{18\mu}\right] d^2$$

where ω = settling velocity
ρ_s = particle density (quartz has a density of 2.6 gm/cm^3)
ρ = fluid density (water is 1.0 gm/cm^3)
d = grain diameter
g = gravitational constant (981 cm/sec^2)
μ = fluid viscosity (water is 0.01 gm/cm·sec)

Reynold's Number (Re):

$$Re = \frac{UL\rho}{\mu}$$

where U is flow velocity
L is a reference length, such as depth
ρ = fluid density (water is 1.0 gm/cm^3)
μ = fluid viscosity (water is 0.01 gm/cm·sec)

Froude Number (Fr):

$$Fr = \frac{U}{\sqrt{g \bullet L}}$$

where g is gravitational acceleration (981 cm/sec^2)
L is a reference length, such as depth
U is flow velocity
g = gravitational constant (981 cm/sec^2)

Stream flow equation:

$$Q = wdv$$

where Q is stream flow
w is width of the channel
d is channel depth
v is velocity of flow