Mid-term pretest review

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Today’s agenda

Settling velocity lab is due today

The mid-term exam is this Thursday (February 28th in rm 325 Brooks).

Today will be spent on a pre-test review.

Note that mid-term exam will be in rm 325 Brooks
19. Given that $b=1.5$ & $c=7.2$, determine $N$ (the number of earthquakes per year with magnitude 6 and greater) where $\log(N)=-bm+c$. On average what is the time interval separating magnitude 6 earthquakes in this area?
18. Determine the dimensions of $\eta$ (the viscosity) in Stokes’s law. See the text for discussions of dimensional analysis (e.g. problem 3.13 on pages 64 and 65 of Waltham’s text). For practice undertake similar analysis for $g$ (the acceleration of gravity) discussed in Question box 4.5 on page 64 of the text.
17. In the diagram below, assume that \( r \) is 10 km and compute \( e \).

\[
\begin{align*}
\rho \text{ Crust} &= 2.7 \text{ g/cm}^3 \\
\rho \text{ Mantle Lithosphere} &= 3.3 \text{ g/cm}^3 \\
r &= \text{kilometer crustal root} \\
e &= \text{mountain height} \\
moho
\end{align*}
\]
16c. What are the slopes of the plotted data during these two periods of deposition?
16b. What is the sedimentation rate in the years preceding 10000 years ago?
a. What is the rate at which sediment is deposited over the period of time extending from 8000 years to 18000 years before present? Just measure a couple points directly from the graph to obtain an approximate estimate of sedimentation rate.

Glacial Lake Monongahela
16. The following graph portrays age/depth data from Glacial Lake Monongahela sediments cored in the area.
15. In the porosity density relationship below, assume \( \phi_0 \) is 0.4 and \( \lambda \) is 1.5. What is the slope (or porosity gradient) between depths of 1.7 and 1.9 km in this area?

\[
\phi = \phi_0 e^{-\lambda z}
\]
13 (cont.) Where exponential population growth is defined as

\[ N = N_0 e^{\lambda t} \]

a) If \( \lambda \) in the above equation is 0.01 /year, how long will it take for the US population to double?

14. What would you need to know to figure out what the constant \( \lambda \) equals?
13. Population growth is often observed to follow an exponential growth relationship. US population growth over the past 200 years or so is definitely adhering to this model (see figure below).
7. Given \( C = C_o F^{(D-1)} \) (see problem 2.12).

Determine \( C_o \) from the plot below of the log of \( C \).
6. Determine the intercept
8. Given a slope of 1150 years/meter and age at a depth of 12.5 meters = 0, what is the intercept ($A_0$) in the age depth relationship $A = kD + A_0$?

where $k$ is the slope and $D$ is the depth?

Show calculations here:
12. List two geological processes that follow exponential decay relationships and note the formula used to describe each of these.
3. Given that $y = q \log(r)$, simplify the expression $10y$. Show your steps and state the rules that you used at each step. Hint 1: you have a product similar to $10ab$; Hint 2: you also have $10 \log$ of a number.

4. Given that $\ln(y) = x$, explain the implied relationship of $x$ to the base $e$ and write as an equation; i.e., what does $y =?$ Explain.
1. Given that $y = xz$, evaluate $\log(y)$.

2. Express $\log \left( \frac{xy}{z} \right)$ as a combination of logs of each variable. Use at least two steps to develop your result.
11. In the porosity depth relationship $\phi = \phi_0 e^{-z/\lambda}$, solve for $z$. Hint: Take the natural log. Show individual steps.
10. What kind of a function is \( s = d_0 + ax^{1/2} \)?
9. Evaluate the log of $C = C_0 F^{(D-1)}$
5. Transform the Gutenberg/Richter equation $\log(N)=-bm+c$ into a function of $N$ rather than $\log(N)$. 
Bring pencil with eraser, ruler and calculator. Paper will be provided.

Study hard and good luck!
Don’t forget that the test will be in room 325 Brooks and … turn in the settling velocity lab before leaving today.

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See you Thursday in rm 325 Brooks