Paleo Problem Set #1

Radiocarbon
1) Create a graph of radiocarbon activity versus time, using the Libby half-life and an initial radiocarbon activity of 13.6 decays per minute/gram carbon.

2) A piece of wood has a $\delta^{14}C$ of -250‰.
a) What is its ^{14}C activity, assuming a standard value of 13.6 dpm/gC ?
b) What is the radiocarbon age if the $\delta13C$ is -25‰?
c) What is the radiocarbon age if the $\delta13C$ is -13‰?
d) Estimate the calibrated ages for the above radiocarbon ages, using the appropriate graph found in: *INTCAL04 terrestrial radiocarbon age calibration, 0-26 cal kyr BP*, Reimer et al, Radiocarbon, Vol 46, Nr 3, 2004, p 1029-1058.
e) Given a radiocarbon age error of $\pm$ 50 years, estimate the errors in the calibrated ages.
f) What are the ages of these samples relative to today?

U/Th coral dating
3a) What are the assumptions for the standard (closed system) method of U/Th coral dating?
b) This method fails to give reliable ages for corals older than ~ 30 ka. What is the fundamental evidence for this?

Paleothermometry
4) Give the fundamental principles, key assumptions, sign of the relationship (if the temperature increases, does the proxy increase or decrease?) and most significant problems for these temperature proxies we discussed in class:
a) faunal assemblages (sign of relationship does not apply)
b) $\delta^{18}O$
c) Mg/Ca (foraminifera)
d) Sr/Ca (corals)
e) alkenones
f) noble gases in groundwater

$\delta^{18}O$
5) This graph is a planktonic foram record from the Eastern equatorial Pacific for the last ~ 30,000 years. What is the temperature change that is implied by this record from the Last Glacial Maximum (coldest part of this record) until the late Holocene (warmest part of the record)?