**EAS 4300/6124: Introduction to Oceanography**

# MIDTERM EXAM

# NAME:

There are 4 questions and you have 60 minutes. Keep your answers short and to the point.

Remember: this exam is not to test your ability to memorize things. Use the concepts you learned in the class to give answers and reasonable explanations to the questions. The questions may have more than one answer so it is important that you explain when asked to do so.

If you have questions during the exam, ask Vincent, although he has a strong French accent you should be able to understand him!

Good luck, and remember this is yet another opportunity to learn something, you are all very good.

Question # 1 (18 pt total)

Figure 1 shows a map of satellite derived topography.

a) (3pt) Draw an arrow to indicate the direction of the relative movement of the bigger plate, mark at least two locations where you expect to find volcanoes (with a letter V) and mark a location of a deep sea trench (with a letter T).

b) (3pt) What sediments do you expect at point A B C D and E?

c) (2pt) Panel B shows a stratigraphy of the ocean floor along the red line transect in Panel A. There are 5 different sediment layers. In the red boxes write the correspondent sediment type for each of the layers.

d) (6pt) Explain carefully the formation of the various layers in the stratigraphy.

f) (3pt) Give 2 reasons why you would expect the oceanic crust to be heavier at location D when compared to B.

g) (2pt) What is a relict sediment? Where would you expect to find one in Panel A? Explain.

Question # 2 (13 pt total)

Figure 2 shows a satellite map of water vapor over the North Pacific/ Gulf of Alaska. White color indicates higher concentration of water vapor.

a) (4pt) There is a clear front indicated by a black arrow. In the white box write down if you expect this front to be a cold or warm front. Explain why.

c) (3pt) According to what you know about the general circulation of the atmosphere do you expect westerly or easterly winds at location A and B? Draw the direction of the winds at location A and B. Is this consistent with the movement of the front?

b) (3pt) This front is associated with a cyclonic or anticyclonic circulation structure? The center of this structure is in the middle of the green circle. Do you expect low or high pressure at the center of the green circle?

d) (3pt) Do you expect precipitation to be stronger at point c or d as the front evolves in time? Is the point you have chosen going to experience gradual prolonged rain or very heavy rain over a short amount of time?

Question # 3 (16 pt total)

Figure 3 shows a map of sea surface temperature for Modern time compared to the last Glacial maxima.

a) (3pt) How are Forminifera useful in reconstructing temperature during the last glacial maxima? (very brief answer please)

b) (6pt) What is the role of the thermohaline circulation in the oceanic heat transport? Do you expect the thermohaline circulation to be stronger during the Modern or Last Glacial according to the sea surface temperature map? Explain.

b) (4pt) If density was only controlled by temperature do you expect the currents to be stronger at location A or B? In which direction are the currents flowing? Explain.

c) (3pt) Would you expect higher sea level north or south of location B? Why?

Question # 4 (18 pt total)

Figure 4 shows a map of surface winds over the Indian Ocean.

a) (5pt) According to what you have learned about the monsoon, is this the winter or summer monsoon? Is India experiencing heavy rain in Figure 4? Explain.

b) (5pt) Indicate if you have upwelling or downwelling at locations a,b,c,d,e and f.

c) (5pt) Sketch the surface currents correspondent to the wind pattern at locations a,b,c,d,e and f.

d) (3pt) If the winds would suddenly stop which currents will disappear first a) the Ekman currents or b)the geostrophic currents? Explain.

Extra Credit

What is the height of a geostationary satellite?

How is it determined? Explain the concept.

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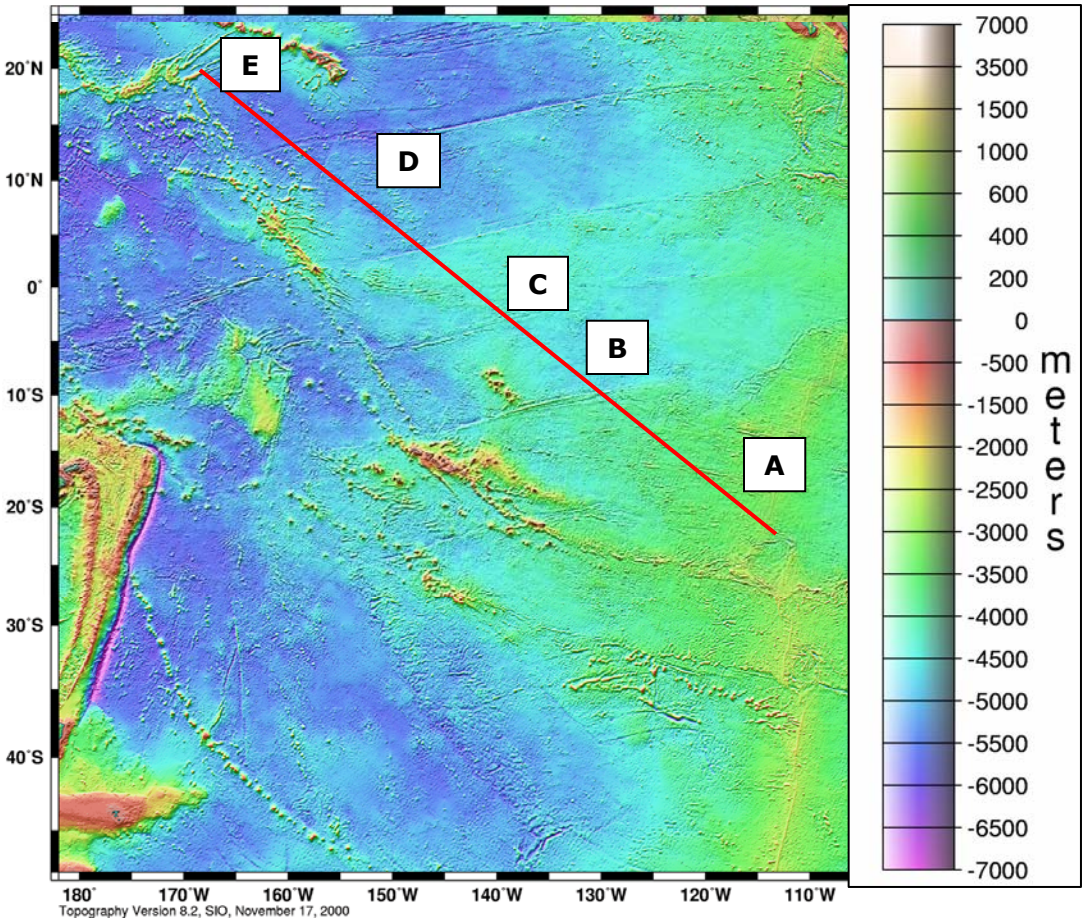
# FIGURES

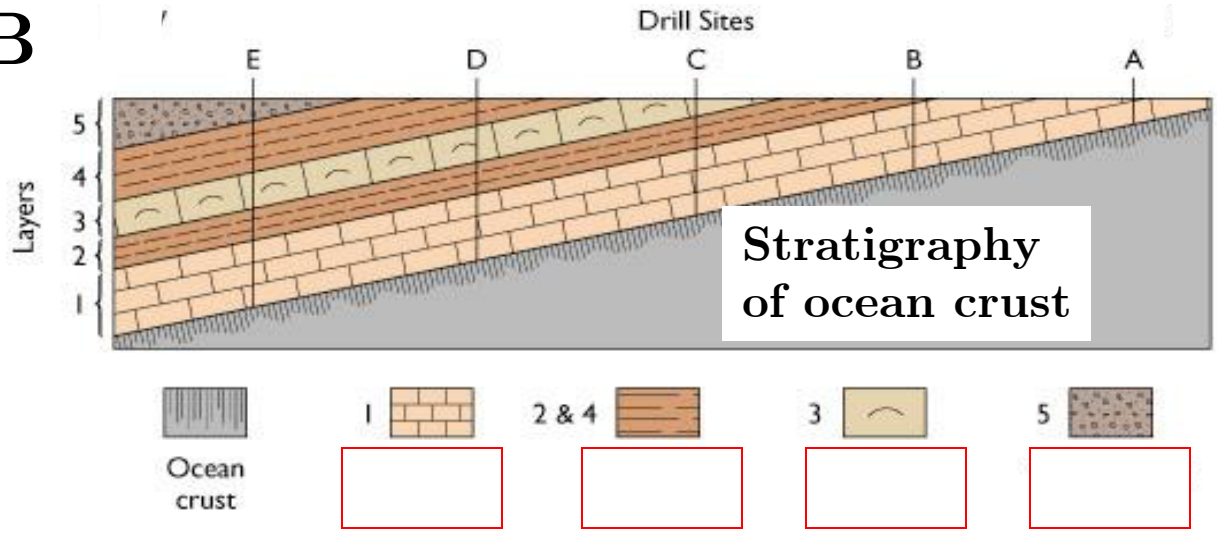
**NAME:** _____ .

# Figure 1

A

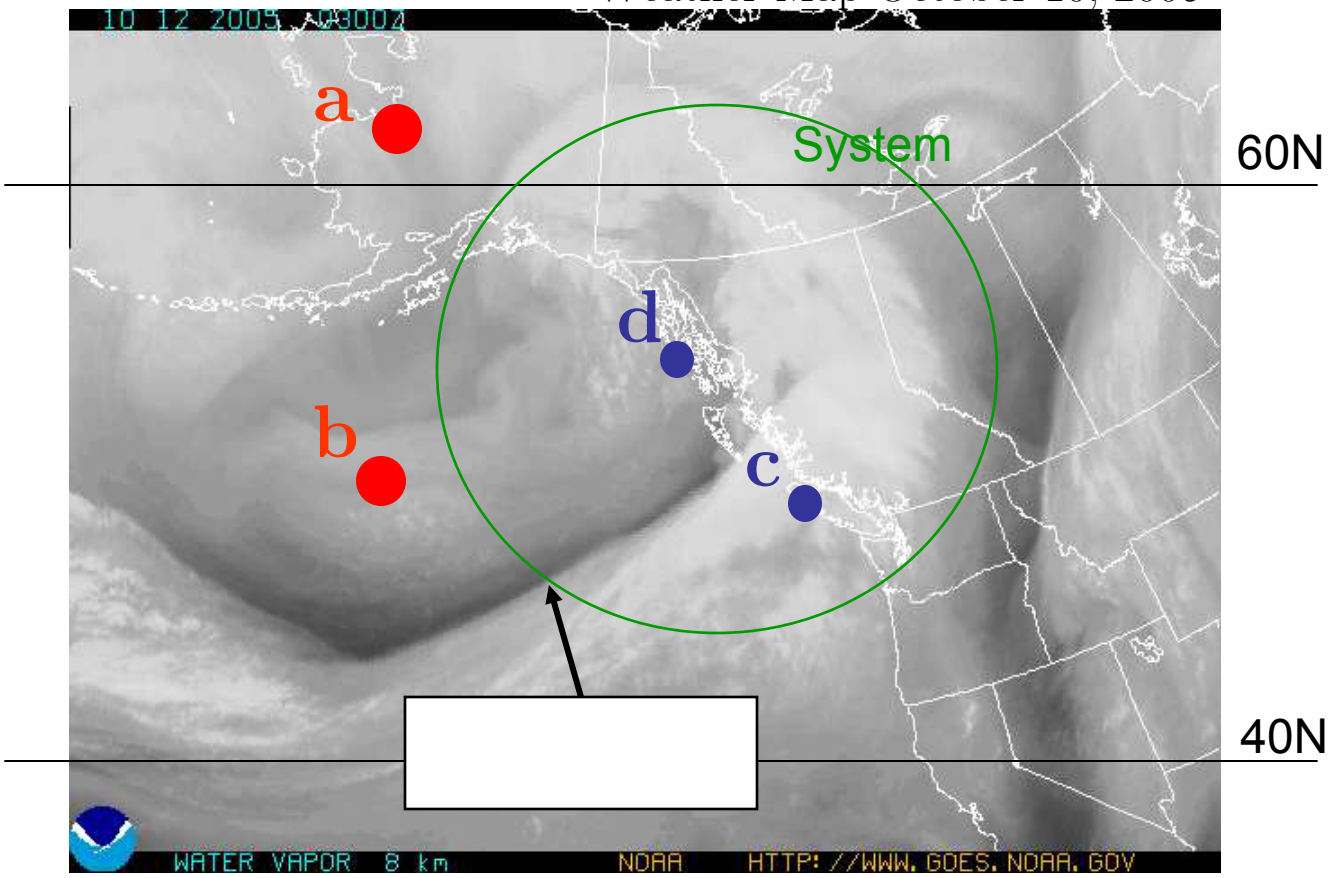

E
D
C
B
A
20°N
10°N
0°
10°S
20°S
30°S
40°S
180°
170°W
160°W
150°W
140°W
130°W
120°W
110°W
Topography Version 8.2, SIO, November 17, 2000
7000
3500
1500
1000
600
400
200
0
-500
-1500
-2000
-2500
-3000
-3500
-4000
-4500
-5000
-5500
-6000
-6500
-7000
meters

B


Drill Sites
E
D
C
B
A
Layers
5
4
3
2
1
Stratigraphy of ocean crust
Ocean crust
1
2 & 4
3
5

# Figure 2

Weather Map October 10, 2005



# Figure 3

Modern

Last Glacial

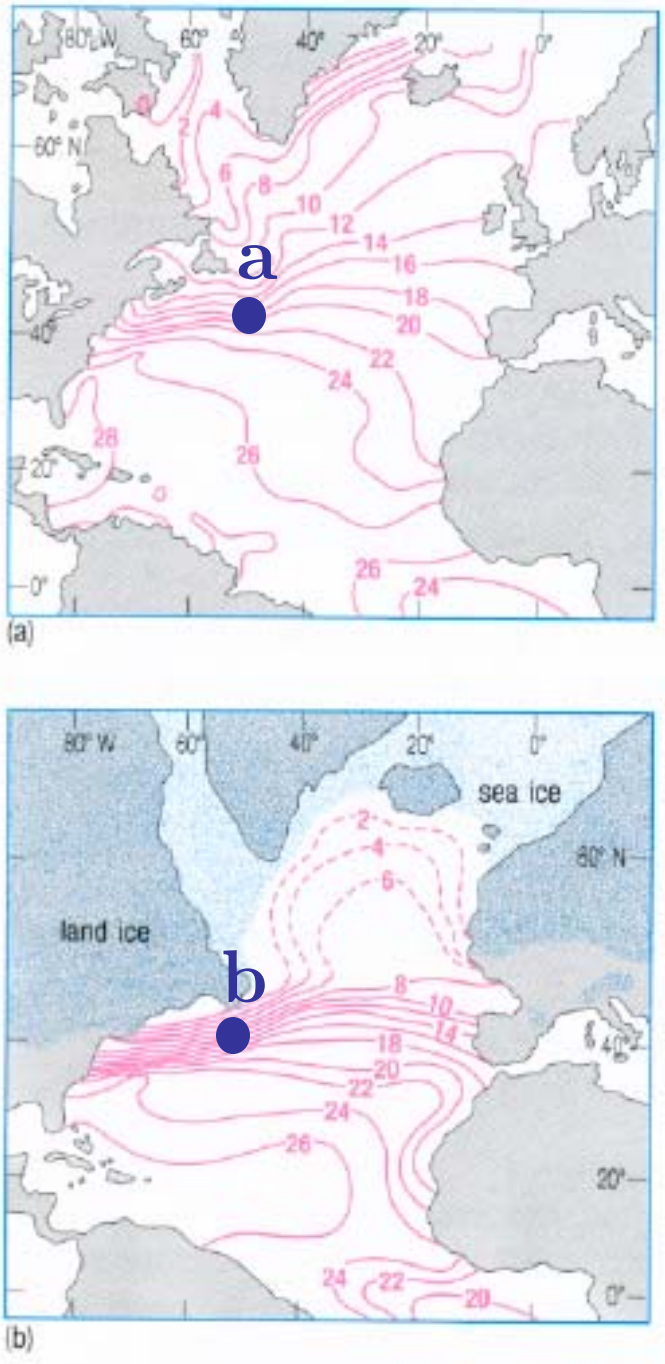



Figure 6.16 Maps comparing the distribution of surface temperatures in the northern Atlantic summer (a) at the present time and (b) 18 000 years ago. Isotherms are in °C (determined in (b) from foraminiferal plankton assemblages in about 100 deep-sea cores). The margins of sea-ice in (b) are deduced from the characteristics of the sediments and from the knowledge that the sea-level was then about 100 m lower than now.

# Figure 4

Surface Winds in the Indian Ocean