

Mid-Term 2 - Version A

The mid-term has a maximum of 100 points: 30 points for three short essays, 30 points for fill-the-gaps sentences, and 40 points for an interpretative part. Please write clearly and use the space provided. Read the questions carefully and do not make unnecessary assumptions! If a problem is not clear, or if you feel that two answers would be correct, write so or ask! If you need extra space, let the instructor know. Good luck!

Academic Integrity

The University Senate requires that students include the following signed statement on each examination: “I pledge on my honor that I have not given or received any unauthorized assistance on this examination”

Name (print):

SID:

Part I: Short Essays (3 Questions * 10 points each = 30 points total)

Briefly answer the following three questions. Use diagrams if appropriate. Please write and explain clearly!

I. What causes jet streams in the upper atmosphere and where can they be found?

2. What are the two types of oceanic circulation and how are they affected by the atmosphere?

3. What is the hydrostatic balance and where can it be found?

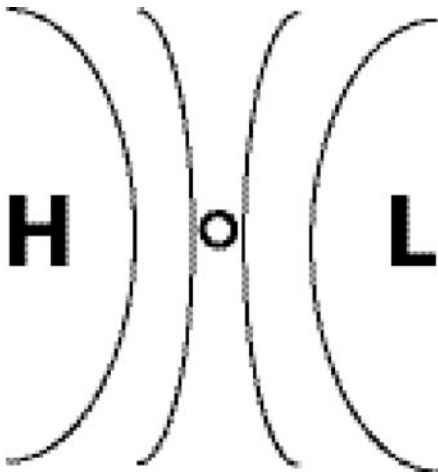
Part II: Fill-the-gaps (15 sentences * 2 points each = 30 points total)

In the sentences below, fill in the gaps with the appropriate terms, or circle the correct term if a list of choices is given.

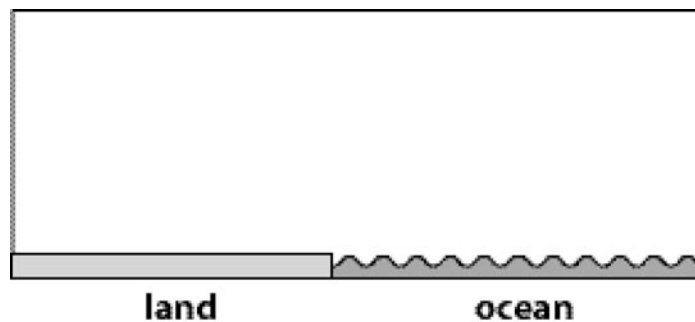
1. A mediterranean climate is characterized by _____ (wet/dry) winters and _____ (wet/dry) summers.
2. 500 hPa heights typically _____ (decrease/increase) with increasing latitude.
3. In geostrophic balance, the _____ force is balanced by the _____ force.
4. The air mass with the highest actual moisture content is abbreviated as _____ (mT, mP, cT, cP).
5. In a tropical seasonal climate, the dry season occurs during the period of _____ (low/high) solar radiation.
6. The Koeppen type _____ (A/B/C/D/E) would normally have the highest annual mean precipitation.
7. Winds on the northern hemisphere circulate clockwise around _____ (low/high) pressure systems.
8. Air from the Gulf of Mexico transported to the US forms _____ (mT, mP, cT, cP) air masses.
9. At the same pressure, cold air is _____ (less/more) dense than warm air.
10. If a column of air is heated, it will have a _____ (smaller/greater) vertical pressure gradient.
11. The first signs of a warm front approaching is the occurrence of _____ clouds (cloud type).
12. Hurricanes are found primarily in the _____ (tropics/subtropics/mid-latitudes/polar regions).
13. Surface winds blow across isobars due to the _____ force.
14. _____ (low/high) pressure systems are often associated with nice, sunny weather.
15. Closer spacing of isobars on a weather map indicates _____ (smaller/greater) wind speeds.

Part III: Interpretative (40 points total)

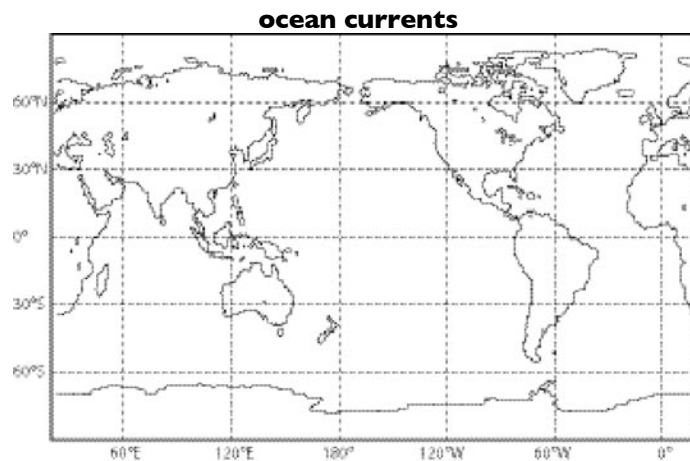
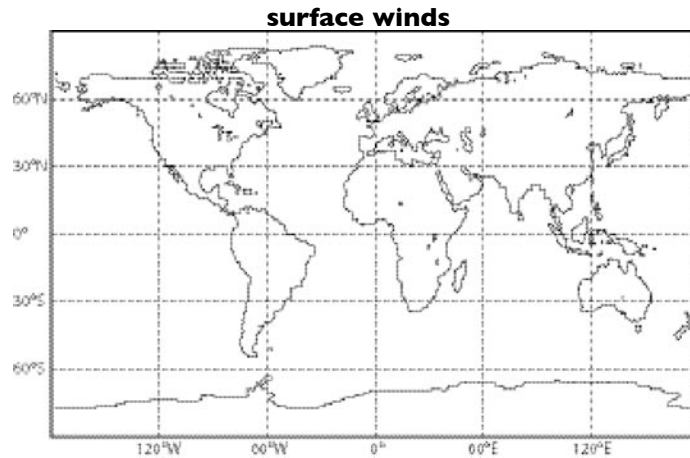
I. Balance of Forces. (5 points) The diagram below shows isobars near the surface and a parcel of air in the center (circle), located somewhere in the northern hemisphere. Draw arrows indicating the direction of forces acting upon the air parcel, assuming that the forces balance. Also draw the direction in which the parcel would travel. Use the abbreviations such as CF (Coriolis Force), PGF (Pressure Gradient Force), FF (Friction Force), GF (gravity force) to label the arrows. Briefly explain the direction of the forces and the resulting motion of the air parcel.



2. Sea breeze. (5 points). Draw into the diagram below the location of low and high pressure at the surface and above as well as the isobars associated with a sea breeze circulation. Then explain briefly what causes the sea breeze.

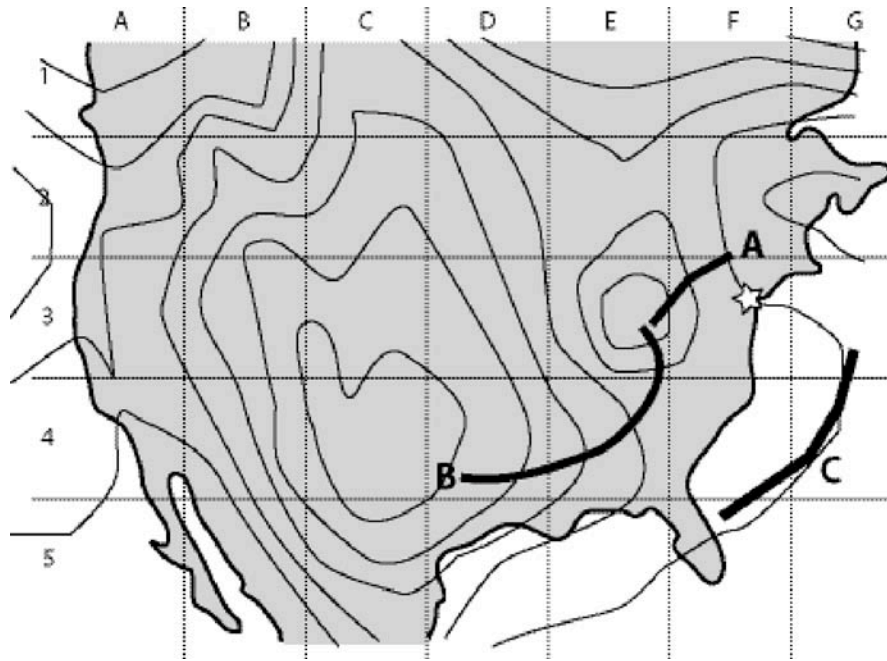


3. Earth's rotation. (5 points). Sketch in the diagrams below how the pattern of surface winds and currents would be if the Earth would rotate the other way around. Focus on the general pattern of the annual mean circulations (i.e. the general direction of winds in the tropics, subtropics, mid-latitudes and polar regions) and ignore the effects of mountain ranges etc. Then explain briefly what would change.



Brief explanation.

4. Air masses and fronts. (5 points) The figure below shows the isobars over the continental United States during a day in October. Also shown is a grid so that you can identify regions. For instance, front B stretches from D4 to E3.



a. Pressure systems. Based on the isobars shown in the map and the configuration of fronts, identify the regions in which a high and a low pressure system is located.

A high pressure system is located in grid box _____.

A low pressure system is located in grid box _____.

b. Fronts. The thick solid lines labeled with A, B and C in the figure denote fronts. What kind of fronts are these?

Front A is a _____ front.

Front B is a _____ front.

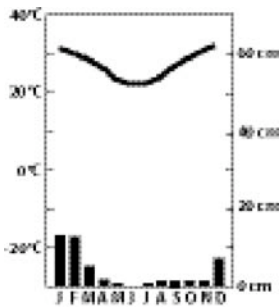
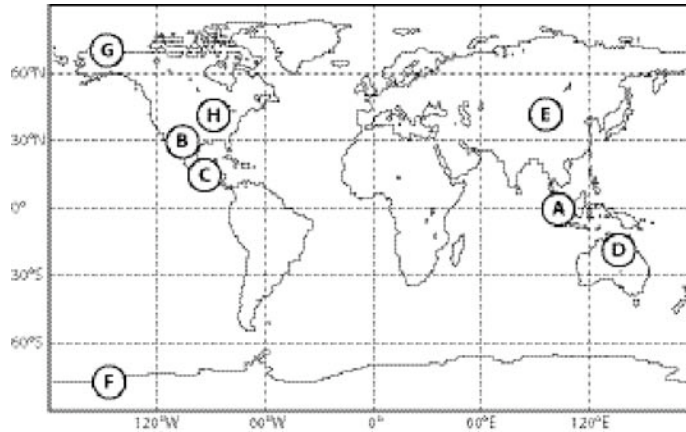
Front C is a _____ front.

c. Air masses. In which region can you find the advection of the following air masses? Identify the regions by the grid coordinates shown in the figure. One example for each type is sufficient. If advection of a certain air mass is not shown in the situation above, use "none".

Advection of continental polar air can be found in region _____.

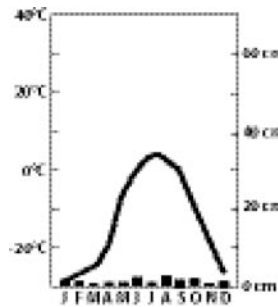
Advection of continental tropical air can be found in region _____.

5. Climate diagrams. (10 points) The diagrams below show the seasonal cycle of temperature (lines) and precipitation (bars) for 8 locations marked on the world map. Match the diagrams with the appropriate location on the map by writing the corresponding letter underneath the diagram (line "Location"). Also for each diagram, write which major Koeppen type the climate represents (line "Koeppen").



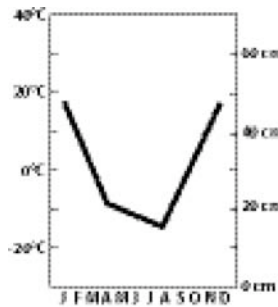
Location: _____

Koeppen: _____



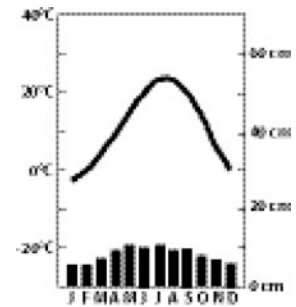
Location: _____

Koeppen: _____



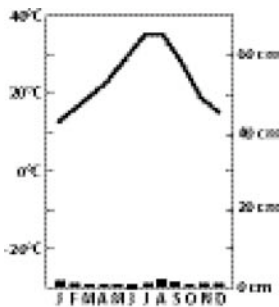
Location: _____

Koeppen: _____



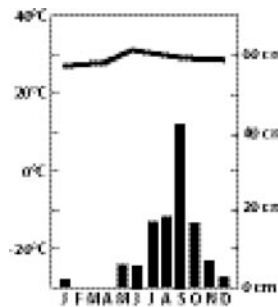
Location: _____

Koeppen: _____



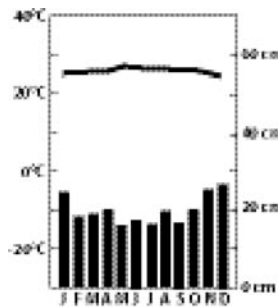
Location: _____

Koeppen: _____



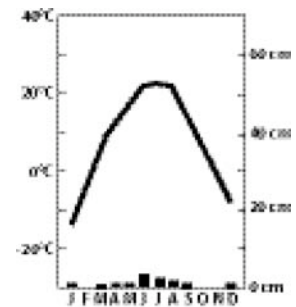
Location: _____

Koeppen: _____



Location: _____

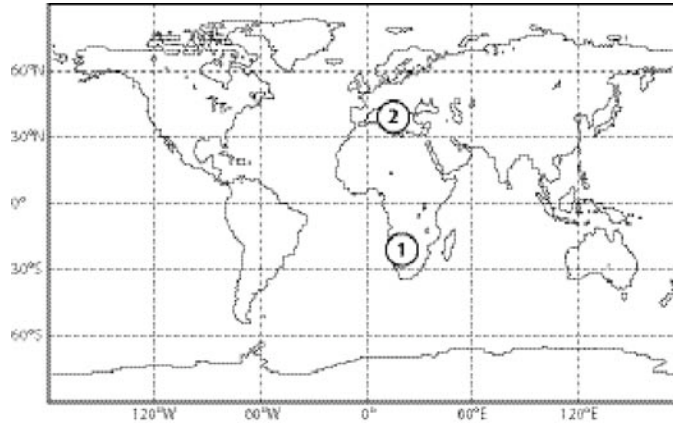
Koeppen: _____



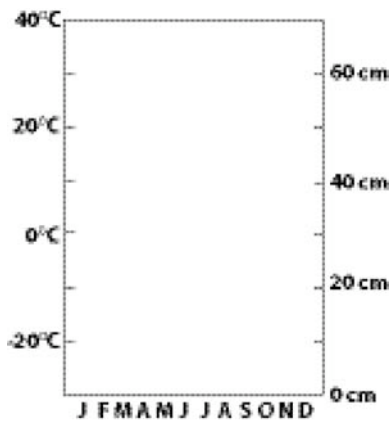
Location: _____

Koeppen: _____

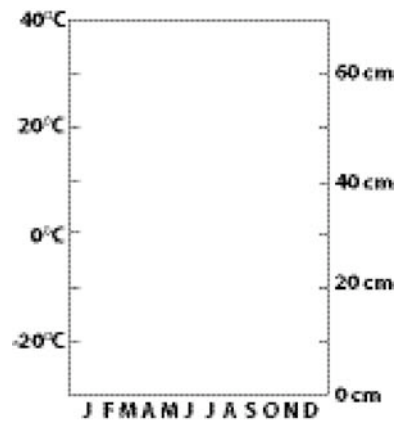
6. Climate diagrams (5 points). In the map below, two locations are shown. Sketch the approximate seasonal course of temperature (as a line) and precipitation (as a bar), and briefly describe what the key characteristics of the climate are likely to be at the two locations.



Location 1:



Location 2:



Brief climate description:

Location 1:

Location 2: