

## SIO 15 (FQ 2024) – Homework #5 Due November 5, 2024

Maximum score: 20 points + 1 bonus point

- 1 penalty point for late submission (more than 30 min past due date)

Divide by 4 for contribution to total cumulative

### ANSWERSHEET

#### Topics 14 – 16

- 1) a) Video 9d shows flood frequency curves for increasing urbanization. Compare the discharge of a 2-year flood in an unurbanized area, a 20-20 area (20% is sewered/20% is impervious), a 50-50 area, and an 80-60 area. Include units! (0.5 pt)  
b) What is the probability of a 100-year flood to occur in any given 1-year interval? (0.5 pt)  
c) Explain why the probability for a 100-year flood in a given 100-year interval is less than 100%. (0.5 pt)  
d) Given the flood frequency curves for the Pedernales and the Navasota rivers in Texas, estimate the discharge of their respective 100-year floods. (include units! allowed error margin: 10%) (0.5 pt)  
(2 points total)

**a) degree of urbanization      discharge (cft/s)** *NB: note that unit is listed once in this table  
this is appropriate and allowed you to omit  
units in later listed values*

<b>unurbanized</b>	<b>75 (allowed range: 70-80)</b>
<b>20-20</b>	<b>110 (allowed range: 105-115)</b>
<b>50-50</b>	<b>190 (allowed range: 185-195)</b>
<b>80-60</b>	<b>295 (allowed range: 290-298)</b>

**also accepted unit: cfs**

**-0.25 pt if units are missing**

**b) 1%**

**c) the 100-year flood may occur after more than 100 years**

**d) Pedernales River: 310,000 cft/s (allowed range: 279,000 – 341,000)**

**Navasota River: 85,000 cft/s (allowed range: 76,000 – 94,000)**

**also accepted unit: cfs**

**-0.25 pt if units are missing**

- 2) a) When did the Banqiao dam in China fail and what natural cause contributed to the failure? (0.5 pt)  
b) The epic 1927 flood of the lower Mississippi inundated 70,000 km<sup>2</sup>. Compare the size of these two floods. Provide a factor, not a difference! (0.5 pt)  
c) Compare the size of the Oroville reservoir with that of the modern Banqiao reservoir? Provide a factor, not a difference! (0.5 pt)  
d) Go to Wikipedia and find the Oroville dam. A  $M_L=5.7$  earthquake in 1975 is thought to be induced seismicity. What are the two possible causes for this quake? (0.5 pt)  
(2 points total)

a) Aug 1975; Typhoon Nina

-0.25 pt for partial answer

b) the Mississippi flood was 5.8 times greater

*NB:  $70K/12K = 5.8$*

also accepted: the Mississippi flood was 6 times greater

no credit for any other answer

c) Oroville reservoir holds 6.4 times more water

*NB:  $4320/675 = 6.4$*

no credit for any other answer

d) weight of the dam; reservoir sits on a local faults

-0.25 pt for partial answer

3) Go to Wikipedia and search for the St. Francis Dam

a) When was this dam built? About how long did construction last? (0.5 pt)

b) For how long was this dam in operation? (0.5 pt)

c) Why did the dam fail? How many people were killed? (0.5 pt)

d) Compared to other disasters in California history, where does this dam failure place it terms of lives lost? (0.5 pt)

(2 points total)

a) 1924-1926; 2 years

-0.25 pt for partial answer

b) 2 years (no credit for 3 years; the dam was demolished in 1929, but it failed in 1928)

c) defective soil foundation and design flaws; at least 431

d) third-deadliest

4) a) What are the two main contributing gases to Earth's atmosphere? Include numbers. (0.5 pt)

b) Which three gases contribute most to Earth's natural greenhouse? Also provide numbers. (0.5 pt)

c) Provide the names of 4 countries in South America that are in the southern hemisphere. (0.25 pt)

d) Provide the names of 4 countries in Africa that are in the southern hemisphere. (0.25 pt)

e) Is Ecuador located in the southern or northern hemisphere? (0.25 pt)

f) Provide 1 country each in South America and Africa that is in the northern hemisphere. (0.25 pt)

(2 points total)

a) nitrogen: 78%; oxygen: 21%

-0.25 pt if more than these two are listed

-0.25 pt if numbers are missing

b) H<sub>2</sub>O (0-4%); CO<sub>2</sub> (419 ppm; accepted range 415 – 422 ppm); CH<sub>4</sub> (2ppm)

c) any 4 of the following:

Argentina, Brazil, Bolivia, Chile, Paraguay, Peru, Uruguay

d) any 4 of the following:

Angola, Botswana, Burundi, Eswatini, Lesotho, Madagascar, Malawi, Mozambique, Namibia, Rwanda, South Africa, Tanzania, Zambia, Zimbabwe,

also accepted (as large parts if not most of it is in the southern hemisphere) Democratic Republic of Congo, Gabon, Republic of the Congo

**not accepted: Kenya and if is split nearly half and half between both hemispheres**

e) neither; it is located on the equator

also accepted: it is located in both hemispheres

no credit: any answer that specifies only one hemisphere

f) for South America: any one of the following:

Colombia, Venezuela, Guyana, French Guiana, Suriname

for Africa: any one of the following:

Algeria, Benin, Burkina Faso, Cameroon, Central African Republic, Chad, Djibouti, Equatorial Guinea, Egypt, Eritrea, Ethiopia, Gambia, Ghana, Guinea, Guinea-Bissau, Ivory Coast (Cote d'Ivoire), Liberia, Libya, Mali, Mauritania, Morocco, Niger, Nigeria, Senegal, Sierra Leone, Sudan, South Sudan, Togo, Tunisia, Uganda, Western Sahara,

**not accepted (as large parts if not most of it is in the southern hemisphere): Democratic Republic of Congo, Gabon, Kenya, Republic of the Congo**

- 5) a) Describe the position of the northern and southern hemispheres with respect to the sun during the northern summer solstice (June 21). (0.5 pt)  
b) About how long is the day and night during the fall equinox in Mexico City? (0.5 pt)  
c) How about Perth, W. Australia? (0.5 pt)  
d) At which time(s) during the year is the sun overhead at noon at the equator? (0.5 pt)  
e) If at all, when is the sun overhead at noon at 23.5°N? (0.5 pt)  
(2.5 points total)

**a) during the northern summer solstice, the northern hemisphere is tilted toward the sun, while the southern hemisphere is tilted away from the sun (southern winter)**

**b) 12 h**

**c) same; 12 h**

**d) on the spring and fall equinox**

**also accepted: March 20 and September 22 (or September 23)**

**-0.25 pt for partial answer**

**e) on northern summer solstice**

**also accepted: June 21 (or June 20)**

- 6) For this problem, use the lecture slide(s) that show the Santa Ana in October 2023.

a) During the Santa Ana weather condition, what happens to the relative humidity, compared to normal days?

Provide typical numbers for both. Include units! (0.5 pt)

b) What happens to daily high temperatures? Provide typical numbers with units. (0.5 pt)

c) What happens to the difference between day and night time temperatures? (0.5 pt)

d) Explain why the change in this difference occurs. (0.5 pt)

(2 points total)

**a) it is much lower; normal days: around 75% (or similar); Santa Ana days: around 20% (or similar)**

**b) are much higher; normal days: around 70 deg F; Santa Ana days: around 80 deg F**

**c) difference is much greater**

**d) lack of water vapor allows days to heat up more and night to cool more**

- 7) a) What happens to air that rises adiabatically, in terms of volume and temperature? (0.5 pt)  
b) Which process typically terminates this type of adiabatic change? (0.5 pt)  
c) What kind of pressure is left at the surface when air rises? (0.5 pt)  
d) At which latitudes would we find the trade winds? (0.25 pt)  
e) From which direction do the trade winds blow in the northern hemisphere? Be as precise as possible. (0.25 pt)

(2 points total)

**a) expands and cools**

**-0.25 pt for partial answer**

**b) condensation**

**c) L**

**d) between 0 and 30 deg N and S**

**e) NE**

- 8) News clip 23 January 2024:

- a) Outside which elementary school did waters rise up to 3 feet? (0.5 pt)  
b) During which 3-hour window did National City get how many inches of rain? (0.5 pt)  
c) The airport received 2.7 inches of rain between midnight and 4 p.m..  
In terms of rainfall on any day in January in San Diego, where does this amount of rainfall place, over which time span of record-keeping? (0.5 pt)  
d) Over a three-day period ending at 3 p.m. on Monday, how much rain had fallen at S.D. International airport, Point Loma, Fashion Valley, Kearny Mesa?  
(provide four numbers and include units for at least one of them) (0.5 pt)

(2 points total)

**a) Balboa Elementary School**

**b) 9 a.m. – 12 p.m.; 2 inches**

**-0.25 pt for partial answer**

**c) the most ever on a January day; since 1850 (also accepted: in 174 years)**

**-0.25 pt for partial answer**

**d)**

<b>Location</b>	<b>Amount (in)</b>
<b>SD Int. Airport</b>	<b>3.29</b>
<b>Point Loma</b>	<b>4.49</b>
<b>Fashion Valley</b>	<b>2.88</b>
<b>Kearny Mesa</b>	<b>2.59</b>

- 9) Find Lake Mead in Google Earth

- a) On which river is the reservoir located? (0.5 pt)  
b) Follow the lake to the west until you encounter the dam that keeps the water in the lake.  
What is the name of this dam? (0.5 pt)  
c) Find this dam in Wikipedia. When was this dam opened? How long did construction last? (0.5 pt)  
d) By how much has electricity generation on the dam declined between 2000 and 2014? (0.25 pt)  
e) What is the ultimate cause for this decline? (0.25 pt)
- (2 points total)

**a) Colorado River**

**b) Hoover Dam**

**c) 1936; 5 years**

**-0.25 pt for partial answer**

**d) 23%**

**e) prolonged drought**

10) Find the school under 8a in Google Earth

a) What is the street address and zip code of this school? (0.5 pt)

b) Zoom out until you see a neighborhood name. What is this name? (0.5 pt)

c) Which neighborhood is to the immediate north? What about the next neighborhood north of that? (0.5 pt)

d) Find Beta St between the neighborhood under 10b and the first under 10c. This street was particularly badly affected by the 23 January San Diego flood. Measure its length from the merge with Birch St to its end. include units (error margin: 20 m) 0.5 pt

e) Which city is to the immediate south of the 10b neighborhood? What city is next (farther south).

Hint: the boundary between the two cities is SR 54. (0.5 pt)

(2.5 points total)

**a) 1844 S 40<sup>th</sup> Street; 92113**

**-0.25 pt for partial answer**

**b) Shelltown**

**c) Southcrest; Mountain View**

**d) 748 m (accepted range: 728 – 768 m)**

**e) National City**