

SIO 15 (FQ 2024) – Homework #1 Due October 8, 2024

Maximum score: 20 points + 1 bonus point

Divide by 4 for contribution to total cumulative

ANSWERSHEET

Topics 1 – 4

- 1) a) Which of the obvious (fatal) natural disasters is the most frequently occurring? (0.5 pt)
b) Name the 2024 Atlantic hurricane that made landfall in the big bend area in Florida in late September. (0.5 pt)
c) As of the time of lecture 1, how many customers lost power in the U.S. due to that storm? (0.5 pt)
d) So far, during the 2024 Atlantic hurricane season provide the name and category of the strongest hurricane? (0.5 pt)
e) In which U.S. state and with which category did this storm make landfall? (0.5 pt)
(2.5 points total)
a) floods
b) Hurricane Helene
c) more than 4 million; also accepted: 4M+; 4,239,641
d) Hurricane Beryl; category 5
-0.25 pt if one of the two answers are missing/wrong
e) Texas; category 1
-0.25 pt if one of the two answers are missing/wrong
- 2) a) Use the class lecture notes and tables. Which type of severe weather has had the highest fatality rate in the U.S., in the last 30 years or so? (0.5 pt)
b) Which two types are second and third, in the correct order? (0.5 pt)
c) Heat waves and the elderly. In a year with no heat wave, the elderly (60+ age group) accounted for which fraction of all deaths? What is this fraction for a year with heat wave? (0.5 pt)
d) Aside from the heat island effect, name two other human-caused aggravating factors that contributed to the deadly 1995 Chicago heat wave. (0.5 pt)
(2 points total)
a) heat waves
b) floods, tornadoes;
-0.25 pt for incomplete/partially wrong answer/wrong order;
c) 21%; 34%
-0.25 pt for partially wrong answer
d) any two of the following for full credit:
- polluted air,
- poor people with no A/C or no money to use A/C,
- overloaded power grid causing power outages
- overtaxed emergency facilities turned people away
- people afraid of crime did not open windows/doors
no credit for: urban heat island, paved ground retains heat, lacking vegetation, A/C heats environment

- 3) a) What is exerted on a coil spring to make it longer? What is the equivalent expression along an earthquake fault? (0.5 pt)
b) Which type of energy is associated with a loaded coil spring? (0.5 pt)
c) When a body at the top of a slope was previously at rest and is now sliding down, which type of energy transforms into which other type of energy? (0.5 pt)
d) By how much does Earth's surface receive more heat from the Sun compared to that from Earth's interior? (0.5 pt)
(2 points total)

a) a force; stress

-0.25 pt for partial answer

b) potential energy

c) potential into kinetic

d) 5300 times more energy from the Sun than from within;

answer including more than 5000 also accepted as long as it is stated that Sun energy dominates

- 4) a) Provide two examples for an outer planet in our Solar System. (0.5 pt)
b) What other expression do we use for such planets? (0.5 pt)
c) What kind of celestial body is Ceres? (0.5 pt)
d) Between which planets in our Solar System would we find Ceres? (0.5 pt)
(2 points total)

a) any two of the following:

Jupiter

Saturn

Uranus

Neptune

b) gas giants

c) accepted answers: asteroid; dwarf planet

+0.25 pt if both are mentioned

d) Mars and Jupiter

- 5) a) How often do spring tides occur? (0.5 pt)
b) In October 2024, on which day does La Jolla have the highest high tide? (0.5 pt)
c) Which Moon phase does this likely correspond to? (0.5 pt)
d) What is the tidal range on this day? INCLUDE UNITS! (0.5 pt)
(2 points total)

a) (at least) twice a month

b) Oct 18

c) either full or new moon

-0.25 pt if only one is mentioned

c) 7.56 ft; or 2.30 m;

-0.25 pt if unit is missing

- 6) a) Name the three principal material properties relevant to Earth's rocks? (0.5 pt)
b) What is the radius of the Earth? (0.5 pt)
c) What is the radius of the (outer) core, i.e. the radius of the core-mantle boundary? (0.5 pt)
d) In percent, the core consequently takes up how much of Earth's radius? (0.5 pt)
(2 points total)

a) elastic, ductile, brittle

b) 6371 km;

-0.25 pt if unit is missing

c) 3480 km;

-0.25 pt if unit is missing

d) 54.6%; also accepted 55%;

-0.25 pt for 54%

- 7) a) Name and describe the two angles that define the orientation of a magnetic field line. (0.5 pt)
b) In 2000, what was the position of magnetic north and geomagnetic north? (0.5 pt)
c) What were these positions in 2020? (0.5 pt)
d) Which process generates Earth's magnetic field? (0.5 pt)
(2 points total)

a) inclination: angle with respect to the horizontal

declination: angle with respect to geographic North

b) magnetic north: 81.0 deg N, 109.6 deg W; geomagnetic north: 79.6 deg N, 71.6 deg W
N and W (or minus E) must be given for full credit

c) magnetic north: 86.5 deg N, 162.9 deg E; geomagnetic north: 80.7 deg N, 72.7 deg W
N and W/E must be given for full credit

d) convection currents in (liquid) outer core

-0.25 pt for geodynamo

-0.5 pt if following copied from website:

convection currents in metallic outer core (mostly Iron) sustains Earth's magnetic field (magnetic dynamo); movement of free metallic electrons cause an electric current that induces a magnetic field

- 8) News Clip September 14, 2024:
a) A storm caused power outages in Louisiana. Which energy company is responsible for providing electricity in that area? (0.5 pt)
b) Which storm caused the power outages? (0.5 pt)
c) As of that Friday afternoon, how many customers in Louisiana remained without power? (0.5 pt)
d) Is this incident unusual/a one-time or rare occurrence? (0.5 pt)
(2 points total)

a) Entergy

b) Hurricane Francine

-0.25 pt if 'hurricane' is missing

- c) 95,000 customers
- d) no

9) News Clip September 14, 2024:

- a) How many major blazes raged in Southern California at the time? (0.5 pt)
 - b) What helped firefighter gain ground against the fires? (0.5 pt)
 - c) Provide the name and acreage burned of the largest of these fires. (0.5 pt)
 - d) By this time how much more area burned in California than in all of 2023? (0.5 pt)
- (2 points total)

a) three

b) cooler temperatures

c) Bridge fire; nearly 52,000 acres;
also accepted: 81 square miles

-0.25 pt if more than 1 fire was mentioned or partially wrong answers

d) nearly three times as much

10) Google Earth (stand-alone or Web browser version ok but Google Earth Pro desktop works best)

- a) Zoom in on the Pacific coast of Mexico. Along the stretch between 15.5 and 20.5°N, which 5 states have Pacific coasts? (0.5 pt)
- b) Provide the capital for each of the 5 states? Depending on which version of Google Earth you use, you may have to consult additional resources, such as Wikipedia. (0.5 pt)
- c) Provide the population number for each of the 5 states. Depending on which version of Google Earth you use, you may have to consult additional resources, such as Wikipedia. (0.5 pt)
- d) In which of these states do we find Acapulco? (0.5 pt)
- e) Measure the distance, in km, between Acapulco and Mexico City (INCLUDE UNITS! allowed error margin 10 km) (0.5 pt)

Special hint when you use the browser plugin rather than stand-alone app: you may have to place placemarks on top of the marks in both cities before you do a measurement.

(2.5 points total)

a) Jalisco; Colima; Michoacan; Guerrero; Oaxaca

b) Guadalajara; Colima; Morelia; Chilpancingo; Oaxaca de Juárez

c) 8.348 million; 731,391; 4.749 million; 3.541 million; 4.132 million

+0.5 pt if a table was made that displays answers of a) – c)

d) Guerrero

e) 295 km; allowed range: 285 – 305 km

-0.25 pt for answer outside of this range but within 275 – 315 km

-0.25 pt if unit is missing