

Name:  
Student Number:

ESS 315 Exam Winter 2003

Please circle the correct answers to the 50 multiple choice questions on your exam and transfer them to your scantron sheet. There is no additional penalty for incorrect answers so you should try to answer every question on this exam. Please hand in both the test paper and scantron form after completing this examination. Grades will be posted by the end of this week.

- . Oxidation of primary iron-bearing minerals in a soil profile \_\_\_\_\_.
  - a. results in the soil becoming coarser grained.
  - b. results in the soil profile becoming redder.
  - c. results in the soil profile becoming shallower.
  - d. does not change the mineral composition of the soil profile.
  - e. all of the above are correct answers
  
- . If you were living in a moist-cool climate like Minnesota the \_\_\_\_\_ facing slopes would generally exhibit the greatest soil development providing all other soil formation factors are held constant.
  - a. north
  - b. west
  - c. east
  - d. south
  - e. all slopes would have identical soil development
  
- . As soil age increases a soil \_\_\_\_\_.
  - a. becomes deeper
  - b. becomes redder
  - c. becomes finer grained
  - d. all of the above are correct
  - e. none of the above are correct

Based on the slope equation shown below (describes a slope at equilibrium) answer questions 4-6.

$$(W \cdot \sin \beta) + V = c_j + (W \cdot \cos \beta - u) \tan \phi$$

where:

**W = weight of the block**

**$\beta$  = angle of slope**

**V = weight of water in the joint of rock**

**$c_j$  = cohesion along the base of the rock**

**u = water pressure along the base of the rock**

**$\tan \phi$  = coefficient of friction**

- . A high magnitude storm will tend to promote sliding because \_\_\_\_\_.
  - a. cohesion will be reduced at the base of slide plane
  - b. weight due to water will be increased
  - c. water pressure will be increased reducing shearing strength
  - d. all of the above are correct
  - e. none of the above are correct
  
- . Earthquake waves can promote slide activity because \_\_\_\_\_.

- a. the slope angle can be briefly increased such that the shear stress is increased.
  - b. the slope angle can be briefly decreased such that the shear stress is increased.
  - c. the slope angle can be briefly increased such that the shear stress is decreased.
  - d. the slope angle can be briefly decreased such that the shear stress is decreased.
- . A slope composed of poorly sorted sediment with angular clasts will tend to have \_\_\_\_\_ cohesion than a slope composed of well sorted rounded clasts.
- a. greater
  - b. less
  - c. similar
  - d. cohesion is not related to the above factors
- . A slope is most stable if the "Shear Strength/Shear Stress" ratio is \_\_\_\_\_.
- a. less than 0
  - b. equal to 0
  - c. less than 1
  - d. equal to 1
  - e. greater than 1
- . A **small amount of water** in regolith tends to \_\_\_\_\_ its shear strength because of \_\_\_\_\_.
- a. decrease/gravitational attraction
  - b. decrease/capillary attraction
  - c. increase/gravitational attraction
  - d. increase/capillary attraction
  - e. no change occurs with the addition of small amounts of water
- . Water can be instrumental in **reducing shear strength** and thereby promoting movement of rock and sediment downslope under the pull of gravity by \_\_\_\_\_.
- a. reducing the natural cohesiveness between grains
  - b. reducing friction at the base through increased fluid pressure
  - c. decreasing gravitational attraction of the particles
  - d. all of the above answers are correct
  - e. reducing the natural cohesiveness between grains and reducing friction at the base through increased fluid pressure
- . Mass-wasting processes all share one thing in common:
- a. They are fast.
  - b. They are very slow.
  - c. They involve water.
  - d. They take place on slopes.
  - e. They are easily classified.
- . Kaolinite clay results from \_\_\_\_\_.
- a. oxidation of iron bearing minerals in the soil horizon
  - b. dissolution of calcium carbonate
  - c. hydrolysis of potassium feldspar and sodium plagioclase
  - d. all of the above reactions can result in kaolinite formation
  - e. none of the above reactions result in kaolinite formation
- . Wind's ability to do work \_\_\_\_\_.
- a. decreases exponentially with velocity

- b. increases linearly with velocity
- c. decreases linearly with velocity
- d. increases linearly with velocity
- e. wind velocity and work are unrelated

. Wind power would be best suited for \_\_\_\_\_.

- a. Florida
- b. Midwestern states
- c. coast of Oregon and Washington
- d. California
- e. southwestern state

. According to the case study completed in laboratory, how much energy is used to produce aluminum from recycled scrap compared to bauxite ore?

- a. 25%
- b. 50%
- c. 6%
- d. 10%
- e. 33%

. Who is our biggest supplier of imported aluminum?

- a. Jamaica
- b. Canada
- c. Brazil
- d. Venezuela
- e. Congo

. What is the most important factor which controls the location of aluminum refineries?

- a. proximity to the ore source
- b. proximity to urban-industrial centers
- c. proximity to inexpensive power
- d. answers a and b are equally important
- e. answers a and c are equally important

. The most common petroleum traps for Middle East reserves are \_\_\_\_\_.

- a. salt domes
- b. coral reefs
- c. anticlinal
- d. synclinal
- e. fault controlled

. The great petroleum reserves of Middle East arose because \_\_\_\_\_.

- a. the temperature-depth conditions were conducive for petroleum to form
- b. the petroleum trap formed after the migration of the petroleum
- c. the petroleum trap formed before migration of the petroleum
- d. both answers a and b are correct
- e. both answers a and c are correct

. Global increase in energy use is closely correlated with the \_\_\_\_\_.

- a. cost of energy exploitation
- b. population growth rate
- c. gross domestic product
- d. the environmental impact of its use
- e. all of the above are correct

. If we only consider the financial cost (no environmental or political factors) of energy use, what type of energy would most power companies choose to generate electricity in the United States?

- oil
- coal
- wind
- solar
- nuclear

. The earth's energy budget offers 174,000 terawatts per year while human populations currently consume \_\_\_\_\_ terawatts per year.

- 1
- 10
- 100
- 1000
- 10,000

. Why is coal extracted from the western U.S. more desirable to burn in power plants than coal mined in the eastern or Midwestern states?

- western coal produces more BTU's per ton than eastern coal
- western coal has less sulfur content than eastern coal and burns cleaner
- western coal is cheaper to mine because it is closer to the surface
- there are no marketable coal reserves in the eastern U.S.
- answers a and c are both correct

. Which of the following atmospheric gases tend to absorb longwave energy and are thought to be responsible for greenhouse warming?

- carbon dioxide
- methane
- nitrogen
- all of the above answers are correct
- only answers a and b are correct

. Atmospheric ozone depletion is caused from \_\_\_\_\_.

- Cl ions in CFC's combining with  $O_2$  molecules to form  $ClO_3$ .
- Cl ions in CFC's combining with  $O_3$  molecules to form elemental  $O_2$  and ClO
- Carbon ions in CFC's combining with  $O_3$  molecules to form elemental  $O_2$  and CO
- Carbon ions in CFC's combining with  $O_2$  molecules to form  $CO_3$
- none of the above answers are correct.

. According to most General Circulation Models, the Earth's global temperature will rise \_\_\_\_\_ following a doubling of atmospheric  $CO_2$ .

- 1° C
- 2° C
- 4° C
- 9° C
- 12° C

. The global rise in temperature following a doubling of atmospheric  $CO_2$  would be \_\_\_\_\_.

- greatest at tropical latitudes
- greatest at temperate latitudes
- greatest at subpolar latitudes

- d. greatest at polar latitudes
- e. the same for all latitudes

. The most common petroleum traps for U.S. Gulf coast reserves are \_\_\_\_\_.

- a. salt domes
- b. coral reefs
- c. anticlinal
- d. synclinal
- e. fault controlled

. The propensity for landslides in the Puget Lowland is due to \_\_\_\_\_.

- a. permeable geologic units overlying impermeable
- b. impermeable geologic units overlying permeable
- c. wet winters
- d. a and c are both correct
- e. fa and b are both correct

. According to your reading it has been empirically determined that \_\_\_\_\_ and \_\_\_\_\_ are the characteristics most closely correlated with the amounts of erosion produced in determining R values (Rainfall and Runoff factor) used in the Universal Soil Loss Equation (USLE).

- a. total energy (E) and maximum 24 hr intensity (I) of rainstorms
- b. total energy and maximum 30 minute intensity (I) of rainstorms
- c. rainfall duration(D) and total energy (E)
- d. annual rainfall (A) reception and soil erodibility (E)
- e. rainfall has very little impact on erosion as it is mainly a substrate factor that controls erosion.

. According to your lab the USLE is mainly applicable to determining \_\_\_\_\_.

- a. erosion from individual storm events
- b. gully erosion
- c. long-term average annual sheet and rill erosion
- d. soil loss from landslides and other mass wasting processes
- e. erosion from all of the above effects.

. Why are soils so poorly developed in the Puget Lowland compared to Central Valley of California?

- a. temperatures are much colder in the Puget Lowland
- b. California soils are derived from more mafic parent materials
- c. Puget Lowland soils are generally much younger than Central Valley soils.
- d. all of the above answers are correct
- e. none of the above answers are correct

**BONUS QUESTIONS**

The Metro Sewage treatment plant can treat a maximum of \_\_\_\_\_ gallons/day of raw sewage.

- a. 4,000,000
- b. 40,000,000
- c. 400,000,000
- d. 400,000
- e. treatment amounts are seasonally dependent

47. On the Whidbey Island field trip we needed to core \_\_\_\_\_ different sites to find the tsunami sand sheet.

- a. 1
- b. 2
- c. 3
- d. 4
- e. 5

48. On the Bainbridge Island field trip we completed our soil pit \_\_\_\_\_.

- a. on landslide deposits at Perkins Lane
- b. at Restoration Point on the uplifted wave-cut platform
- c. in a forestry preserve
- d. on a vacant lot in a subdivision
- e. at Fort Warden State Park

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49. In lab we found that the \_\_\_\_\_ horizon had the lowest pH in the soil we collected in the field.

- a. A
- b. E
- c. B
- d. C
- e. O

50. Rank the cost of energy from lowest to highest cost/kwh (assuming there is not environmental cost of its use).

- a. nuclear, oil, solar, coal, geothermal
- b. nuclear, coal, oil, geothermal, solar
- c. oil, nuclear, coal, wind, gas
- d. oil, coal, solar, wind, nuclear
- e. solar, geothermal, oil, coal, nuclear

**Student Questions**

- . Acid rain is **mainly** caused from \_\_\_\_\_.
- nuclear waste percolating into soils
  - CO<sub>2</sub> produced from burning fossil fuels
  - SO<sub>2</sub> and NO<sub>x</sub> from burning fossil fuels
  - all of the above are correct
  - only answers b and c are correct

What is the newest technology being used for cleanup at the Hanford site today?

- Removal of contaminated soil from the site
- Cameras that can see cracks through the sludge in holding pools
- Iron nanoparticles that remove carbon tetrachloride
- Screening device used to detect nuclear material
- None of the above

The answer is C.

Hey Terry this is Ryan Brewer from ESS 315. My question for the final on the Central Valley Aquifer is "The thickness of the Central Valley Aquifer System saturated with freshwater varies on the depth and permeability of the rocks that underlie \_\_\_\_\_.

- marine deposits
- CONTINENTAL DEPOSITS (answer)
- the western San Joaquin Valley
- the Tulare Basin where the Aquifer starts (very incorrect)

According to Mario Molina, and F. Sherwood Rowland, they hypothesized that 1 chlorine atom could damage \_\_\_\_\_ o zone molecules?

- 1000
- 25,000
- 100,000
- 1,000,000
- 10,000

Correct Answer: C

What is one of the key factors that makes tidal energy possible?

- Low tidal ranges
- High tidal ranges
- A combination of fresh and salt water
- Coral reefs nearby
- An area clear of underwater debris

the correct answer is 2.

What was attributed to the failure of the St. Francis Dam?

- a) The dam was built on an ancient landslide plane.
- b) The soils were saturated at the abutments.
- c) 1920~Rs geologic analysis was insufficient.
- d) The forces imposed upon the dam were not in equilibrium.
- e) All of the above are correct.

ANSWER: e) All of the above are correct.

Following is my question regarding the presentation I prepared on laterites:

Highly weathered, iron-oxide rich soil formed from chemical weathering in the tropics is known as:

- a) caliche
- b) laterite
- c) loess
- d) pedocal

How many times can 1.7 trillion gallons of water fill Safeco Field?

- a) 40
- b) 400
- c) 4,000 --> this is the answer
- d) 40,000

As we know the drainage of wetlands are detrimental during times of high precipitation because they serve as natural reservoirs for water runoff. What percentage of wetlands have been drained in the Mississippi River area since the 1940s which led to the great flooding in 1993?

- A: 15%
- B: 50%
- C: 80%
- D: 5%

80% of wetlands along the river have been drained since the 40s

My question is: Which region of the US is most affected by acid rain and why?

- a. The south due to intense humidity.
- b. The west due to emissions from volcanic activity.
- c. The east due to burning sulfur-rich coal.
- d. The south due to burning sulfur-rich coal.
- e. The midwest due to high altitudes of the Appalachians.

The correct answer is 'C'. Not that I had to tell you that.