ES104 Final Exam Study Guide – Summer 2024

ES104 Final Exam (100 pts) Monday July 22, 2024

RECOMMENDED STUDY TECHNIQUES

1) review the "How to Study Physical Science" guide available on the web site.
2) use the concepts below as a guide to help you focus on your notes
3) memorize terms and concepts (make flash cards, rewrite definitions 100 times, etc.)
4) go back over the labs and make sure you can do the tricks / skills
5) review some of the important figures in your lab manual and text
6) Review the Canvas practice quizzes and answers; test yourself with questions and answers.
7) be able to link the terms to concepts, and the concepts to Earth processes
8) Go to the class website and view all "Slide Shows/Figures / Overheads to Accompany Class Notes"

Week 1 – Introduction

http://www.wou.edu/las/physci/taylor/gs104/introf00.pdf

Earth System Science
system
astronomy
geology
meteorology
oceanography
geosphere
atmosphere
hydrosphere
biosphere
inner core
outer core
mantle
crust
oceanic crust
continental crust
asthenosphere
nitrogen-oxygen-carbon dioxide
photosynthesis
earth rotational axis
scientific method
observation
hypothesis
hypoth. testing
model
theory
law
mass
matter
energy
~~thermal energy~~
~~mechanical energy~~
~~law of energy conservation~~
system
model
solar system
earth system
geothermal energy
examples of geothermal
Earth Controls:
    solar energy
    geothermal energy
    gravity
age of earth
4.5 billion years old
big bang

Week 1 – Solar System

http://www.wou.edu/las/physci/taylor/gs104/univnew.pdf

Earth system
rotational period
rotational direction
orbital period
~~lunar cycle~~
~~lunar system~~
~~lunar cycle~~
~~full moon~~
~~new moon~~
~~lunar orbital direction~~
terrestrial planets
jovian planets
"gas giants"
planets: m,v,e,m,j,s,u,n,p
"sun" / star
planet vs. moon
star vs. planet
~~EM Spectrum~~
~~gamma ray~~
~~x ray~~
~~uv radiation~~
~~ROYGBIV~~
~~infrared~~
~~radio~~
~~wavelength~~
~~frequency~~
~~speed of light~~
~~visible light~~
~~light year~~
know your planet
    characteristics
~~heliocentric~~
~~geocentric~~
gravity
~~c = wavelength x frequency~~

Week 2 - Plate Tectonics

http://www.wou.edu/las/physci/taylor/gs104/tectonic.pdf

Mineral
Element
Rock
Rock Types
Igneous
e.g. basalt
e.g. granite

Sedimentary
e.g. sandstone
Metamorphic
Magma
Lava
Weathering
Sediment
Volcano
Earthquake
Seismology
Crust
Oceanic
Continental
Lithosphere (Plate)
Crust
Upper Mantle
Asthenosphere
Outer Core
Inner Core
Plate Tectonics
Plate Boundaries
Convergent
Divergent
Transform
Convergent
Subduction
Subduction Trench
Volcanic Arc
(e.g. Cascades)
Plate Destruction
accretionary tectonics
Divergent
Seafloor Spreading
Mid-Oceanic Ridge
Plate Creation
Transform Fault
e.g. San Andreas
e.g. Offset Mid-Ocean Ridge
Alfred Wegner
Continental Drift
Jig-Saw Fit of Continents
Pangaea
Match-up of Fossils
Match-up of Geology
Modern Evidence
Paleomagnetism
Seafloor Stripes
Polar Wandering
Normal Polarity
Reverse Polarity
Seismic Distribution
Volcanic Distribution
Hot Spots
Hot Spot Tracks / Hawaii
Hawaiian Islands
Seamounts
Volcanic Islands
Subduction Zone Types
Oceanic-Oceanic
e.g. Japan
Oceanic-Continental
e.g. Cascades
Continental-Continental
e.g. Himalayas
Plate Motion Rates
1-10 cm/yr
Continental Rifting
e.g. Red Sea
Plate Driving Mechanism
Internal Heat
Radioactive Source
Heat Exchange
Mantle Convection
Convection cells
rising hot rock
sinking cool rock
Ridge Push
Trench Pull
Density Driven

Week 3 - Earthquakes
http://www.wou.edu/las/physci/taylor/gs104/quakes.pdf

earthquake
epicenter
focus
wave refraction
wave reflection
~~s-wave shadow zone~~
~~p-wave shadow zone~~
seismic risk
seismic hazard
p wave
s wave
compressional wave
shear wave
surface wave
love wave
San Andreas Fault
fault creep
stick-slip
fault
~~blind fault~~
seismic waves
source of earthquakes
normal fault
reverse fault
strike slip fault
~~fault strand~~
~~fault zone~~
~~fault segment~~
ductile deformation
elastic deformation
brittle deformation
elastic rebound
foreshocks
aftershocks
main shock
wave form
wavelength
frequency
amplitude
body waves
surface waves
longitudinal waves
primary waves
shear waves
transverse waves
seismograph
seismogram
first p-wave arrival
first s-wave arrival
p wave velocity
s wave velocity
surface wave velocity
~~epicenter / triangulation~~
~~Mercalli Scale~~
earthquake intensity
earthquake magnitude
Richter Scale
seismicity
tsunami
ground shaking

earthquake / landslides
liquefaction

Week 3 – Pacific Northwest Earthquake Hazards
http://www.wou.edu/las/physci/taylor/gs104/orquake.pdf

Oregon / Pacific Northwest
PNW earthquake hazards
subduction zone
    earthquakes
crustal earthquakes
volcanic earthquakes
paleoseismology
last PNW big event = 300 yr
tsunami deposits (sand)
bay mud
coastal uplift
coastal subsidence
marsh submergence
tsunami cycle
Risk Factors
GPS / ground motion
hazard
risk
~~alluvium~~
~~bedrock~~
~~groundwater~~
~~Monmouth hazards~~
~~Willamette Valley hazards~~
~~saturated sediments~~
~~ground shaking~~

Week 3 – Volcanism
http://www.wou.edu/las/physci/taylor/gs104/volcanic.pdf

volcanic eruptions
explosive eruption
quiescent eruption
magma viscosity factors
temperature
silica content
gas content
>temp, < viscosity
<temp, > viscosity
>silica, > viscosity
<silica, <viscosity
>gas, > explosiveness
>viscosity, > explosiveness
products of volcanic eruptions
lava – pyroclastics - gas
low silica lava = basaltic
    pahoehoe
    aa
high silica lava = rhyolitic
escaping gases
water vapor
carbon dioxide
hydrogen sulfide
pyroclastic materials
    fine ash
    pumice
    cinders
    blocks / bombs

anatomy of volcano
    crater
    caldera
    magma chamber
    central vent
    flank eruption
volcano types
    shield (e.g. Newberry, Hawaii)
    cinder (e.g. Lava Butte)
    stratovolcano (e.g. Mt. Hood)
collapsed caldera (Crater Lake)
~~Intrusive Igneous Bodies~~
    ~~dikes~~
    ~~sills~~
    ~~laccoliths~~
    ~~batholiths~~
    ~~stocks~~
    ~~volcanic necks~~

Week 4 – Minerals
http://www.wou.edu/las/physci/taylor/gs104/matter.pdf
http://www.wou.edu/las/physci/taylor/gs104/minrl.pdf

matter
elements
periodic chart
compounds
nucleus
proton
neutron
electron
~~electron shells~~
~~atomic no.~~
~~octet rule~~
~~atomic weight~~
mineral
rock
silica-oxygen tetrahedron
~~cubic atomic arrangement~~
atomic arrangement
mineral definition
physical properties
color
luster
streak
fracture
hardness
cleavage
fracture
specific gravity
density
rock forming minerals
crustal composition
silicate minerals
carbonate minerals
oxides
halides
sulfates
magnetic minerals
acid-fizz mineral

Week 4 – Rocks / Igneous Rocks
http://www.wou.edu/las/physci/taylor/gs104/igrks.pdf

rock
igneous
sedimentary
metamorphic
magma
lava
cooling / crystallization
weathering
erosion
lithification
metamorphism
heat
pressure
rock cycle

magma cooling
igneous rock
magma
lava
buoyant magma
rising magma
less dense magma
extrusive
volcanic
intrusive
plutonic
rate of cooling
slow-phaneritic
fast-aphanitic
very rapid-glassy
muti-phase cool - porphyritic
mafic igneous rocks
plutonic = gabbro
volcanic=basalt
felsic igneous rocks
plutonic = granite
volcanic = rhyolite
intermediate igneous rocks
plutonic = diorite
volcanic = andesite
classification of igneous rocks
mineral composition
felsic
mafic
rock texture
aphanitic
phaneritic
glassy
porphyritic

Skills and Concepts

Can you sketch the interior of the Earth?

Can you complete basic unit calculations from English to Metric and vice versa?

Can you calculate density?

If given conversion factors, can you work a unit conversion problem?

What is the scientific method? Can you list the elements of the process?

Which direction does heat flow and why?

Why does a hot air balloon rise? Why do hot rocks rise? Why does magma rise, Why do their cold counterparts sink?

What is the difference between a star and planet? A planet and moon?

Explain why we look back in time when we look into space?

Can you list 3 essential characteristics of each of the planets? Can you name the planets in order from the sun?

~~Can you draw and label a diagram of the lunar cycle~~
~~Can you draw and label a diagram of the seasonal climate cycles of the Earth? Why do we have seasons?~~

What types of geologic features are found at what types of plate boundaries? (e.g. volcano, earthquake, mountains, volcanic islands?)

Can you draw and label a cross-section of a subduction zone? a seafloor spreading center?

How do we know that Hawaii is located over a hotspot? What is a hot spot ?

What is the difference between continental drift and plate tectonics?

How did the theory of plate tectonics evolve?

Can you draw a diagram of the plate tectonic setting of the Pacific Northwest?

Can you associate / match plate tectonic setting to geologic - geographic areas, as discussed in class?

How do we know when the last great subduction zone earthquake was in the PNW?

What happens to Oregon coast during an earthquake cycle?

If given a seismography with arrival times of P-S-surface waves, can you locate the geographic epicenter of an earthquake on a map?

Based on topographic map pattern, can you identify the difference between a shield volcano and a stratovolcano?

Based on observing images and diagrams, can you identify basic volcanic and igneous features such as cinder cones, stratovolcano, shield volcanoc, ash deposits, lava flows, aa vs. pahoehoe flows, dikes, sills, batholiths

Can you identify basic mineral a and rock specimens:

Can you calculate the rate of plate motion in cm/yr?