2025 Earth and Space Scrimmage

Double Elimination 6

August 10th, 11:45-12:15 PM PT

TOSS-UP

1) Earth science – *Multiple Choice* Identify all of the following statements that are true regarding salt fingering: 1) It is gravity driven 2) It occurs when cold, fresh water underlies warm, salty water 3) Heat diffuses more quickly than salinity

ANSWER: All

BONUS

1) Earth science – *Multiple Choice* Which of the following types of desert landscapes is LEAST likely to be found where deflation rates are high?

W) Badlands
X) Erg
Y) Hamada
Z) Reg

ANSWER: X) Erg

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TOSS-UP

2) Space science – *Multiple Choice* In order for a moon to be stripped from its host planet, it must cross which of the following boundaries?

W) Roche limit
X) L3
Y) Hill sphere
Z) Event Horizon

ANSWER: Y) Hill sphere

BONUS

2) Space science – *Short Answer* Callisto, an inner moon of Jupiter, has a crater-covered surface. In contrast, outer moons such as Himalia and Amalthea receive significantly less cratering. This is mainly a result of what effect, where potential impactors are directed towards the planet and results in more impacts on the inner moons?

ANSWER: Gravitational focusing
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TOSS-UP

3) Earth science – *Multiple Choice* Which of the following best resembles pseudomorphism?

W) Andalusite rearranging into kyanite as pressure increases
X) Limonite possessing a cubic shape as a result of substitution of pyrite
Y) Twinning of aragonite resulting in a hexagonal appearance
Z) Recrystallization of garnet resulting in coarser grains due to high temperature and pressure

ANSWER: X) Limonite possessing a cubic shape as a result of substitution of pyrite

BONUS

3) Earth science – *Multiple Choice* Which of the following best characterizes the upper atmospheric zonal circulation at latitudes 30N and 60N, respectively?

W) Westerly, easterly
X) Westerly, Westerly
Y) Easterly, Westerly
Z) Easterly, Easterly

ANSWER: X) Westerly, Westerly

TOSS-UP

4) Earth science – *Multiple Choice* At which of the following locations is melange least likely to be found?

W) Accretionary wedge
X) River delta
Y) Base of continental slopes
Z) Fold thrust belts

ANSWER: X) River delta

BONUS

4) Earth science – *Short Answer* Identify all of the following 3 events caused by orographic forcing that promote lee-side cyclone formation: 1) Enhanced low-level convergence on the lee side 2) Strengthening of upper-level wind shear on the lee side 3) Warming of air masses due to compression on the windward side

ANSWER: 1 and 2

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TOSS-UP

5) Space science – *Short Answer* What hypothesis states that naked singularities do not exist in the universe?

ANSWER: Cosmic censorship hypothesis

BONUS

5) Space science – *Short Answer* Identify all of the following four moons of Jupiter whose material compose the Gossamer rings: 1) Io 2) Europa 3) Callisto 4) Ganymede

ANSWER: None
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TOSS-UP

6) Earth science – *Short Answer* Identify all of the following conditions that are conducive to the formation of chevron faults: 1) Compressional stress 2) Layers with contrasting stiffness 3) Being deep in the Earth's crust

ANSWER: 1 and 2

BONUS

6) Earth science – *Short Answer* Identify all of the following three statements that are true regarding internal waves in the ocean: 1) They are wind driven 2) They tend to more closely follow the thermocline than the halocline 3) They can propagate vertically and horizontally

ANSWER: 2 and 3

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TOSS-UP

7) Space science – *Short Answer* White dwarfs are hypothesized to cool to become black dwarfs over time periods that are longer than the age of the universe. Similarly, red dwarfs will evolve into what type of star by increasing its surface temperature over trillions of years?

ANSWER: Blue dwarf

BONUS

7) Space science – *Multiple Choice* The solar wind slows down below the speed of sound after it crosses which of the following boundaries?

W) Heliosheath
X) Heliopause
Y) Heliosphere
Z) Termination shock

ANSWER: Z) Termination shock
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TOSS-UP

8) Earth science – *Multiple Choice* Carbonatite, an igneous rock containing high concentrations of carbonate and rare earth elements, is most likely to form in which of the following environments?

W) Continental rifts
X) Mid-ocean ridges
Y) Supervolcano hotspots
Z) Cinder cones

ANSWER: W) Continental rifts

BONUS

8) Earth science – *Short Answer* Identify all of the following three statements that are true regarding thalwegs, line connecting the lowest points in on the river bed: 1) Erosion occurs at the thalweg 2) The thalweg is generally more sinuous than the river 3) Water in the channel flows the fastest at the thalweg

ANSWER: 1 and 2

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TOSS-UP

9) Earth science – *Multiple Choice* The Chocolate Hills in the Philippines is noted for its abundance of cone-shaped hills, as well as mogotes, poljes and cenotes. Which of the following karst landscapes does this describe?

W) Kegelkarst
X) Paleokarst
Y) Salt karst
Z) Tower karst

ANSWER: W) Kegelkarst

BONUS

9) Earth science – *Short Answer* The formation of columnar jointed basalt results from contraction during cooling. What physical property of basalt controls the spacing and size of these fractures?

ANSWER: Thermal conductivity
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TOSS-UP

10) Space science – *Short Answer* By name or number, identify all of the following black holes that does NOT process an ergosphere: 1) Schwarzschild 2) Reissner-Nordstrom 3) Kerr-Newman

ANSWER: 1 and 2

BONUS

10) Space science – *Multiple Choice* Which of the following best describes the identity of the warm-hot intergalactic medium, or WHIM?

W) Hot dark matter
X) Halo of excited gas
Y) Baryonic plasma
Z) Massive dark nebulae

ANSWER: Y) Baryonic plasma

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TOSS-UP

11) Space science – *Multiple Choice* "Which of the following best describes the electron orbitals of atoms in a white dwarf?

W) Same energy but different quantum numbers
X) Same quantum number but different energies
Y) Same energy and quantum numbers
Z) Different energies and quantum numbers

ANSWER: W) Same energy but different quantum numbers

BONUS

11) Space science – *Short Answer* Dwarf galaxies such as the Magellanic Clouds are often characterized as what other type of galaxies that is gravitationally bound in orbit to a more massive and luminous host galaxy?

ANSWER: Satellite galaxies
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TOSS-UP

12) Earth science – *Multiple Choice* Which of the following minerals is thought to be the most abundant in the lower mantle, and also most abundant in Earth overall?

W) Olivine
X) Ringwoodite
Y) Bridgemanite
Z) Stishovite

ANSWER: Y) Bridgemanite

BONUS

12) Earth science – *Multiple Choice* Tiger's eye exhibits chatoyancy due to fibrous quartz formed through replacement of which of the following minerals?

W) Magnetite
X) Crocidolite
Y) Satin Spar
Z) Goethite

ANSWER: X) Crocidolite

TOSS-UP

13) Earth science – *Multiple Choice* Which of the following air mass types is likely to bring the least amount of precipitation?

W) mP
X) mT
Y) cP
Z) cT

ANSWER: Y) cP

BONUS

13) Earth science – *Multiple Choice* Seismic moment, used in calculating earthquake magnitudes, is measured in which of the following SI units?

W) Newtons
X) Newton meters
Y) Newtons per meter
Z) Newtons per second

ANSWER: X) Newton meters

TOSS-UP

14) Earth science – *Multiple Choice* In boundary-layer meteorology, the Monin–Obukhov length L is a factor that describes the degree to which buoyancy suppresses turbulence. A large negative value of L indicates which of the following about atmospheric stability?

W) Absolute Instability
X) Conditional Stability
Y) Absolute Stability
Z) Conditional instability

ANSWER: Y) Absolute stability

BONUS

14) Earth science – *Multiple Choice* "Under which of the following conditions is one most likely to find cristobalite?

W) Hydrothermal vents
X) Abyssal plains
Y) Volcanic ash
Z) Nuclear explosion sites

ANSWER: Y) Volcanic ash

TOSS-UP

15) Space science – *Short Answer* Saturn's north pole exhibits a hexagon shaped formation because its jet stream interferes with itself to form what type of wave?

ANSWER: Standing wave

BONUS

15) Space science – *Multiple Choice* In an alternative universe, the ionization energy of an hydrogen atom is ten times higher than the universe we know. How would the redshift of the cosmic microwave background in the alternative universe compare to our universe?

W) It is higher
X) It is lower
Y) It is the same
Z) It cannot be determined

ANSWER: W) It would be higher