

2024 Earth and Space Scrimmage

Round Robin 2

August 4th - 6th

TOSS-UP

1) Space science – *Short Answer* The circular restricted three-body problem involves two primary bodies that orbit circularly about their common center of mass and a third body that has negligible mass. At how many points in this system does the net force on the third body equal zero?

ANSWER: 5

TOSS-UP

2) Space science – *Multiple Choice* Atira [**ah-tih-ra**], Apollo, and Amor are all types of which of the following sub-planetary bodies?

- W) Asteroids
- X) Comets
- Y) Dwarf planets
- Z) Moons

ANSWER: W) Asteroids

TOSS-UP

3) Earth science – *Short Answer* Identify all of the following three statements that are true regarding the layers of Earth's atmosphere: 1) Temperature decreases with altitude in each layer; 2) Air pressure decreases with altitude in each layer; 3) Ozone is only found in the stratosphere.

ANSWER: 2 only

TOSS-UP

4) Earth science – *Short Answer* What term is given to the type of movement that occurs as pressure melts and lubricates ice at the bottom of a glacier, allowing the entire glacier to move together?

ANSWER: Basal slip (ACCEPT: Basal sliding, anything with “basal”)

TOSS-UP

5) Earth science – *Short Answer* Identify all of the following three properties that correctly describe the first minerals to crystallize on Bowen's reaction series: 1) High silica content; 2) High ionic character; 3) Resistant to weathering.

ANSWER: 2 only

TOSS-UP

6) Space science – *Multiple Choice* According to the Rayleigh criterion, the resolving power of a telescope is proportional to its aperture diameter raised to what power?

- W) -2
- X) -1
- Y) 1
- Z) 2

ANSWER: X) -1

TOSS-UP

7) Earth science – *Short Answer* The clathrate gun hypothesis suggests that abrupt climate change could occur as ocean warming destabilizes ice-like compounds on the ocean floor containing what greenhouse gas?

ANSWER: Methane

TOSS-UP

8) Space science – *Short Answer* A Hubble classification of S0 [**s-zero**] denotes what type of galaxy, which possesses elements of both elliptical and spiral galaxies?

ANSWER: Lenticular

TOSS-UP

9) Earth science – *Multiple Choice* Based on prevailing interpretations of the stratigraphic record, during which of the following geologic periods was eustatic sea level highest?

- W) Cambrian
- X) Triassic
- Y) Cretaceous
- Z) Paleogene

ANSWER: Y) Cretaceous

TOSS-UP

10) Earth science – *Short Answer* Dolostone is produced by the reaction of calcite with groundwater enriched in what element?

ANSWER: Magnesium

TOSS-UP

11) Earth science – *Multiple Choice* Eclogites typically form in which of the following sets of conditions?

- W) Low temperature, low pressure
- X) Low temperature, high pressure
- Y) High temperature, low pressure
- Z) High temperature, high pressure

ANSWER: Z) High temperature, high pressure

TOSS-UP

12) Space science – *Short Answer* Order the following three stellar populations from highest to lowest metallicity: 1) Population I; 2) Population II; 3) Population III.

ANSWER: 1, 2, 3

TOSS-UP

13) Earth science – *Short Answer* Identify all of the following three environmental lapse rates, in degrees Celsius per kilometer, that would likely create absolutely unstable conditions: 1) 2; 2) 4; 3) 8.

ANSWER: None

TOSS-UP

14) Earth science – *Short Answer* Order the following three eruption styles in terms of increasing explosiveness: 1) Surtseyan; 2) Strombolian; 3) Vulcanian.

ANSWER: 2, 3, 1

TOSS-UP

15) Earth science – *Short Answer* Peter the petrologist is studying an interesting sedimentary rock found on the ocean floor containing poorly sorted angular quartz grains embedded in a clay-rich matrix. What rock did he likely find?

ANSWER: Greywacke [*gray-wack-ee*]

TOSS-UP

16) Space science – *Short Answer* The lighthouse model is most often used to describe rapid changes in brightness of what type of astronomical object?

ANSWER: Pulsars

TOSS-UP

17) Earth science – *Short Answer* When two valley glaciers merge, what type of moraine is often created due to the coalescence of two lateral moraines?

ANSWER: Medial moraine

TOSS-UP

18) Earth science – *Multiple Choice* Which of the following metamorphic processes is most directly responsible for the formation of skarns?

- W) Regional metamorphism
- X) Contact metamorphism
- Y) Cataclastic metamorphism
- Z) Metasomatism

ANSWER: Z) Metasomatism

TOSS-UP

19) Space science – *Short Answer* If Earth were tidally locked to the Sun, identify all of the following three quantities that would be equal to one year: 1) Sidereal day; 2) Sidereal year; 3) Synodic day.

ANSWER: 1 and 2

TOSS-UP

20) Space science – *Short Answer* Order the following four layers of a 10 solar mass star from innermost to outermost: 1) Corona; 2) Core; 3) Radiative zone; 4) Convective zone.

ANSWER: 2, 4, 3, 1