

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