

2024 Earth and Space Scrimmage

Round Robin 4

August 10th - 12th

TOSS-UP

1) Space science – *Short Answer* Titan’s atmospheric dynamics are often described as similar to Earth because it has polar seas, clouds, and precipitation primarily composed of what compound?

ANSWER: Methane

TOSS-UP

2) Space science – *Short Answer* Star David emits radiation at a peak wavelength of 500 nanometers. If David’s radius doubles, with the surface temperature remaining constant, what will be the new peak wavelength of David’s spectra in nanometers?

ANSWER: 500

TOSS-UP

3) Earth science – *Short Answer* Brine rejection surrounding Antarctica creates what cold, salty water mass that is denser than almost any other water in the ocean?

ANSWER: Antarctic Bottom Water (ACCEPT: AABW)

TOSS-UP

4) Space science – *Short Answer* Order the following three gases in terms of increasing concentration in Venus’s atmosphere: 1) Nitrogen; 2) Carbon dioxide; 3) Sulfur dioxide.

ANSWER: 3, 1, 2

TOSS-UP

5) Earth science – *Multiple Choice* Light rays bend as they pass through Earth’s atmosphere. If the atmosphere was removed, which of the following best characterizes how the timing of sunrise and sunset would be affected?

- W) Earlier sunrise and sunset
- X) Earlier sunrise and later sunset
- Y) Later sunrise and earlier sunset
- Z) Later sunrise and sunset

ANSWER: Y) Later sunrise and earlier sunset

TOSS-UP

6) Earth science – *Short Answer* What law is typically used to calculate the movement of groundwater through aquifers in non-uniform landscapes?

ANSWER: Darcy's law

TOSS-UP

7) Space science – *Short Answer* Identify all of the following three epochs [**eh-pauks**] of the early universe in which the electromagnetic and weak forces were unified: 1) Planck epoch; 2) Inflation; 3) Recombination.

ANSWER: 1 and 2

TOSS-UP

8) Earth science – *Short Answer* Identify all of the following three changes that are associated with an increase in a volcano's explosiveness: 1) Increase in volatile concentration; 2) Increase in magma temperature; 3) Increase in silicate complexity.

ANSWER: 1 and 3

TOSS-UP

9) Space science – *Short Answer* For a satellite orbiting Earth, what is the ratio of the kinetic energy needed to maintain a stable orbit around the planet to the minimum kinetic energy needed to escape the planet's gravity entirely?

ANSWER: 1:2

TOSS-UP

10) Earth science – *Multiple Choice* Which of the following processes generally leads to the exfoliation of an igneous intrusion?

- W) Increase in temperature
- X) Decrease in temperature
- Y) Increase in pressure
- Z) Decrease in pressure

ANSWER: Z) Decrease in pressure

TOSS-UP

11) Space science – *Multiple Choice* Which of the following statements is INCORRECT regarding the Sun?

- W) Solar granules are hottest at their limbs and coolest at their centers
- X) Sunspots have strong calcium absorption lines
- Y) The corona is the hottest part of the Sun's atmosphere
- Z) Large coronal holes exist near the poles of the Sun

ANSWER: W) Solar granules are hottest at their limbs and coolest at their centers

TOSS-UP

12) Earth science – *Short Answer* Identify all of the following three features that are associated with fault-block mountains: 1) Detachment faults; 2) Fracture zones; 3) Half-grabens [**grah-bens**].

ANSWER: 1 and 3

TOSS-UP

13) Earth science – *Multiple Choice* Which of the following environments do garnets most commonly form in?

- W) Intrusive igneous
- X) Extrusive igneous
- Y) Low-grade metamorphic
- Z) High-grade metamorphic

ANSWER: Z) High-grade metamorphic

TOSS-UP

14) Earth science – *Short Answer* Order the following four geologic periods from first to last in Earth's history: 1) Devonian; 2) Jurassic; 3) Ordovician [**or-da-vish-ahn**]; 4) Silurian.

ANSWER: 3, 4, 1, 2

TOSS-UP

15) Space science – *Short Answer* Order the following three spectral classes in terms of increasing surface temperature: 1) G; 2) M; 3) W.

ANSWER: 2, 1, 3

TOSS-UP

16) Earth science – *Multiple Choice* Which of the following erosional features is NOT formed by glaciers?

- W) V-shaped valleys
- X) Sheepbacks
- Y) Arêtes [**ah-reh-ts**]
- Z) Cirques [**sir-ks**]

ANSWER: W) V-shaped valleys

TOSS-UP

17) Earth science – *Multiple Choice* A hook echo typically indicates the formation of which of the following atmospheric phenomena?

- W) Derecho [**da-ray-cho**]
- X) Hurricane
- Y) Lightning
- Z) Tornado

ANSWER: Z) Tornado

TOSS-UP

18) Earth science – *Short Answer* Identify all of the following three mechanisms that would favor the formation of a temperature inversion: 1) Radiation cooling during a clear evening; 2) Sinking of air associated with deep anticyclones; 3) Movement of a shallow cold front across the land surface.

ANSWER: All

TOSS-UP

19) Space science – *Short Answer* Given that the James Webb Space Telescope is primarily an infrared telescope, which of the following astronomical phenomena is the telescope likely NOT observing?

- W) Exoplanets
- X) Pre-main sequence stars
- Y) Brown dwarfs
- Z) White dwarfs

ANSWER: Z) White dwarfs

TOSS-UP

20) Earth science – *Short Answer* Identify all of the following three minerals that commonly exhibit a cubic crystal habit: 1) Calcite; 2) Fluorite; 3) Pyrite.

ANSWER: 2 and 3