

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