

Ryan Cohen
LIGHTNING ROUND

TOSS-UP

1) MATH *Short Answer* What is the equation of the line normal to the curve $y = x^2 + 2$ at its vertex?

ANSWER: $x = 0$

TOSS-UP

2) PHYSICS *Short Answer* When air experiences dielectric breakdown, what odiferous gas is produced?

ANSWER: Ozone

TOSS-UP

3) EARTH AND SPACE SCIENCE *Short Answer* Which two of the following four statements correctly describe granite?

- 1: Granite is extrusive and generally is not considered felsic.
- 2: Granite is amorphous and granular.
- 3: Granite is usually found in the continental plates of the Earth's crust.
- 4: Granite consists mainly of quartz, mica, and feldspar.

ANSWER: 3 AND 4

TOSS-UP

4) BIOLOGY *Short Answer* If the Krebs cycle enzyme α -ketoglutarate dehydrogenase is deficient, there will be an accumulation of what metabolite?

ANSWER: α -ketoglutarate

TOSS-UP

5) CHEMISTRY *Multiple Choice* For a condensation phase transition, the change in enthalpy of the substance is:

- W) greater than 0
- X) less than 0
- Y) equal to 0
- Z) dependent on the substance

ANSWER: X) LESS THAN 0

TOSS-UP

6) MATH *Multiple Choice* What is the area of an equilateral triangle with a side length of 5cm?

- W) $25/4 \text{ cm}^2$
- X) $25/8 \text{ cm}^2$
- Y) $25\sqrt{3}/2 \text{ cm}^2$
- Z) $25\sqrt{3}/4 \text{ cm}^2$

ANSWER: Z) $25\sqrt{3}/4 \text{ cm}^2$

TOSS-UP

7) PHYSICS *Multiple Choice* A sample of pure water is cooled from 3°C to 2°C while kept at constant pressure. Which of the following MUST be true regarding the sample:

- W) internal energy increased
- X) density decreased
- Y) volume decreased
- Z) it froze

ANSWER: X) DENSITY DECREASED

TOSS-UP

8) EARTH AND SPACE SCIENCE *Short Answer* What type of star is most commonly distinguished by the presence of lithium?

ANSWER: BROWN DWARF

TOSS-UP

9) BIOLOGY *Short Answer* Name all of the following four steps of photosynthesis that occur in the grana:

- 1: Light energy from the sun is used to split water.
- 2: Hydrogen is converted to NADPH.
- 3: ATP is synthesized from ADP and inorganic phosphate.
- 4: CO₂ and ATP are used to create sugar in the Calvin Cycle.

ANSWER: 1, 2, AND 3

TOSS-UP

10) CHEMISTRY *Short Answer* What is the bond angle between the bonds of an ammonium ion?

ANSWER: 109.5°

TOSS-UP

11) MATH *Multiple Choice* Which of the following lines is an asymptote of the equation $y = x^3/(x^2-4)$?

- W) $y = x$
- X) $y = 0$
- Y) $x = 4$
- Z) $y = 1$

ANSWER: W) $y = x$

TOSS-UP

12) PHYSICS *Multiple Choice* Which of the following electrical components opposes changes in current:

- W) resistor
- X) diode
- Y) inductor
- Z) capacitor

ANSWER: Y) INDUCTOR

TOSS-UP

13) EARTH AND SPACE SCIENCE *Multiple Choice* Obduction is:

- W) common and occurs when the edge of a tectonic plate consisting of continental crust is thrust over the edge of an adjacent plate consisting of oceanic crust
- X) uncommon and occurs when the edge of a tectonic plate consisting of continental crust is thrust over the edge of an adjacent plate consisting of oceanic crust
- Y) common and occurs when the edge of a tectonic plate consisting of oceanic crust is thrust over the edge of an adjacent plate consisting of continental crust
- Z) uncommon and occurs when the edge of a tectonic plate consisting of oceanic crust is thrust over the edge of an adjacent plate consisting of continental crust

ANSWER: Z) UNCOMMON AND OCCURS WHEN THE EDGE OF A TECTONIC PLATE CONSISTING OF OCEAN CRUST IS THRUST OVER THE EDGE OF AN ADJACENT PLATE CONSISTING OF CONTINENTAL CRUST

TOSS-UP

14) BIOLOGY *Short Answer* What genetic disorder is caused by a presence of a third copy of chromosome 21?

ANSWER: DOWN SYNDROME

TOSS-UP

15) CHEMISTRY *Multiple Choice* Acetic acid and glucose have the same:

- W) molecular formula
- X) classical formula
- Y) empirical formula
- Z) structural formula

ANSWER: Y) EMPIRICAL FORMULA

TOSS-UP

16) MATH *Short Answer* A single 6-sided die is rolled. What are the odds of rolling a number that is not 4?

ANSWER: 5:1

TOSS-UP

17) PHYSICS *Multiple Choice* ALL indexes of refraction are:

- W) greater than 1
- X) greater than or equal to 1
- Y) less than 1
- Z) less than or equal to 1

ANSWER: X) GREATER THAN OR EQUAL TO 1

TOSS-UP

18) EARTH AND SPACE SCIENCE *Short Answer* What is it called when the Sun crosses the celestial equator moving northward?

ANSWER: VERNAL EQUINOX (ACCEPT: MARCH EQUINOX)

TOSS-UP

19) BIOLOGY *Short Answer* Name all of the following 3 parts of a cell that the centriole is directly involved in the creation or organization of:

- 1: mitotic spindle
- 2: centrosome
- 3: flagella and cilia

ANSWER: '1, 2, AND 3' or 'ALL OF THEM'

TOSS-UP

20) CHEMISTRY *Short Answer* What element has the electron configuration $1s^2 2s^2 2p^4$?

ANSWER: OXYGEN

TOSS-UP

21) MATH *Short Answer* Factor the expression $9a^3 - 15a^2 + 3a - 5b$.

ANSWER: $(3a^2 + b)(3a - 5)$

TOSS-UP

22) PHYSICS *Multiple Choice* If a 1 kg object is taken from sea-level to an altitude of 7000ft, which of the following will be true?

- W) The mass will decrease.
- X) The mass will increase.
- Y) The weight will decrease.
- Z) The weight will increase.

ANSWER: Y) THE WEIGHT WILL DECREASE.

TOSS-UP

23) EARTH AND SPACE SCIENCE *Short Answer* What tall, steep type of volcano is responsible for creating many of Earth's greatest mountains, including Mount Fuji in Japan, Mount Shasta in California, and Mount St. Helens in Washington?

ANSWER: COMPOSITE VOLCANOES (ACCEPT: STRATOVOLCANOES)

TOSS-UP

24) BIOLOGY *Short Answer* The powdery substance that is seen coming out of puffball fungi is actually what?

ANSWER: SPORES

TOSS-UP

25) CHEMISTRY *Short Answer* Give the empirical formula for the alkene containing five carbon atoms.

ANSWER: C₅H₁₀