

TOSS UP

1) MATH *Multiple Choice* The length of the minor axis of an ellipse with the equation $(x+4)^2/4 + (x+5)^2/2 = 1$ is

- W) 2.828
- X) 4
- Y) 0.707
- Z) 1.414

ANSWER: W) 2.828

BONUS

1) MATH *Short Answer* What is the definite integral from 2 to 24 of $[\ln(2x) + e^x]dx$? Do not evaluate e.

ANSWER: $13 + e^2 + e^{24} + C$

TOSS UP

3) PHYSICS *Multiple Choice* The inverse of the period of a wave is called the

- W) Focus
- X) Wavelength
- Y) Frequency
- Z) Mirror

ANSWER: Y)

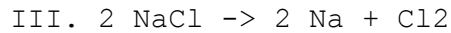
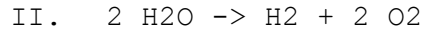
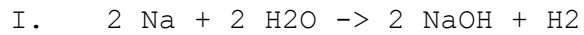
BONUS

4) PHYSICS *Short Answer* How much kinetic energy does a 30kg bob on a pendulum, starting with a maximum height of 5m, have at 2/3 of the way down?

ANSWER: 1000 J

TOSS UP

5) CHEMISTRY *Multiple Choice* Which of the following reactions, using numbers or words, is a spontaneous reaction?



ANSWER: I Only

BONUS

6) CHEMISTRY *Short Answer* What are the coefficients for the balanced form of the equation: $\text{C}_7\text{H}_{16} + \text{O}_2 \rightarrow \text{CO}_2 + \text{H}_2\text{O}$

ANSWER: 1 11 7 8

TOSS UP

7) BIOLOGY *Multiple Choice* Which is not an enzyme involved in DNA replication?

W) Topoisomerase

X) Helicase

Y) DNA Polymerase II

Z) DNA Polymerase III

ANSWER: Y) DNA Polymerase II

BONUS

8) BIOLOGY *Short Answer* Which scientist performed the first widely accepted transformation experiment?

ANSWER: (Fred) Griffith

TOSS UP

9) EARTH AND SPACE *Multiple Choice* What is the spectral type of the Sun?

- W) G Type
- X) O Type
- Y) A Type
- Z) B Type

ANSWER: W) G Type

BONUS

10) EARTH AND SPACE *Short Answer* What is the most widely accepted method to locate the epicenter of an earthquake?

ANSWER: Triangulation

TOSS UP

11) MATHEMATICS *Multiple Choice* Given that $\log_{\text{base } a} \text{ of } 729$ is 6, what is the value of a ?

- W) 2
- X) 3
- Y) 6
- Z) 9

ANSWER: X) 3

BONUS

12) MATHEMATICS *Short Answer* Convert 111011 from base 2 to base 3.

ANSWER: 2012

TOSS UP

13) MATHEMATICS *Multiple Choice* How many distinct sets are possible with the numbers 2,2,3,4,4,4,5?

- W) 7
- X) 5040
- Y) 420
- Z) 60480

ANSWER: Y) 420

BONUS

14) MATHEMATICS *Short Answer* What is the magnitude of the resultant of the vectors $\langle 1, 2 \rangle$ and $\langle 2, 2 \rangle$?

ANSWER: 5

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15) PHYSICS *Multiple Choice* Given a wave with a wavelength L , what is the wavelength of the third harmonic?

- W) $3L$
- X) $2/3L$
- Y) $1/3L$
- Z) $1/9L$

ANSWER: X) $2/3L$

BONUS

16) PHYSICS *Short Answer* What is the height of the highest point reached by an object thrown at 30 degrees at 20 meters/second from a height of 5 meters?

ANSWER: 10 meters

TOSS UP

17) CHEMISTRY *Multiple Choice* What is the acidity of an acid with a concentration of OH^- of 10^{10} ?

- W) 10
- X) 2
- Y) 8
- Z) 4

ANSWER: 4

BONUS

18) CHEMISTRY *Short Answer* What is the final temperature of a mixture of water when 20 kg of water at 100°C is poured into water with a mass of 100kg an initial temperature of 10°C ? Give answer to nearest whole number.

ANSWER: 18°C

TOSS UP

19) BIOLOGY *Multiple Choice* What are the three sites in a ribosome?

- W) A M P
- X) E P A
- Y) R P E
- Z) R A P

ANSWER: X) E P A

BONUS

20) BIOLOGY *Short Answer* Which of the following organelles are not found in animal cells? Nucleus, chloroplasts, mitochondria, lysosome

ANSWER: Chloroplasts

TOSS UP

21) EARTH AND SPACE *Multiple Choice* Which of the following planets is considered to be a jovian planet?

- W) Mercury
- X) Saturn
- Y) Earth
- Z) Venus

ANSWER: X) Saturn

BONUS

22) EARTH AND SPACE *Short Answer* During which age did mammals begin to prosper?

ANSWER: Cenozoic

TOSS UP

23) MATHEMATICS *Multiple Choice* What is a possible length of the third side of a triangle, given that two of the sides are 5 and 8?

- W) 13
- X) 10
- Y) 2
- Z) 1

ANSWER: X) 10

BONUS

24) MATHEMATICS *Short Answer* What is the length of side c of a triangle given that side a is 5, side b is 8, and angle C is 60° ? Do not evaluate the square root.

ANSWER: $\sqrt{129}$