

TOSS UP

1) MATHEMATICS *Multiple Choice* What is the union of two sets $\{0,1,2,3\}$ and $\{0,1,2,4\}$?

- W) $\{3,4\}$
- X) $\{1,2,3\}$
- Y) $\{0,1,2,3,4\}$
- Z) $\{0,1,2\}$

ANSWER: Y) $\{0,1,2,3,4\}$

BONUS

2) MATHEMATICS *Short Answer* What is the area of an equilateral triangle with side lengths of $2\sqrt{3}$?

ANSWER: $3\sqrt{3}$

TOSS UP

3) PHYSICS *Short Answer* If a sheet of metal has a coefficient of linear expansion of 0.1 and an area of 0.25 m^2 at 0°C , what is its change in area at 50°C ?

ANSWER: 2.5 m^2

BONUS

4) PHYSICS *Multiple Choice* If a spaceship accelerates away from earth at $0.9c$ and accelerates back, the ages of the space travelers relative to those of the people on Earth will be:

- W) Older
- X) Younger
- Y) The same
- Z) Cannot be determined

ANSWER: W) Older

TOSS UP

5) BIOLOGY *Multiple Choice* Which of the following contains both correct base pair matches in DNA?

- W) Thymine - Cytosine, Guanine - Adenine
- X) Thymine - Adenine, Guanine - Cytosine
- Y) Thymine - Guanine, Adenine - Cytosine
- Z) Thymine - Adenine, Guanine - Uracil

ANSWER: X) Thymine - Adenine, Guanine - Cytosine

BONUS

6) BIOLOGY *Short Answer* In which cellular process is the Ced-9 gene involved in?

ANSWER: Apoptosis

TOSS UP

7) CHEMISTRY *Short Answer* What is the weakest intermolecular force known?

ANSWER: London dispersion force OR Van Der Waal's force

BONUS

8) CHEMISTRY *Multiple Choice* What is the name of the constant h in the equation $E=h\nu$?

- W) Boltzmann Constant
- X) Planck's Constant
- Y) Avogadro's Number
- Z) Gravitational Constant

ANSWER: X) Planck's Constant

TOSS UP

9) ENERGY *Multiple Choice* Which country uses the most energy?

- W) United States
- X) Libya

- Y) Mexico
- Z) Great Britain

ANSWER: W) United States

BONUS

10) ENERGY *Short Answer* Which form of renewable energy requires relatively high elevations and little obstruction?

ANSWER: Wind (energy)

TOSS UP

11) EARTH AND SPACE *Short Answer* What geological type of land is Hawaii?

ANSWER: Archipelago

BONUS

12) EARTH AND SPACE *Multiple Choice* To the nearest tenth, how far is the Andromeda galaxy in mega-light years?

ANSWER: 2.5

TOSS UP

13) MATHEMATICS *Multiple Choice* What is the fifth triangular number?

- W) 1
- X) 3
- Y) 15
- Z) 21

ANSWER: Z) 21

BONUS

14) MATHEMATICS *Short Answer* What is the area of a regular hexagon with side lengths of 6?

ANSWER: $54\sqrt{3}$

TOSS UP

15) PHYSICS *Short Answer* Which law states that the extension of a spring is in direct proportion with the load applied to it?

ANSWER: Hooke's Law

BONUS

16) PHYSICS *Multiple Choice* The unit for specific heat is

- W) $\text{kg}\cdot\text{m}/2$
- X) $\text{J}\cdot\text{g}/^{\circ}\text{C}$
- Y) $\text{J}/\text{g}\cdot^{\circ}\text{C}$
- Z) J/g

ANSWER: Y) $\text{J}/\text{g}\cdot^{\circ}\text{C}$

TOSS UP

17) BIOLOGY *Multiple Choice* Which of the following organelles do both animal and plant cells share?

- W) Mitochondria
- X) Chloroplast
- Y) Centrosome
- Z) Central vacuole

ANSWER: W) Mitochondria

BONUS

18) BIOLOGY *Short Answer* By name or number, give all of the 3 following types of bonds that are not involved in the primary structure of a protein.

- I) Covalent bonds
- II) Ionic bonds
- III) Hydrogen bonds

ANSWER: None

TOSS UP

19) CHEMISTRY *Short Answer* What type of bond is the strongest bond?

ANSWER: Covalent (bond)

BONUS

20) CHEMISTRY *Multiple Choice* What is the atomic number of the element with the electron configuration of $1s^2 2p^2 2p^6 3s^2 3p^6 3d^{10} 4s^2 4p^6 4d^7 5s^1$?

- W) 42
- X) 43
- Y) 44
- Z) 45

ANSWER: Y) 44

TOSS UP

21) ENERGY *Multiple Choice* Which element has the highest specific heat?

- W) Oxygen
- X) Copper
- Y) Gold
- Z) Silver

ANSWER: W) Oxygen

BONUS

22) ENERGY *Short Answer* What is the efficiency of a Carnot engine with an absolute temperature of 100°C for the hot reservoir and an absolute temperature of 10°C for the heat sink?

ANSWER: 0.9

TOSS UP

23) EARTH AND SPACE *Short Answer* What orientation of the Sun, Moon, and Earth are required for a solar eclipse?

ANSWER: Sun, Moon, Earth

BONUS

24) EARTH AND SPACE *Multiple Choice* What is the name for a system of two stars that orbit around a common center of mass?

- W) Poly star
- X) Binary star
- Y) Bright star
- Z) 2-star