NWI2 RR1

TOSS-UP

1) BIOLOGY - *Multiple Choice* Which of the following animals is not part of the class mammalia?

W) Kangaroo
X) Echidna
Y) Killer Whale
Z) Kiwi

ANSWER: Z) KIWI

BONUS

1) BIOLOGY - *Multiple Choice* Which of the following is an example of a keystone species?

W) Beavers
X) Grass
Y) Mosquitos
Z) Ants

ANSWER: W) BEAVERS

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TOSS-UP

2) CHEMISTRY - *Multiple Choice* Which of the following ions is not isoelectronic with argon?

W) S^{2-}
X) Cl^{-}
Y) Na^{+}
Z) Ca^{2+}

ANSWER: Y) Na^{+}
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BONUS

2) CHEMISTRY - *Short Answer* How many moles of O_2 would be required to completely combust 1 mole of butene, with formula C_4H_8?

ANSWER: 6

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TOSS-UP

3) PHYSICS - *Short Answer* A ball of mass 8 kg is dropped from the top of a 5 meter tall building. Assuming gravitational acceleration is 10 m/s^2 and neglecting air resistance, what is the velocity, in meters per second, right before the ball hits the ground?

ANSWER: 10

BONUS

3) PHYSICS - *Short Answer* A ball is launched vertically with an initial velocity of 8 m/s. Assuming gravitational acceleration is 10 m/s^2 and neglecting air resistance, what is the maximum vertical displacement in meters and how long does it take to reach that height in seconds?

ANSWER: 3.2 meters, 0.8 seconds

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TOSS-UP

4) MATH - *Short Answer* Oscar is visiting a new ice cream shop. The ice cream shop has 4 ice cream flavors, 5 toppings, 4 syrup flavors, and 3 types of cones. If Oscar chooses one type in each of the four categories, how many different ice cream combinations can he have?

ANSWER: 240

BONUS

4) MATH - *Short Answer* 5 friends, Alice, Bob, Charlie, Dan, and Earl are going to watch the new hit movie *Moana 2*. If all 5 seats they reserved are in one row and Dan and Alice must sit together, how many ways are there to organize these 5 people?

ANSWER: 48

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TOSS-UP

5) EARTH AND SPACE - *Multiple Choice* Isobars on a map connect regions with the same value of which of the following?
W) altitude
X) pressure
Y) temperature
Z) local gravity

ANSWER: X) pressure

BONUS

5) EARTH AND SPACE - *Short Answer* Name all of the following 3 glacial features which are erosional in nature:
1) drumlin
2) moraine
3) kettle lake

ANSWER: 3 only

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TOSS-UP

6) Energy – *Short Answer* Researchers at the National Renewable Energy Lab are testing new methods for the commercial production of hydrogen. Hydrogen gas is most commonly produced via what process, which uses an electric current to split water into hydrogen and oxygen?

ANSWER: Electrolysis

BONUS

6) Energy – *Multiple Choice* The ALTEMIS experiment at Savannah River National Lab involved the intentional contamination of groundwater with radioactive nuclides from 1955 to 1988. To remediate the effects of this contamination, scientists installed a low-permeability cap in the region to prevent further drainage. Which of the following sediment types did the scientists most likely install?

W) Clay
X) Gravel
Y) Sand
Z) Silt

ANSWER: W) Clay

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TOSS-UP

7) BIOLOGY - *Short Answer* How many chromosomes per somatic cell would an individual with Down syndrome have?

ANSWER: 47

BONUS

7) BIOLOGY - *Multiple Choice* Which of the following chromosomes codes for the least amount of genetic information?

W) Chromosome 1
X) Chromosome 5
Y) X Chromosome
Z) Y Chromosome

ANSWER: Z) Y Chromosome

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TOSS-UP

8) CHEMISTRY - *Multiple Choice* Which of the following techniques would best be used to separate two immiscible liquids?

W) Buchner Funnel
X) Separatory Funnel
Y) Distillation
Z) Chromatography

ANSWER: X) SEPARATORY FUNNEL

BONUS

8) CHEMISTRY - *Short Answer* Oscar wants to create a Daniell cell as a gift for Daniel helping him with his electrochemistry homework. If the half reaction Zn^{2+}+2e--Zn has a standard cell potential of -0.76V, and Cu^{2+}+ 2e--Cu has a standard cell potential +0.34V, what is the standard cell potential of a Daniell cell, with a Zinc anode and Copper cathode in volts?

ANSWER: 1.1

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TOSS-UP

9) PHYSICS - *Short Answer* What is the name of the theorem that states work done on an object is equal to its change in energy?

ANSWER: Work-energy theorem

BONUS

9) PHYSICS - *Short Answer* Oscar pushes a box 5 meters horizontally with a force of 8 newtons. If this took him 10 seconds, how much power, in watts, did he exert?

ANSWER: 4
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TOSS-UP

10) MATH - *Short Answer* Simplify the following expression: $\frac{8x}{3y} \cdot \frac{6y}{4x^2}$ (Read as: The fraction with numerator 8x and denominator 3y times the fraction with numerator 6y and denominator 4x squared)

Answer: 4/x (Read as: 4 over x)

BONUS

10) MATH - *Short Answer* Name all of the following three quadratics that have a root of 5

1) $x^2 - 6x - 5$ (Read as: x squared minus 6x minus 5)

2) $2x^2 - 13x + 15$ (Read as: 2x squared minus 13x plus 15)

3) $x^2 - 8x + 15$ (Read as: x squared minus 8x plus 15)

ANSWER: 2 and 3
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TOSS-UP

11) EARTH AND SPACE - *Multiple Choice* Which of the following planets has an axial tilt greater than 90 degrees?

W) Jupiter
X) Mercury
Y) Neptune
Z) Venus

ANSWER: Z) Venus

BONUS

11) EARTH AND SPACE - *Short Answer* By name or number, name all of the following geologic formations that are not created by subduction zones:

1) trench
2) rift valley
3) back-arc basin

ANSWER: 2 only

TOSS-UP

12) ENERGY – *Multiple Choice* Researchers at Lawrence Livermore National Lab recently discovered that iron-titanium alloys tend to form icosahedral units along their boundaries. This icosahedral structure exhibits which of the following types of symmetry?

W) Triangular
X) Rectangular
Y) Pentagonal
Z) Hexagonal

ANSWER: Y) Pentagonal

BONUS

12) ENERGY – *Short Answer* Researchers at Jefferson Lab are studying the formation of lambda particles, which are typically made up of an up, down, and strange quark. Identify all of the following three types of particles that lambda particles fall under:
1) Baryons
2) Hadrons
3) Mesons

ANSWER: 1 and 2

TOSS-UP

13) BIOLOGY - *Short Answer* By name or number, rank the following three regions of the human vertebrae from superior to inferior: 1) thoracic, 2) lumbar, 3) cervical

ANSWER: 3, 1, 2

BONUS

13) BIOLOGY - *Short Answer* Which plant hormone is primarily responsible for fruit ripening?

ANSWER: ETHYLENE

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TOSS-UP

14) CHEMISTRY - *Short Answer* What is the hybridization of the central carbon atom in the $CO3^{2-}$ ion

ANSWER: sp^2

BONUS

14) CHEMISTRY - *Short Answer* The critical point on a pressure-temperature diagram refers to a state where which two states of matter exist in equilibrium, what are these two states of matter?
ANSWER: LIQUID AND GAS

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TOSS-UP

15) PHYSICS - *Short Answer* Which of the following 3 properties are all true regarding an inelastic collision?
1) Kinetic energy is conserved
2) Total energy is conserved
3) Momentum is conserved

ANSWER: 2, 3

BONUS

15) PHYSICS - *Short Answer* Oscar owns a beautiful red box. Suddenly, Moudu (Read: Moedoo) shines a blue light onto the red box. What color is produced when this occurs?

ANSWER: Black

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TOSS-UP

16) MATH - *Multiple Choice* What is the cosine of the smallest angle in an 8-15-17 triangle?

W) 8/15
X) 15/17
Y) 8/17
Z) 17/15

ANSWER: X) 15/17

BONUS

16) MATH -*Short Answer* What is the product of the roots of the polynomial three x-cubed plus four x-squared plus three x minus nine?

ANSWER: 3

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TOSS-UP

17) EARTH AND SPACE - *Short Answer* Oscar found a rock while on a hike and wants to identify it himself. Which of the following characteristics can he use to help identify the rock as either igneous, metamorphic, or sedimentary?
1) foliation
2) cleavage
3) grain composition

ANSWER: 1 AND 3

BONUS

17) EARTH AND SPACE - *Multiple Choice* Oscar observes the rock that he found and notes that it is igneous with large grain size and light color. Which of the following categorizations would this rock most likely fall into?
W) felsic, intrusive
X) mafic, intrusive
Y) mafic, extrusive
Z) felsic, extrusive

ANSWER: W) FELSIC, INTRUSIVE

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TOSS-UP

18) Energy - *Short Answer* Researchers at the Frederick National Laboratory for Cancer Research are investigating treatments for cancerous tumors caused by HIV infections. HIV is particularly dangerous because it is an example of what type of viruses, which generate DNA from their RNA genomes and insert it into their host cell?

ANSWER: RETROVIRUSES

BONUS

18) Energy - *Multiple Choice* Researchers in the SPRUCE experiment at Oak Ridge National Lab are studying the effects of climate change on peat bogs in northern Minnesota and Canada. Which of the following Köppen climate classifications are these researchers studying?

W) A
X) B
Y) C
Z) D

ANSWER: Z) D
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TOSS-UP

19) BIOLOGY - *Short Answer* Which type of horizontal gene transfer occurs when a bacteriophage transfers genetic material from one bacterium to another?

ANSWER: Transduction

BONUS

19) BIOLOGY - *Multiple Choice* Which component of the RNA polymerase holoenzyme is responsible for initiation of transcription in bacterial transcription?

W) Core Enzyme
X) Sigma Factor
Y) Beta Subunit
Z) Omega Subunit

ANSWER: X) Sigma Factor

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TOSS-UP

20) CHEMISTRY - *Short Answer* Identify all of the following three characteristics that generally INCREASE as you move from left to right across a period. 1) Electron affinity, 2) Atomic Radius, 3) First ionization energy.

ANSWER: 1, 3

BONUS

20) CHEMISTRY - *Short Answer* Oscar would like to conduct a chromatography experiment with a hexane mobile phase. Rank the following three molecules in terms of increasing retention factor in the experiment: 1) Water, 2) Ethanol, 3) Acetone

ANSWER: 1, 2, 3
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