Round 31

1. EARTH and SPACE

Writer: Shamaul Dilmohamed

Toss Up: Multiple Choice

Which of the following elements is found in the earth's crust as both
a native element and as a compound?
W) argon
X) copper
Y) chlorine
Z) silicon

Toss Up Answer: X

Bonus: Multiple Choice

In geological studies, cemented volcanic ash is called:
W) caldera
X) a-a
Y) lava
Z) tuff

Bonus Answer: Z

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2. ENERGY

Writer: Elias Milborn

Toss Up: Multiple Choice

Which of the following is measured by total harmonic distortion, a standard for gauging the quality of power provided to customers?
W) How distorted the waveform is from a pure sinusoidal waveform
X) How distorted the waveform is from a triangular waveform
Y) The difference between a sinusoidal waveform and a triangular waveform
Z) the maximum value of a sinusoidal wave form with respect to the refference point of the waveform

Toss Up Answer: W

Bonus: Multiple Choice

Which of the following is NOT an accurate representation of a limitation on the production and use of bioplastics?
W) using crops for plastic diverts plants from the food supply
X) bioplastics are unlikely to disintegrate in a landfill
Y) bioplastics produce a variety of pollutants when burned
Z) Individuals at home would find it more difficult to compost bioplastics

Bonus Answer: Y

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3. EARTH and SPACE

Writer: Shamaul Dilmohamed

Toss Up: Short Answer

What is the most common galaxy shape in our universe?

Bonus Answer: irregular

Bonus: Multiple Choice

Astronomers use cepheids principally as measures of what?
W) size
X) speed
Y) chemical composition
Z) distance

Bonus Answer: Z

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4. PHYSICS

Writer: Charles Zhang

Toss Up: Short Answer

Assume that Earth is in circular orbit around the Sun with kinetic energy K and potential energy U, taken to be zero for infinite separation. What is the relationship between K and U?

Bonus Answer: K = -U/2 (accept equivalent forms)

Bonus: Multiple Choice

A planet is in circular orbit around the Sun. Its distance from the Sun is four times the average distance of Earth from the Sun. The period of this planet, in Earth years, is:
W) 4
X) 8
Y) 16
Z) 64

Bonus Answer: X

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5. EARTH and SPACE

Writer: Shamaul Dilmohamed

Toss Up: Short Answer

To the nearest day, how long is the sidereal period of the moon?

Bonus Answer: 27 days

Bonus: Short Answer

The only supernova explosion in modern times visible in the sky to the naked eye
became visible in which year?

Bonus Answer: 1987

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6. PHYSICS

Writer: Charles Zhang

Toss Up: Multiple Choice

If a wheel is turning at 3.0/PI rad/s, what is it's period?
W) 3.14
X) 6.58
Y) 8.73
Z) 9.67

Toss Up Answer: X

Bonus: Multiple Choice

What is the total energy of a block attached to a spring with spring constant of 50 N/m if the block's velocity corresponds to the equation, v(t) = 10sin(2t) (READ AS: v of t equals 10 times sin of quantity 2*t)?

W) 100 J
X) 125 J
Y) 250 J
Z) 500 J

Bonus Answer: X

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7. BIOLOGY

Writer: Calvin Vuong

Toss Up: Multiple Choice

Which of the following is required for motor proteins to function in the movement of chromosomes toward the poles of the mitotic spindle?
W) intact centromeres
X) a kinetochore attached to the metaphase plate
Y) ATP as an energy source
Z) synthesis of cohesin

Toss Up Answer: Y

Bonus: Short Answer

At which phase are centrioles beginning to move apart in animal cell mitosis?

Bonus Answer: prophase (DO NOT ACCEPT: prometaphase)

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8. PHYSICS

Writer: Charles Zhang

Toss Up: Multiple Choice

A wheel starts from rest and has an angular acceleration that is given by α(t) = (6 rad/s^4)t^2 (READ AS: 6 radians per seconds to the fourth times t squared). What is the angle the wheel turns through after time t?
W) [(1/8)t^4] rad
X) [(1/4)t^4] rad
Y) [(1/2)t^4] rad
Z) [t^4] rad

Toss Up Answer: Y

Bonus: Short Answer

String is wrapped around the periphery of a 5.0-cm radius cylinder, free to rotate on its axis. The string is pulled straight out at a constant rate of 10 cm/s and does not slip on the cylinder. As each small segment of string leaves the cylinder, what does its acceleration change by?

Bonus Answer: 0.2 m/s^2

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9. EARTH and SPACE

Writer: Shamaul Dilmohamed

Toss Up: Multiple Choice

What is the driving force present in a supernova explosion?
W) electromagnetic force
X) strong nuclear force
Y) gravitational force
Z) weak nuclear force

Toss Up Answer: Y

Bonus: Short Answer

What gas is the Mars atmosphere primarily made up of?

Bonus Answer: Carbon dioxide

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10. PHYSICS

Writer: Charles Zhang

Toss Up: Short Answer

What is the unit of the quantity 1/(4PIe_o) (READ AS: 1 over 4 times Pi times epsilon naught)?

Bonus Answer: N*m^2/C^2 (READ AS: newton meters squared over coulomb squared)

Bonus: Short Answer

An time-varying electric field is given by (24t^2 N/C)*i + (30t N/C)*j + (16/t N/C) *k. What is its flux at time t=2 as it passes through a region in the y-z plane whose area is given by A(t)=2t?

Bonus Answer: 112 N/C

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11. ENERGY

Writer: Ivan Zhang

Toss Up: Multiple Choice

Which of the following outputs the most energy?

W) Coal

X) Natural Gas

Y) Petroleum

Z) Surface Oil

Toss Up Answer: W

Bonus: Short Answer

What is the powerhouse of the cell?

Bonus Answer: Mitochondria

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12. BIOLOGY

Writer: Calvin Vuong

Toss Up: Multiple Choice

Which of the following proteins are involved in binary fission as well as eukaryotic mitotic division?

W) cyclins

X) Cdks (read as an acronym)

Y) condensins

Z) actin and tubulin

Toss Up Answer: Z

Bonus: Short Answer

The materials used to synthesize a new cell wall in plant cell cytokinesis comes primarily from which plant cell organelle?

Bonus Answer: Golgi apparatus (ACCEPT: Golgi complex, Golgi body, Golgi)

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13. ENERGY

Writer: Olivia Gallager

Toss Up: Short Answer

Which of the following, by name or number, are not considered to be a greenhouse gas: Nitrous Oxide, Water Vapor, Methane, and Nitrogen gas.

Bonus Answer: Nitrogen Gas, 4

Bonus: Short Answer

What are the two most used fuels for nuclear reactors?

Bonus Answer: Plutonium and Uranium

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14. BIOLOGY

Writer: Calvin Vuong

Toss Up: Short Answer

Which cyclin-CdK complex triggers the cell's passage past the G2 checkpoint into mitosis?

Bonus Answer: MPF (ACCEPT: mitosis promoting factor, maturation promoting factor)

Bonus: Short Answer

In which cell cycle phase does the most important checkpoint, also called the restriction point, occur?

Bonus Answer: G1 (ACCEPT: between G1 and S)

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15. EARTH and SPACE

Writer: Matthew Lee

Toss Up: Multiple Choice

Between which two reference minerals from Moh's Scale of Hardness does the hardness of a steel file fall in between?

W) Fluorite and Apatite

X) Apatite and Feldspar

Y) Feldspar and Quartz

Z) Quartz and Topaz

Toss Up Answer: Y

Bonus: Short Answer

Name in order from smallest grain size to greatest grain size these rocks: Sandstone, Conglomerate, Shale.

Bonus Answer: Shale, Sandstone, Conglomerate

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16. BIOLOGY

Writer: Calvin Vuong

Toss Up: Multiple Choice

The MPF protein complex turns itself off in the cell cycle by

W) activating a process that destroys its cyclin components

X) activating an enzyme that stimulates cyclin

Y) binding to chromatin

Z) activating the anaphase-promoting complex

Toss Up Answer: W

Bonus: Short Answer

The cyclin component of MPF is destroyed toward the end of which cell cycle phase?

Bonus Answer: M phase (ACCEPT: mitosis, mitotic phase)

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17. BIOLOGY

Writer: Shanjeed Ali

Toss Up: Multiple Choice

What does it mean when an organism that can self-fertilize is true breeding?

W) the organism will produce offspring that are genetically identical to it

X) the organism's offspring will all be genetically identical to each other

Y) the organism is heterozygous for the gene that controls that trait

Z) the organism's offspring will have the same phenotype for a certain trait

Toss Up Answer: Z

Bonus: Short Answer

Gregor Mendel is known as the father of modern genetics due to his work with pea plants. Which of the following traits did he study: plant height, pod color, leaf shape, flower position?

Bonus Answer: All except leaf shape

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18. BIOLOGY

Writer: Shanjeed Ali

Toss Up: Short Answer

Ruminants have the ability to digest what substance due to microorganisms in the stomach?

Bonus Answer: Cellulose

Bonus: Short Answer

What is the main site of methane production in ruminants?

Bonus Answer: Rumen, accept first chamber/stomach

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19. BIOLOGY

Writer: Shanjeed Ali

Toss Up: Multiple Choice

Which of the following is not an phyla in the kingdom animalia?

W) Chordata

X) Lycophyta

Y) Bryozoa

Z) Cnidaria

Toss Up Answer: X

Bonus: Short Answer

What is the order of the house mouse, mus musculus?

Bonus Answer: Rodentia

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20. BIOLOGY

Writer: Shanjeed Ali

Toss Up: Multiple Choice

Which of the following is not true about genetically modified food?

W) genetically modified organisms are generally safe for human consumption

X) over 80 % of corn grown in the US is genetically modified

Y) genetically modified crops require larger amounts of pesticides

Z) genetically modified crops can yield greater harvests for less cost

Toss Up Answer: Y

Bonus: Short Answer

Bt corn is genetically modified to produce a certain protein that is poisonous to certain insects. What is the genus of the source of the genetic material that produces this corn?

Bonus Answer: Bacillus

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21. BIOLOGY

Writer: Calvin Vuong

Toss Up: Short Answer

The synaptonemal complex forms in which phase of meisois?

Bonus Answer: Prophase I (DO NOT ACCEPT: prophase, prophase II)

Bonus: Multiple Choice

Which of the following best describes the frequency of crossing over in animals?

W) ~50 per chromosome pair

X) ~2 per meiotic cells

Y) ~1 per pair of sister chromatids

Z) at least 1-2 per chromosome pair

Bonus Answer: Z

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22. BIOLOGY

Writer: Calvin Vuong

Toss Up: Short Answer

At which stage of mitosis are chromosomes usually photographed in order to produce a karyotype?

Bonus Answer: metaphase

Bonus: Short Answer

Name all of the following that a homologous pairs of chromosomes share in common.

I. length

II. loci of genes

III. characteristics encoded by their genes

IV. DNA sequence

Bonus Answer: I, II, III only

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23. BIOLOGY

Writer: Calvin Vuong

Toss Up: Short Answer

Asexual prokaryotic cell division occurs via which process?

Bonus Answer: binary fission

Bonus: Multiple Choice

Mitosis in protists differ from other forms of eukaryotic mitosis in which way?

W) Microtubules attach to the chromosome kinetochores.

X) Chromosomes are condensed in prophase.

Y) The nuclear envelope is not disassembled and remains intact throughout the process.

Z) Sister chromatids cross over.

Bonus Answer: Y

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24. BIOLOGY

Writer: Calvin Vuong

Toss Up: Multiple Choice

Fluctuations in the concentration of which of the following molecules is most responsible for transitioning between the phases of the cell cycle?

W) Cyclin-dependent kinases

X) potassium ions

Y) sucrose

Z) cyclins

Toss Up Answer: Z

Bonus: Multiple Choice

What occurs after the M phase checkpoint in the cell cycle?

W) Cohesins alter separase to allow chromatids to separate.

X) Separase enzyme cleaves cohesins and allows chromatids to separate.

Y) Kinetochores are able to bind to spindle microtubules.

Z) Daughter cells are allowed to pass into G1.

Bonus Answer: X

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25. BIOLOGY

Writer: Calvin Vuong

Toss Up: Multiple Choice

Which of the following types of cells do not exhibit density-dependent inhibition concerning reproduction?

W) neurons

X) cells in your liver

Y) cells in a malignant tumor

Z) cells surrounding your stomach

Toss Up Answer: Y

Bonus: Short Answer

Which cell part is most directly responsible for detecting the cell density of its surrounding area in order for the cell to exhibit density-dependent inhibition?

Bonus Answer: extracellular matrix

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