Preethi Raju

Varied Lightning Round: 25 Toss-ups

1) BIOLOGY Short Answer: What is the name of the protein shell enclosing a viral genome?  
ANSWER: capsid

2) MATH Multiple Choice: What is the definite integral of the quantity sine of x minus cosine of x dx when the a value equals 0 and the b value equals pi over 2?

W) -2  
X) -1  
Y) 0  
Z) 1

ANSWER: Y

CHEMISTRY Short Answer: Isomers of organic compounds that readily introconvert by the movement of hydrogen are known as what? The acetone pairs of ketone and enol is an example.

ANSWER: Tautomer

3) EARTH/ ASTRO: Multiple Choice: Mount Saint Helens is what type of volcano?

W) Lava dome  
X) Composite  
Y) Cinder cone  
Z) Shield

ANSWER: X

4) ENERGY Short Answer: How many calories does it take to heat 50 kg of water from 20 to 70 degrees Celsius?

ANSWER: 2500 calories

5) PHYSICS Short Answer: Order the following fundamental forces of physics from strongest to weakest.

1 Strong   
2) Electromagnetic  
3) Weak  
4) Gravity  
ANSWER: 1,2,3,4

6) CHEMISTRY Short Answer: By name of number, order the following 4 acids from a weakest to strongest.  
1) perchloric  
2) hydroiodic  
3) Hydrobromic  
4) Hydrochloric  
ANSWER: 4, 3, 2, 1

7) BIOLOGY Short Answer: By name or number denote which of the following 4 statements is/are true.  
1) Hyperactive p53 can lead to cancer.  
2) Ras is a receptor tyrosine kinase.  
3) Proto-oncogenes are genes that cause cancer due to mutation.  
4) Viruses do not cause cancer.  
ANSWER: none or 0

8) MATH Short Answer: What is the definite integral of dx over quantity 1 plus x squared?

ANSWER: arctanx

9) EARTH/ ASTRO: Multiple Choice: Mafic rocks have high concentration of what compared to felsic?

W) Carbon  
X) Aluminum  
Y) Magnesium  
Z) Iron

ANSWER: Z

10) ENERGY Multiple Choice: Which of the following has the highest output efficiency?

W) Concentrated solar power with parabolic troughs  
X) Coal  
Y) Nuclear  
Z) Wind power

ANSWER: W

11) PHYSICS SHORT ANSWER: The ratio of water vapor in a sample of air to the volume of the sample is known as what?

ANSWER: absolute humidity

12) CHEMISTRY Short Answer: Give the coefficients of the balanced equation from left to right: \_\_ KOH + \_\_ H3PO4 → \_\_ K3PO4 + \_\_ H2O.

ANSWER: 3, 1, 1, 3

13) BIOLOGY Multiple Choice: What is the difference between siRNA and miRNA?  
W) siRNA doesn’t block transcription but miRNA can.  
X) siRNA comes from long, double-stranded RNA and miRNA from a single hairpin.  
Y) siRNA comes from a single hairpin and interacts with the Dicer; the miRNA doesn’t.  
Z) miRNA can only block transcription while siRNA can only degrade mRNA.  
ANSWER: X

14) ENERGY Multiple Choice: Which of the following percentages is closest to the efficiency of a human cell?

W) 20  
X) 30  
Y) 40  
Z) 50

ANSWER: Y

15) MATH Multiple Choice: In a regular hexagon, the side length is 3. What is the length from the vertex to the center?

ANSWER: 1.5 root 2 (root of 4.5)

16) EARTH/ ASTRO Mult: Which of isotope is most helpful to determining the age of fossils found in the Pleistocene era?

W) Uranium- 238  
X) Potassium-40  
Y) Carbon-14  
Z) Argon-40

ANSWER: Y

17) PHYSICS SHORT ANSWER: Which statement is true?

W) Mesons are stable  
X) Mesons are composed of two quarks and one antiquark.  
Y) Mesons participate only in the strong interactions.  
Z) Mesons are part of the hadron particle family.

ANSWER: z

18) ENERGY Short Answer: By name of number, order the following 4 events from a thermal power plant from first to last.  
1) The shaft spins coils of copper wire around a ring of magnets.  
2) Electricity is sent to a switchyard.  
3) The turbine spins a shaft.  
4) Water is heated into steam.  
ANSWER: 4, 3, 1, 2

19) BIOLOGY Short Answer: What is the name of the small protein that tags other proteins, leading to a proteosome degrading the tagged protein?   
ANSWER: Ubiquitin

20) MATH Short Answer: Fred and Bob want to paint a house. Fred works twice as fast as Bob, who takes four hours to paint a wall. How long does it take both of them combined to paint four walls?

ANSWER: 16/3 hours

21) MATH Short Answer: How many unique prime factors are in 72?

ANSWER: 2

22) EARTH/ASTRO Short Answer: What is the name of the larger and more populated constellation of the two referred to as Orion’s hunting dogs?

ANSWER: Canis Major

23) PHYSICS SHORT ANSWER: A man runs around a race track with radius of 100 meters and tangential velocity of 10 meters per second. What is the angular velocity?

ANSWER: 1 radian per second

24) EARTH/ ASTRO Mult: The moon reflects what percentage of light absorbed from the sun?

W) 7%  
X) 29%  
Y) 43%  
Z) 62%

ANSWER: W

25) BIOLOGY Short Answer: By name or number order the following 4 events of miRNA synthesis from 1st to last .  
1) miRNA binds to mRNA to degrade it  
2) The Dicer cuts at the loop and single-strand ends of the hairpin.  
3) An enzyme cuts each “hairpin” from the primary transcript of miRNA.  
4) One strand of RNA is degraded.

ANSWER: 3, 2, 4, 1