1. Math toss up short answer The first 3 terms of a geometric series are 1, -1, and 1. Find the sum of the first 9001 terms of the series.

Answer: 1

Math Bonus short answer: Quadrilateral ABCD is inscribed in circle O with radius 10. If AB=CD=6 and BC=DA, compute the area of ABCD

Answer: 48

2. Biology short answer: Modern taxonomy groups crocodiles, snakes, and other reptiles together in Reptilia, while Birds are classified separately. However, crocodiles are actually more closely related to birds, making the class Reptilia, in its traditional form, what?

Answer: papaphyletic

Bonus short answer: What is the relationship between the following two pairs.

I. Our forearms and the wings of a bat

II The wings of a bat and the wings of a bee

Answer: homologous, analygous

3. Earth and Space toss up multiple choice: What type of Earth quake, with examples such as one in Charleston, South Carolina and the Cape Ann earthquake in South Carolina, often occur on old faults once parts of ancient plate boundaries?

Answer: Intraplate

Bonus multiple choice: The angle of tilt of the earth cycles between which of the following, in degrees

W) 15 and 16

X) 17 and 19

Y) 22 and 24

Z) 27 and 28

4. Physics toss up multiple choice: If f is the focal length and D is the aperture diameter of a lense, which of the following is the intensity of light reaching the film proportional to?

W) D/F

X) D^2/F^2

Y) F/D

Z F^2/D62

Answer: X

Physics bonus short answer: Lenses for vision correction are usually described in terms of the power. Including units, what is the power of a lense with a focal length of .50 meters?

Answer: 2 diopter

5. Chemistry toss up short answer: According to Baldwin’s rules, name all of the following three which are favoured.

I. 5-endo-trig

II. 7-exo-trig

III. 4 endo-tet

Answer: II only

Chemistry bonus multiple choice: What is the feature of pyridine which makes it stable?

Answer: Aromaticity

7. Math toss up multiple choice: What are the last two digits of 2^2012th power?

W) 8

X) 24

Y) 56

Z)96

Answer: Z

Math bonus short answer: Find the remainder when graham’s number is divided by 25

Answer: 12

8. Biology toss up short answer: What regions make it possible for living cells within the trunk to exchange gases with the outside air for cellular respiration>

Answer: lenticels

Biology bonus multiple choice: Order the following 4 from innermost to outermost in a stem of a tree

I. Vascular Cambium

II. Pith

III Cork

IV Primary phloem

Answer: II, I, IIII, III

9. Earth and Space toss up short multiple choice: The hardness of a steel file is closest to that of which of the following minerals?

W) Apatite

X) Quartz

Y)Corundum

Z) Diamond

Answer: X

Earth and Space bonus short answer: For amphibole, a double chain silicate, what is the angle when the bonds between the double chains break?

W) 30 degrees

X) 60 degrees

Y) 90 degrees

Z) 120 degrees

Answer: Z

10. Physics toss up short answer: What process, in which electrons are slowed down or stopped and their kinetic energy is converted to a continuous spectrum of photons, is involved in x-ray emission?

Answer: Bremsstrahlung

Physics bonus short answer: Name this technique for recording a reproducing an image of an object through the use of interference effects, which produces an image that is truly three dimensional, unlike an ordinary photograph or television system. In order to produce the image, the object is illuminated with a monochromatic light, and a photographic film is placed so that it is struck by scattered light from the object and by direct light from the source.

Answer: Holography

11. Chemistry toss up short answer: What is the name for the carbon directly joined to fluorine in Fluorobenzenes?

Answer: Ipsum Carbon

Chemistry bonus short answer: A reaction between an aldehyde and a cyanide gives this, a compound containing a nitrile group and a hydroxyl group.

13. Math toss up multiple choice: How many ways are there to separate 8 people into 2 science bowl teams of 4.

W) 70

X) 280

Y) 840

Z) 2520

Answer: W

Math bonus multiple choice: 10 coins are flipped. Find the probability that at least five land on heads.

193/512

14. Biology toss up short answer: What vessel, which nutrients converge towards directed by capillaries by veins, leads directly to the liver.

Answer: Hepatic portal vessal

Biology bonus short answer: Which of the following reactions prevails in red blood cells travelling through pulmonary capillaries, with Hb=hemoglobin

W) Hb+4O2=>Hb(O2)

X) CO2+H2O=>H++HCO3-

Y) Hb+4CO2=>HbCO2 4

Z) Hb(O2)4=>Hb+4O2

15. Earth and Space toss up short answer: Rubies are red because of small amounts of chromium inside of them. What element gives emeralds their green color?

Answer: Chromium

Earth and Space bonus multiple choice: Name all of the following four statements which is or are true about crystals:

I. Luster tends to be glassy for covelantly bonded crystals

II. Cleavage is good if the bonds in a crystal are weak

III. Covalently bonded minerals tend to be less dense than ionically bonded crystals

IV. Iron tends to color strongly

Answer: II, III, and IV

16. Physics toss up short answer: Which of the following four statements is or are true about quantum tunneling?

I. The scanning tunneling microscope uses electron tunneling to create images of surfaces down to the scale of individual atoms

II. the wave function is sinusoidal outside of the barrier

III. The possible energy levels of a harmonic oscillator are integer multiples of hbar time the angular frequency

IV. The wave function is 0 inside of the barrier.

Answer: I and II

Physics bonus short answer: In what place was the sixth quark, top, discovered?

Answer: Tevatron

17. Chemistry toss up multiple choice: Which of the following is not true

W) Changing the configuration of a molecule always means that bonds are broken.

X) A different configuration is a different molecule

Y) Changing the conformation of a molecule means rotating around bonds without breaking them.

Z) Conformations of a molecule are all considered to be different molecules

Answer: Z

18. Chemistry bonus short answer: What four groups are carried by a tetrahedral carbon atom?

OH, CN, RCH2 and H

19. Math toss up short answer: The average of numbers a and b is 5, the average of b and c is 7, and the average of c and a is 15. Find the average of a, b, and c.

Answer: 9

Math bonus multiple choice: A set of vectors is known as what if none of them is in the span of the other.

Answer: Linearly independent

20. Biology toss up multiple choice: What is another name for Euphausids, which are eaten by Baleen Whales

Biology bonus short answer: The energetic hypothesis predicts that

W) Food chains should be shorter in habitats of higher photosynthetic productivity  
X) Food chains should be longer in habitats of higher photosynthetic productivity

Y) Food chains should be non-existent in habitats of higher photosynthetic productivity

Z) Food chains’ length should be invariant of the photosynthetic productivity of a region.

21. Earth and Space toss up multiple choice: Which of the following is correct about tides created by the sun?

W) The tides created by the sun are about twice as large as those created by the moon?  
X) The tides created by the sun are of very close magnitude to those created by the moon

Y) The tides created by the sun are about half as large as those created by the moon

Z) The magnitude of the tide from the sun is negligible compared to those of the moon.

22. Physics toss up short answer: What is the total entropy change for a carnot engine if the temperatures of the hot and cold reservoirs are respectively -23 C and 77 C

Answer: 0

Physics bonus short answer: Assuming an ideal monatomic solid, what is the molar heat capacity of a crystal to three significant figures?

Answer: 3R

25. Math toss up short answer: The mapping from the group of R^2 to R with addition which sets f(R)=proj(r,(1,0)) is which of the following 4

I. A homomorphism

II. Injective

III. Surjective

IV. An Isomorphism

Answer: I and III

Math bonus multiple choice: The Cauchy Schwartz inequality states which of the following:

W) ||u||+||v||>= ||u+v||  
X) <u+v,u+v> >= <u,u>+<v,v>

Y) ||u||||v||>= <u,v>

Z) <u+v,u+v>+<u-v,u-v>=2<u,u>+2<v,v>

Answer: Y