g = 9.8 ms-2

1. Chemistry – Which selection shows the correct pairing of an ion with its emission spectrum color?
   1. Sodium – red
   2. Lithium – orange
   3. Barium – violet
   4. Boron – green
   5. None of the above
2. Chemistry - Which of the following reactions produces an insoluble (in water) product?
   1. NaCl + KNO3
   2. NH4NO3 + NaOH
   3. NaC2H3O2 (sodium acetate) + KNO3
   4. KC2H3O2 (sodium acetate) + Mg(NO3)2
   5. None of the above
3. Chemistry – Which of the following molecules exhibits sp2 hybridized carbon atoms?
   1. Alkanes
   2. Alkenes
   3. Alkynes
   4. Cycloalkanes
   5. None of the above
4. Chemistry – Short Answer – What is the name for a mixture of right handed and left handed chiralities (enantiomers)?
5. Chemistry – Short Answer – Which compound has the higher boiling point? Why? (Methanol vs. Ethanol)
6. Chemistry – Short Answer – What is the oxidation state of chromium in the following ion (Cr4O13-2) What color are chromates (usually) when chromium is in this state? Would this compound be a good reductant or oxidant? Why?
7. Biology – In eukaryotic cells, transcription cannot begin until…
   1. The two DNA strands have completely separated and exposed the promoter
   2. Several transcription factors have bound the promoter
   3. The 5’ caps are removed from the mRNA
   4. The DNA introns are removed from the template
   5. DNA nucleases have isolated the transcription unit
8. Biology - Which component is not directly involved in translation?
   1. mRNA
   2. DNA
   3. tRNA
   4. ribosomes
   5. GTP
9. Biology - Which of the following describe human somatic cells
   1. All human cells
   2. Only the sex cells
   3. All human cells excluding the sex cells
   4. Gametes
   5. None of the above
10. Biology – Describe Samuel Swanson in three words (the word “revolutionary” may only be used once)
11. Biology – Short Answer – In the human body, what is used to describe a blood-filled sac formed by an outpouching in an arterial or venous wall?
12. Biology – Short Answer - This genetic condition is caused when a human male has an extra X chromosome in his genetic material
13. Biology – Short Answer - Identify the developmental origin of two of the following tissues in vertebrates
    1. Central nervous system
    2. Digestive system
    3. Muscle
14. Math – Change the hexadecimal number 343a to decimal
15. Math – As ‘x’ approaches 0 the function f(x) = (cosx \* tanx / sinx^2) equals what?
16. Math – “If it is October, then it is autumn”. Which of the following is true?
    1. The inverse of the statement
    2. The converse
    3. The contrapositive
    4. None of the above
17. Math – How many ways can 10 people be divided into 2 groups, one with 7 people and the other with 3 people?
18. Math – (  ) What type of conic section is this? Identify its vertices and center.
19. = ?
20. Physics – If a 1000kg vehicle hits a tree traveling a constant 20 ms-1 with how much force will the vehicle impart to the unfortunate plant?
    1. 1000 Newtons
    2. 10000 Newtons
    3. 20000 Newtons
    4. 0 Newtons
    5. None of the above
21. Physics – Cold fusion was once thought impossible yet the discovery of a process that allows fusion to occur in the sun may allow it to eventually be developed. Name this process.
22. Physics – Speed of sound = 343 ms-1. Humans can hear sound between 20 Hz and 20 kH. What are the wavelength for these frequencies.
23. There is a girl chasing Owen Kelly, playa, at 5ms-1 with a mass of 136.1 kg. Owen, who already has enough women to keep him busy, takes a sharp turn allowing the girl to fall off a cliff. Luckily it is winter. And there is snow on the ground. (Owen was visiting his chateau in the alps). Due to this the girl is able to get up unscathed. The hole the girl left in the snow was about 8 meters. What was her average acceleration as she slowed to a stop in the snow? Include the word “coup” at least three times in your answer (This question is worth triple every other question)
24. Physics – What is the binding energy, pur nucleon, of a Beryllium nucleus 9Be4 in Mev assuming that the mass of the nucleus is 9.010003 amu, the mass of a proton is 1.0072765 amu, and the mass of a neutron is 1.008665 amu?
    1. 49
    2. 6
    3. 73
    4. 58
    5. 2
25. Physics – For an object moving in uniform circular motion, the direction of the instantaneous acceleration vector is:
    1. Tangent to the path of motion
    2. Zero
    3. Directed radially outward
    4. Directed radially inward
26. Physics – Is a burn produced by steam likely to be..
    1. More severe than a burn produced by water at the same temperature (100oC)
    2. Less Severe
    3. Just as bad
    4. It depends on the position of the moon
27. Physics – I have a cup of water (100 grams of water) at 50oC but it just isn’t hot ENOUGH. I also have an electric heater that has an output of 60 watts. How long do I have to run the heater to boil the water? (specific heat of water = 4.180 J/gCo)
28. BONUS - State the laws of thermodynamics (bonus = my affection)
29. Earth Science (sort of) – Which of the following types of coal causes the LEAST amount of pollution
    1. Bituminous
    2. Lignite
    3. Peat
    4. Anthracite
    5. Methane
30. Earth Science (this is really more energy) – The majority of acid rain is caused by what? How can one fix this?
31. Earth Science – This is a volcanic rock characterized by its low density and ability to float in water
    1. Obsidian
    2. Pumice
    3. Pahoehoe
    4. Rhyolite, filthy, filthy rhyolite
32. Earth Science – This is a term used to refer to a dome shaped intrusion
    1. Laccolith
    2. Volcanic neck
    3. Cinder cone
    4. Caldera
    5. ;)
33. Earth Science – Which of the following rocks (Jesus Christ, it’s a mineral!) is not a silicate?
    1. Orthoclase
    2. Muscovite
    3. Augite
    4. Magnetite
34. Earth Science – Which of the following minerals can be considered the most common in earths crust?
    1. Magnetite
    2. Granite
    3. Olivine
    4. Muscovite
35. Earth Science – Draw a picture of a subduction zone.
36. Earth Science – This layer of earth composes the crust and the upper mantle.
37. Energy- When the ambient temperature increases, the value of resistance for a typical resistor: increases/decreases/does not change?
38. General Science- What type of symmetry is associated with adult echinoderms?
39. (Double Points) Who is the coolest science bowl captain ever and why?
40. Bonus! Write your favorite Owen Kelly quote. You may use your phone to view his quotes on imgur.com/a/d2nRh but more points will be awarded for good quotations not located there.
41. If you’re feeling risky, ask me a science related question. If I get it wrong, you get +3 points. If I get it right or if it’s a dumb question, you lose 5 points.