Things to mention

- Four questions for all categories except for energy
- Difficulty is, regs, regs, nats RR, nats DE
- There's superpower, which is 4 points, power which is 3 points in all questions. If you get it after power then you get 2 points.
- In order to prevent blind guessing for multiple choice, there is a 1 point penalty for incorrect responses for multiple choice.
- There is no penalty for incorrect responses on short answers.
- You do not have to buzz on a question if you do not want to, particularly you don't need to buzz on multiple choice.
- You have 7 seconds to answer.
- Buzz in dms

TOSS-UP

Biology [3] – *Multiple Choice* Intermediate filaments are cytoskeletal structural components** composed of which of the following proteins?

W) Actin*
X) Myosin
Y) Tubulin
Z) Keratin

ANSWER: Z) KERATIN [SS]

TOSS-UP

Biology [4] – *Short Answer* Many hormones directly stimulate target cells to induce effects. However,** some hormones have other endocrine glands as their targets.* What is the name given to these hormones?

ANSWER: TROPIC HORMONES [SS]

TOSS-UP

Biology [5] – *Multiple Choice* Which of the following best describes brassinosteroids' effect on root growth at low and high concentrations respectively?

W) Low concentrations inhibit root growth, High concentrations** promote root growth
X) Low concentrations promote root growth, High concentrations inhibit root growth*
Y) Both low and high concentrations inhibit root growth
Z) Both low and high concentrations promote root growth

ANSWER: X) LOW CONCENTRATIONS PROMOTE ROOT GROWTH, HIGH CONCENTRATIONS INHIBIT ROOT GROWTH [SS]

TOSS-UP

Biology [8] – *Short Answer* Hemoglobin can transition from its T-state to its R-state by the shifting of the position of what amino acid residue**, to which the F-helix is* attached?

ANSWER: HISTIDINE (ACCEPT: HISTIDINE F8) []

TOSS-UP

Chemistry [1] – *Short Answer* Rank the following four hydrohalic acids in increasing acidity**: 1) HF*; 2) HCl; 3) HBr; 4) HI.

ANSWER: 1, 2, 3, 4 [SS]

TOSS-UP

Chemistry [3] – *Multiple Choice* How many sigma and pi bonds, respectively, are found in one molecule of acetone?

W) 5 sigma, 1 pi**
X) 7 sigma, 2 pi
Y) 9 sigma, 1 pi*
Z) 10 sigma, 1 pi

ANSWER: Y) 9 SIGMA, 1 PI [SS]

TOSS-UP

Chemistry [6] – *Multiple Choice* What is the absolute difference in the number of nodes in the HOMO of 1,3,5-Hexatriene and the number of nodes in the LUMO of 1,3-Butadiene?

W) 0 **
X) 1
Y) 2
Z)* 3

ANSWER: W) 0 [SS]

TOSS-UP

Chemistry [9] – *Multiple Choice* The reaction of sodium borohydride with an alpha-beta unsaturated ketone, generally reduces both the carbonyl and the carbon-carbon double bond. The addition of which of the following compounds to the reaction vessel would force $NaBH_4$ to attack only the carbonyl group?

W) $KHSO_3$**
X) $CeCl_3$*
Y) $BeCl_2$
Z) $SnCl_2$

ANSWER: X) $CeCl_3$ [SS]

TOSS-UP

Earth and Space [1] – *Multiple Choice* Which of the following jovian planets has a retrograde** rotation?

W) Jupiter
X) Saturn
Y) Uranus*
Z) Neptune

ANSWER: Y) URANUS [SS]

TOSS-UP

Earth and Space [2] – *Short Answer* Order the following three types of magma in increasing viscosity.** 1) Basaltic; 2) Rhyolitic;* 3) Andesitic.

ANSWER: 1, 3, 2 [SS]

TOSS-UP

Earth and Space [6] – *Short Answer* The removal of the lithospheric mantle from the base of a plate causes the isostatic rebound of the remaining surface** of the plate. What term is given to* this process by which the upper crust separates from the lower crust and lithospheric mantle?

ANSWER: DELAMINATION [SS]

TOSS-UP

Earth and Space [8] – *Multiple Choice* Spectra containing strong titanium oxide absorption bands are most prevalent among which of the following spectral classes?**

W) A
X) G
Y) M*
Z) T

ANSWER: Y) M [SS]

TOSS-UP

Math [1] – *Short Answer* Alice, Bob, Chris, and David are sitting around a circular table. How many** different seating arrangements are possible for the 4 of them* to sit around the table?

ANSWER: 6 []

TOSS-UP

Math[3] – *Short Answer* What is the sum of the roots of the polynomial $4x^3 - 6x^2 + **\ 9x + *$ 17?

ANSWER: 3/2 (ACCEPT: 1.5) []

TOSS-UP

Math [6] – *Multiple Choice* A circle is inscribed in a regular hexagon, and another circle is circumscribed about the same regular hexagon. What is the ratio of the area of the larger circle to** the smaller circle?

W) 2/sqrt(3)
X) 4/3
Y) 3/2*
Z) 2

ANSWER: X) 4/3 []

TOSS-UP

Math [8] – *Multiple Choice* Which of the following numbers can NOT be written as the sum of 3 perfect squares?

W) 2021**
X) 2022
Y) 2023*
Z) 2024

ANSWER: Y) 2023 []

TOSS-UP

Physics [3] – *Multiple Choice* Which of the following subatomic particles is the most penetrating?

W) Neutrino **
X) Electron
Y) Proton *
Z) Neutron

ANSWER: W) Neutrino []

TOSS-UP

Physics [2] – *Multiple Choice* At which of the following launch angles, in degrees, should a projectile be launched from ground level to maximize its ** range?

W) 15
X) 30 *
Y) 45
Z) 60

ANSWER: Y) 45 []

TOSS-UP

Physics [6] – *Short Answer* If the charge of a non-relativistic point charge triples and its acceleration doubles, then** by what factor does its emitted* power increase?

ANSWER: 36 []

TOSS-UP

Physics [8] – *Multiple Choice* In CGS-EMU units, the vacuum permeability is defined to be unitless. In this system, what are the units of inductance? **

W) unitless
X) cm
Y) cm^2 *
Z) cm^3

ANSWER: X) cm []