LSU-PHYSICS IQ TEST – ANSWERS (2010)

(1) Participate in one of the Block Party activities and get a signature to prove your participation. The Ping Pong Tournament Director was Peter Diener, the Mad Scientist Competition Host was Jonathan Dowling, and the Rock Band & Guitar Hero manager was Jen Andrews.

(2) **D.** 50 yards [The distance traveled is proportional to the surface gravity. So a lunar golf shot of 300 yards on the Moon would only go 300*(1/6) yards or 50 yards for the same swing on Earth.]

(3) The pairs of first names had to be legally married, and both people are currently and officially in our Department. The pairs are Ken & Mette, Brad & Martha, Rachel &Rob, Neel & Kalani, ad Gabriela & Jorge. The line segments

form a symbol ⊃, which is the symbol for the planet Pluto. The planet Pluto is the source of the name for Plutonium. With everyone knowing that Uranium (named after Uranus) is Z=92, so in order, Neptunium (named after Neptune) must be Z=93, and Plutonium must be Z=94.

(4) The *Big Bang Theory* characters were voted as follows:
- **A.** Sheldon   Jorge Pullin
- **B.** Leonard   Ravi Rau
- **C.** Penny   Beverly Rodriguez
- **D.** Rajesh   Ravi Rau
- **E.** Howard   Zach Byerly
- **F.** Leslie   Gabriela Gonzalez

(5) The star υ And is visible to the unaided eye tonight and it is very similar to our Sun. This ordinary star now has three discovered planets in orbit. The outermost has an orbital period of about 4 years. What is its distance from its star (in units of AU, the average Earth-Sun distance)? Estimate its surface temperature?
    A. 2.5 AU, 160°K
This is a simple Kepler's Law problem, where for sun-like stars we have $P_{yr}^2 = R_{AU}^3$. We are told $P_{yr}=4$, so the orbital radius R is $4^{2/3}=2.5$ AU. A simple energy balance for the planet with the Boltzmann Equation for the radiated light and the inverse square law for the input light gives that for Sun-like stars the planet surface temperature scales as $260°K * R_{AU}^{-0.5}$, or 160°K.

(6)
- **A.** Limin Xiao   **3.** Gamma Ray Burst Redshift Catalog and Applications
- **B.** Jeff Kissel   **1.** Calibrating and Improving the Sensitivity of the LIGO Detectors
- **C.** Jay Call   **4.** Generalized Curvilinear Advection Formalism for Finite Volume Codes Doing Relativistic Hydrodynamics
- **D.** Jake Slutsky   **5.** Quantifying the Impact of Data Quality on Searches for Gravitational Waves from Binary Coalescing Systems with LIGO
- **E.** Yang Gao   **2.** New Strategies for Phase Estimation in Quantum Optics

(7) **B.** ~45°N

Dubhe is 5° above Merak, and simple scaling from The picture is 15-20° above the horizon. Dubhe is 28° from Polaris, so Polaris is 43-48° above the horizon. The latitude of the observer equals the altitude of Polaris above the horizon. So Van Gogh painted at a latitude of ~45°. [The actual Latitude of Arles France is 43°.]

(8) Like most state universities, LSU is suffering from budget cutbacks as part of the usual business cycles. Perhaps our department can use some of our special expertise to provide substantial additional funding. Which of the following methods would actually likely work in practice?

      A. Prof. R. Hynes could astound the gullible world by putting forth the new science discipline of "X-ray Astrology". Calculate your horoscope with Sco-X-1 ascendant, calculate your biorhythm according to the Crab pulsar, … This new fad would sell a zillion books, with profits to the Department.

      All the others have essentially zero chance of working in practice. But the idea of one of the local astro-profs writing an astrology book is fully possible, although of near zero chance. <u>If</u> written, the prof would be trading their good name (their formerly good name) for large sales and likely substantial publicity. I would think that such a book would be a best seller and create quite a furor about tenure tracks. Such a book would create large profits, and those <u>could</u> get turned over to the Department.

(9) Find any one of the <u>new</u> graduate students or <u>new</u> professors and get them to sign their name or put an 'X'; and introduce yourself: For this, I got a third signatures, a third 'remarks', and a several X's or Chinese signatures.

(10) There are actually two lines of authority for Andrew Collazzi. The primary one is for his paycheck, and he is a TA so that line goes through Ray Chastain. The other line of authority is his academic line, and that goes through me. So both D and E are correct answers.

      D. Collazzi→Schaefer→Cherry→Carman→Hamilton→Martin→Lombardi→Board of Supervisors →Board of Regents→Jindal

      E. Collazzi→Chastain→Browne→Cherry→Carman→Hamilton→Martin→Lombardi→Board of Supervisors →Board of Regents→Jindal