

2008 LSU-PHYSICS IQ TEST

More than one answer might be correct, or none . . . Circle the correct answer(s).

Name:

- (1) Many of the physics faculty have 'offbeat' items on their department web page (perhaps with a link). Who has each of the following on their web pages:
- A. Britney Spears Guide to Semiconductor Physics
 - B. Professor playing bagpipes (two answers)
 - C. Hundreds of movie reviews rated with beer bottles
 - D. Professor blowing big colorful bubble from right ear
 - E. Full frontal nude pictures with only strategic fig leaf covering
- (2) A slinky (a long loose helical spring) is held at one end such that the other end is at rest one foot off the ground. The top end of the slinky is released. Immediately after the top end is released, what will be the motion of the *bottom*?
- A. The bottom will rise higher off the ground for a brief interval (no rotation)
 - B. The bottom will remain at a steady height for a brief interval (no rotation)
 - C. The bottom will immediately start to fall (no rotation)
 - D. The bottom will immediately fall, then briefly rise before the fall resumes (no rotation)
 - E. The bottom will immediately start to fall (with rotation in one direction {bonus points to say *which* direction})
- (3) Hollywood movies often have their physics content being laughably bad. Below are a set of movie premises which are fundamentally based on physics. Which premise has already been turned into a major Hollywood movie?
- A. An asteroid the size of Texas gets knocked out of orbit by a teeny comet and heads straight for Earth, only for us to be saved by a wildcat oil driller setting off an A-bomb minutes before impact so that the asteroid splits and passes on both sides of the Earth
 - B. Beautiful nuclear physicist realizes that oil companies are hiding successful cold fusion reactor technology, so she blows the whistle and is soon running for her life, until Tommy Lee Jones (shouting "Go go go!") uses his quantum computer to decode the oil company files and send them to the New York Times (the acting is as bad as the plot)
 - C. Astronomer discovers dark interstellar cloud fast approaching the Solar System, so our hero organizes a secret scientific institute to help humanity live through the long 'cloud winter', only to find that the Black Cloud is sentient, whereupon they talk the cloud into leaving the Solar System, thus saving humanity
 - D. The Earth's magnetic field mysteriously fades to zero, thus threatening all humanity, with the only way to save the world being to send the world's greatest scientist to the Earth's core to set off an Abomb to start the core rotating again.
 - E. Maverick genius constructs mini-black-hole in New Mexico that escapes confinement and starts 'orbiting' within the Earth popping to the surface every 45 minutes, with the threat of eating up the whole Earth unless the US and Russia aim particle beams at it

- (4) How many professors in our Department have their legal name pronounced as 'Shay-fer'?
- 1
 - 2
 - 3
 - 4
 - 5
- (5) A particle of mass m moves along a line and is subject to a drag force $F=-Av^2$, where v is its instantaneous velocity. If the particle starts with velocity v_0 at time $t=0$, what is its velocity at time t ? [This is from the Placement Exam for incoming students.]
- $v_0 \exp[Atv_0/m]$
 - $v_0 \exp[-(At/m)^2]$
 - $v_0[1-(Atv_0/m)]$
 - $1/[(At/m)+(1/v_0)]$
 - $v_0(Atv_0/m)^{-2}$
- (6) Why is the sky blue?
- Mie scattering of sunlight off aerosol particles increases as $\lambda^{-1.3}$, so the blue scatters more, and with the sky light all being scattered light, then the blue will dominate and the sky will appear blue
 - Rayleigh scattering of sunlight off atmospheric molecules increases as λ^{-4} , so the blue scatters more
 - Thompson scattering of sunlight off electrons increases as λ^{-2} , so the blue scatters more
 - Rutherford scattering of cosmic rays off atomic nuclei excites nitrogen to emit Slater series lines in blue and green parts of the spectrum
 - Molecular absorption lines (primarily from ozone and water vapor) prevents much of the red and orange light from getting through
- (7) The Olympics have provided awesome performances and wonderful sights. For each of the Olympic events listed below, who in our Department is most likely to win the gold medal? There are no *a priori* correct answers, so I will take these tests sheets as a vote and use the results to score this question. So select from the following people for each of the gold medals as you think the majority will vote. The people are Joey Chatelain, Sarvnipun Chawla, Rachel Collyer, Robert Collyer, Randy Gould, Hwang Lee, Ashley Pagnotta, Dan Sheehy, Christoph Wildfleur, Limin Xiao, David Young, and Yuan Zhang.
- 100-m dash = _____
 - All-round gymnastics = _____
 - Ping pong = _____
 - Bicycle road race = _____
 - Synchronized diving (two names needed here) = _____

(8) What color is the sun?

- A. Yellow (based on observations recorded in many crayon drawings stuck to refrigerators with magnets)
- B. White (based on direct observation of a white sheet of paper held in direct sunlight)
- C. Pale green (based on Wein's Law, with $T_{\text{sun}}=5770^{\circ}\text{K}$ so that $\lambda_{\text{max}}=0.51 \mu$)
- D. Pale red (for any blackbody, with $T_{\text{sun}}=5770^{\circ}\text{K}$ so that $\nu_{\text{max}}=2 \times 10^{14}$ Hz which is in the far red)
- E. Pale yellow (for all G-type main sequence stars)

(9) What really happened at Roswell, New Mexico, on 7 July 1947?

- A. Alien spacecraft crashed, the wreckage was recovered by the US military, the alien bodies were taken to Area 51 for autopsy, and the military immediately launched a cover-up (with a result that great advances were made in semiconductor physics and Velcro)
- B. The debris found on the ranch near Roswell (actually the smaller of two debris fields) was a simple result of a failed rocket launch attempt from the nearby White Sands Proving Grounds (second in the Vanguard series of launches), with the cover-up to avoid publicity and acute embarrassment, so indeed the Roswell incident was a spaceship crash (White Sands had been the site of the highly secret Trinity A-bomb test and it is the site of top secret rocket tests even to today)
- C. That area of New Mexico had already long been the site of scientific ballooning and rocket experiments, and one of the balloon payloads came down near Roswell with the balloon fabric seen as 'alien debris' (with a result that the NSBF facility is now in nearby Fort Sumner)
- D. The crash was of an Air Force transport carrying top secret (but unremarkable) machinery to White Sands Proving Grounds, hence the cover-up (although conspiracy theorists claim the crash was caused by aliens aiming the meteor impact)
- E. It really was a cover-up of a military secret, Project Mogul in this case, where aluminum reflectors (identified as weird shaped metallic debris from the spacecraft) were a top-secret device to look for Soviet nuclear tests (this is part of many such military experiments, including the Vela satellites that discovered the rogue Israeli/South African bomb test and Gamma Ray Bursts)

(10) Our Department has an active knitting group. Who are active members of this group?

- A. Ashley Pagnotta and Martha Schaefer
- B. Laura Linhardt and Limin Ziao
- C. Jen Andrews and Shannon Fritz
- D. Andrew Collazzi and Phil Sprunger
- E. Mette Gaarde and Shanan Schatzle