

LSU-PHYSICS IQ TEST (2013)

6 September 2013, start at exactly 4:00 PM

Hosted by Prof. J. Dowling

QUESTION LIST

1. What is Einstein's equation relating mass and energy?

Correct answer is $E=mc^2$

2. Here is a full Coke can and an empty Coke can, when I roll them down this ramp simultaneously, which reaches the bottom first, or do they get to the bottom simultaneously?

Correct answer FULL CAN REACHES BOTTOM FIRST. I will hand you in advance a pair of coke cans, and there will be a table nearby that you can lift up to form a ramp. So to answer the question, simply demonstrate that the full can reaches bottom first. The physics is that the full can has a small specific moment on inertia (more of its mass is close to its rotational axis), so it takes less energy to spin it up, so its potential energy goes into linear motion instead of rotational motion. Here are three ****wrong**** answers (well, they are real effects, just negligible or incomplete) that you can include in your 'patter':

***The full can 'wins' because its larger inertia overcomes air resistance

***They reach bottom at the same time, as ramps are just slowed down falling (or imagine a vertical ramp), and everything falling accelerates equally under gravity.

***The empty can 'wins' because there is no sloshing to steal the energy. (Recall, how uncooked eggs spin down so fast, while boiled eggs keep spinning.)

3. Here is a pendulum with a one meter string, what is its period?

Correct answer TWO SECONDS ($2*\pi*\text{SQRT}(L/g)=2.007$ seconds). Accept anything from 1.5-2.5 seconds. I will provide you with a 1-meter string pendulum. You can let it have, say, one swing in advance, as a demo, and people should be able to get in the right ball park even if they don't do the equation.

4. What is Einstein's *middle*** name?**

The correct answer is that he had NO MIDDLE NAME.

5. What is the color of the Sun when viewed with it high up in the sky?

Correct answer WHITE. Accept no other answer. When I run this question through Google, seven of the top ten hits give the wrong answer. This is a horrible comment on the 'Information Age' that we are so proud to be in, because what do you do when much of the 'information' is wrong?

I have done the calculation of the Sun's color from its spectrum (passed through a standard atmosphere) as folded through the eye's sensitivity and put onto a CIE color diagram, and the Sun is very close to what is defined as white. But here is a quick experimental proof. Take a white sheet of paper, go into a dark closet, shine a red light on the paper and it looks red, shine a green light on the paper and it looks green, and shine a blue light on the paper and it looks blue. Now take the same piece of paper and go outside on a sunny day, and see what color the paper looks like.

6. Name one of our professors working on the T2K experiment that has just announced definitive evidence of muon to electron neutrino oscillations?

Correct answer THOMES KUTTER, or MARTIN TZANOV, or BILL METCALF

7. What animal is shown on the front cover of Prof. Dowling's new popular book?

Correct answer is CAT.

8. What did Einstein originally want to call what later became known as his 'Theory of Relativity'?

Correct answer THEORY OF INVARIANTS. Max Planck talked Einstein into the new name..

9. Spock is from the planet Vulcan, but there has long ago been a persistent claim to have a planet in our Solar System that was named Vulcan. Where was this planet supposed to be in our Solar System?

Correct answer INSIDE THE ORBIT OF MERCURY or any variant. Historically, in the 1800's there were occasional claims to seeing Vulcan transiting the Sun, and Le Verrier hypothesized this planet to account for the precession of Mercury's orbit (later explained by Einstein).

10. Numerically, what is the inverse of the atomic fine structure constant to five significant digits?

Correct answer is 137.035999173 or just 137.036.

11. A few months ago, Prof. Pullin has published a very interesting and exciting paper in PhysRevLet about Loop Quantum Gravity and black holes. What is the essence of their discovery?

Correct answer THEIR MODEL AVOIDS ANY SINGULARITY, AND HAS A 'WORMHOLE' TO SOMEWHERE/WHEN ELSE. Accept any answer that gets this essence, so for example, NO SINGULARITY or such is fine.

12. What particle is a flavor-neutral meson consisting of a charm quark and a charm antiquark?

Correct answer is the J/Ψ particle, or even CHARMONIUM for excited states. The double name was because Burton Richter and Sam Ting both independently discovered it at the same time.

13. What professor's home page has the "Britney Spears Guide to Semiconductor Physics?"

Correct answer is JONATHAN DOWLING

14. Name one professor in our department who speaks fluent Estonian?

Correct answer is JUHAN FRANK

15. What is the element just below ruthenium in the Periodic Table?

Correct answer OSMIUM or OS