

*This is an extra credit assignment for physics and is due the day of your Regents examination (25<sup>th</sup> of June 2008). You must watch the three movies: THE ATOM (The Clash of the Titans, The Key to the Cosmos and The Illusion of the Reality) and answer the following 37 questions. You MUST type the assignment, and to facilitate that, I am uploading a word document version of it online. The following is a link to the movies:*  
<http://ipb.quicksilverscreen.com/index.php?showtopic=51994>

1. According to the movie, Boltzmann committed suicide in 1906; what was his great idea?
2. What is one reason scientists felt the need to study atoms?
3. What was Einstein's most important paper about (the one which mathematically proved the existence of atoms) What was his experiment?
4. What were the other two of Einstein's papers about?
5. How were Rutherford and Bohr different?
6. What was the most important experiment by Rutherford?
7. What was the most important discovery of Bohr (that was opposed by Einstein and De Broglie)?
8. What did Pauli, who was one of Bohr's students, discover (the infamous exclusion principle)?
9. How did Heisenberg and Schrödinger differ in ideas? Which one was a quantum physicist and which one believed in the wave nature of the electron?
10. What was the most important discovery of Heisenberg?
11. In the famous conference in Brussels, Einstein, Bohr, De Broglie, Pauli, Heisenberg, and Schrödinger presented their ideas; who were on Einstein's side and who were on Bohr's side? Which group won the argument?
12. What was the Copenhagen interpretation of the atom and what was its significance?
13. What was the most important discovery of Madame Currie? What element did she discover?
14. How did Rutherford carry out transmutation for the first time (making him the first ever successful alchemist)? What element did he use?
15. What was the problem with Rutherford's initial model of the atom?
16. In 1932, a nuclear particle was discovered back then! What was that nuclear particle (which Rutherford had not taken into account when constructing his model)?
17. What is the relationship between the strong nuclear force and sunshine?!
18. Firing neutrons at what element first resulted in fission (by Otto Hahn)? What element was expected to be produced? What element was produced instead?
19. Which elements are most likely to go through fission and which ones are most likely to go through fusion?

20. What are the three elements with the most stable nucleus? Which is the most stable?  
What two fundamental forces of nature balance each other in that element?
21. Who was Sir Fred Hoyle and what did he discover? What are super novae?
22. Who was George Gamow and how were his views different from that of Hoyle's?
23. Why was the Big Bang needed to create all the elements?
24. What was the experiment that confirmed the Big Bang theory?
25. Paul Adrian Maurice Dirac was famous for unifying which two fields? Write Dirac's equation!
26. What was so strange about Dirac's equation that shocked Dirac himself?
27. What happens if matter and antimatter come in contact with each other?
28. What antimatter is used in PET scans in hospitals?
29. What was Richard Feynman famous for?
30. What is the QED theory?
31. How is empty space NOT so empty?! From where is energy borrowed in empty space?
32. Who was Murray Gellman and what was his very famous discovery?
33. What is a linear accelerator and what is it used for?
34. What is the world made of (as far as we know)? What forces have so far been unified?  
Which force was never a part of quantum mechanics until most recently?
35. What is String theory? What is Brane theory? What is Quantum-Loop theory?
36. What is the "Measurement Problem"? What is the Schrödinger's cat experiment?

IN THE END OF THE MOVIE, KHALILI INTERVIEWS SOME PHYSICISTS OR SHARES THEIR OPINION WITH US.

37. Write an essay (minimum 250 words) summarizing those opinions IN YOUR OWN WORDS.

Please Note:

THE ONLY WAY YOU WOULD GET A ZERO ON THIS ASSIGNMENT IS IF YOU PLAGIARIZE!

