

List of possible subjects for a homework (max 3 pages, if possible with figures)

1. Methods of science research: Hypothesis, postulates, laws, theory.
2. Physical law should have mathematical beauty (P. A. M. Dirac).
3. Are physical experiments in laboratory just a reproduction of nature?
4. The highest, the smallest in the nature. The dimension of different things.
5. Why do we need of “Bureau International des Poids et Mesures (France)”?
6. How does the ant know the way home with no guiding clues on the desert plain?
7. Space measurement, from first measurements to GPS.
8. Time measurement, from a walk under the moon to the modern atomic clocks.
9. Motion as fundamental concept of human existence.
10. Speed measurements from smallest mobiles to light velocity.
11. High speed video camera can reveal interesting features of fast motion.
12. Gravitational mass versus inertial mass.
13. The physical problems of Egyptians pyramid builders.
14. Roller coaster and circular motion.
15. Ballistics and curvilinear motion.
16. Temperature measurements, from absolute zero to supernova.
17. Barometric formula for the air pressure.
18. Origin of the Universe.
19. Limits of the observable Universe.
20. The last three minutes of Universe.
21. Stephen Hawking’s short time history.
22. Strings theory of the Universe.
23. Black holes are indeed black?
24. The Entropy and Universal order. Perpetuum mobile.
25. Multiple Universes. Do we have a twin brother?
26. Is possible a time travel?
27. Wormholes, space folding and the future space travels.
28. Isaac Newton’s “Philosophiæ Naturalis Principia Mathematica”.
29. Kepler laws for the solar system.
30. Meteorites, asteroids orbiting around Earth and hypothesis of dinosaurian disappearances.
31. Galilean relativity versus Einstein relativity.
32. Special relativity: Michelson Morley experiment. The ether problem.
33. Special relativity versus star Bradley aberration of light.
34. Special relativity: The Lorentz-Einstein-Poincaré transforms.

35. Special relativity: The twins' paradox.
36. Special relativity:  $E = mc^2$  and mass variation with velocity.
37. Special relativity: The muon problem.
38. General relativity and the gravitational problem.
39. The dream of a final theory. GUT (general union theory).
40. Symmetry in the Universe. Is preferred the right handed to the left handed and matter to anti-matter?
41. Emmy Noether's Theorem: Time uniformity and the law of energy conservation.
42. Emmy Noether's Theorem: Space homogeneity and the law of linear momentum conservation.
43. Emmy Noether's Theorem: Space isotropy and the law of angular momentum conservation.
44. Satellite stability and geostationary satellites for telecommunications.
45. The physics of car accidents.
46. The car that runs with oil versus the car that runs on water.
47. The self-righting Segway Human Transporter.
48. Galilean fingerprint on the modern physics.
49. XXI century new physical experiments.
50. Mission to Mars: Did we land on the Moon.
51. Mission to Mars: Large g forces. Human mission problem versus automatic mission.
52. Mission to Mars: Trajectory of spacecraft.
53. Mission to Mars: Fuel problem.
54. Mission to Mars: Take-off problems.
55. Mission to Mars: Landing on Mars.
56. Mission to Mars: To be there on time.
57. Mission to Mars: Space baseball.
58. The physics of ice skaters.
59. Observation and applications of centrifugal inertial forces.
60. Observation of Coriolis inertial force. Equator experiments.
61. Sky-scrapers damped oscillations.
62. Resonance phenomena in Nature.
63. Nuclear Magnetic Resonance in medicine.
64. Lissajous figures: Application to cathodic oscilloscope and TV image encoding.
65. Wave interference in nature.
66. How can a building sink into the ground? The physics of earthquakes.
67. Sounds produced by musical instruments with strings.
68. Sounds produced by musical instruments with membranes. 2D interference patterns.

69. Sounds produced by musical instruments with air columns.
70. Wave superposition. Voice modulation and voice recognition.
71. Doppler Effect, a way to measure the Universe dilatation.
72. Physiological effects of infrasounds.
73. Generation of ultrasounds and ultra-acoustic applications.
74. Electrical discharges in gases.
75. Earth magnetic field and navigation from ancient times to modern well logging.
76. Maxwell equations and Finite Element Methods (FEM) analysis.
77. Electromagnetic waves: Radio waves and applications.
78. Electromagnetic waves: Micro-waves and applications.
79. Electromagnetic waves: Infrared e.m waves applications.
80. Electromagnetic waves: Ultraviolet e.m. waves and human protection.
81. Electromagnetic waves: Infrared spectroscopy applied in chemistry and biology.
82. Electromagnetic waves: X-ray diffraction and applications.
83. Electromagnetic waves: How can a solar explosion shut down a power-grid system?
84. The electric and/or magnetic field produced by brain activity.
85. The van Allen radiation belt of Earth.
86. Discovery of elementary particles.
87. Elementary particles accelerators.
88. The Cosmic Background Radiation.
89. Inside nucleus. Instead of atomic bombs better nuclear reactors.
90. High velocity trains. Magnetic levitation.
91. Schrödinger equations and Copenhagen interpretations of wave function.
92. Schrödinger cat's imaginary experiment.
93. Light spectra a method for remote study.
94. Tunneling microscope and atomic resolution images.
95. Holography and modern applications.
96. LASER applications in medicine.
97. LASER application in telecommunications.
98. Magnetic memories of PC.
99. The fan uses in PC's. Fast Cray supercomputers (Seymour Roger Cray).
100. Semiconductor applications in nowadays life.
101. High temperature superconductors and their applications.