ABIOM: Physics – problems for examination

1. Vertical throw – how to determine the ascent time?

2. Projectile motion – how to determine range of projectile?

3. How Izaak Newton has determined the circular velocity?

4. Discuss difference bewteen the two forms of the second Newton's law of motion

5. What is a meaning of an inertial reference frame?

6.What is a source of friction force? What is a difference between static and kinetic friction coefficients?

7. How one can determine coefficient of static friction?

8. Discuss the meaning of the law of conservation of momentum.

9. How Izaak Newton has determined gravitational force depends on distance between the interacting bodies?

10. What are consequences of the principle of equivalence of gravitational mass and inertial mass?

11. Explain meaning of principle of superposition of gravitational fields.

12. How gravitational field strength depends on distance from the centre of uniform sphere (inside and outside)?

13. Explain why work performed by constant force acting on distance can be calculated as dot product of the force and translation vectors?

14. What is a meaning of potential energy?

15. Why the gravitational potential energy has always negative value?

16. Definition of potential of the gravitational field. What is a shape of the equipotential energy surface in the gravitational field created by Earth?

17. Why the vector of strength of gravitational field is equal to vector of gravitational acceleration?

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18. What are differences between conservative and nonconservative forces?

19. When we can apply the principle of conservation of mechanical energy?

20. What is a meaning of the escape velocity?

21. What is a meaning of the impulse of the force?

22. Explain meaning of the law of conservation of momentum.

23. Explain meaning of the general law of conservation of energy.

24. Describe analogous parameters of translational and rotational motions.

25. What is relationship between the vectors of angular and linear velocities of point rotating on circle with radius ***r***.

26. Definition of moment of inertia.

27. Definition of angular momentum.

28. Definition of torque.

29. Newton's 2nd law for rotation.

30. Explain meaning of the rule of conservation of angular momentum.

31. Explain meaning of the rule of conservation of angular momentum for isolated system.

32. Kinetic energy of rotating rigid body.

33. Explain why top execute precession motion.

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34. Describe graphical model of simple harmonic motion.

35. Explain why period *T* of harmonic oscillation is independent on amplitude *A*.

36. In which forms the mechanical energy is stored in oscillating spring with an attached particle?

37. Explain meaning of the equation of motion of harmonic oscillator.

38. Give some examples of longitudinal waves and transverse waves.

39. Describe phenomenon of interference of waves.

40. Describe phenomenon of standing wave.

41. Explain meaning of the Huygens' principle.

42. Explain the Doppler effect.

43. Discuss similarities and differences between the Coulomb's law and the Newton's law of gravitation.

44. Discuss similarities and differences between the gravitation field strength and electric field strength.

45. Explain meaning of the electric flux.

46. Explain meaning of the Gauss' law.

47. Definition of electric potential.

48. Discuss the relationship between the electric field strength and the potential.

49. In which form is stored energy in charged capacitor?

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50. What is the Lorentz force?

51. Explain meaning of the Ampere's law for steady-state current.

52. What forces are acting between two parallel wires carrying current?

53. Discuss forces acting on rectangular coil carrying current in uniform magnetic field.

54. Explain meaning of the Bohr magneton.

55. Explain meaning of the 3rd Maxwell's equations.

56. What effect will induce uniform magnetic field on rotating rectangular loop made of conducting wire?

57. Explain meaning of the Faraday's law.

58. Describe phenomenon of self-induction.

59. Discuss phenomena occurring in the LC oscillator.

60. Discuss analogies between the LC oscillator and the simple mechanical harmonic oscillator.

61. What is the total energy density of the electromagnetic field.

62. Explain meaning of the general form of the 4th Maxwell's equations.

63. Describe the spectrum of electromagnetic waves and characterize different ranges of this spectrum.

64. Explain meaning of the Poynting vector.

65. Discuss interaction of electromagnetic field with very good conductor.

66. Discuss interaction of electromagnetic field with an insulator.

67. Describe phenomenon of single-slit diffraction.

68. Describe patterns created by light passing diffraction gratings.

69. Describe phenomenon of polarization of light by reflection