Physics Facts:

Mechanics

Kinematics

1. Average velocity is the total displacement traveled per unit time. Average speed is not the magnitude of the average velocity.

2. The slope of a position-time graph gives the velocity. The slope of a velocity-time graph gives the acceleration.

3. The area under the lineor curve of a velocity-time graph is the displacement. The area under the line or curve of an acceleration-time graph is the velocity.

4. Free fall problems can be solved like other acceleration problems by substituting 'a' for 'g' = 9.8 m/s^2. The sign of 'g' is (+) or (-) depending on whether you choose up or down as the positive direction.

5. For projectile motion the vertical component of the velocity at the maximum height is zero.

6. For projectile motion the horizontal component of the velocity remains constant.

Dynamics

7. An object in equilibrium has no resultant force acting on it. The sum of all the x components is zero, the sum of all the y components is zero.

8. The equilibrant force is equal in magnitude but opposite in direction to the resultant vector.

9. Static friction exists between two surfaces when motion is impending; kinetic friction occurs when two surfaces are in relative motion. In either case, the friction forces are proportional to the normal force and mu.

10. The inertia of an object is measured by its mass.

11. An unbalanced force must produce acceleration.

12. Uniform circular motion refers to motion in a circle where the speed is constant and only the direction changes. The change in direction produced by a central force is called centripetal acceleration.

13. Centripetal force and centripetal acceleration vectors are toward the center of the circle while the velocity vector is tangent to the circle.

14. The gravitational force is directly proportional to the product of the masses and inversely proportional to the square of the distance between them.

Momentum

15. The impulse is the product of the average force and the time interval through which it acts.

16. The momentum of a particle is its mass times velocity.

17. Momentum is conserved in all collision systems. Kinetic energy is conserved only in elastic collisions.

Work, Energy and Power

18. Work is a scalar quantity equal to the product of the displacement and the component of the force in the direction of the displacement.

19. For an object traveling in circular motion, the centripetal force never does work.

20. Kinetic energy is the capacity of doing work as a result of motion.

21. Gravitational potential energy is the energy which results from the position of an object relative to the earth.

22. Work-Energy Theorem: Net work is equal to the change in kinetic energy.

23. Work done on a system changes the total energy of the system.

24. Power is the rate at which work is done.

Waves

25. Transverse wave particles vibrate perpendicular to the wave direction and longitudinal wave particles vibrate parallel to the direction of the wave propagation.

26. Sound waves are longitudinal and mechanical. Light waves are transverse and electromagnetic.

27. The energy of a wave is proportional to the amplitude.

28. Interference: When two or more waves exist simultaneously in the same medium, the resultant amplitude depends upon the phase relationship between them.

29. Whenever two waves are nearly the same frequency and exist simultaneously in the same medium, beats are set up.

30. Doppler effect is the apparent change in frequency of a source of sound when there is relative motion of the source and the listener.

31. Wave behavior is proven by diffraction, interference and the polarization of light.

32. The electromagnetic spectrum (radio, microwaves, infrared, visible, ultraviolet, x-ray and gamma rays) is listed from lowest frequency to highest.

33. As the frequency of a wave increases its energy increases and its wavelength decreases.

34. Coherent light waves are all in phase.

35. In Young's double-slit experiment interference and diffraction account for the production of bright and dark fringes.

36. All angles in reflection and refraction are measured from the normal.

37. Concave mirrors are converging and convex mirrors are diverging. Concave lenses are diverging and convex lenses are converging.

38. Light rays bend away from the normal as they gain speed and a longer wavelength by entering a slower index of refraction (less optical density) medium while the frequency remains constant.

39. Light slows down, bends toward the normal and has a shorter wavelength when it enters a higher index of refraction (high optical density) medium while the frequency remains constant.

Electricity AND Magnetism

40. Coulomb's Law: the force of attraction or repulsion between two point charges is directly proportional to the product of the two charges and inversely proportional to the square of the separation between the charges.

41. Use the sign of the charges to determine the direction of the forces and Coulomb's Law to determine their magnitudes.

42. Electric fields point in the direction of the force on a positive test charge.

43. Electric fields between two parallel plates are uniform in strength except at the edges.

44. The electric potential energy increases as a positive charge is moved against the electric field.

45. The energy gained by a charged particle which is accelerated through a potential difference can be expressed in electron volts (eV).

46. The electric potential (V) is equal to the work per unit charge.

47. Resistance depends on the kind of material (resistivity), the length, cross-sectional area, and temperature.

48. All resistors in parallel have equal voltage (V). Adding a resistor in parallel decreases the total resistance of a circuit.

49. All resistors in series have equal current (I). Adding a resistor in series increases the total resistance of a circuit.

50. Kirchhoff's First Rule: The sum of all the currents entering a junction point equals the sum of all the currents leaving the junction point. This rule is based on the conservation of electric charge.

51. Kirchhoff's Second Rule: The algebraic sum of all the gains and losses of potential around any closed path must equal zero. This rule is based on the law of conservation of energy.

52. Magnetic fields point from the north to the south outside the magnet.

53. Magnetic field is measured in Teslas, magnetic flux is measured in Webers.

54. The magnitude of the current is directly proportional to the rate at which magnetic flux lines are cut by a conductor.

Modern and Nuclear Physics

55. The particle behavior of light is proven by the photoelectric effect.

56. The kinetic energy of the ejected electrons is the energy of the incident radiation minus the work function of the surface.

57. Increasing light frequency increases the kinetic energy of the emitted photoelectrons.

58. Increasing light intensity increases the number of emitted photoelectrons but not their kinetic energy.

59. Below a certain frequency, called the threshold frequency no electrons are emitted no matter how intense the light beam.

60. De Broglie proposed that all objects have wavelengths related to their momentum.

61. All electromagnetic waves originate from accelerating charged particles.

62. The lowest energy state of a atom is called the ground state.

63. The number of nucleons is equal to protons + neutrons.

64. All nuclei weigh less than their parts. This mass defect is converted into binding energy. ($E=mc^2$) One amu of mass is equal to 931 MeV of energy.

65. Nuclear fusion is a reaction in which two nuclei are combined to form a large nucleus. Fusion is the source of energy in stars.

66. Nuclear fission is a reaction in which a nucleus is split.

67. Nuclear forces are strong and short ranged.

UNITS

MEASUREMENT	UNIT	SYMBOL	EXPRESSED IN BASE UNITS	EXPRESSED IN OTHER SI UNITS
Acceleration		m/s^2	m/s^2	
Capacitance	Farad	F	$A^2.s^4/kg.m^2$	
Current	Ampere	A		C/s
Electric charge	Coulomb	C	A.s	
Electric field		N/C	$kg.m/C.s^2$	
Electric resistance	Ohm	Ω	$kg.m^2/A^2.s^3$	V/A
Energy, work	Joule	J	$kg.m^2/s^2$	N.m
Emf, voltage	Volt	V	$kg.m^2/A.s^3$	
Force	Newton	N	$kg.m/s^2$	
Frequency	Hertz	Hz	s^{-1}	
Magnetic field	Tesla	T	$kg/A.s^2$	N.s/C.m or Wb/m^2
Magnetic flux	Weber	Wb	$kg.m^2/A.s^2$	V.s
Pressure	Pascal	Pa	kg/ms^2	N/m^2
Potential difference	Volt	V	$kg.m^2/A.s^3$	W/A or J/C
Power	Watt	W	$Kg.m^2/s^3$	J/s