

MOCK BOARD EXAMINATION IN
GENERAL ENGINEERING AND APPLIED SCIENCES (C)

June 3, 2009

1. The “real fundamental particles” of matter.
 - a. Atom
 - b. Electron
 - c. Proton
 - d. Lepton and quarks
2. This varies when number of neutrons varies.
 - a. Isotopes
 - b. Nuclides
 - c. Binding energy
 - d. None of these
3. Uses 1 molecule + 1 electron.
 - a. Molecular + dot
 - b. Compound
 - c. Substance
 - d. Isotope
4. Change in volume
 - a. Glitch
 - b. Variation
 - c. Voluminous
 - d. Transformation
5. When safeguarding of human lives in involved, the Philippines Electronics Code requires that:
 - a. communication companies should wait for the revision of the code.
 - b. Communication companies should update its practices as soon as possible
 - c. In case of an accident, communication companies may invoke the provision of his code to bail them out
 - d. Communication companies may not follow the provision of the code
6. A person may offer his services as an ECE provided that he is _____.
 - a. a graduate ECE
 - b. an ECE practitioner with ten years experience
 - c. holding a valid registration as ECE issued by PRC
 - d. a permanent resident for at least 3 years
7. The time required by an elevator to lift a weight varies directly with the weight and the distance through which it is to be lifted and inversely as the power of the motor. If it takes 30 seconds for a 10-hp motor to lift 100 lbs through 50 feet, what size of motor is required to lift 800 lbs in 40 seconds through a distance of 40 feet?
 - a. 58 hp
 - b. 48 hp
 - c. 50 hp
 - d. 56 hp
8. Whenever a net force acts on a body, it produces acceleration in the direction of the resultant force, and acceleration that is directly proportional to the mass of the body. This theory is popularly known as:
 - a. Faraday’s Law of Forces
 - b. Newton’s second Law of Motion
 - c. Hooke’s Law if equilibrium
 - d. Newton’s First Law of Motion
9. An automobile accelerates at a constant rate of 15 mi/hr to 45 mi/hr in 15 seconds, while traveling in a straight line. What is the average acceleration?
 - a. 2 ft/s
 - b. 2.12 ft/s
 - c. 2.39 ft/s
 - d. 2.93 ft/s
10. A 50 kg block of wood rest on the top of the smooth plane whose length is 3 m and whose altitude is 0.8 m. How long will it take for the block to slide to the bottom of the plane when released?
 - a. 1.52 sec
 - b. 2.51 sec
 - c. 2.41 sec
 - d. 2.14 sec
11. According to this law, “the force between two charges varies directly as the magnitude of each charge and inversely as the square of the distance between them.”
 - a. Law of Universal Gravitation
 - b. Newton’s Law
 - c. Coulomb’s Law
 - d. Inverse Square Law
12. To maximize the horizontal range of the projectile, which of the following applies?
 - a. Maximize velocity
 - b. Maximize the angle of elevation and velocity
 - c. Maximize the angle of elevation
 - d. The tangent function of the angle of trajectory must be equal to one.

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13. A boat can travel 8 mi/hr in still water. What is its velocity with respect to the shore if it heads 35° East of North in a current that moves 3 mi/hr west?
- 8.963 mph
 - 4.556 mph
 - 6.743 mph
 - 5.4 mph
14. A horizontal force of 80,000 N is applied unto a 120 ton load in 10 seconds. Find its acceleration.
- 0.67 m/s^2
 - 0.75 m/s^2
 - 1.05 m/s^2
 - 1.35 m/s^2
15. Pedro runs with a speed of 20 kph. Five minutes later, Mario started running to catch Pedro in 20 minutes. Find the velocity of Mario.
- 22.5 kph
 - 25 kph
 - 27.5 kph
 - 30 kph
16. What is the change in potential energy of 50 kg block in an inclined frictionless plane from a point 20 m from the ground to a point 3 m from the ground?
- 7338.5 J
 - 8338.5 J
 - 9338.5 J
 - 5338.5 J
17. _____ is the process of migration of fine particles of solid suspended in liquid to the anode or cathode when an electric field is applied to the suspension.
- Anaphoresis
 - Cataphoresis
 - Electroporesis
 - Electrolysis
18. The SI unit of LUMINOUS INTENSITY in a given direction of a source emitting monochromatically at 540 terahertz with a radiant intensity in that direction equal to 1 / 683 Watt per Steradian.
- Stilb
 - Candela
 - Amagat
 - Blondel
19. The difference between the observed value of the function and the computed value, the vertical distance from the plotted point to the curve as drawn is called the ____ corresponding to that point.
- Residual
 - Dual
 - Gradient
 - Tangent
20. A process in which heat is absorbed is called _____.
- Exothermic
 - Endothermic
 - Mesothermic
 - Isothermic
21. The economic principle that "Investment will accentuate economic booms and depressions" i.e. the cycle of: depression, expansion, progress and recession, is called ____ principle.
- Vicissitude
 - Accelerator
 - Pareto Optimality
 - Diminishing Returns
22. In statics, _____ is a framework composed of members joined at their ends to form a rigid structure.
- Lever
 - Joists
 - Purlins
 - Truss
23. _____ is an imaginary fluid which was thought to permeate all space through which light waves were assumed to propagate and the existence of such medium was disproved through the Michelson-Morley Experiments.
- Ether
 - Elixir
 - Albedo
 - Bingham Fluid
24. In a building structure, if at least one of its individual members is a multi-force member, it is called a/ an _____.
- Truss
 - Arch
 - Bridge
 - Frame
25. A measure of the reflecting power of a non-luminous object, such as a planet or a natural satellite or a surface feature on such a body.
- Albedo
 - Illuminance
 - Irradiance
 - Chrominance

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26. _____ is a definite amount of matter whose parts are fixed in position relative to one another.
- Deformable Body
 - Solid Body
 - Ideal Fluid
 - Rigid Body
27. A unit of volume often used in the study of the equations of state of gases, the molar volume of a gas at 0°C and one atmosphere.
- Torr
 - Amagat
 - Pascal
 - Blondel
28. The ratio of interest payment to the principal for a given unit of time and is expressed as percentage of the principal.
- Interest
 - Interest Rate
 - Investment
 - Rate of Return
29. According to this law: "In any gas whose volume and mass are kept constant, the same rise in temperature produces the same increase of pressure.
- Dalton's Law
 - Amonton's Law
 - Charle's Law
 - Boyle's Law
30. _____ method is a method of depreciation whereby the amount to recover is spread over the estimated life of the asset in terms of the periods or units of output.
- Sum of Years Digit
 - Matheson
 - Straight Line
 - Declining Balance
31. The study of projectiles and the extent to which their trajectories are affected by shape, propulsion systems, gravity, temperature and wind.
- Ballistics
 - Astrionics
 - Cybernetics
 - Cryogenics
32. _____ is the interest rate at which the present worth of the cash flow on a project or the interest earned by an investment is zero.
- Effective Rate
 - Rate of Return
 - Nominal Rate
 - Yield
33. If a long iron cylinder is made to rotate at very high speed about its longitudinal axis, a slight magnetism is developed proportional to the angular speed of rotation. This magnetization is called _____
- Barnet Effect
 - Degaussing
 - Curie Effect
 - Hysteresis
34. _____ Scale is a scale used in meteorology in which successive values of wind velocities are assigned numbers ranging from zero (calm) to twelve (hurricane) to indicate wind forces.
- Rossi - Forrel
 - Richter
 - Beaufort
 - Buy-Ballot's
35. A substance which remains rigid under a shear stress until the magnitude of the stress exceeds the yield stress, whereupon, the substance flows like a Newtonian Fluid.
- Ether
 - Albedo
 - Bingham Fluid
 - Plastic
36. A C.G.S. unit of current equivalent to ten (10) amperes is the _____.
- Savart
 - Biot
 - Lenz
 - Gauss
37. A metric unit of LUMINANCE equivalent to the emission of a uniform diffuser at a rate of one lumen per square meter.
- Blondel
 - Candela
 - Stilb
 - Candle Power
38. According to _____ law, "In a magnetic circuit, the reluctance is the ratio of the magnetomotive force to the magnetic flux.
- Lenz's
 - Ampere's
 - Bosanquet's
 - Biot-Savart

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39. The quantity of heat required to raise the temperature of one pound of water by a degree Fahrenheit.
- Joule
 - BTU
 - Calorie
 - Celsius
40. "When a beam of light is reflected from a surface, polarization may occur and the sum of angles of incidence and refraction at maximum polarization is a right angle". This statement is popularly called: _____ Law.
- Brillouin's
 - Malus
 - Brewster's
 - Raman's
41. The variation in width of the optical energy gap of certain semiconductors with the amount of doping is called _____ effect.
- Burnstein
 - Brattain
 - Fleming
 - Bardeen
42. _____ is a method of depreciation where a fixed sum of money is regularly deposited at compound interest in a real or imaginary fund in order to accumulate an amount equal to the total depreciation of an asset at the end of the asset's estimated life.
- Sinking Fund
 - Double Declining Balance
 - SYD
 - Straight Line
43. The bluish light emitted by a beam of a high-energy charged particles passing through a transparent medium at a speed faster than light in that given medium.
- Cherenkov Radiation
 - Tesla Effect
 - Corona Discharge
 - Roentgen Effect
44. _____ is a surface which can be generated by moving a straight line called rulings or generators.
- Ruled Surface
 - Rough Surface
 - Quadric Surface
 - Cylinder
45. The removal from a circuit or circuit element of any unwanted AC components particularly those with common power supply and is done by using a series inductance or shunt capacitance. This process is called _____
- Degaussing
 - Rectification
 - Inversion
 - Decoupling
46. _____ is a unit of lens power and is equal to the reciprocal of focal length expressed in meters.
- Steradian
 - Dioptre
 - Acceptance
 - Aperture Number
47. According to _____ Law: "The product of the atomic weight and specific heat of a solid element (atomic heat) is constant for all elements." This constant is about 6.4.
- Gitna and Laki's
 - Dulong and Petit's
 - Duane-Hunt's
 - Carnot-Clausium's
48. The quantity of electricity that is required to liberate or deposit one gram-equivalent of an iron, equivalent to 96,490 coulombs.
- Farad
 - Faraday
 - Statcoulombs
 - Biot
49. The SI unit of absorbed dose of ionizing radiation equal to the energy in Joules absorbed by one kilogram of irradiated material.
- Sievert
 - Gray
 - Curie
 - Roentgen
50. According to Hubble's Law: "The ratio of velocity to distance of galaxies in the universe is a constant whose reciprocal is the time calculated to have elapsed since the collapsed state of the universe existed." This constant, called "Hubble Time" is equal to _____
- One Light Year
 - 1.9×10^{10} years
 - 9.46×10^{15} hours
 - 5.88×10^{12} sec
51. _____ is a unit of luminance equal to the luminance of a surface that emits

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- one lumen per square centimeter.
- a) Stilb
b) Lambert
c) Candela
d) Lux
52. According to _____ : "If a plane polarized beam of light is allowed to fall on a polarizer, the intensity of the transmitted beam is proportional to the square of the cosine of the angle between the plane of polarization of the incident light and the plane of polarization that would be required for total transmission of the beam."
- a) Malus Law
b) Maxwell's Law
c) Corpuscular Theory
d) Newton's Law
53. _____ is a CGS unit of viscosity equal to the tangential force per unit area (in dynes per square centimeter) required to maintain unit difference in a fluid one centimeter apart.
- a) Erg
b) Poise
c) Slug
d) Hooke
54. The ratio of reflected light to the incident light on a surface is called _____
- a) SWR
b) Reflectance
c) Reflectivity
d) Irradiance
e) Illuminance
55. In the FPS system, a mass that moves with an acceleration of one foot per second squared when a force of one pound acts on it is expressed in terms of _____.
- a) Poundal
b) Slugs
c) Dynes
d) Ergs
56. The SI unit of magnetic flux density equal to one weber per square meter is the
- a) Gauss
b) Oersted
c) Maxwell
d) Tesla
57. A right prism is a prism whose lateral edges are perpendicular to its bases; its lateral faces are rectangles. A _____ of a prism is the perpendicular distance between the planes of its bases.
- a) Altitude
b) Azimuth
c) Element
d) Sector
58. A car's brake system exerts 3000 Newtons. It will take _____ seconds before the car stops from a velocity of 30 meters per second.
- a) 10
b) 15
c) 5
d) 2
59. A mothballed nuclear power plant at Chernobyl operates at an output of 100 megawatts daily. This reactor required a mass of _____ kilograms of nuclear fuel.
- a) 0.96×10^{-5}
b) 9.6×10^{-5}
c) 0.0096×10^{-5}
d) 9.6×10^{-5}
60. A Landing Ship (LST) BRP LANAO DEL NORTE of the Philippine Navy used during the "Battle of Leyte Gulf" Golden Anniversary was drifting at a speed of two knots away from the shoreline. The ship's drift speed in kilometers per hour is _____
- a) 3.704
b) 7.304
c) 3.407
d) 1.852
61. While chasing Cheeta and Jane, Tarzan was swinging in the vines somewhere in the remote jungles of Africa at a maximum height of seven (7) feet and a minimum height of three (3) feet above the ground. What was Tarzan's maximum velocity?
- a) 32 ft/sec
b) 18 ft/sec
c) 16 ft/sec
d) 12 ft/sec
62. Pegasus, the most trusted horse of Zeus, exerts one Horse Power to pull his "Chariot of Fire" at a force equivalent to 300 Newtons. The chariot's speed in meters per second is _____
- a) 250
b) 0.25
c) 25
d) 2.5
63. _____ is a unit of pressure or stress

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- resulting from a force of one Newton acting uniformly over an area of one square meter.
- Pascal
 - Torr
 - Stoke
 - Poise
64. The “The Long March” rocket used in launching the Philippine satellite “Aguila” whose expanding gases leaves the rocket at 3 kilometers per second sulting from oxidation of solid propellants at a rate of 30 kilograms per second. The thrust force developed by the launcher rocket is about ____ Newtons.
- 9×10^8
 - 9×10^9
 - 9×10^3
 - 9×10^4
65. A unit of distance used in astronomy equivalent to 3.08572×10^{13} kilometers.
- Light -year
 - Parsec
 - Furlong
 - Fathom
66. A member of the Philippine Navy Seals under the PN Special Warfare Group searching for survivors of the ill-fated vessel, MIV Dona Paz, directs a beam of light at the surface of the sea at an angle of incidence of 40 degrees. Assuming a refractive index of 1.33 for water, the angle of refraction is ____ degrees.
- 58.75
 - 49.75
 - 39.75
 - 29.75
67. ____ is a unit of length equal to 1,650,763.73 wavelengths of the orange-red light radiated by the isotope Krypton-86 atom, as measured in vacuum. Angstrom
- Barn
 - Meter
 - Fathom
 - Furlong
68. ____ factor is mathematical expression also known as the present value of the annuity.
- Present Worth
 - Load
 - Power
 - Demand
69. ____ is the distribution of the initial cost by periodic changes to operation as in depreciation or the reduction of a debt by either periodic or irregular prearranged program.
- Annuity
 - Perpetuity
 - Capital Recovery
 - Amortization
70. A 20 kilogram mortar projectile has a velocity of 600 meters per second. The shell acquired the velocity in a mortar barrel 3 meters long. The average force against the shell as it was fired was ____ KiloNewtons.
- 2400
 - 3600
 - 1200
 - 600
71. An aluminum cube, 10 centimeters on a side, is subjected to a shearing force of $(10)^6$ Newtons. The top of the cube is displaced 0.03 centimeters with respect to the bottom. Its shear modulus is ____ Gigapascals.
- 44
 - 33
 - 11
 - 22
72. A unit of heat which is equal to 1.055 joule is the ____
- BTU
 - Calorie
 - Therm
 - Torr
73. In measuring pressure, 1 millimeter of mercury is equivalent to a unit called ____
- Pascal
 - Psi
 - Torr
 - Therm
74. A 60 gram bullet moving with a speed of 500 meters per second strikes a 5 kilogram block moving in the same direction with a speed of 30 meters per second. The resultant speed of the bullet and the block is ____ meters/second, assuming the bullet to be embedded in the block.
- 53.6
 - 63.5
 - 35.6
 - 65.3
75. A ball rebounds vertically from a

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- horizontal floor to a height of 20 meters. On the next rebound, it reaches a height of 14 meters. The coefficient of restitution between the ball and the floor was ____
- 0.483
 - 0.837
 - 19.8
 - 16.565
76. A flywheel 1.2 meters in diameter accelerates uniformly from rest to 2000 rpm in 20 seconds. The angular acceleration is ____ radians per second.
- 14.50
 - 10.45
 - 15.40
 - 41.5
77. How much heat energy will be required to heat 100 grams of copper from 10°C to 100°C if its specific heat is $385 \text{ Joule / kg}^{\circ}\text{K}$?
- 4.37 kJoule
 - 3.47 kJoule
 - 7.34 kJoule
 - 4.73 kJoule
78. ____ is the duration of 9,192,631,770 periods of the radiation corresponding to the transition between the two hyperfine levels of the ground state of Cesium-133.
- Hour
 - Second
 - Minute
 - Microsecond
 - Light-year
79. A unit of potential difference equivalent to 299.7930 volts is the ____
- Statvolt
 - Abvolt
 - Kilovolt
 - Gamma
80. One bar of pressure is equivalent to ____ Pascals.
- 1×10^5
 - 29.53
 - 101325
 - 133.3224
81. At Andap Valley at the vicinity of Marihatag, Surigao del Sur, the Army Artillery Battalion placed on special mission, fired a 155 mm howitzer against a heavily fortified enemy encampment under “Ka Migo” as an aftermath of the infamous “Marihatag Massacre”. The projectile’s initial velocity is 300 m/sec and takes off at an angle 30° with the horizontal. At what distance (in kilometers) from the cannon tube will the projectile strike the ground? Neglect air resistance, Magnus Force, Coriolis’s Effect, wind shear and other atmospheric factors.
- 7.96
 - 9.76
 - 6.79
 - 7.69
82. A 60 gram bullet was fired horizontally into a 50 kilogram sandbag suspended on a rope, 900 mm long. It was calculated from the observed angle θ , that the bag with the bullet embedded in it swings to a height of 30 mm. The speed of the bullet as it entered the bag was ____ meters per second.
- 460
 - 604
 - 640
 - 406
83. Find the nominal rate which if converted quarterly could be used instead of 15% compounded semiannually.
- 14.37 %
 - 14.73 %
 - 14.93 %
 - 15.56 %
84. A vertical stone column 12.5 feet high has an elliptical base with the major axis twice the length of the minor axis. If the stone weighs 160 pounds per cubic foot, the area of the largest axial or longitudinal section of the column is ____ square feet when the column’s total weight was found to be 12,400 pounds.
- 46.698
 - 49.668
 - 48.669
 - 64.968
85. If money is worth 8%, determine the present value of a perpetuity of P1,000 payable annually, with the first payment due at the end of five (5) years.
- P 9,187.87
 - P 9,178.87
 - P 9,272.64
 - P 9,272.46

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86. In eight years, the amount of P 2,825 at 5% interest compounded quarterly will be _____.
a) P 4,166.77
b) P 4,397.86
c) P 4,188.86
d) P 4,203.97
87. According to _____ theorem: "The velocity of outflow of a liquid from an orifice is equal to the square root of twice the product of the height of the liquid above the opening and the acceleration due to gravity" or in equation form: $v = \sqrt{2(g)(h)}$
a) Bernoulli's
b) Torricelli's
c) Pascal's
d) Archimedes
88. _____ ratio test is a generalized ratio test or a method of showing if a series is convergent or divergent, where the absolute value of the ratio of each term to the one before it is taken as $|(\frac{U_{n+1}}{U_n})|$.
a) D'Alembert's
b) Brinell's
c) De Morgan's
d) Kruskal-Wallis
89. The AFP RSBS donated some "seed money" to generate additional funds for the AFP Provident Trust Fund Scholarship program supporting the educational needs of beneficiaries of soldiers killed in action. How long will it take for this amount to triple itself if it is deposited at AFPSLAI compounded at 8% annually?
a. 14.3 years
b. 41.3 years
c. 31.4 years
d. 3.41 years
90. A share in the profits of a company paid to shareholders, the rate of which is declared at the company's annual general meeting and will reflect the preceding year's profit.
a. Common Stock
b. Preferred Stock
c. Dividend
d. ROI
91. _____ refers to a collision of two bodies for which the restitution coefficient is equal to one.
a) Elastic Collision
b) Inelastic Collision
c) Plastic Deformation
d) Dendritic Collision
92. Mr. J. Reyes borrowed money from the bank. He received from the bank P1842 and promised to pay P2000 at the end of 10 months. Determine the simple interest.
a. 15.7%
b. 16.1%
c. 10.29%
d. 19.45%
93. You loan from a firm an amount of P100, 000 with a rate of simple interest of 20%, but the interest was deducted from the loan at the time the money was borrowed. If at the end of one year, you have to pay the full amount of P100, 000, what is the actual rate of interest?
a. 18.8%
b. 25%
c. 27.5%
d. 30%
94. A VOM has a current selling price of P400. If its selling price is expected to decline at the rate of 10% per annum due to obsolescence. What will be its selling price after 5 years?
a. P236.20
b. P200.00
c. P213.10
d. P245.50
95. A man expects to receive P20 000 in 10 yrs. How much is that money worth now considering interest at 6% compounded quarterly?
a. P12 698.65
b. P11 025.25
c. P17 567.95
d. P15 678.45
96. A man wants to make 14% nominal interest compounded semi-annually on a bond investment. How should that man be willing to pay now for a 12%- P10 000 bond, that will mature in 10 yrs and pays interest semi-annually?
a. P2, 584.19
b. P3, 118.05
c. P8. 940.60
d. P867.82
97. If you borrowed money from friend with simple interest of 12%, find the present worth of P50 000, which is due at the end of 7 months.
a. P46 200

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- b. P44 893
 - c. P46 729
 - d. P45 789
98. This occurs in a situation where a commodity or service is supplied by a number of vendors and there is nothing to prevent additional vendors entering the market.
- a. elastic demand
 - b. perfect competition
 - c. monopoly
 - d. oligopoly
99. Maria sold a pen for P600 at 25% loss. Find the loss or gain if she sold it for P640.
- a. 20%
 - b. 30%
 - c. 15%
 - d. 10%
100. How much must the paid-up capital be of an authorized company stock of P2M?
- a. P62 500
 - b. P100 000
 - c. P125 000
 - d. P200 000

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ANSWERS

1. D Lepton and quarks
2. A isotopes
3. A molecular + dot
4. A glitch
5. B communication
companies should update its practices as soon as possible
6. C holding a valid registration as ECE issued by PRC
7. B, $t = k Wd/P$; $k = tP/Wd$
 $(tP/Wd)_1 = (tP/Wd)_2$
 $30(10)/100(50) = 40P/800(40)$
 $P = 48\text{hp}$
8. B
9. D 2.93 ft/sec^2
10. A 1.51 secs
11. C
12. D
13. C
 $V_R = \text{resultant speed of boat by cosine law:}$
 $V_R = 3^2 + 8^2 - 2(3)(8) \cos 55^\circ$
 $V_R = 6.743 \text{ mph}$
14. A
 $m = \text{mass}$
 $m = 120 \text{ metric ton} = 120000 \text{ kg}$
 $F = ma$
 $80000 = 120000 a$
 $a = 0.67 \text{ m/s}^2$
15. B
 $S_1 = S_2$
 $v_1 t_1 = v_2 t_2$
 $20(25) = v_2(20)$
 $v_2 = 25 \text{ kph}$
16. B
 $\Delta PE = \text{work done on the block}$
 $\Delta PE = \text{force} \times \text{distance}$
 $\text{force} = w = mg = 50(9.81) = 490.5 \text{ N}$
 $\Delta PE = 490.5 \times 20 - 30)$
 $\Delta PE = 8338.5 \text{ joules}$
17. C. Electroporesis
18. B Candela
19. A Residual
20. B Endothermic
21. B Accelerator
22. D Truss
23. A Ether
24. D Frame
25. A Albedo
26. D Rigid Body
27. B Amagat
28. B Interest Rate
29. B Amonton's Law
30. C Straight Line
31. A Ballistics
32. B Rate of Return
33. A Barnet Effect
34. C Beaufort
35. C Bingham Fluid

36. B Biot
37. A Blondel
38. C Bosanquet's
39. B BTU
40. C Brewster's
41. A Burnstein
42. A Sinking Fund
43. A Cherenkov Radiation
44. A Ruled Surface
45. D Decoupling
46. D Aperture Number
47. B Dulong and Petit's
48. B Faraday
49. B Gray
50. B $1.9 \times 10^{10} \text{ years}$
51. B Lambert

NOTE: The following are the definitions of the units used in Optics:

* CANDELA - the SI unit of luminous intensity equal to 1/683 watt per steradian.

* LUX - the SI unit of illumination intensity equal to 1 lumen per square meter.

* LUMEN - the SI unit of luminous flux equal to the light emitted per second in a cone of one steradian solid angle by a point source of one candela.

* NIT - the SI unit of luminance equal to one candela per square meter.

* STILB - An old metric unit of LUMINANCE equivalent to one candela per square centimeter

52. A Malus Law
 53. C Slug
 54. B Reflectance
 55. B Slugs
 56. D Tesla
 57. A Altitude
 58. A 10
- Impulse = Momentum; $3000(t) = 1000(30)$ or $t = 10 \text{ seconds}$
59. D 9.6×10^{-5}
- According to Einstein's energy equation: $E = m(c)^2$ or $m = E/(c)^2$
and $1 \text{ watt} = 1 \text{ joule/sec}$
 $m = [(100 \times 10^6 \text{ Joule/sec/day}) (86400 \text{ sec/day})] / [3 \times 10^8 \text{ m/sec}^2]$
 $m = 9.6 \times 10^{-5} \text{ kilograms}$
60. A 3.704
 61. C 16 ft/sec

By law of conservation of energy:
Potential Energy = Kinetic Energy

$$(m)(g)(\Delta h) = (1/2) (m)(v)^2 \text{ or } v = \sqrt{(2)(g)(h)} = \sqrt{(2)(32)(4)} = 16 \text{ feet/second}$$

62. D 2.5
- 1 HP = 746 watts or joule/sec;

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* Power = Work / Time = [Force x Distance] / (Time) = Force x Velocity;

63. A Pascal

64. D 9×10^4

Force = (Mass)(Acceleration) = (Mass) (Velocity) / (Time)

Thrust Force = (30 kg/sec)(3×10^3 m / sec) = 9×10^4 Newtons

65. B Parsec

NOTE: 1 light-year = 9.46055×10^{12} kilometers

66. A 58.75

By Snell's Law: $(n_1) (\sin \theta_1) = (n_2) (\sin \theta_2)$

$1.33 \sin 40^\circ = (1) \sin \theta_2$; or $\sin \theta_2$

0.855; Therefore: $\theta_2 = \arcsin$

0.855 = 58.75 degrees

67. C Fathom

68. A Present Worth

69. D Amortization

70. C 1200

The work expended by the powder on the shell in the mortar equals the Kinetic energy of the moving shell. Since $W = (F)(s) = (1/2)(m)(v)^2$ then $(F)(3) = (1/2)(20)(600)^2$ or $F = 1200$ kilonewtons.

71. B 33

Shearing Stress = Tangential

Force / Face Area = 10^6 N /

$(0.1\text{m})^2 = 10^8$ Pascals

Shearing Strain = Displacement /

Altitude = $0.03 \text{ cm} / 10 \text{ cm} = 0.003$

Shearing Modulus = Stress / Strain =

$10^8 \text{ Pascal} / 0.003 = 33 \times 10^9$

Pascals

72. C Therm

73. C Torr

74. C 35.6

Momentum Before Impact =

Momentum After Impact $(0.06 \text{ kg})($

$500 \text{ m/sec}) + (5 \text{ kg})(30 \text{ m/sec}) =$

$(0.06 + 5)(v)$; or $V = 180 / 5.06 =$

$35.6 \text{ meters / sec}$

75. B 0.837

76. B 10.45

The wheel starts from rest, Hence:

$\omega_o = 0$. $\omega = \omega_o + \alpha (t)$. $2000 \text{ rpm} =$

$[(2000 \text{ rev})(60 \text{ sec/min})] / [2 (\pi)$

$\text{rad / rev}] = 209 \text{ radians / second}$ α

$= [\omega - \omega_o] / t = [(209 - 0) \text{ rad / sec}] /$

$20 \text{ sec} = 10.45 \text{ rad / sec}^2$

77. B 3.47 kJoule

Heat Required = (Mass)(Specific

Heat)(Temperature Change)

$Q = (0.1 \text{ kg})(385 \text{ J/kg-}^\circ\text{K})(100 - 10)$

$= 3.47 \text{ kJoule}$

78. B Second

79. A Statvolt

NOTE: 1 Abvolt = 1×10^{-8} volt;

1 Lambda = 1×10^{-9} cubic meter

(It is a unit of volume)

80. A 1×10^5

81. A 7.96

Resolve the initial velocity into V_x

and V_y components. Then: $V_x =$

$V \cos 30^\circ = 260 \text{ m/sec}$;

$V_y = V \sin 30^\circ = 150 \text{ m/sec}$. Let

$S_y =$ Vertical displacement and t

$=$ time for projectile to hit the

ground.

Solve for time (t) using vertical

motion. The

projectile is at its initial level at

the end of its flight ($S_y = 0$).

Then, $S_y = 0 = (150)(t) + (1/2)(-$

$9.81)(t)^2$, from which $t = 30.6$

seconds.

Considering horizontal motion

alone;

$X = (V_x)(t) = (260)(30.6) = 7960$

meters

$X = 7.96 \text{ kilometers..}$

82. C 640

Let $V_1 =$ Speed of bullet before

impact; $V_2 =$ Speed of (Bag + _____

Bullet) after impact

Then $V_2 = \sqrt{(20)(g)(h)} = \sqrt{$

$(2)(9.8)(0.03) = 0.767 \text{ meter /}$

second

*Momentum Before Impact =

Momentum After Impact

$(0.06 \text{ kg})(V_1) + 0 = [(0.06 + 50)$

$\text{kg}]$

$[0.767 \text{ m/sec}] = 38.39602$;

Then: $V_1 = 38.399602 / 0.06 =$

639.934 m / sec

83. B 14.73 %

Let $I =$ Annual Effective Rate; At

$n = 2$;

$I = [1 + (i_n/m)]^m - 1 = [1 +$

$(0.15/2)^2 - 1 = 0.155625$

$0.155625 = [1 + (i_n/4)]^4 - 1$;

Extracting the fourth root from

both sides:

$1.036822 = 1 + (i_n/4)$ $i_n =$

$4(0.036822) = 0.14728$ or

approximately 14.73 %

compounded quarterly.

84. B 49.668

Let a and b be the major and

minor axes, respectively.

Then, $b = a / 2$; The area of

the ellipse is given by the

formula: $B = (\pi)(a)(b) =$

$(\pi)(a)(a/2) = [(\pi)(a)^2] / (2)$.

The Volume of the column is

given by $V = (B) (h)$, then: $V =$

$\{[(\pi) (a)^2] / (2)\} (12.5 \text{ ft}) =$

$12,400 \text{ ft}^3 / (160 \text{ pound /cubic}$

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feet).

Solving for a:

$$a = \sqrt{[(12,400)(2)]} /$$

$$[(160)(12.5\pi)] = \sqrt{3.947} =$$

1.9867 ft; Then the Axial

Area =

$$A = (2a)(h) \quad A =$$

$$(2)(1.9867)(12.5) =$$

A = 49.6675 square feet.

$$85. \quad A \quad P \quad 9,187.87$$

$$P = R / I = 1000 / 0.08 = P$$

$$12,500.00; \quad P = 12,500 /$$

$$(1.08)^4 = P \quad 9,187.87$$

$$86. \quad D \quad P \quad 4,203.97$$

$$F = P(1 + i)^n = P2,825[1 +$$

$$(0.05 / 4)]^{(8)(4)} = P \quad 4,203.97$$

$$87. \quad B \quad \text{Torricelli's}$$

$$88. \quad A \quad D \quad \text{"A lembert's}$$

$$89. \quad A \quad 14.3 \text{ years}$$

$$F = P(1 + 0.08)^n \text{ and for the}$$

$$\text{amount to triple, } F = 3P =$$

$$P(1 + 0.08)^n; \text{ canceling } P$$

$$\text{from both sides; } 3 = (1.08)^n ;$$

$$\text{Therefore: } \log 3 = n \log$$

$$1.08 \text{ or } n = \log 3 / \log 1.08$$

$$= 14.275 \text{ years}$$

$$90. \quad C \quad \text{Dividend}$$

$$91. \quad A \quad \text{Elastic Collision}$$

$$92. \quad C,$$

For simple interest,

$$F = P + Pin$$

$$F = P(1 + in)$$

$$2000 = 1842(1 + I \quad 10/12 \text{ yrs})$$

$$I = 10.29\%$$

$$93. \quad B,$$

$$P = 100000 - 20\% (100000)$$

$$P = 80000$$

$$I = 20\% (100000) = 20000$$

$$I = \text{actual interest rate}$$

$$I = \text{actual interest rate}$$

$$I = i/P_{\text{actual}} = 20000 / 80000$$

$$I = 25\%$$

$$94. \quad A,$$

$$F = F = P(1 + I)^n$$

$$F = 400[1 + (-0.10)^5]$$

$$F = P236.20$$

$$95. \quad B$$

$$I = 6\% \text{ compounded quarterly}$$

$$I = 6\%/4 = 1.5\% \text{ per quarter}$$

$$\text{compounded quarterly}$$

$$N = 10 \text{ yrs} = 40 \text{ quarters}$$

$$F = P(1 + I)^n$$

$$20000 = P(1 + I)^{40}$$

$$P = P11025.25$$

$$96. \quad C$$

$$I = 14\% \text{ compounded semi-annually}$$

$$I = 14\%/2 = 7\% \text{ per semi-annual}$$

$$\text{compounded semi-annually}$$

$$N = 10 \text{ yrs} = 20 \text{ semi-annuals}$$

$$R = \text{bond paying rate}$$

$$R = 12\%$$

$$R = 12\%/2 = 6\% \text{ per semi-annual}$$

$$D = \text{semi-annual dividend}$$

$$D = rp$$

$$D = 0.06 (10000)$$

$$D = P600$$

$$\text{Investment} = \text{income}$$

$$F_p = FA + 10000$$

$$P(1 + 0.07)^{20} = 600[(1 + 0.07)^{20}$$

$$- 1/0.07] + 10 \quad 000$$

$$P = P8940.60$$

$$97. \quad C$$

$$F = P + Pin$$

$$F = P(1 + in)$$

$$50000 = P[1 + 0.12(7/12 \text{ yr})]$$

$$P = P \quad 46729$$

$$98. \quad B, \text{ perfect condition}$$

$$99. \quad A, 20\%$$

$$\text{Let: } M = \text{marked price}$$

$$P600 = 0.75M$$

$$M = 800$$

$$\text{At } P640 \text{ selling price,}$$

$$\% \text{ loss} = 1 - 640/800$$

$$\% \text{ loss} = 0.20 = 20\%$$

$$100. \quad C,$$

$$\text{subscribed Capital} = 4 \times \text{paid-up}$$

$$\text{capital}$$

$$\text{Authorized Capital} = 4 \times \text{subscribed}$$

$$\text{capital}$$

$$\text{Authorized Capital} = 16 \times \text{paid-up}$$

$$\text{capital}$$

$$\text{Paid-up capital} = P125 \quad 000$$