成功大學材料系 93 學年度碩士班研究生入學考試試題

A 卷：普通物理、物理冶金、近代物理。共 90 題，滿分 90 分。倒扣至零分為止。

科目名稱： 普通物理

每題為 4 選 1，每一題答對得 1 分，答錯倒扣 0.25 分。

1. A monochromatic light beam of frequency 6.00×10^{14} Hz crosses from air into a transparent material where its wavelength is measured to be 300 nm. What is the index of refraction of the material?
Ⓐ 1.25 Ⓑ1.47 Ⓒ1.61 Ⓓ1.82

2. The electric field between parallel plates connected to a 100-V power supply is 5.00 kV/m. How far apart are the plates?
Ⓐ2.0cm Ⓑ2.5cm Ⓒ5.0cm Ⓓ10.0cm

3. A ball of radius 5.0 cm and mass 3.0 kg is attached to one end of a spring of mass 2.0kg and force constant 1000 N/m. A ball of radius 6.0 cm and mass 5.0 kg is attached to the other end of the spring, and the combination is thrown into the air. What is the acceleration of this system's center of mass?
Ⓐ0.5 g Ⓑ1.0 g Ⓒ2.5 g Ⓓ3.0 g

4. A body of mass 0.10 kg is attached to a vertical massless spring with force constant 4.0×10^{3} N/m. The body is displaced 10.0 cm from its equilibrium position and released. How much time elapses as the body moves from a point 8.0 cm on one side of the equilibrium position to a point 6.0 cm on the same side of the equilibrium position?
Ⓐ1.2×10^{-3} s Ⓑ1.4×10^{-3} s Ⓒ1.6×10^{-3} s Ⓓ1.8×10^{-3} s

5. A hockey puck of mass 0.4 kg is shot across the ice with an initial speed of 40.0m/s. When the puck reaches the goal 20.0 m away, it is moving at a speed of 39.6 m/s. What is the work done on the puck by the force friction?
Ⓐ–3.58 J Ⓑ–4.11 J Ⓒ–5.53 J Ⓓ–6.37 J

6. The capacitance of a parallel-plate capacitor is 2.0 pF. If the area of each plate is 2.4×10^{-4} m^2, what is the plate separation? The permittivity constant ϵ_0 is 8.854×10^{-12} $C^2/N\cdot m^2$.
Ⓐ1.1×10^{-2} m Ⓑ1.1×10^{-3}m Ⓒ1.1×10^{-4} m Ⓓ1.1×10^{-5}m

(背面仍有題目,請繼續作答)

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7. A rod of length 10 cm moves through a 1.5-T magnetic field at a constant velocity of 10 m/s. What is the potential difference between the ends of the rod?
Ⓐ0.5 V Ⓑ1.0 V Ⓒ1.5 V Ⓓ2.0 V

8. A flywheel with a moment of inertia of 100 kg • m^2 is rotating at an angular speed of 600 rev/min about a fixed axis. What is its rotational kinetic energy?
Ⓐ1.97×10^3 J Ⓑ1.97×10^4 J Ⓒ1.97×10^5 J Ⓓ1.97×10^6 J

9. To summon her dog, Virginia blows a whistle that has a frequency of 500 Hz. What is the frequency heard by the dog if he is running toward Virginia at 10 m/s? Assume that the speed of sound is 330 m/s.
Ⓐ358 Hz Ⓑ460 Hz Ⓒ515 Hz Ⓓ611 Hz

10. A 50-N • m torque is applied to a rigid body that is free to rotate around a fixed axis, The body stars from rest and rotates through 40 rad in 20 s. What is its moment of inertia?
Ⓐ250 kg • m^2 Ⓑ400 kg • m^2 Ⓒ500 kg • m^2 Ⓓ800 kg • m^2

11. The de Broglie wavelength of an α-particle (He^4 neucleus) of kinetic energy 10 MeV. Ⓐ $4.53 * 10^{-14}$ Ⓑ $4.53 * 10^{-15}$ Ⓒ $4.53 * 10^{-16}$ Ⓓ $4.53 * 10^{-17}$ m.

12. What is the smallest distance that it could possibly resolve for an electron microscope operating at 50 kV. Ⓐ$5.48 * 10^{-9}$ Ⓑ $5.48 * 10^{-10}$
Ⓒ $5.48 * 10^{-11}$ Ⓓ $5.48 * 10^{-12}$ m.

13. Calculate the wavelength of electromagnetic waves needed to excite a hydrogen atom from the 1s into the 2s state. Ⓐ $1.22 * 10^{-5}$ Ⓑ $1.22 * 10^{-6}$
Ⓒ $1.22 * 10^{-7}$ Ⓓ $1.22 * 10^{-8}$ m.

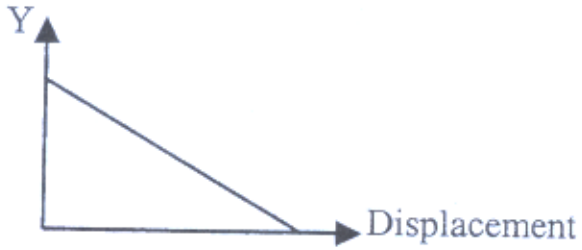
14. Electromagnetic radiation of wavelength 20nm is incident on atomic hydrogen. Assuming that an electron in its ground state is ionized. what is the maximum velocity at which it may be emitted? Ⓐ $4.13 * 10^5$ Ⓑ $4.13 * 10^6$
Ⓒ $4.13 * 10^7$ Ⓓ $4.13 * 10^8$ m s^{-1}.

15. Which of the following is/are vectors? (1) Momentum (2) Kinetic energy (3) Potential difference Ⓐ (1) only Ⓑ (2) only
Ⓒ (1) and (3) Ⓓ (2) and (3).

16. For a body falling freely under gravity, Y has a linear relationship with the displacement of the body as shown below. Y may represent

Ⓐ the potential energy of the body Ⓑ the kinetic energy of the body

Ⓒ the acceleration of the body Ⓓ the velocity of the body.



17. Which of the following involve(s) an energy transfer of 100 J?

(1) A mass of 10 kg is raised vertically by 10m

(2) A mass of 2 kg gains speed of 10 ms^{-1} from the rest

(3) A 10W heater is switched on for 10 seconds;

Ⓐ (3) only Ⓑ (1) and (2) only

Ⓒ (2) and (3) only Ⓓ (1), (2) and (3).

18. Two particles A and B of masses 2 kg and 1kg respectively move in opposite directions. The initial velocity of A is 4 ms^{-1} towards the right, while that of B is 2ms^{-1} towards the left. They collide head on. After the collision, the velocity of A becomes 1 ms^{-1} towards the RIGHT. What would be the velocity of particle B?

Ⓐ 2 ms^{-1} towards the right

Ⓑ 3 ms^{-1} towards the right

Ⓒ 4 ms^{-1} towards the right

Ⓓ 6 ms^{-1} towards the right.

19. Which of the following statements about the image of a real object formed by a plane mirror is NOT correct? The images is Ⓐ erect Ⓑ laterally inverted

Ⓒ smaller than the object Ⓓ virtual.

20. Which of the following conclusions may be drawn from Rutherford's alpha particle scattering experiment?

(1) Most of the mass of an atom is concentrated in a tiny nucleus

(2) Electrons in an atom move around the nucleus

(3) Neutrons are present in an atom;

Ⓐ (1) only Ⓑ (1) and (2) only Ⓒ (1) and (3) only Ⓓ (1), (2) and (3).

(背面仍有題目,請繼續作答)

21. A farsighted person has her near point at 100 cm. What focal length of contact lens should you prescribe to let her just read a book at 25cm?

Ⓐ −33 cm Ⓑ −25 cm Ⓒ 33 cm Ⓓ 25 cm

22. An astronomical telescope is listed in a catalog as having magnification 10 x. If the total length of the telescope (when adjusted or a normal, relaxed eye) is 1, what is the focal length of the eyepiece lens?

Ⓐ 10 1/11 Ⓑ 1 /10 Ⓒ 9 1/10 Ⓓ 1 /11

23. As an object flashes past me at speed $\upsilon = 0.8c$, I measured its mass to be 15 kg. What is its rest mass?

Ⓐ 9kg Ⓑ 12kg Ⓒ 25kg Ⓓ 19kg

24. In the fission of a nuclear fuel, 0.1% of the rest energy is released as heat, which is used to drive an electric generator. When 1Kg of the fuel is fissioned, the electric generator delivers 3 x 10 13 J of electrical energy. What is the efficiency of the generator?

Ⓐ 10 % Ⓑ 0.1% Ⓒ 25% Ⓓ 33%

25. A long horizontal wire carries a current exactly south. What is the direction of the magnetic force on an electron that is traveling exactly north, vertically above the wire? (Ignore the earth's magnetic field)

Ⓐ vertically up Ⓑ vertically down Ⓒ due east Ⓓ due west

26. Very fine smoke particles are suspended in air. The translational rms speed of a smoke particle is 4.9 x10 −3m/s, and the temperature is 22 °C. The mass of particle is:

Ⓐ 5.1×10^{-16} kg Ⓑ 4.9×10^{-18} kg Ⓒ 4.9×10^{-16} kg Ⓓ 5.1×10^{-18} kg

27. When the nucleus ^{12}B undergoes β^- decay, what is the daughter nucleus ?

Ⓐ ^{12}B Ⓑ ^{12}C Ⓒ ^{11}B Ⓓ ^{13}N

28. Ten grams of carbon from a freshly felled tree produce 150 electrons per minute. Ten grams of carbvon extracted from a prehistoric wooden tool produce 25% of that decay tree. Given that the half life of 14 C is 5780 years, about how old is the tool?

Ⓐ 16,800 years Ⓑ 4,300 years Ⓒ 22,900 years Ⓓ 11,500 years

29. Two pucks of masses m_1=3m and m_2=2m collide head-on and stick together. Before the collision, their velocities were v1 =2 u to the right and v2 =3 u to the left. What is the velocity of the two combined masses just after the collision?

Ⓐ u to the left Ⓑ 0 Ⓒ u to the right Ⓓ 5u to the right

30. A golf ball is hit with initial speed vo at an angle θ above the horizontal fairway. Let H denote the maximum height of the ball above the ground and Ttop the time for the ball to get to this point. Let R denote the range (the total horizontal distance traveled before returning to the ground) and Ttotal the total time in the air. Consider the following statements.

(A) H = (vo sin θ)2/(2g); (B) Ttop = (2vo sin θ)/g

(C) H=voTtop sin θ ; (D) R =vo T total conθ ; (E) T total = 2T top

Which of the following is a list of all those statements that are true?

Ⓐ A;B;C Ⓑ A Ⓒ A;D;E Ⓓ C;D;E

(背面仍有題目,請繼續作答)

科目名稱： 物理冶金

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31. If a silver specimen is annealed for a long time under conditions favoring the development of grooves along the lines where internal grain boundaries intersect the outer surface of the sample, a groove angle of 139.5° occurs. If the grain boundary energy for silver is 0.790 J/m, what is the energy of the solid-vapor surface?

Ⓐ 0.967 Ⓑ 0.678 Ⓒ0.854 Ⓓ0.491J/m^2.

32. On the assumption that the self-diffusion coefficient of a simple cubic metal whose lattice constant equals 0.300 nm is given by the equation, $D = 10^{-4}e^{-200{,}000/RT}$ m^2/s, determine the mean time of stay of an atom at a lattice site.

Ⓐ 1.89×10^{-7} Ⓑ 7.61×10^{-8} Ⓒ3.89×10^{-6} Ⓓ7.43×10^{-5} s.

33. It is determined by experiment that the kirkendall markers placed at the interface of a diffusion couple, formed by welding a thin plate of metal A to a similar plate of metal B, move with a velocity of 4.5×10^{-12} m/s toward the A component when the concentration $N_A = 0.38$ and the concentration gradient, dN_A/dx, is 2.5×10^{-2} per m. The chemical diffusion coefficient under these conditions is 3.25×10^{-14} m^2/s. Determine the value of the intrinsic diffusivity of the B component.

Ⓐ 3.93×10^{-14} Ⓑ 7.61×10^{-8} Ⓒ3.89×10^{-11} Ⓓ2.13×10^{-13} m^2/s

34. Calculate the Madelung constant for an infinite chain of alternating positive and negative ions +-+-+ and so on.

Ⓐ 3ln2 Ⓑ 4ln2 Ⓒ 2ln2 Ⓓ5ln2.

35. Determine powder patterns, S, values for the {111} planes, if the specimen is a gold powder. Assume that copper $K_{\alpha1}$ radiation (λ= 0.1541 nm) is used and that the lattice parameter of the gold crystal is 0.4078 nm.

Ⓐ38. 8 Ⓑ 34.4 Ⓒ 56.4 Ⓓ67.7 mm.

36. Determine the magnitude of the tangential component of the force between a dipole and an electron if r =0.35 nm, θ= 45°, a =1.5×10^{-3} nm and the dipole charges are the same as that on an electron.

Ⓐ -1.14×10^{-12} Ⓑ-3.93×10^{-14} Ⓒ-0.57×10^{-11} Ⓓ -2.13×10^{-13} N.

37. A typical cross-head speed in a tensile machine is 0.2 in per min. Estimate the dislocation velocity that would be obtained with a strain rate of 0.00167 s^{-1} in an iron specimen with a dislocation density of 10^{10} m/m^3 and the Burgers vector is 0.248 nm.
Ⓐ $6.734x10^{-12}$ Ⓑ$3.933x10^{-14}$ Ⓒ$0.579x10^{-11}$ Ⓓ $2.138x10^{-13}$ ms^{-1}.

38. Which of the following is false about the theoretical shear strength of a particular set of crystal planes? Ⓐ It increases as the shear modulus increases.
Ⓑ It increases as the interplanar distance increases.
Ⓒ It depends on tempeature.
Ⓓ It depends on the interatomic potential of material.

39. The following Burgers vectors are for unit dislocations in NaCl. Which dislocation has the lowest elastic energy?
Ⓐ $(a_o/2)[001]$ Ⓑ$(a_o/2)[103]$ Ⓒ$(a_o/2)[110]$ Ⓓ$(a_o/2)[012]$

40. The zero point energy of the solid neon crystal is reported to be 590 J/mol. On the basis of this information estimate the maximum lattice vibrational frequency, v_m, of the neon lattice. Ⓐ $1.313x10^{12}$ Ⓑ$3.933x10^{14}$ Ⓒ$0.579x10^{11}$ Ⓓ $2.138x10^{13}$Hz.

41. A screw dislocation lies Ⓐ at 0 degree to its Burgers vectorⒷ at 45 degree to its Burgers vector Ⓒ at 60 degree to its Burgers vector Ⓓ at 90 degree to its Burgers vector

42. A screw dislocation moves Ⓐ at 0 degree to its Burgers vectorⒷ at 45 degree to its Burgers vector Ⓒ at 60 degree to its Burgers vector Ⓓ at 90 degree to its Burgers vector.

43. Number of vacancy equals to Ⓐ n x exp $(-H_f/RT)$ Ⓑ n x exp $(-H_f/2RT)$ Ⓒ 2n x exp $(-H_f/RT)$ Ⓓ 4n x exp $(-H_f/2RT)$, where n=number of atoms, R=gas constant, and H_f = activation enthalpy for the formation of vacancies.

(背面仍有題目,請繼續作答)

44. The shear strain around a screw dislocation is Ⓐ $b/(\pi r)$ Ⓑ $b/(2\pi r)$ Ⓒ $b/(3\pi r)$ Ⓓ $b/(4\pi r)$, where r is the radius of the Burgers circuit.

45. Time required to recover a given fraction of the total yield point recovery is Ⓐ $[A \exp(-Q/RT)]^{-1}$ Ⓑ $[A \exp(-Q/RT)]^{-1/2}$ Ⓒ $[A \exp(-Q/RT)]^{-1/3}$ Ⓓ $[A \exp(-Q/RT)]^{-2}$, where A = constant, Q=activation energy and R=gas constant.

46. Dislocation velocity is proportional to
Ⓐ $\ln(1/T)$ Ⓑ $\ln(1/T^2)$ Ⓒ $\exp(1/T)$ Ⓓ $\exp(1/T^2)$

47. In terms of the effects of inclusion on the growing grain size, which of the following is correct? Ⓐ $R = 3r/(4f)$ Ⓑ $R = 4r/(3f)$ Ⓒ $R = 2r/(3f)$ Ⓓ $R = 3r/(2f)$, where R is the radius of curvature of the average grain, r is the radius of the inclusion, and f is the volume fraction of inclusion.

48. Scheil equation is in the form of Ⓐ $C_0 = C_l (1-f_s)^{(1-k)}$ Ⓑ $C_0 = C_l (1-f_s)^{(k-1)}$ Ⓒ $C_l = C_0 (1-f_s)^{(1-k)}$ Ⓓ $C_l = C_0 (1-f_s)^{(k-1)}$, where C_0 is solute concentration of material, C_l is solute concentration in the liquid, f_s is solid fraction, and $k = C_s / C_l$, where C_s is solute concentration in the solid

49. In terms of the solubility of gas in metal, which of the following is correct? Ⓐ $C = B \exp(-Q/RT)$ Ⓑ $C^{1/2} = B \exp(-Q/RT)$ Ⓒ $C^2 = B \exp(-Q/RT)$ Ⓓ $C = B \exp(-Q/2RT)$, where C is solubility of the dissolved gas, Q is the work to introduce a mole of gas into the metal, R is gas constant, and B is a constant.

50. The maximum free energy of the nucleus of a droplet of liquid formed in a vapor phase is Ⓐ $3\pi\gamma r^2/4$ Ⓑ $3\pi\gamma r^2/2$ Ⓒ $2\pi\gamma r^2/3$ Ⓓ $4\pi\gamma r^2/3$, where γ is the specific surface energy, and γ is the critical radius.

51. A FCC crystal is epitaxially grown on a HCP crystal. The orientation relationship between them is Ⓐ (111)//(0001) and [-1,1,0]//[1,0,-1,0] Ⓑ (111)//(0001) and [-1,1,0]//[1,1,-2,0] Ⓒ (110)//(0001) and [-1,1,0]//[1,0,-1,0] Ⓓ (110)//(0001) and [-1,1,0]//[1,1,-2,0]

52. For a FCC crystal a twin can be formed in the stacking sequence of Ⓐ ABCACBCABC Ⓑ ABCACABCABC Ⓒ ABCABCBACBA Ⓓ ABCBCBCABC

53. In p-GaN semiconductors the formation of Ga vacancies can Ⓐ increase the electron concentration Ⓑ decrease the electron concentration Ⓒ increase the hole concentration Ⓓ decrease the hole concentration

54. In p-GaN semiconductors the formation of N vacancies can Ⓐ increase the electron concentration Ⓑ decrease the electron concentration Ⓒ increase the hole concentration Ⓓ decrease the hole concentration

55. For a diamond cubic lattice, the extinct diffraction plane is Ⓐ (220) Ⓑ (224) Ⓒ (111) Ⓓ (200)

56. For a FCC crystal an intrinsic stacking fault can be formed in the stacking sequence of Ⓐ ABCABACABC Ⓑ ABCACBCABC Ⓒ ABCACABC Ⓓ ABCACBABC

57. For an orthorhombic crystal with three lattice constants, a = 1i, b = 2j, c = 3k, the reciprocal lattice vector, G_{123}, is Ⓐ [1,2,3] Ⓑ [3,2,1] Ⓒ [1,1,1] Ⓓ [2,2,2]

58. For a BCC crystal the extinct diffraction plane is Ⓐ (100) Ⓑ (110) Ⓒ (200) Ⓓ (220)

59. In order to reduce the shape change in the crystal during FCC-HCP transformation Ⓐ one Ⓑ two Ⓒ three Ⓓ four different Shockley partials can be used.

60. For $Bi_{4-x}Ti_3O_{12-y}$ films, substitution of higher-valent cations for some Ti atoms would Ⓐ increase oxygen vacancies Ⓑ decrease oxygen vacancies Ⓒ increase Bi vacancies Ⓓ decrease Bi vacancies in the films.

(背面仍有題目,請繼續作答)

科目名稱： 近代物理

每題為 4 選 1，每一題答對得 1 分，答錯倒扣 0.25 分。

61. Which of the following statements is correct? Ⓐ Orbital quantum number *l* is an integer that must be greater than $|m_l|$, where m_l is the magnetic quantum number. Ⓑ Three dimensions in the space give three quantum numbers. Ⓒ Magnetic quantum number *l* is an integer that must be greater than $|m_l|$, where m_l is the orbital quantum number. Ⓓ Principal quantum number may not be an integer.

62. Which of the following descriptions about the Zeeman effect is correct? Ⓐ In the presence of an external magnetic field, a quantum state breaks up into several sub-states. Ⓑ Following Ⓐ, the breaking up leads to a splitting of individual spectra lines. Ⓒ Following Ⓑ, the splitting is normally limited to 3 components. Ⓓ All of the above are correct.

63. The principal quantum number Ⓐ was first proposed by Max Plank Ⓑ is used only for one-electron atom Ⓒ is used for all atoms except for one-electron atom Ⓓ represents the quantization of energy.

64. An electron Ⓐ may have an intrinsic momentum and a magnetic moment Ⓑ must have an intrinsic momentum and a magnetic moment Ⓒ must have an intrinsic momentum but not a magnetic moment Ⓓ may have an intrinsic momentum but not a magnetic moment.

65. If electrons were in a symmetric system, then Ⓐ two identical electrons could exist in the same state Ⓑ two identical electrons could not exist in the same state Ⓒ two identical electrons could have the same set of quantum numbers Ⓓ two identical electrons could continuously radiate electromagnetic waves.

66. Total angular momentum includes Ⓐ orbital angular momentum **L** and spin angular momentum **S** Ⓑ only orbital angular momentum **L** Ⓒ only spin angular momentum **S** Ⓓ all of the above are incorrect.

67. The wave function of H_2 Ⓐ must be antisymmetrical Ⓑ can be either symmetrical or antisymmetrical Ⓒ must be symmetrical Ⓓ has not been determined yet.

68. Molecular energy includes contribution(s) from Ⓐ rotation of the molecule Ⓑ vibration of the atoms Ⓒ electron configuration Ⓓ all of the above.

69. CO molecule has a bond length of 0.113 nm and the masses of ^{12}C and ^{16}O atoms are 1.99 x 10^{-26} kg and 2.66 x 10^{-26} kg, respectively. When CO is in its lowest rotational state, its angular velocity would be Ⓐ 3.23 x 10^{6} rad/s Ⓑ 3.23 x 10^{11} rad/s Ⓒ 3.23 x 10^{5} rad/s Ⓓ 3.23 x 10^{7} rad/s

70. Gas molecules energy in an idea gas Ⓐ has a symmetrical distribution Ⓑ has a Bose-Einstein distribution Ⓒ has an average of 3 kT Ⓓ has a continuous energy distribution.

71. In a system of bosons, the presence of a particle in a certain state Ⓐ "increases" Ⓑ "decreases" Ⓒ "either increases or decreases" Ⓓ "prevents" the probability of finding other particles in the same state.

72. When an energized beam collides with a solid, simulated emission probability Ⓐ ≠ Ⓑ ≥ Ⓒ = Ⓓ ≤ absorption probability.

73. A nucleus Ⓐ may not have an angular momentum Ⓑ may have an angular momentum and a magnetic moment Ⓒ may not have a magnetic momentum Ⓓ may not have a angular momentum or a magnetic moment.

74. In each nuclear energy level, the exclusive principle Ⓐ allows only 2 neutrons of opposite spin and 2 protons of opposite spin Ⓑ allows only 2 neutrons of opposite spin but does not give any requirement on the spin of protons Ⓒ allows only 2 protons of opposite spin but does not give any requirement on the spin of neutrons Ⓓ does not give any requirement on the spin of protons or neutrons.

75. Nuclear forces are Ⓐ always attractive Ⓑ always repulsive Ⓒ either attractive or repulsive Ⓓ comparable to or smaller than the Coulomb force.

76. The relativity show which of the following is not a constant:
Ⓐ length Ⓑ mass, Ⓒ time, Ⓓ all the above

77. Which word is incorrect in the L-A-S-E-R nomenclature
Ⓐ Amplification, Ⓑ Stimulated, Ⓒ Excitation, Ⓓ Radiation

(背面仍有題目,請繼續作答)

78. The difference between a 3-level and 4-level laser is
Ⓐ exist an intermediate state Ⓑ has no meta-stable state
Ⓒ has no ground state Ⓓ all the above

79. Harmonic oscillator is used to describe the energy level of
Ⓐ an electron in an atom, Ⓑ an electron in a molecular,
Ⓒ an electron in a metal, Ⓓ an atom in the crystal

80. The electron level in an atom can be approximately described by the following potential wells: Ⓐ inverse parabolic well, Ⓑ infinite square well,
Ⓒ thin barrier, Ⓓ finite curved well

81. Compton effect describes Ⓐ photon can be created by the scattering of free electron, Ⓑ electromagnetic radiation due to the electron jumping between energy levels, Ⓒ electron emission from outer layer of atom due to excitation, Ⓓ all the above

82. Who derive the following equation $p = h/\lambda$ Ⓐ Planck, Ⓑ Einstein, Ⓒ Schrodinger, Ⓓ De Broglie

83. Based on the Bohr's atomic model, if the ground state electron orbit radius is r in Hydrogen atom, what is the orbit radius in the first excited state?
Ⓐ 0.25r, Ⓑ 0.5r, Ⓒ 2r Ⓓ 4r

84. The <x2> in quantum mechanics is usually used to express
Ⓐ expected value, Ⓑ wave function Ⓒ Schrodinger equation Ⓓ eigenvalues

85. What would it be if the plank constant is smaller than it is now: Ⓐ angular momentum of electron will be smaller Ⓑ light of speed will be faster Ⓒ the energy of red light will be higher Ⓓ none of the above

86. The transition of an electron between different energy levels are Ⓐ having the same probability Ⓑfollowing the selection rule Ⓒ the principle quantum number need to be changed Ⓓ true for all the above.

87. The magnetic quantum number is used to describe the quantization of
Ⓐ energy Ⓑ angular momentum magnitude
Ⓒ angular momentum of direction Ⓓ all the above

88. It is known that the larger the quantum number, the closer quantum physics approaches classical physics. This statement is based on which of the following principle or effect
Ⓐ Zeeman effect Ⓑ uncertainty principle Ⓒ exclusion principle Ⓓ correspondence principle

89. In the following effects or phenomena, which requires the highest energy

Ⓐ Atomic excitation Ⓑ Tunneling effect Ⓒ Compton effect Ⓓ Pair Production

90. In the quantum mechanics, both the infinite potential wall and finite potential wall boundary conditions (BC) are used to describe the wave functions of particle in a box. Which of the following statement is correct
Ⓐ the energy levels are lowered in infinite potential wall BC
Ⓑ the wave function can not penetrate the wall in infinite potential wall BC
Ⓒ the expectation values of wave function is > 0 out side the wall in infinite wall BC
Ⓓ all the above statement are not true.