

PG-TRB 2019 - PHYSICS

Time: 3 hours

MODEL EXAM – 4 (19 PHME04)

Marks : 150

1. Which of the following vectors is parallel to the resultant of $\vec{A} = 2\hat{i} - 4\hat{j} + \hat{k}$ and $\vec{B} = \hat{i} + \hat{j} - 2\hat{k}$
 (A) $3\hat{i} - 3\hat{j} - 2\hat{k}$ (B) $6\hat{i} - 6\hat{j} - 2\hat{k}$ (C) $\hat{i} - \hat{j} + \hat{k}$ (D) $6\hat{i} - 6\hat{j} + 2\hat{k}$
2. Which of the following is the solution of Laplace equation? If $U =$
 (A) $\frac{1}{r}$ (B) r^2 (C) $x^2y^2+z^2$ (D) $r^2\sin\theta + \cos\varphi$
3. If \vec{A} and \vec{B} are irrotational, $\vec{A} \times \vec{B}$ is
 (A) irrotational (B) solenoidal
 (C) irrotational and solenoidal (D) neither irrotational nor solenoidal
4. Let $A = [a_{ij}]$ given by $a_{ji} = (i-j)^3$ is a
 (A) Symmetric (B) Identity (C) Anti-Symmetric (D) none of the above
5. The Eigen values of the matrix $\begin{bmatrix} 0 & -i \\ i & 0 \end{bmatrix}$ are
 (A) 1,1 (B) 1,-1 (C) 1,0 (D) 0,0
6. The generating function of Legendre polynomial $P_n(x)$ is $g(x,t) =$
 (A) $(1 - 2xt + t^2)^{-1/2}, |t| < 1$ (B) $(1 + 2xt + t^2)^{-1/2}, |t| < 1$
 (C) $(1 + 2xt + t^2)^{1/2}, |t| < 1$ (D) e^{-t^2+2tx}
7. Which one of the following sets form a group under multiplication?
 (A) all integers from $-\infty$ to $+\infty$ (B) $(1,-1)$
 (C) all integers from 0 to $+\infty$ (D) all integers from 1 to $+\infty$
8. If A is Hermitian matrix then $|e^A|$ is given by
 (A) $|A|$ (B) A (C) $\text{tr}(A)$ (D) $e^{\text{tr}(A)}$
9. $\beta(p,q)$ and $\Gamma(p)$ functions are related by
 (A) $\beta(p,q) = \Gamma(p) \Gamma(q)$ (B) $\beta(p,q) = \Gamma(p) + \Gamma(q)$
 (C) no relationship exist among them (D) $\beta(p,q) = \frac{\Gamma(p) \Gamma(q)}{\Gamma(p+q)}$
10. Mutually Exclusive events
 (A) contain all sample points (B) contain all common sample points
 (C) does not contain any sample points (D) does not contain any common sample points
11. In a Binomial Distribution, if 'n' is the number of trials and 'p' is the probability of success, then the mean value is given by
 (A) np (B) n (C) p (D) $np(1-p)$
12. In a Binomial Distribution, the mean and variance are equal
 (A) true (B) false (C) none of these (D) data insufficient
13. For larger values of 'n', Binomial Distribution
 (A) loses its discreteness (B) tends to Poisson's distribution
 (C) remains same (D) keeps changing
14. If 'm' is the mean of a Poisson Distribution, the standard deviation is given by
 (A) \sqrt{m} (B) m^2 (C) m (D) $m/2$
15. If 'm' is the mean of Poisson Distribution, the $P(0)$ is given by
 (A) e^{-m} (B) e^m (C) e (D) m^{-e}
16. The shape of the Normal Curve is
 (A) flat (B) circular (C) bell shaped (D) spike
17. Normal distribution is symmetric about
 (A) mean (B) variance (C) standard deviation (D) covariance

18. For a standard normal variate, the value of mean is
 (A) ∞ (B) 1 (C) 0 (D) not defined
19. The area under a standard normal curve is
 (A) zero (B) 1 (C) ∞ (D) not defined
20. Binomial Distribution is a ----- distribution.
 A) continuous (B) discrete (C) irregular (D) not a probability
21. Which of the following is the unit of scattering cross-section?
 (A) m^{-2} (B) barn (C) steradian (D) fermi
22. Two bodies of masses m and $3m$ are connected by a spring of spring constant 'k'. The frequency of normal mode is -----
 (A) $\sqrt{\frac{3k}{4m}}$ (B) $\sqrt{\frac{k}{m}}$ (C) $\sqrt{\frac{k}{4m}}$ (D) $\sqrt{\frac{4k}{3m}}$
23. The system is said to be in equilibrium. If generalized forces acting on the system are equal to zero, then
 (A) P.E. has an extremum (B) P.E. has an minimum
 (C) K.E. has an extremum (D) none of these
24. If a force is applied on the equilibrium body the potential energy of a body is increased. This system is
 (A) stable (B) unstable (C) balanced (D) configuration
25. Which one is wrong?
 (A) $T = \frac{1}{2} \vec{\omega} L^2$ (B) $T = \frac{1}{2} I \omega^2$ (C) $I = m r^2$ (D) $L = m_i [\omega r_i^2 - r_i (r_i \cdot \omega)]$
26. The shortest path between any two points in the x-y plane can be represented as
 (A) $y = ax + bx^2$ (B) $\frac{dy}{dx} = ax + b$
 (C) $y = ax + b$ (D) ax^2 , where a and b are constants
27. Which among is non-holonomic constraint
 (A) simple pendulum composed of a weight and an inextensible string attached at the top end to the pivot
 (B) rigid body in uniform motion under the action of conservative force field.
 (C) Foucault pendulum
 (D) particle moving in a smooth horizontal plane
28. In order that the work done by a force \vec{F} is independent of physical path taken by a particle, the necessary and sufficient condition is that \vec{F} can be expressed as
 (A) $-\nabla V(r)$ (B) $-\nabla V(r)$ (C) $\nabla \cdot V(r)$ (D) $\nabla \times V(r)$
29. The Poisson Bracket formed between any two pair of the components of the angular momentum vector \vec{L} satisfies
 (A) $[L_i, L_j] = 0$ (B) $[L_i, L_j] = i \epsilon_{ijk} L_k$ (C) $[L_i, L_j] = 1$ (D) $[L_i, L_j] = \epsilon_{ijk} L_k$
30. The number of degrees of freedom of a rigid body is
 (A) 1 (B) 6 (C) infinity (D) 3
31. A particle moves under the influence of attractive force of the form $F = -ar^n$. Its path can be closed one if n =
 (A) -1 (B) for any value of n (C) -2 (D) 2
32. Which one is wrong?
 (A) In principle axis all product of inertia vanishes
 (B) principle moment of inertia cannot be negative
 (C) Scalar of a tensor is of rank two
 (D) product of inertia coefficient is 6

33. A 10 g marble is in a box of width 10 cm. Then its lowest possible energy is
 (A) 5.5×10^{-32} J (B) 2.5×10^{-64} J (C) 5.5×10^{-64} J (D) 10.5×10^{-64} J
34. A thermally insulated container holds N_0 molecules of an ideal monatomic gas at absolute temperature T_0 . Molecules escape from the container through small holes in the walls and in such a process at a temperature T , the average kinetic energy of a molecule is $2kT$. The number of molecules that remain in the container when the temperature has fallen to $\frac{1}{2} T_0$ is
 (A) $\frac{N_0}{2}$ (B) $\frac{N_0}{4}$ (C) $\frac{N_0}{8}$ (D) $\frac{N_0}{5}$
35. The r.m.s speed of oxygen (mass of oxygen molecule is 5.31×10^{-26} kg) at 0° C is
 (A) 0 (B) 461 m/s (C) 46.1 m/s (D) 561 m/s
36. In a $2n$ dimensional phase space, the volume of a phase cell is
 (A) h^n (B) h^{2n} (C) h (D) h^3
37. Wein's displacement law says that
 (A) $\frac{\lambda_m}{T} = \text{constant}$ (B) $\lambda_m T = \text{constant}$ (C) $\lambda_m T^2 = \text{constant}$ (D) $\lambda_m \nu = \text{constant}$
38. The energy density of black body radiation at temperature T is proportional to
 (A) T (B) T^2 (C) T^4 (D) T^{-2}
39. In a canonical ensemble, a system A of fixed volume is in contact with a large reservoir B. Then
 (A) A can exchange only energy with B. (B) A can exchange only particles with B
 (C) A can exchange energy and particles with B. (D) Chemical potential remains unchanged.
40. The concept of degenerate electron gas finds application in
 (A) ferromagnetism (B) diamagnetism (C) thermionic emission (D) white dwarfs
41. The Planck radiation formula reduces to
 (A) Rayleigh-Jeans formula on the shorter wavelength side.
 (B) Rayleigh-Jeans formula on the longer wavelength side.
 (C) Wien's radiation formula on the longer wavelength side.
 (D) Stefan's formula on the longer wavelength side.
42. The only processes that can take place in nature are those for which the entropy change ΔS is given by
 (A) $\Delta S \geq 0$ (B) $\Delta S \leq 0$ (C) $\Delta S = 0$ (D) $\Delta S \leq 1$
43. Phase changes are usually.
 (A) endothermic (B) exothermic (C) high energy (D) high pressure
44. The field outside a uniformly charged sphere of charge q and radius a is
 (A) $\frac{q}{a}$ (B) $\frac{q}{a^2}$ (C) $\frac{q}{4\pi a \epsilon_0}$ (D) $\frac{q}{4\pi \epsilon_0 a^2}$
45. Space craft A is moving at a speed $0.9c$ with respect to earth. If another space craft B is to pass A at a relative speed of $0.5c$ in the same direction then the speed of B is
 (A) $0.5c$ (B) $0.9c$ (C) $0.97c$ (D) $0.94c$
46. The energy equivalent of one atomic mass unit is
 (A) 1.5×10^{-10} J (B) 931 eV (C) 1 J (D) 931 KeV
47. The de Broglie wavelength of a charged particle of charge q , accelerated through a potential difference of V volts is $\lambda =$
 (A) $\frac{h}{2mqV}$ (B) $\frac{h}{\sqrt{2mqV}}$ (C) zero (D) $\frac{1}{\sqrt{2mqV}}$
48. Two long parallel conducting wires carrying currents in the same direction are kept at a distance d apart. The force per unit length is
 (A) $\frac{\mu_0 I_1 I_2}{2\pi d}$ (B) $\frac{\mu_0 I_1 I_2}{2\pi d^2}$ (C) $\frac{\mu_0 I_1 I_2}{4\pi d}$ (D) $\frac{\mu_0 I_1 I_2}{\pi d}$
49. The diffraction pattern of a single slit of width a and illuminated by light of wavelength λ is formed on a screen kept at a distance D ($\gg a$) from the slit. Then the distance of the first minimum of the diffraction pattern from the central maximum is
 (A) $\frac{\lambda D}{a}$ (B) $\frac{\lambda}{a}$ (C) $\frac{\lambda D}{2a}$ (D) $\frac{2\lambda D}{a}$

50. In a Young's double hole arrangement, the spacing between the holes is 0.1 cm and the screen is 50 cm away from the plane of the holes. When a thin mica sheet ($n = 1.5$) is introduced in the path of one of the interfering beams, the central fringe gets shifted by 0.2 cm. The thickness of the mica sheet is
 (A) 7.0×10^{-4} cm (B) 8.0×10^{-4} cm (C) 8.0×10^{-5} cm (D) 8.0×10^{-4} mm
51. In the Michelson interferometer arrangement, if one of the mirrors is moved by a distance 0.08 mm, 250 fringes cross the field of view. The wavelength of the light is
 (A) 6000 Å (B) 6500 Å (C) 6400 Å (D) 5400 Å
52. A left circularly polarised beam ($\lambda = 58\lambda_3 \text{ \AA}$) is incident normally on a calcite crystal of thickness 0.005141 mm, cut with its optic axis parallel to the surface. Refractive index of calcite for O-ray and E-ray are $n_o = 1.65830$ and $n_e = 1.48641$. The emergent beam is -----polarised.
 (A) plane (B) left circularly (C) elliptically (D) right circularly
53. For silver, magnetic permeability $\mu = 4\pi \times 10^{-7} \text{ N/A}^2$ and electrical conductivity $\sigma = 3 \times 10^7 \Omega^{-1} \text{ m}^{-1}$. Its skin depth at a frequency of 10^8 Hz is
 (A) 9×10^{-4} cm (B) zero (C) 9×10^{-4} mm (D) 9×10^{-4} mm
54. The equation $\nabla \cdot \mathbf{B} = 0$ implies
 (A) existence of magnetic monopoles (B) absence of magnetic monopoles
 (C) existence of electric monopoles (D) existence of electric dipoles
55. In the case of hollow cylindrical wave guides
 (A) TEM waves can occur inside it
 (B) Transverse magnetic waves can exist for which $E_x = 0$
 (C) Transverse electric waves can exist for which $E_x \neq 0$
 (D) TEM waves cannot occur inside it
56. The power radiated by a single point charge is proportional
 (A) its velocity (B) its acceleration
 (C) square of its acceleration (D) square of its velocity
57. The Coulomb gauge condition is given by (\vec{A} is the vector potential and ϕ is the scalar potential associated with electromagnetic field)
 (A) $\nabla \cdot \mathbf{A} = 0$ (B) $\nabla \times \mathbf{A} = 0$ (C) $\frac{\partial A}{\partial t} + \nabla \cdot \mathbf{A} = 0$ (D) none of these
58. The Poynting vector \vec{S} is given by
 (A) $\mathbf{E} \times \mathbf{B}$ (B) $\frac{1}{\mu_0} \mathbf{E} \times \mathbf{B}$ (C) $\frac{1}{\mu_0} \mathbf{E} \times \mathbf{H}$ (D) $\mathbf{E} \cdot \mathbf{B}$
59. The concept of displacement current was introduced
 (A) ampere (B) Maxwell (C) Coulomb (D) Gauss
60. The longest wavelength present in the Balmer series (the value of Rydberg constant is $1.097 \times 10^7 \text{ m}^{-1}$)
 (A) 543 nm (B) 579.3 nm (C) 600 nm (D) 656 nm
61. The concept of electron spin was introduced to explain
 (A) Pauli's exclusion principle (B) Stern-Gerlach experiment
 (C) Stability of electron orbits (D) Stark effect
62. In a He-Ne laser,
 (A) laser transition takes place in Ne (B) laser transition takes place in He
 (C) colour of the laser light is blue (D) Ne atoms are used to excite He atoms
63. In the microwave spectrum of CO, the $J = 0 \rightarrow J = 1$ absorption line occurs at a frequency of $1.15 \times 10^{11} \text{ Hz}$. The bond length of CO molecule is (reduced mass of CO molecule is $1.14 \times 10^{-26} \text{ kg}$)
 (A) 0.113 mm (B) 0.113 nm (C) 0.226 nm (D) 0.226 mm
64. The number of fundamental vibrations that a nonlinear N-atomic molecule can have is
 (A) $3N-5$ (B) $2N-6$ (C) $3N-6$ (D) $3N$
65. A planar AB_3 molecule has 4 fundamental vibrations. Then
 (A) All vibrations are Raman and IR active
 (B) The symmetric stretching mode is Raman active and IR inactive
 (C) The symmetric stretching mode is IR active and Raman inactive
 (D) The symmetric stretching mode is both Raman and IR active

66. The term symbols of the ground states of ^{12}Mg and ^{13}Al are respectively
 (A) $^1\text{S}_0$ and $^2\text{P}_{1/2}$ (B) $^1\text{S}_0$ and $^2\text{P}_{3/2}$ (C) $^3\text{S}_0$ and $^1\text{P}_{1/2}$ (D) $^1\text{S}_{1/2}$ and $^2\text{P}_{1/2}$
67. Sodium atom is subjected to a weak magnetic field. The number of possible spectral lines in place of the doublet will be
 (A) 8 (B) 6 (C) 10 (D) 4
68. Hyperfine splitting of atomic spectral lines is due to
 (A) Spin-orbit coupling
 (B) Application of external magnetic field
 (C) Application of external electric field
 (D) The effect of nuclear spin on the electron angular momentum
69. Franck-Condon principle states that
 (A) An electronic transition takes place so rapidly that a vibrating molecule does not change its inter nuclear distance during the transition.
 (B) An electronic transition takes place so rapidly that a rotating molecule does not change its inter nuclear distance during the transition.
 (C) A rotational transition takes place so rapidly that a vibrating molecule does not change its inter nuclear distance during the transition.
 (D) A vibrational transition takes place so rapidly that a rotating molecule does not change its inter nuclear distance during the transition
70. Choose the correct statement:
 (A) NMR spectrometers operate at microwave frequencies
 (B) NMR spectrometers operate in the radio frequency range
 (C) NMR spectrometers operate at optical frequencies.
 (D) ESR spectrometers operate at short radio frequency range
71. Mossbauer spectroscopy is concerned with
 (A) emission of gamma rays by excited nuclei and their reabsorption by another nuclei in the ground state
 (B) emission of radio waves from nuclei
 (C) decay of excited nuclei
 (D) absorption of gamma rays by molecules
72. Electron spin resonance spectroscopy is shown by
 (A) Atoms or molecules containing electrons with paired spins
 (B) Atoms or molecules containing electrons with unpaired spins
 (C) Nuclei containing nucleons with unpaired spins
 (D) The interaction of electric field with the nuclei
73. In a Ruby laser, ruby rod consists of
 (A) Al_2O_3 crystal with some aluminium atoms replaced by silicon atoms
 (B) Al_2O_3 crystal with some aluminium atoms replaced by chromium atoms
 (C) Al_2O_3 crystal with some oxygen atoms replaced by helium atoms
 (D) Al_2O_3 crystal.
74. The time taken for 60% of a sample of radon to decay (half life of radon is 3.82 days) is
 (A) 50.5 days (B) 5.05 years (C) 5.05 days (D) 3.05 days
75. 1 barn is
 (A) 10^{-25} m^2 (B) 10 m^2 (C) 10^{-28} m^2 (D) 10^{-28} m^2
76. The process $p + e^- \rightarrow n + \nu$ is
 (A) beta decay (B) positron decay (C) electron capture (D) not an allowed one
77. The parity of spherical harmonics $Y_{l,m}(\theta, \varphi)$ is
 (A) $(-1)^m$ (B) $(-1)^\ell$ (C) $(-1)^{\ell+m}$ (D) 1

78. The commutator $[x, p_x^n]$ is equal to
 (A) $n\hbar p_x^{n-1}$ (B) $n\hbar p_x^n$ (C) $i\hbar p_x^{n-1}$ (D) $-n\hbar p_x^{n-1}$
79. If $|\psi\rangle = \sum c_n |n\rangle$ where $n = 1, 2, 3, \dots$, then c_n is given by
 (A) $\langle n|\psi\rangle$ (B) $\langle n|n\rangle$ (C) $\langle\psi|\psi\rangle$ (D) $\langle\psi|n\rangle$
80. Expectation value of S_x^2 in an eigen state of S_z is
 (A) 0 (B) 1 (C) \hbar (D) $\frac{1}{4}\hbar^2$
81. The average value of $\frac{1}{r}$ for an electron in an hydrogen atom whose wave function is given by $\frac{1}{\sqrt{\pi a^3}} e^{-\frac{r}{a}}$ is
 (A) 1 (B) a (C) $\frac{a}{2}$ (D) $\frac{1}{a}$
82. For scattering by a hard sphere of radius a the total s-wave scattering cross section is
 (A) a^2 (B) $4\pi a^2$ (C) a (D) πa^2
83. If α stands for the Dirac matrix, the velocity operator of the Dirac particle is given by
 (A) α (B) α^2 (C) $c\alpha$ (D) α^3
84. The ground state wave function for the harmonic oscillator is given by $\varphi = N e^{-\left(\frac{x^2}{2a}\right)}$. Then $(\nabla_x)(\nabla_p)$ for this state is
 (A) $2a$ (B) a (C) $\frac{1}{2}\hbar$ (D) $\hbar\omega$
85. Choose the correct statement.
 (A) Fermions are described by antisymmetric wave functions and they obey Pauli's exclusion principle.
 (B) Fermions are described by symmetric wave functions and they obey Pauli's exclusion principle.
 (C) Bosons are described by symmetric wave functions and they obey Pauli's exclusion principle.
 (D) Bosons are described by antisymmetric wave functions and they do not obey Pauli's exclusion principle.
86. Ultraviolet light of wavelength 350 nm is incident on a potassium surface. If the work function of potassium is 2.2 eV, the kinetic energy of the photoelectron is
 (A) 1.3eV (B) 13 eV (C) 5.0 eV (D) 0.35 eV
87. Choose the correct statement appropriate for Klein-Gordon equation:
 (A) Probability density is always positive.
 (B) Probability density is not always positive and energy can be negative.
 (C) It can describe particles with spin
 (D) Probability density is always positive but energy can be negative.
88. The order of energy of gamma rays is
 (A) eV (B) KeV (C) GeV (D) MeV
89. Which of the following pairs of nuclei are mirror nuclei?
 (A) $^{13}\text{Al}_{27}$ and $^{14}\text{Si}_{28}$ (B) $^{13}\text{Al}_{27}$ and $^{13}\text{Al}_{26}$ (C) $^{13}\text{Al}_{27}$ and $^{14}\text{Si}_{27}$ (D) $^{14}\text{Si}_{27}$ and $^{14}\text{Si}_{28}$
90. Choose the correct statement:
 (A) A neutron and a proton can form a stable deuteron ground state if their spins are parallel.
 (B) A neutron and a proton can form a stable deuteron ground state if their spins are antiparallel.
 (C) A neutron and a proton cannot form a stable ground state
 (D) A neutron and a proton cannot form a stable triplet state
91. Identify the missing element in the reaction ${}^9_4\text{Be} + {}^4_2\text{He} \rightarrow 3 {}^4_2\text{He} + ?$
 (A) 1_0n (B) 1_1n (C) ${}^9_4\text{Be}$ (D) ${}^1_1\text{H}$
92. Light elements in stars are produced by
 A) Nuclear fission B) Nuclear fusion C) Chemical reaction D) Nuclear transmutation
93. Which of the following particles are responsible for holding together quarks to form hadrons?
 (A) mesons (B) glue balls (C) intermediate vector bosons (D) gluons

94. Colour centre is a lattice defect which
 (A) Emits visible light (B) Emits ultra violet light
 (C) absorbs visible light (D) absorbs phonons
95. Josephson effect implies
 (A) Current flow between superconductors separated by a thin conductor
 (B) Current flow through a superconductor
 (C) Current flow between superconductors separated by a thin insulator
 (D) Current flow through a superconductor placed in a magnetic field
96. Which of the following statements is correct? (T_N is the Neel temperature)
 (A) In an antiferromagnet, spins are ordered anti parallel for $T > T_N$
 (B) an antiferromagnet, spins are ordered antiparallel for $T < T_N$
 (C) In an antiferromagnet, spins are ordered parallel for $T < T_N$
 (D) In a ferromagnet, spins are ordered anti parallel for $T < T_N$
97. A d. c voltage of $5.0 \mu\text{V}$ is applied across a Josephson junction. The frequency of the radiation emitted at the junction is
 (A) 24 GHz (B) 2.4 Hz (C) 24 Hz (D) 2.4 GHz
98. If d is the interplanar spacing in a crystal, Bragg reflection can occur only for wavelength λ such that .
 (A) $\lambda \geq d$ (B) $\lambda \leq d$ (C) $\lambda \leq 2d$ (D) $\lambda \geq 2d$
99. A vertical wire of length carries a current of 1A at 10MHz. The total radiated power is nearly
 (A) 0.13W (B) 0.88W (C) 7.3W (D) 73W
100. The excess-3 code for 597 is given by _____
 (A) 100011001010 (B) 100010100111 (C) 010110010111 (D) 010110101101
101. If A and B are the inputs of a half adder, the sum is given by _____
 (A) A AND B (B) A OR B (C) A XOR B (D) A EX-NOR B
102. One example of the use of an S-R flip-flop is as _____
 (A) transition pulse generator (B) racer (C) switch debouncer (D) astable oscillator
103. Whose operations are more faster among the following?
 (A) combinational circuits (B) sequential circuits (C) latches (D) flip flops
104. In J-K flip-flop, "no change" condition appears when $J = \text{-----}$ and $K = \text{-----}$.
 (A) 1,1 (B) 1,0 (C) 0,1 (D) 0,0
105. How many AND, OR and EXOR gates are required for the configuration of full adder?
 (A) 1,2,2 (B) 2,1,2 (C) 3,1,2 (D) 4,0,1
106. A phase shift oscillator has a feedback network consisting of 3 identical RC sections with $R = 100\text{k}\Omega$ and $C = 0.01\mu\text{F}$. The frequency of the oscillations is ----- Hz.
 (A) 65 (B) 130 (C) 160 (D) 650
107. Which of the following regarding op-amp is not correct?
 (A) It uses direct coupling (B) input impedance is high
 (C) output impedance is high (D) voltage gain can be adjusted using external resistors
108. Which of the following DOES NOT represent an exclusive OR operation for inputs A and B?
 (A) $(A+B)\overline{AB}$ (B) $(A+B)AB$ (C) $(A+B)(\overline{A} + \overline{B})$ (D) $A\overline{B} + B\overline{A}$
109. Minimum number of flip-flops required to construct a mod 200 counter is
 (A) 14 (B) 7 (C) 8 (D) 9
110. In a microprocessor ----- bus is bidirectional?
 (A) address (B) data (C) address and data (D) address and control

111. புருனர் கருத்துப்படி செயல்சார்ந்த அறிதல் நிலை எவ்வயதுக்கு உரியது?
A. 0-2 B. 3-7 C. 8-14 D. 0-7
According to Bruner, age group for enactive mode is
A. 0-2 B. 3-7 C. 8-14 D. 0-7
112. கவனித்தல் எதைப் பொறுத்தது?
A. மனவெழுச்சி B. முயற்சி C. A & B D. குறிப்பிட்ட எதுவுமில்லை
Attention depends on
A. emotion b. trying c. Both A & B d. None
113. கவனக்குலைவு என்பது
A. ஒரே நேரத்தில் இரு செயல்களைக் கவனிப்பது
B. எந்தத் தூண்டலையும் கவனிக்காத நிலை
C. பயன்படாத தூண்டலின் மேல் கவனம் செல்வது
D. இவை எதுவுமில்லை
114. கவனத்திற்கான அகக்காரணி எது?
A. புதுமை B. தேவை C. மாற்றம் D. அசைவு
Which of the following is an internal factor for attention?
A. Novelty B. Need C. Movement D. Change
115. மர்பி கூற்றுப்படி புலன்காட்சிக் கூறுகள் எத்தனை?
A. 5 B. 6 C. 3 D. 4
Perceptual elements according to Morphy is
A. 5 B. 6 C. 3 D. 4
116. பரிவு எத்தனை வகைப்படும்?
A. 2 B. 3 C. 4 D. 5
Sympathy is of
A. 2 B. 3 C. 4 D. 5
117. கீழ்க்கண்டவற்றில் எது எதிர்மறை மனவெழுச்சி?
A. உற்சாகம் B. மகிழ்ச்சி C. பரிவு D. அருவருப்பு
Which of the following is a negative emotion?
A. Joy B. Happiness C. Sympathy D. disgust
118. தாய் சிரிப்பதைப் பார்க்கும் சிறுகுழந்தை தானும் கைகொட்டி சிரிப்பது என்பது
A. சார்பெண்ணம் B. வார்ப்பெண்ணம் C. செயலாற்ற்பரிவு D. செயலுற்ற்பரிவு
Child's laugh after the laugh of its mother is a kind of
A. Sterotype B. Prejudice C. Passive sympathy D. active sympathy
119. கற்றலுடன் தொடர்புடைய மூளையின் பகுதி எது?
A. ஹைப்போதலாமஸ் B. புறணி C. தலாமஸ் D. சிறுமூளை
The part of the brain which has a relationship with learning?
A. Hypothalamus b. Central cortex C. thalamus D. Cerebellum
120. 'S' வகை வளைகோட்டின் முதல்நிலை எது?
A. சுணக்கம் B. தேக்கநிலை C. சீரான முன்னேற்றம் D. வீழ்ச்சி
First step of 'S' type curve
A. Spurt B plateau C. steady growth D. fall
121. பாவ்லவ் - ன் சோதனையை விரிவுபடுத்தியவர் யார்?
A. வாட்சன் B. ஸ்கின்னர் C. கோஹ்லர் D. கோஃப்கா
Who among the following extended the Pavlov's theory?
A. Watson B. skinner c. Kohler D. Kofka
122. காக்கனையின் படிநிலைக் கற்றல் கோட்பாடு யாரிடம் செய்த சோதனைகளை அடிப்படையாகக் கொண்டது?
A. விஞ்ஞானிகள் B. மிருகங்கள் C. மருத்துவர்கள் D. விமான ஓட்டிகள்
Gagne's theory of hierarchial learning was derived based on the experiments with
A. Scinetists B. animals c. Doctors D. Pilots
123. பொதுமைப்படுத்துதல் கோட்பாடு வழங்கியவர் யார்?
A. பேக்லி B. தார்ண்டைக் C. ஜட் D. பிராய்டு
Theory of Generalisation was explained by
A. Bagley B. Thronidike C. Judd D. Freud

124. சிறப்பான கற்றல் மேம்பாட்டின் அடிப்படை
A. கற்றல் மாற்றம் B. நுண்ணறிவு C. நினைவு D. கவர்ச்சி
Basis for better learning and development is
A. Transfer of learning B. Intelligence C. Memory D. Interest
125. வலுவேற்றம் தொடர்புடைய கற்றல்
A. 5 வகை B. முயன்று தவறிக்கற்றல் C. R வகை D. உட்காட்சிவழிக் கற்றல்
Reinforcement is linked with
A. 5 type conditioning B. Trial and error C. R type conditioning D. Insightful learning
126. CAVD - உடன் தொடர்புடையவர்
A. ரேவன் B. தார்ண்டைக் C. பீனே - சைமன் D. ஸ்டெர்ன்
CAVD is related with
A. Raven B. Thorndike C. Binet - Simon D. Stern
127. மிக உயர்வானவர்களின் நு.ஈ.
A. 120 - 140 B. 90 - 110 C. 110 - 120 D. 140 க்கு மேல்
Very superior has the IQ of
A. 120 - 140 B. 90 - 110 C. 110 - 120 D. Above 140
128. "ஆய்வு" என்பது எவ்வகை ஊக்கி ஆகும்?
A. இரண்டாம் நிலை B. மூன்றாம் நிலை C. உளவியல் D. முதன்நிலை
'Rest' is categorized as _____ motive
A. secondary B. Tertiary C. Psychological D. Primary
129. பின்னூட்டம் என்ற பதத்தை முதலில் பயன்படுத்தியவர்
A. ஜான் டூயி B. மக்டூகல் C. தார்ண்டைக் D. ஸ்கின்னர்
The word 'Feed back' was coined by
A. John Dewey B. McDougall C. Thorndike D. Skinner
130. மனப்பான்மையை அளவிட 5 புள்ளிகள் அளவுகோலைப் பயன்படுத்தியவர் யார்?
A. லிக்கர்ட் B. தர்ஸ்ட்டன் C. ஸ்ட்ராங் D. மர்ரே & மார்சன்
Five point scale was used by _____ for measuring attitude
A. Likert B. Thurstone C. Strong D. Murray & Morgan
131. வார்தா திட்டம் தொடங்கப்பட்ட ஆண்டு
A. 1947 B. 1932 C. 1937 D. 1946
Vardha scheme was introduced in the year of
A. 1947 B. 1932 C. 1937 D. 1946
132. 'Secrets of Childhood' என்ற புத்தக ஆசிரியர் யார்?
A. புரோபல் B. காந்திஜி C. மாண்டிசோரி D. நில்
The author of the book 'Secrets of childhood' was
A. Froebel B. Gandhiji C. Montessori D. Neil
133. 'கின்டர்கார்டன்' என்பது எம்மொழி வார்த்தை?
A. ஆங்கிலம் B. லத்தீன் C. கிரேக்கம் D. ஜெர்மன்
'Kindergarten' is a _____ word
A. English B. Latin C. Greek D. German
134. "ஒருங்கிணைந்த கல்வி" - என்பது யாருடைய கல்வித்தாக்கம் ஆகும்
A. அரவிந்தர் B. காந்திஜி C. விவேகானந்தர் D. தாகூர்
'Integral Education' is the concept of
A. Aurobindo B. Gandhiji C. Vivekananda D. Tagore
135. சென்னைப் பல்கலை தோற்றுவிக்கப்பட்ட ஆண்டு
A. 1910 B. 1810 C. 1857 D. 1867
Madras University was established in the year of
A. 1910 B. 1810 C. 1857 D. 1867
136. 'D' தேவைகள் எத்தனை?
A. 3 B. 4 C. 2 D. 7
The number of 'D' needs are?
A. 3 B. 4 C. 2 D. 7
137. "இயற்கையும் மனிதனும் இணைந்த செயல்படு நிலை" - என்பது யாரின் கல்வித்தாக்கம் ஆகும்
A. அரவிந்தர் B. காந்திஜி C. அன்னிபெசன்ட் D. தாகூர்
Active communion with nature and man - is the concept of
A. Aurobindo B. Gandhiji C. Anne Besent D. Tagore

138. சுற்றல் வளைகோட்டின் வடிவம் யாது?
A. L B. X C. S D. N
The shape of the learning curve is
A. L B. X C. S D. N
139. முதல் Summer hill பள்ளிகளைத் தோற்றுவித்தவர் _____ ஆண்டு _____
A. புரோஃபல், 1922 B. நீல், 1922 C. நீல் 1912 D. புரோஃபல், 1912
The first summerhill school was formed by _____ in _____
A. Froebel, 1922 B. Neil, 1922 C. Neil 1912 D. Froebel, 1912
140. ரூஸோ கூற்றுப்படி எதிர்மறைக் கல்வியின் வயதுவரம்பு
A. 6 - 10 B. 7 - 12 C. 9 - 13 D. 13 - 19
The period of negative education according to Rousseau
A. 6 - 10 B. 7 - 12 C. 9 - 13 D. 13 - 19
141. பெண்களுக்கு வாக்குரிமை அளித்த முதல் நாடு?
A. நியூசிலாந்து B. USA C. அயர்லாந்து D. இந்தியா
Which among the following countries was the first to give women the right to vote?
A. Newzealand B. USA C. Ireland D. India
142. சூரிய ஒளி பூமியை வந்தடைய எடுத்துக் கொள்ளும் நேரம்
A. 8 min. B. 8 min. 16 sec. C. 9 min. D. 7 min. 16 sec.
Time taken by sunlight to reach earth is
A. 8 min. B. 8 min. 16 sec. C. 9 min. D. 7 min. 16 sec.
143. செல்களை பற்றிய பரப்பு?
A. Cosmology B. Cytology C. Animology D. Nucleology
Study of Cell?
A. Cosmology B. Cytology C. Animology D. Nucleology
144. B₁₂ - ன் வேறுபெயர்?
A. Calciferol B. Cyanocobalamin C. Niacin D. Retinol
Other name for Vitamin B₁₂?
A. Calciferol B. Cyanocobalamin C. Niacin D. Retinol
145. சீனாவின் தேசிய விளையாட்டு
A. Tennis B. Hockey C. Volleyball D. Table Tennis
National sports of China?
A. Tennis B. Hockey C. Volleyball D. Table Tennis
146. மனித உடலின் பெரிய சுரப்பி எது?
A. கல்லீரல் B. தைராய்டு C. கணையம் D. அட்ரீனல்
Largest gland in human body?
A. Liver B. Thyroid C. Liver D. Adrenal
147. இந்தியாவின் முதல் டால்பின் ஆராய்ச்சி மையம் எப்பல்கலைக்கழகத்தில் அமையவுள்ளது?
A. டெல்லி B. ஹரியானா C. பாட்னா D. சென்னை
India's first dolphin research centre will be located in the university of
A. Delhi B. Haryana C. Patna D. Chennai
148. எத்தனால் அடிப்படையாகக் கொண்ட மோட்டார் சைக்கிளை தயாரிக்க உள்ள நிறுவனம் எது?
A. ஹோண்டா B. TVS C. பஜாஜ் D. Hero Motor
Which motor company is planned to start the products of motor cycles using ethanol?
A. Honda B. TVS C. Bajaj D. Hero motor corporation
149. 'Black buck' எனப்படும் கறுப்பு மான்களின் சரணாலயம் தமிழ்நாட்டில் எங்குள்ளது?
A. முதுமலை B. ஸ்ரீவில்லிப்புத்தூர் C. ஆனைமலை D. வல்லநாடு
Black buck sanctuary in T.Nadu is located at
A. Mudhumalai B. Srivilliputhur C. Aaaimalai D. Vallanadu
150. 'குடவோலை' முறையை அறிமுகப்படுத்தியவர்கள்
A. சேரர்கள் B. சோழர்கள் C. பாண்டியர்கள் D. பல்லவர்கள்
'Kudavolai' method was introduced by
A. Chera B. Chola C. Pandy D. Pallava