Entrance Exam

2024



QUESTION PAPER

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1. The eigenvalues of the matrix $\begin{pmatrix} 1 & 1 \\ 1 & 1 \end{pmatrix}$ are

(A) 1,0
(B) 1,1
(C) 1,2
(D) 0,2

2. The product of two matrices A and B is possible only if

(A) the number of rows and columns in A and B are equal
(B) the number of rows in A is equal to the number of rows in B
(C) the number of columns in A is equal to the number of columns in B
(D) the number of columns in A is equal to the number of rows in B

3. The value of the determinant $\begin{vmatrix} 1 & 2 & 3 \\ 2 & 3 & 1 \\ 2 & 4 & 6 \end{vmatrix}$ is

(A) 16
(B) 0
(C) 20
(D) 10

4. The determinant $\begin{vmatrix} i & j & k \\ A_x & A_y & A_z \\ B_x & B_y & B_z \end{vmatrix}$ can be represented by

(A) $\vec{A} \cdot \vec{B}$
(B) $\vec{A} \times \vec{B}$
(C) $\vec{B} \times \vec{A}$
(D) $(i + j + k) \times \vec{A} \times \vec{B}$

5. If a force of $(2i + 3j + 4k)N$ displaces a body through $(2i + 3j + 7k)m$, the work done by the force is

(A) 18 J
(B) 18 ergs
(C) 41 J
(D) 41 ergs

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6. The unit vector of $\vec{A} = 1\hat{i} + 2\hat{j} + 3\hat{k}$ is

(A) $(\hat{i} + \hat{j} + \hat{k})$

(B) $\sqrt{14}(1\hat{i} + 2\hat{j} + 3\hat{k})$

(C) $\frac{1}{\sqrt{14}}(1\hat{i} + 2\hat{j} + 3\hat{k})$

(D) $14(1\hat{i} + 2\hat{j} + 3\hat{k})$

7. If *y* is a function of *x*, then for the function $y(x)$ to be maximum or minimum, the condition is

(A) $\frac{dy}{dx} \neq 0$

(B) $\frac{dy}{dx} < 0$

(C) $\frac{dy}{dx} > 0$

(D) $\frac{dy}{dx} = 0$

8. $\frac{d}{dx}\left(e^x\right)$ is

(A) e^x

(B) xe^x

(C) $\frac{e^x}{x}$

(D) zero

9. A satellite *S* is moving in an elliptical orbit around the earth. The mass of the satellite is very small compared to the mass of the earth. Then,

(A) The acceleration of *S* is always directed towards the center of the earth
(B) The angular momentum of *S* about the center of the earth changes in direction, but its magnitude remains constant
(C) The total mechanical energy of *S* varies periodically with time
(D) The linear momentum of *S* remains constant

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10. The escape velocity of a body from the earth is v. If the mass and radius of earth were doubled, the escape velocity will be

(A) v
(B) $2v$
(C) $4v$
(D) $\frac{v}{2}$

11. Two bodies of masses 10 kg and 2 kg are moving with velocities 3 m/s and –1 m/s. What is the velocity of the center of mass?

(A) 2 m/s
(B) 1 m/s
(C) 4 m/s
(D) 2.33 m/s

12. A light body and a heavy body have same momentum. Which has more kinetic energy?

(A) Lighter body
(B) Heavier body
(C) Both bodies have same kinetic energy
(D) Cannot say unless the velocities are known



13. A body of mass m is accelerating in a direction opposite to gravity. Then its

(A) apparent weight will be equal to mg
(B) apparent weight will be greater than mg
(C) apparent weight will be less than mg
(D) apparent weight will be zero

14. A person stands on a rotating platform with folded hands. If he suddenly outstretches his arms, then the angular velocity

(A) decreases
(B) increases
(C) remains same
(D) becomes zero

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15. The potential energy of an oscillating simple pendulum is

(A) zero
(B) maximum at the extreme position
(C) maximum at the mean position
(D) maximum at a point midway between mean position and extreme position

16. The moment of inertia of a wheel having radius of gyration 60 cm is 360 kgm^2. Then its mass will be

(A) 200 kg
(B) 500 kg
(C) 1000 kg
(D) 800 kg

17. If A is the amplitude of simple harmonic motion, the distance covered by a body in one complete oscillation is

(A) A
(B) $2A$
(C) $4A$
(D) $\frac{A}{2}$

18. A particle executes SHM represented by $y = 0.02 \sin 100t$. The amplitude and frequency of motion are

(A) 0.02 m and 100 Hz
(B) 0.01 m and 50 Hz
(C) 0.02 m and $\left(\frac{50}{\pi}\right)$ Hz
(D) 0.02 m and $\left(\frac{100}{\pi}\right)$ Hz

19. The change in frequency due to Doppler effect does not depend on

(A) the speed of the source
(B) the speed of the observer
(C) the frequency of the source
(D) the separation between the source and the observer

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20. An electron is moving with a velocity $v = 0.8c$, where c is the velocity of light. Then its phase velocity will be

(A) 0.8 c
(B) 0.2 c
(C) 1.25 c
(D) c

21. An ultrasound signal sent vertically into the sea water gets reflected from the bottom of the sea and reaches the surface 0.8 s after it was sent. If the speed of sound in sea water is 1500 m/s, the depth of the sea is

(A) 1500 m
(B) 600 m
(C) 1200 m
(D) 330 m

22. When two waves with same frequency and constant phase difference interfere,

(A) there is a gain in energy
(B) there is a loss in energy
(C) the energy is redistributed and the distribution changes with time
(D) the energy is redistributed and the distribution remains constant in time

23. A tuning fork produces sound waves in air. If the temperature of the air increases, then which one of the following parameter will change?

(A) Displacement amplitude
(B) Frequency of sound waves
(C) Speed of sound waves
(D) Time period

24. In a diffraction grating, the grating constant refers to

(A) Width of one slit in the grating
(B) Number of rulings on a grating
(C) Property of the material which it is made of
(D) Order of the diffraction

25. Dichroism refers to

(A) splitting of the ray of light into ordinary and extra ordinary ray
(B) selective absorption of one of the rectangular components of vibrations of the light vector
(C) splitting of the white light into component wavelengths
(D) chromatic aberration in lenses

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26. Gauss law in electrostatics expresses conservation of

(A) charge
(B) lines of force
(C) energy
(D) momentum

27. Poisson equation relates

(A) vector potential and electric field
(B) vector potential and current density
(C) electric field and electric potential
(D) charge density and electric field

28. A sinusoidal voltage $V = (200 \sin 377t)$ is applied to a resistor of 10 Ω resistance. What is the frequency of the supply?

(A) 50 Hz
(B) 377 Hz
(C) 60 Hz
(D) 100 Hz

29. A parallel plate capacitor has plates of area A and separation d. It is charged to a potential difference V and the charging battery is then disconnected. The plates are pushed closer until their separation is $\frac{d}{2}$. The ratio of final stored energy to initial stored energy by the capacitor is

(A) $\frac{1}{2}$
(B) $\frac{1}{8}$
(C) 1
(D) 2

30. The magnetic potential energy stored in a certain inductor is 25 mJ, when the current in the inductor is 60 mA. This inductor is of inductance

(A) 13.89 H
(B) 138.88 H
(C) 0.138 H
(D) 1.389 H

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31. Poynting vector of a plane electromagnetic wave propagating in the direction $\hat{k}$ is

(A) perpendicular to $\hat{k}$

(B) parallel to $\hat{k}$

(C) antiparallel to $\hat{k}$

(D) at an angle $\frac{\pi}{4}$ to $\hat{k}$

32. Eddy currents developed on a conductor moving in a magnetic field will tend to

(A) speed up the motion
(B) slow down the motion
(C) rotate the conductor
(D) oscillate the conductor

33. Which one of the following is **not** an exact differential?

(A) dQ (Q = heat absorbed or released)
(B) dU (U = internal energy)
(C) dS (S = entropy)
(D) dF (F = free energy)

34. Which one of the following statements is false?

(A) Adiabatic expansion of a gas is reversible
(B) Joule-Thomson expansion of a gas is irreversible
(C) Adiabatic expansion of a gas always leads to cooling effect
(D) Joule-Thomson expansion of a gas always leads to heating effect

35. A black body is at a temperature of 5760 K. The energy of radiation emitted by the body at wavelength 250 nm is U_1 and at wavelength 500 nm is U_2. If the value of Wien's constant b is 2.88×10^6 mK, which of the following is correct?

(A) $U_1 = U_2$
(B) $U_1 = U_2 = 0$
(C) $U_1 > U_2$
(D) $U_2 > U_1$

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36. The efficiency of Carnot's engine working between 127°C and 27°C is

(A) 100%
(B) 50%
(C) 25%
(D) 75%

37. If the entropy of a system remains constant in a thermodynamic process, the process is

(A) Isobaric
(B) Isochoric
(C) Isothermal
(D) Adiabatic

38. The ensemble average value approaches most probable value

(A) if the mean square fluctuation is small
(B) if the mean square fluctuation is large
(C) if the number of particles in the system is small
(D) if the time of measurement is small

39. Which one of the following statements about statistical distribution is correct?

(A) Maxwell-Boltzmann distribution is applicable to particles with integral spin
(B) Fermi-Dirac statistics is applicable to distinguishable particles
(C) Bose-Einstein statistics applies to ideal gas system
(D) Bose-Einstein statistics is symmetric under exchange of particles

40. Quantum statistics approach Maxwell- Boltzmann statistics under the classical limit of

(A) high temperature and low particle density
(B) temperature T approaching 0 K
(C) low temperature and high pressure
(D) low pressure

41. Which one of the following about black body radiation is **incorrect**?

(A) A black body emits radiation continuously over a range of wavelengths
(B) Emissivity is equal to absorptivity for a black body
(C) A perfect black body emitter is also a perfect absorber of radiation
(D) The wavelength at which maximum intensity of radiation occurs is directly proportional to temperature

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42. A body moves with a velocity $0.2c$. Then the ratio of the moving mass to rest mass will be

(A) 1.2
(B) 1.04
(C) 0.2
(D) 1

43. Light of frequency γ is incident on a certain photoelectric substance with threshold frequency γ_0. The work function of the substance is then

(A) $h\,\gamma$
(B) $h\,\gamma_o$
(C) $h\,\gamma - h\gamma_o$
(D) $h\,\gamma + h\gamma_o$

44. A particle moving in the $+X$ direction is represented by a wave function

(A) a sin $(kx - \omega t)$
(B) a cos $(kx - \omega t)$
(C) $a\ e^{i(kx-\omega t)}$
(D) $a\ e^{-i(kx-\omega t)}$

45. An eigen function of the operator $\frac{d^2}{dx^2}$ is $\psi = e^{2x}$. Then the corresponding eigen value is

(A) $2x$
(B) 2
(C) 4ψ
(D) 4

46. The momentum operator is represented by

(A) $\hat{P}_x = -\hbar \frac{d}{dx} P$

(B) $\hat{P}_x = -i\hbar \frac{d}{dx}$

(C) $\hat{P}_x = -i\hbar \frac{d}{dt}$

(D) $\hat{P}_x = -i \frac{d}{dx}$

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47. An electron has a momentum of 5.4×10^{-26} kg m/s with an accuracy of 0.05%. What is the minimum uncertainty in the location of the electron?

(A) 1.95×10^{-6} m

(B) 3.4×10^{-6} m

(C) 27×10^{-6} m

(D) 5.4×10^{-6} m

48. Frequency of any line in the characteristic X-ray spectrum is

(A) directly proportional to the atomic number of the target element
(B) directly proportional to the square root of the atomic number of the target element
(C) directly proportional to the square of the atomic number of the target element
(D) independent of the atomic number of the target element

49. The intensity of the X-rays produced by an X-ray tube is determined by

(A) the filament voltage
(B) potential difference between the cathode and anode
(C) size of the cathode
(D) filament current

50. Which one of the following elements are isobars?

(A) O_8^{16}, O_8^{17}

(B) C_8^{13}, N_7^{14}

(C) C_6^{14}, N_7^{14}

(D) H_1^1, H_1^2

51. Radius of the nucleus $_{13}Al^{27}$ is (assume the constant r_o as 1.3×10^{-15} m)

(A) 1.3×10^{-15} m

(B) 3.9×10^{-15} m

(C) 3.9×10^{-13} m

(D) 1.3×10^{-13} m

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52. If M is the atomic mass and A is the mass number, then the packing fraction f is defined as

(A) $M - A$

(B) $\frac{A}{M - A}$

(C) $\frac{M - A}{A}$

(D) $\frac{M + A}{A}$

53. Binding energy per nucleon is

(A) $c^2 \times$ packing fraction
(B) $c^2 \times$ mass defect
(C) mass defect $\times$ packing fraction
(D) $c^2 \times$ mass number

54. Among seven crystal systems, the most symmetric and least symmetric ones are

(A) Cubic and Monoclinic
(B) Tetragonal Triclinic
(C) Cubic and Triclinic
(D) Orthorhombic and Triclinic

55. If a, b and c are lattice parameters and α, β and γ are the angles between (a, b), (b, c) and (c,a), then for a tetragonal crystal system

(A) $a = b = c$ and $\alpha = \beta = \gamma = 90^o$
(B) $a = b \neq c$ and $\alpha = \beta = \gamma = 90^o$
(C) $a \neq b \neq c$ and $\alpha = \gamma = 90^o$
(D) $a \neq b \neq c$ and $\alpha \neq \beta \neq \gamma$

56. Which one of the following does **not** have a face centered cubic (fcc) structure?

(A) NaCl
(B) Diamond
(C) KCl
(D) $CuSO_4$

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57. The wavelength λ associated with a particle of mass m moving with a velocity v is given by

(A) $\lambda = \frac{h}{mv}$

(B) $\lambda = \frac{hv}{m}$

(C) $\lambda = \frac{m}{hv}$

(D) $\lambda = \frac{mv}{h}$

58. The reciprocal lattice of bcc lattice is

(A) bcc lattice itself
(B) hcp lattice
(C) fcc lattice
(D) simple cubic lattice

59. Which one of the following statements about Fermi level in **not** correct?

(A) Fermi level in *p*-type semiconductor is closer to valance band
(B) Fermi level in *n*-type semiconductor is closer to conduction band
(C) Fermi level in intrinsic semiconductor lies in the middle of the forbidden gap
(D) Fermi level in intrinsic semiconductor is dependent on temperature

60. When the potential difference applied to the forward bias *pn*-junction is increased, the width of the depletion region

(A) increases
(B) decreases
(C) remains unchanged
(D) increases only on the *p*-side of the junction

61. The quantity $\frac{kT}{q}$ (where k is the Boltzmann constant, T is the temperature and q is the electronic charge) has units of

(A) Energy
(B) Voltage
(C) Current
(D) Electron density

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62. Pick out the **incorrect** choice from the following.

(A) Zener diodes are more heavily doped than ordinary diodes
(B) Zener diodes have narrower depletion region than ordinary diodes
(C) Zener breakdown involves ionization by collision
(D) Zener diodes are designed to exhibit breakdown at low voltages (~ a few volts)

63. For an *npn* transistor to function as an amplifier

(A) E-B junction should be forward biased and C-B junction should be reverse biased
(B) E-B junction should be reverse biased and C-B junction should be forward biased
(C) Both E-B and C-B junctions should be forward biased
(D) Both E-B and C-B junctions should be reverse biased

64. The input signal given to a CE amplifier having a voltage gain of 150 is $V_i = 2\cos(15t + \frac{\pi}{3})$. The corresponding output signal will be

(A) $300\cos(15t + \frac{4\pi}{3})$

(B) $300\cos(15t + \frac{\pi}{3})$

(C) $75\cos(15t + \frac{2\pi}{3})$

(D) $2\cos(15t + \frac{5\pi}{6})$

65. In a two stage RC-coupled amplifier, the gain of first stage is 4 and the gain of second stage is 8. If 1 mV of input signal is given to the amplifier, the output of the entire amplifier will be

(A) 32 mV
(B) 12 mV
(C) 12 V
(D) 4 mV

66. If A_v is the voltage gain of an amplifier and β is the feedback factor, then the Barkhausen criterion for oscillator is

(A) $1 + A_v\beta = 0$
(B) $1 + A_v\beta = 1$
(C) $A_v\beta = 0$

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(D) $|A_v\beta| = 0$

67. If the input wave form of an op-amp differentiator circuit is a triangular wave, then the output waveform will be

(A) Sine wave
(B) Triangular wave
(C) Square wave
(D) Spike

68. An inverting op-amp has an input resistance of 100 KΩ and feedback resistance of 600 KΩ. If the input DC voltage is −1 V, then the output of the op-amp will be

(A) −6 V
(B) +7 V
(C) +8 V
(D) +6 V

69. The binary number 110 · 001 expressed in decimal number system is

(A) 6.3
(B) 6.125
(C) 6.001
(D) 0.625

70. If A and B are logic variables, which of the following identity is **not** true?

(A) $A \cdot \overline{A} = 0$
(B) $\overline{A + B} = \overline{A} + \overline{B}$
(C) $\overline{A \cdot B} = \overline{A} + \overline{B}$
(D) $A + \overline{A} = 1$

71. The output of a certain logic gate is represented by the Boolean expression $Y = \overline{A}B + A\overline{B}$. Then, the gate will be

(A) XOR gate
(B) XNOR gate
(C) NAND gate
(D) NOT gate

72. A half adder circuit has

(A) two inputs and one output
(B) one input and two outputs
(C) two inputs and two outputs
(D) one input and one output

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73. Consider heating a metal plate of finite length and height (x, y). The temperature of the metal plate at different points is given by $T(x, y) = 100 - 20y$. What is the rate of change of temperature along its height, for a unit length?

(A) 0
(B) 80
(C) –20
(D) 1

74. Which of the following is not an example for a vector field?

(A) Earth's magnetic field
(B) Earth's gravitational field
(C) Temperature data on Earth's surface
(D) Wind flow data on Earth's surface

75. The third derivative of the function $f = x^2 + x$, is

(A) $2x$
(B) 2
(C) 0
(D) x

76. A matrix M is non-singular, if

(A) $|M| = 0$
(B) $|M| \neq 0$
(C) $|M^{-1}| = 0$
(D) $|M^{-1}| \neq 0$

77. A jet engine works on the principle of conservation of

(A) Linear momentum
(B) Angular momentum
(C) Energy and Mass
(D) Mass

78. Angular momentum of a particle moving under the influence of a central force is

(A) Always infinity
(B) Always conserved
(C) Always zero
(D) Always infinity and conserved

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79. Which of the following is correct according to Kepler's second law?

(A) Radius vector from the sun to any planet sweeps equal area in equal time
(B) A planet moves faster at the point of its closest than that of its farthest approach to the sun
(C) Radius vector from the sun to any planet sweeps unequal area in equal time
(D) Both (A) and (B)

80. Consider two wires *X* and *Y*. The radius of wire *X* is 3 times the radius of *Y*. If they are stretched by the same load then the stress on *Y* is

(A) equal to that on *X*
(B) nine times that on *X*
(C) half that on *X*
(D) thrice that on *X*

81. Bernoulli's theorem is only applicable for

(A) Incompressible liquids
(B) Viscous liquids
(C) Non-viscous liquids
(D) Both (A) and (C)

82. Moment of inertia depends on

(A) Mass distribution about the axis of rotation
(B) Force
(C) Independent of mass distribution
(D) Density

83. Contraction in length of an object along its direction of motion is called

(A) Gauss contraction
(B) Lorentz-Fitzgerald contraction
(C) Proper- length
(D) Reference contraction

84. The Young's modulus for a perfect rigid body is

(A) constant
(B) 1
(C) 0
(D) Infinity

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85. The periodic time of a body moving in simple harmonic motion is

(A) Directly proportional to the momentum of swinging body
(B) Directly proportional to its angular velocity
(C) Inversely proportional to the angular velocity
(D) Directly proportional to the weight of the body

86. In the Simple Harmonic Motion, the velocity of a particle lags acceleration by

(A) 180°
(B) 90°
(C) 45°
(D) 30°

87. A Lissajous figure is used to measure

(A) Amplitude and Flux
(B) Frequency and Amplitude Distortion
(C) Voltage and Frequency
(D) Frequency and Phase shift

88. The oscillation in which the amplitude decreases steadily with time is known as

(A) Damped oscillations
(B) Forced oscillations
(C) Undamped oscillations
(D) Simple oscillations

89. What happens to the energy of a particle, in SHM, with time in the presence of damping forces?

(A) Stays constant
(B) Decreases linearly
(C) Decreases exponentially
(D) Decreases cubically

90. Which of the following variables has zero value at the extreme position in SHM?

(A) Acceleration
(B) Speed
(C) Displacement
(D) Angular frequency

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91. A source of sound moves towards an observer. What happens to the speed of sound in the medium?

(A) Increases
(B) Decreases
(C) Remains the same
(D) Depends on speed with which source moves

92. The product of the Geometric Length of the path light follows through the system, and the refractive index of the medium is known as

(A) Fermat path
(B) Ray path
(C) Optical path
(D) Optical path difference

93. Which of the following component is not used during the production of circularly polarized light?

(A) Half-wave plate
(B) Quarter-wave plate
(C) Light source
(D) Nicol prism

94. What is the SI unit of Resolving power?

(A) m^{-1}
(B) cm^{-1}
(C) s^{-1}
(D) no SI unit

95. Electric Field intensity is measured in

(A) Volts/meter
(B) Newton/meter
(C) Newton/ampere
(D) Amperes/meter

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96. According to the Poynting theorem, the energy flow per unit time out of any closed surface is

(A) Integral of *S* over the length of the surface
(B) Integral of *S* over the area of the surface
(C) Differential of *S* over the length of the surface
(D) Differential of *S* over the area of the surface

97. Kirchoff's Voltage Law is applied in

(A) Mesh analysis
(B) Nodal analysis
(C) Both mesh and nodal analysis
(D) Neither mesh nor nodal analysis

98. Kirchoff's Current Law is applied at

(A) Loop
(B) Node
(C) Both loop and node
(D) Neither loop nor node

99. Capacitance increases with

(A) increase in distance between the plates
(B) decrease in plate area
(C) decrease in distance between the plates
(D) increase in density of the material

100. Capacitors charge and discharge in …… manner.

(A) Linear
(B) Constant
(C) Square
(D) Exponential

101. What happens to the potential difference between the plates of a capacitor as the thickness of the dielectric slab increases?

(A) Increases
(B) Decreases
(C) Remains the same
(D) Becomes zero

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102. In an RLC series phasor, we start drawing the phasor from which quantity?

(A) Voltage
(B) Resistance
(C) Impedance
(D) Current

103. Two gases separated by an impermeable but movable partition are allowed to freely exchange energy. At equilibrium, the two sides will have the same

(A) pressure and temperature
(B) pressure and volume
(C) volume and temperature
(D) volume and energy

104. Consider two particles and two non-degenerate quantum levels 1 and 2. Level 1 always contains a particle. Hence, what is the probability that level 2 also contains a particle for each of the two cases:

(i) when the two particles are distinguishable and
(ii) when the two particles are bosons?

(A) (i) 1/ 2 and (ii) 1/3
(B) (i) 1/ 2 and (ii) 1 /2
(C) (i) 2 /3 and (ii) 1/ 2
(D) (i) 1 and (ii) 0

105. For a black body radiation in a cavity, photons are created and annihilated freely as a result of emission and absorption by the walls of the cavity. This is because

(A) the chemical potential of the photons is zero
(B) photons obey pauli exclusion principle
(C) photons are spin-1 particles
(D) the entropy of the photons is very large

106. For a gas under isothermal condition its pressure P varies with volume V as $P = KV^{-5/3}$. The bulk modules B is proportional to

(A) $V^{-1/2}$
(B) $V^{-2/3}$
(C) $V^{-3/5}$
(D) $V^{-5/3}$

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107. What is the order of the radius of an electron orbit in a hydrogen atom?

(A) 10^{-8} m
(B) 10^{-9} m
(C) 10^{-11} m
(D) 10^{-13} m

108. The orientation of atomic orbitals depends on their

(A) spin quantum number
(B) azimuthal quantum number
(C) principal quantum number
(D) magnetic quantum number

109. The important conclusion given by Millikan's experiment about the charge is

(A) charge is never quantized
(B) charge has no definite value
(C) charge is quantized
(D) charge on oil drop always increases

110. Which of the following crystal systems has the highest symmetry?

(A) Triclinic
(B) Monoclinic
(C) Cubic
(D) Orthorhombic

111. The coordination number of a face-centered cubic (FCC) crystal structure is

(A) 4
(B) 6
(C) 8
(D) 12

112. What is the primary charge carrier in an intrinsic semiconductor at room temperature?

(A) Electrons
(B) Holes
(C) Donor ions
(D) Acceptor ions

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113. What is the primary function of a single-stage amplifier?

(A) To increase the power of the input signal
(B) To amplify the voltage or current of the input signal
(C) To filter out noise from the input signal
(D) To convert the input signal from analog to digital

114. How many variables are typically involved in De Morgan's Theorem?

(A) One
(B) Two
(C) Three
(D) Four

115. The change in momentum is called

(A) Mass
(B) Speed
(C) Impulse
(D) Torque

116. The ***x*** – component of a force of 50 N is 40 N, then what will be the ***y*** – component of the same applied force?

(A) 20 N
(B) 30 N
(C) 40 N
(D) 50 N

117. A Uranium – 238 nucleus (^{238}U) transforms into Thorium – 234 nucleus (^{234}Th) by emitting

(A) Alpha particle
(B) Beta particle
(C) Positron
(D) Gamma ray

118. Nuclei are spherical or nearly spherical in shape having radius R given by (A is the mass number and R_0 is a constant)

(A) $R = R_0 A^{1/3}$

(B) $R = R_0 A^2$

(C) $R = R_0 A^{1/2}$

(D) $R = R_0 A$

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119. An alpha particle is same as that of a

(A) helium nucleus
(B) hydrogen nucleus
(C) proton
(D) positron

120. $^{4}_{2}\mathrm{He} + {}^{197}_{79}\mathrm{Au} \rightarrow {}^{197}_{79}\mathrm{Au} + {}^{4}_{2}\mathrm{He}$ is a good example of

(A) Disintegration
(B) Elastic scattering
(C) Inelastic scattering
(D) Photo disintegration

121. The cross section which defines a distribution of emitted particles with respect to the solid angle is called

(A) Differential cross section
(B) Scattering cross section
(C) Partial cross section
(D) Nuclear cross section

122. The particles which have intrinsic angular momentum equal to an integral multiple of $\hbar$

(A) Bosons
(B) Fermions
(C) Photons
(D) Graviton

123. According to Gay-Lussac law for a perfect gas, the absolute pressure of a gas varies directly as

(A) Temperature
(B) Volume, if temperature is kept constant
(C) Absolute temperature, if volume is kept constant
(D) Absolute volume

124. In which one of the following thermodynamic processes, there is no flow of heat between the system and the surroundings?

(A) Isobaric
(B) Adiabatic
(C) Isochoric
(D) Isothermal

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125. If temperature of the source is increased, the efficiency of Carnot engine

(A) decreases
(B) first increases and then remains constant
(C) remains constant
(D) increases

126. The latent heat of steam (vaporization of water) at atmospheric pressure is about

(A) 2257 kJ/kg
(B) 1535 kJ/Kg
(C) 1875 kJ/kg
(D) 2685 kJ/kg

127. A container with rigid walls is filled with a sample of ideal gas. The absolute temperature of the gas is doubled. What happens to the pressure of the gas?

(A) Triples
(B) Doubles
(C) Quadruples
(D) Decreased to one-half

128. The process of heat transfer by the movement of mass from one place to another is called

(A) Conduction
(B) Radiation
(C) Convection
(D) Induction

129. The product of moment of inertia and angular momentum is called

(A) Torque
(B) Work done
(C) Momentum
(D) Force

130. If T and V represent kinetic energy and potential energy respectively, then the Lagrangian function L is given by

(A) $T + V$
(B) TV
(C) $T - V$
(D) $V - T$

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131. A regulated DC power supply of 10 V would use ……. as a filter capacitor.

(A) Mica capacitor
(B) Electrolytic capacitor
(C) Air capacitor
(D) Paper capacitor

132. The typical barrier potential (V_0) for silicon is

(A) 0.3 V
(B) 0.5 V
(C) 0.7 V
(D) 0.1 V

133. The resistivity of pure germanium under standard conditions is about

(A) 6×10^4 Ω cm
(B) 60 Ω cm
(C) 3×10^6 Ω cm
(D) 6×10^{-4} Ω cm

134. A crystal diode has forward resistance of the order of

(A) kΩ
(B) Ω
(C) MΩ
(D) μΩ

135. A power gain of 1,000,000 is expressed decibels as

(A) 30 dB
(B) 60 dB
(C) 120 dB
(D) 600 dB

136. In an emitter follower, we employ…… negative current feedback

(A) 50%
(B) 25%
(C) 100%
(D) 75%

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137. Young's modulus of a perfect rigid body is

(A) Unity
(B) Negative
(C) Infinity
(D) Zero

138. According to Hooke's law of elasticity, within elastic limits, if the stress is increased, the ratio of stress to strain

(A) increases
(B) decreases
(C) becomes zero
(D) remains constant

139. Rain drops are spherical because of

(A) Viscosity
(B) Air resistance
(C) Surface tension forces
(D) Atmospheric pressure

140. If angular speed of a body becomes double, its rotational kinetic energy will become

(A) 2 times
(B) 4 times
(C) half
(D) 3 times

141. Total electric flux emanating from a charge q Coulomb placed in air is

(A) q/ε_0
(B) $\varepsilon_0 q$
(C) q
(D) $4\pi q$

142. The deviation of charge distribution of a nucleus from spherical symmetry can be estimated by measuring its

(A) Electric dipole moment
(B) Magnetic dipole moment
(C) Electric quadrupole moment
(D) Electric charge

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143. The internal resistance of an ideal current source is

(A) zero
(B) small but finite
(C) infinite
(D) large but finite

144. Four particles: electron, proton, He^+ and Li^+ are projected with the same velocity perpendicular to a given magnetic field. Then the circle described will be smallest for

(A) Electron
(B) Proton
(C) He^+
(D) Li^+

145. Which of the following materials requires least magnetizing field to magnetize it?

(A) Gold
(B) Silver
(C) Tungsten
(D) Cobalt

146. During the motion, if the centre of gravity of molecule changes, the molecule is executing

(A) Vibration
(B) Rotation
(C) Electronic motion
(D) Translation

147. Which one of the following phenomenon is the only event to prove that the light is made up of transverse waves?

(A) Polarisation
(B) Scattering of light
(C) Diffraction
(D) Interference

148. The scattering of a beam of light by colloidal particles is termed as

(A) Thomson effect
(B) Tyndall effect
(C) Raman effect
(D) Compton effect

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149. Focal length of a plane mirror is

(A) ∞
(B) 0
(C) -1
(D) 1

150. Which one of the following colour of white light is least deviated by the glass prism?

(A) Green colour
(B) Orange colour
(C) Violet colour
(D) Red colour

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ANSWER KEY

Subject Name: 613 PHYSICS

Sl No.	Key	Sl No.	Key	Sl No.	Key	Sl No.	Key	Sl No.	Key
1	B	31	B	61	B	91	C	121	A
2	D	32	B	62	C	92	C	122	A
3	B	33	A	63	A	93	A	123	C
4	B	34	D	64	A	94	D	124	B
5	C	35	D	65	A	95	A	125	D
6	C	36	C	66	A	96	B	126	A
7	D	37	D	67	C	97	A	127	B
8	A	38	A	68	D	98	B	128	C
9	A	39	D	69	B	99	C	129	A
10	A	40	A	70	B	100	D	130	C
11	D	41	D	71	A	101	B	131	B
12	A	42	B	72	C	102	D	132	C
13	B	43	C	73	C	103	A	133	B
14	A	44	C	74	C	104	C	134	B
15	B	45	D	75	C	105	A	135	B
16	C	46	B	76	B	106	D	136	C
17	C	47	A	77	A	107	C	137	C
18	C	48	C	78	B	108	D	138	D
19	D	49	D	79	D	109	C	139	C
20	C	50	C	80	B	110	C	140	B
21	B	51	B	81	D	111	D	141	A
22	D	52	C	82	A	112	B	142	C
23	C	53	A	83	B	113	B	143	C
24	A	54	C	84	D	114	B	144	A
25	B	55	B	85	C	115	C	145	D
26	B	56	D	86	B	116	B	146	D
27	B	57	A	87	D	117	A	147	A
28	C	58	C	88	A	118	A	148	B
29	D	59	D	89	C	119	A	149	A
30	A	60	B	90	B	120	B	150	D

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