No. of Pages. 20

Code No.	Y – 3075

Register Number :

Name :

Time : 2 Hours

Max.Marks : 100

Entrance Examination for Admission to Four Year Under Graduate Degree Programmes in the Teaching Departments, 2026

CSS

PHYSICS

GENERAL INSTRUCTIONS

1. The Question Paper is having 100 Objective Questions, each carrying one mark.
2. The answers are to be marked **only** in the "**OMR Sheet**" provided.
3. **Negative marking** : **0.25 marks** will be deducted for each wrong answer .

INSTRUCTIONS FOR FILLING THE OMR SHEET

- The OMR sheet should not be folded or crushed.
- Use only blue/black ball point pen to fill the circles.
- Use of pencil is strictly prohibited.
- Circles should be darkened completely and properly.
- Cutting and erasing on this sheet is not allowed.
- Do not leave any stray marks on the sheet.
- Do not use marker or white fluid to hide the mark.
- WRONG METHODS

CORRECT METHOD

DO NOT WRITE HERE

Choose appropriate answer from the options in the questions.

(100 × 1 = 100 marks)

1. Which of the following is a derived unit?
   A. metre
   B. kilogram
   C. second
   D. newton

2. The period, T of oscillation of a liquid drop depends on density p. surface tension S, radius r. T is proportional to,
   A. $\sqrt{\frac{\rho r^3}{S}}$
   B. $\sqrt{\frac{S}{\rho r^3}}$
   C. $\frac{pr^3}{S}$
   D. $\frac{S}{\rho r^3}$

3. The electric field of an electromagnetic wave in free space is given by, $E = E_0 \sin(kx - \omega t)$. Which of the following statement is correct?

A. The wave is longitudinal

B. The magnetic field is in the direction of propagation

C. The electric and magnetic fields are perpendicular to each other

D. The wave cannot propagate in vacuum

4. Which experiment confirmed the wave nature of electrons?

A. Rutherford scattering experiment

B. Davisson-Germer experiment

C. Young's double-slit experiment

D. Hertz photoelectric experiment

5. The concept of displacement current was introduced by Maxwell to :

A. Explain the origin of electric charge

B. Modify Gauss's law

C. Ensure continuity of current in circuits like a charging capacitor

D. Explain magnetic materials

6. In the photoelectric effect, the stopping potential. V_s is related to the frequency of incident light, f as (ϕ - work function) :

A. $V_s \propto f^2$

B. $V_s = \frac{hf - \phi}{e}$

C. $V_s \propto \sqrt{f}$

D. $V_s = hf + \phi$

7. The minimum frequency of light required to eject electrons from a metal surface is called :

A. Threshold frequency

B. Cut-off frequency

C. Work function

D. Photon energy

8. The de Broglie wavelength of a particle decreases when :

A. Its speed decreases

B. Its momentum increases

C. Its mass decreases

D. Its energy remains constant

9. The half-life of a radioactive isotope is 10 hours. If the initial number of nuclei is 1×10^{20}, how many nuclei remain after 30 hours?

A. 1.25×10^{19} B. 1.0×10^{19}

C. 5×10^{19} D. 2.5×10^{19}

10. In the Davisson-Germer experiment, electrons were diffracted by a crystal. If the accelerating voltage is doubled, the de Broglie wavelength of the electrons :

A. Doubles

B. Halves

C. Becomes $\frac{1}{\sqrt{2}}$ times the original magnitude

D. Remains unchanged

11. The first ionization energy of hydrogen is 13.6 eV. What is the wavelength of light required to ionize hydrogen from the first orbit?

A. 91.2 nm B. 121.6 nm

C. 102 nm D. 100 nm

12. In the photoelectric effect, the maximum kinetic energy of the photoelectrons is K_{max} when the frequency light is f. What will happen to the maximum kinetic energy if the frequency is increased by a factor of 2?

A. Doubles B. Becomes four times

C. Increases by *hf* D. Remains the same

13. An electron in a hydrogen atom makes a transition from n = 3 to n = 2, What is the energy of the emitted photon? (Take R_H = 13.6eV)

A. 1.89 eV B. 2.55 eV

C. 10.2 eV D. 12.1 eV

14. A sample contains 3×10^{24} radioactive nuclei with decay constant $\lambda = 0.01\,s^{-1}$. What is the initial activity of the sample?

A. $3\times10^{22}\,s^{-1}$ B. $3\times10^{24}\,s^{-1}$

C. $3\times10^{20}\,s^{-1}$ D. $3\times10^{25}\,s^{-1}$

15. In an adiabatic process for an ideal gas, which of the following is true?

A. $\Delta U = 0$ B. $Q = 0$

C. $W = 0$ D. $Q = W = 0$

16. The mass defect of a nucleus is 0.025 u. What is the corresponding binding energy?

(1 u = 931 MeV)

A. 23.3 MeV B. 25 MeV

C. 27 MeV D. 20 MeV

17. A monatomic ideal gas is compressed adiabatically from volume V_1 to V_2. If the initial pressure is P_1, what is the final pressure P_2? Given, $\gamma = \frac{C_p}{C_v}$ for a monatomic ideal gas.

A. $P_2 = P_1\left(\frac{V_1}{V_2}\right)$ B. $P_2 = P_1\left(\frac{V_1}{V_2}\right)^{\gamma}$

C. $P_2 = P_1\left(\frac{V_2}{V_1}\right)^{\gamma}$ D. $P_2 = P_1\left(\frac{V_2}{V_1}\right)$

18. A diode has a forward voltage drop of 0.7 V and is connected in series with a 1 $k\Omega$ resistor to a 5 V battery. What is the current through the diode?

A. 4.3 mA B. 5 mA

C. 0.7 mA D. 3.3 mA

19. A student connects both inputs of a two-input NAND gate to the same signal A. What will be the output of the circuit?

A. A B. Á

C. Always 1 D. Always 0

20. A solar cell generates 0.5 A at 0.6 V. What is the power delivered to the load?

A. 0.3 W B. 0.6 W

C. 1.2 W D. 0.5 W

21. A transistor in common-emitter configuration has β=100. If the base current is 20 μA, what is the collector current?

A. 2 mA
B. 20 mA
C. 200 μA
D. 1 mA

22. In A p-n junction diode is initially in equilibrium. It is then subjected to different biasing conditions. In which case will the electric field inside the depletion region increase while the width of the depletion region also increases?

A. Forward bias with small applied voltage
B. Forward bias with large applied voltage
C. Reverse bias with increasing applied voltage
D. Zero bias but increasing temperature

23. The binding energy of a nucleus is 2.24 MeV per nucleon. The mass number is 4. What is the total binding energy?

A. 8.96 MeV
B. 4.48 MeV
C. 2.24 MeV
D. 6.72 MeV

24. A photodiode is operated in reverse bias and exposed to light of increasing intensity. What change is observed in the circuit?

A. The current decreases as light intensity increases
B. The current increases as light intensity increases
C. The voltage across the photodiode becomes zero
D. The resistance of the photodiode becomes infinite

25. The first law of thermodynamics is a statement of:

A. Conservation of momentum
B. Conservation of energy
C. Conservation of mass
D. Entropy increase

26. The efficiency of a Carnot engine operating between temperatures T_h and T_c is (T_h - temperature at hot reservoir: T_c - temperature at cold reservoir):

A. $1-\frac{T_c}{T_h}$
B. $\frac{T_h}{T_c}$
C. $\frac{T_c}{T_h}$
D. $1-\frac{T_h}{T_c}$

27. A monatomic ideal gas undergoes an adiabatic expansion and the temperature drops from 500 K to 300K. If the initial volume is V_1, what is the ratio of final to initial volume V_2/V_1? (Take γ = 5/3)

A. 1.50 B. 1.8

C. 2.1 D. 2.5

28. Kepler's third law states that for planets orbiting the Sun :

A. $T \propto r$ B. $T^2 \propto ^3$

C. $T^2 \propto r$ D. $T^3 \propto r^2$

29. The displacement of a particle in simple harmonic motion is given by $x(t) = 0.1 \sin(20t)$ meters. What is the period of oscillation?

A. 0.2 s B. 0.1 s

C. 0.628 s D. 0.314 s

30. A particle undergoes simple harmonic motion with amplitude 0.1 m and angular frequency 10 rad/s. What is the maximum speed of the particle?

A. 1 m/s B. 0.5 m/s

C. 2 m/s D. 10 m/s

31. A stationary observer hears the sound of a siren from an approaching ambulance and then as it moves away. How does the observed frequency change during this motion?

A. The frequency remains constant throughout

B. The frequency is lower when approaching and higher when moving away

C. The frequency is higher when approaching and lower when moving away

D. The frequency depends only on the loudness of the siren

32. A string of length 1 m is fixed at both ends. The speed of a transverse wave on the string is 200 m/s. What is the fundamental frequency of the string?

A. 50 Hz B. 100 Hz

C. 200 Hz D. 400 Hz

33. Two waves of slightly different frequencies interfere to produce beats. If the beat frequency is 5 Hz and one wave has a frequency of 250 Hz, the frequency of the second wave is :

A. 245 Hz B. 255 Hz

C. 245 or 255 Hz D. 250 Hz

34. A sound wave of wavelength 0.68 m is traveling in air at 340 m/s. Two speakers emit this wave in phase. What is the distance between points of maximum constructive interference?

A. 0.34 m
B. 0.68 m
C. 1.36 m
D. 0.17 m

35. A satellite is orbiting the Earth in a circular orbit at a height equal to the radius of the Earth. The acceleration due to gravity at this height is :

A. $g/2$
B. g
C. g/8
D. $g/4$

36. The escape velocity from the surface of the Earth is v_e. If the radius of the Earth were doubled while keeping mass constant, the new escape velocity would be :

A. v_e
B. $\sqrt{2}v_e$
C. $\frac{v_e}{\sqrt{2}}$
D. $\frac{v_e}{2}$

37. The acceleration due to gravity gat a height h above the Earth's surface is given by :

A. $g_h = g\left(1+\frac{h}{R}\right)$
B. $g_h = g\left(1-\frac{h}{R}\right)$
C. $g_h = g\left(\frac{R}{R+h}\right)^2$
D. $g_h = g\left(\frac{R+h}{R}\right)^2$

38. The ratio of lateral strain to longitudinal strain in a stretched wire is called :

A. Bulk modulus
B. Young's modulus
C. Shear modulus
D. Poisson's ratio

39. A metal wire of length 2 m and cross-sectional area 1 mm^2 is stretched by a force of 200 N. Its extension is 0.2 mm. What is the Young's modulus?

A. 1×10^{11}Pa
B. 1×10^{10}Pa
C. 2×10^{11}Pa
D. 2×10^{12}Pa

40. According to Pascal's law, the pressure applied on a confined fluid is :
    A. Unequally transmitted in all directions
    B. Equally transmitted in all directions
    C. Transmitted only in the direction of the force
    D. Zero

41. The critical velocity for a fluid in a pipe is related to :
    A. Reynolds number
    B. Bernoulli's principle
    C. Surface tension
    D. Viscosity only

42. A liquid drop of radius 1 mm has a surface tension of 0.07 N/m. What is the excess pressure inside the drop?
    A. 0.07 Pa
    B. 0.14 Pa
    C. 140 Pa
    D. 70 Pa

43. A sphere of radius r falls in a viscous fluid with terminal velocity v_t. If the radius is doubled, what happens to the terminal velocity?
    A. It remains the same
    B. Doubles
    C. Quadruples
    D. Increases 8 times

44. A force F acts at a, point which is at a distance r from the axis, the resulting torque τ is given by :
    A. $\tau = F$ralways
    B. $\tau = F\,r\sin\theta$
    C. $\tau = \frac{F}{r}$
    D. $\tau = \frac{r}{F}$

45. The moment of inertia of a uniform thin rod about its center is :
    A. $\frac{1}{12}ML^2$
    B. $\frac{1}{3}ML^2$
    C. $\frac{1}{2}ML^2$
    D. ML^2

46. A system of two particles of masses m_1 and m_2 are separated by a distance d. The center of mass is located at a distance x from m_1. What is x?
    A. $x = \frac{m_1 d}{m_1 + m_2}$
    B. $x = \frac{m_2 d}{m_1 + m_2}$
    C. $x = \frac{d}{2}$
    D. $x = \frac{m_1 - m_2}{m_1 + m_2} d$

47. The centre of mass of a uniform rod of length L is located at :

A. One end of the rod

B. $\frac{L}{4}$ from one end

C. Midpoint of the rod

D. $\frac{3L}{4}$ from one end

48. A uniform disc of mass M and radius R rotates about an axis through its center perpendicular to the plane. Its moment of inertia is :

A. $\frac{1}{2}MR^2$

B. $\frac{1}{4}MR^2$

C. $\frac{1}{3}MR^2$

D. MR^2

49. A rigid body rotates about a fixed axis with angular acceleration α. The angular momentum L is related to torque τ by :

A. $\tau = L$

B. $\tau = I\alpha$

C. $\tau = \frac{L}{I}$

D. $\tau = I\omega^2$

50. If no external force acts on a system of particles, the velocity of the center of mass :

A. Increases

B. Decreases

C. Remains constant

D. Oscillates

51. Three capacitors of capacitances 2 μF, 3 μF and 6 μF are connected in series. The equivalent capacitance is:

A. 1 μF

B. 2 μF

C. 6 μF

D. 11 μF

52. Two identical charges are placed at a distance r, exerting force F. If each charge is doubled and the distance is halved, the new force becomes :

A. 4 F

B. 8 F

C. 16 F

D. 32 F

53. A charge +q is placed at the center of a cube. The electric flux through one face of the cube is :

A. $\frac{q}{\varepsilon_0}$ B. $\frac{q}{3\varepsilon_0}$

C. $\frac{q}{6\varepsilon_0}$ D. Zero

54. The work done in moving a charge around a closed path in an electrostatic field is :

A. Positive B. Negative

C. Infinite D. Zero

55. The electric field at a point on the axial line of an electric dipole at large distance r varies as :

A. $\frac{1}{r}$ B. $\frac{1}{r^2}$

C. $\frac{1}{r^3}$ D. $\frac{1}{r^4}$

56. Two point charges +q and -q are separated by distance 2a. At the midpoint between them, electric potential is :

A. Zero B. Maximum

C. Minimum D. Infinite

57. A dielectric slab is inserted completely between the plates of a charged isolated capacitor. Then :

A. Capacitance decreases

B. Charge increases

C. Potential difference decreases

D. Stored energy increases

58. The initial potential of an isolated spherical conductor is V (taking potential zero at infinity). If its radius is doubled while charge remains constant, the new potential is :

A. 2 V B. $\frac{V}{2}$

C. 4 V D. Remains as V

59. A wire of resistance R is stretched to double its original length without change in volume. The new resistance becomes :

A. R
B. 2 R
C. 8 R
D. 4 R

60. The drift velocity of electrons in a conductor increases when :

A. Temperature increases only
B. Potential difference across conductor increases
C. Length of conductor increases only
D. Cross-sectional area increases only

61. In a balanced Wheatstone bridge, the ratio arms are 2Ω and 4Ω. If one known arm is 6Ω, the unknown resistance is :

A. 3Ω
B. 6Ω
C. 12Ω
D. 24Ω

62. A potentiometer wire is 10 m long and has a potential gradient of 0.2 V/m. The balancing length for a cell of emf 1.5 V is :

A. 5 m
B. 7.5 m
C. 10 m
D. Balance not possible

63. Two cells of emf E and internal resistance r are connected in parallel. The equivalent emf and internal resistance are :

A. E, r
B. $2E, \frac{r}{2}$
C. $E, \frac{r}{2}$
D. $2E, 2r$

64. Two resistors of 3Ω and 6Ω are connected in parallel across a battery The ratio of heat produced in them in equal time is :

A. 1 : 2
B. 2 : 1
C. 1 : 4
D. 4 : 1

65. A proton enters perpendicular to a uniform magnetic field with velocity v and moves in a circular path of radius r. If both velocity and magnetic field are doubled, the new radius becomes :

A. r
B. 2r
C. $\frac{r}{2}$
D. $4r$

66. A coil of 100 turns rotates with angular speed ω about an axis in its plane perpendicular to a uniform magnetic field. If angular speed is doubled, the maximum induced emf becomes :

A. Half
B. Same
C. Double
D. Four times

67. The self-inductance of a coil depends on :

A. Material of core
B. Number of turns
C. Geometry of coil
D. All of these

68. In an LCR series circuit at resonance, the phase difference between voltage and current is: :

A. 90°
B. 45°
C. 0°
D. 180°

69. Two long parallel conductors carry equal currents in opposite directions. They will :

A. Attract each other
B. Repel each other
C. Produce no force
D. Rotate about each other

70. The SI unit of magnetic flux is :

A. tesla
B. weber
C. henry
D. ohm

71. In a series LCR circuit connected to an AC source, the current is maximum when :

A. $X_L > X_C$
B. $X_L < X_C$
C. $X_L = X_C$
D. R = 0

72. An object is placed at a distance of 30 cm from a concave mirror of focal length 20 cm. The image is formed at :

A. 60 cm in front of mirror
B. 40 cm in front of mirror
C. 60 cm behind mirror
D. 40 cm behind mirror

73. A moving coil galvanometer can be converted into an ammeter by connecting :

A. High resistance in series
B. Low resistance in parallel
C. High resistance in parallel
D. Capacitor in series

74. According to Lenz's law, induced current always :

A. Increases magnetic flux
B. Opposes change causing it
C. Flows in clockwise direction
D. Becomes zero instantly

75. RMS value of AC current I_0 is :

A. I_0
B. $\frac{I_0}{2}$
C. $\frac{I_0}{\sqrt{2}}$
D. $\sqrt{2} I_0$

76. Transformer works on the principle of :

A. Self induction
B. Mutual induction
C. Magnetic attraction
D. Heating effect

77. A convex lens of focal length 20 cm is placed in contact with another convex lens of focal length 30 cm. The focal length of the combination is :

A. 10 cm
B. 12 cm
C. 24 cm
D. 50 cm

78. A person can read clearly only beyond 50 cm. The power of lens required to read a book at 25 cm is :

A. +2 D
B. –2 D
C. +4 D
D. –4 D

79. A ray of light passes from glass $(\mu = 1.5)$ to air. The critical angle is closest to :

A. 30° B. 42°

C. 48° D. 60°

80. A prism has retracting angle 60° and angle of minimum deviation 30°. The refractive index of the prism material is :

A. $\sqrt{2}$ B. $\sqrt{3}$

C. 1.61 D. 1.73

81. A microscope has objective focal length 1 cm and eyepiece focal length 5 cm. If tube length is 20 cm, the magnifying power for normal adjustment is :

A. 80 B. 100

C. 120 D. 140

82. A concave mirror forms a real image twice the size of the object on a screen. If focal length is 15 cm. the object distance is :

A. 22.5 cm B. 30 cm

C. 45 cm D. 60 cm

83. When a lens is immersed in a liquid having the same refractive index as the lens material, what happens to a beam of light falling on it :

A. Converges B. Diverges

C. No deviation D. Reflects

84. A student claims that the focal length of a lens is always constant. Which of the following situations would prove this statement incorrect?

A. Using the same lens in air and measuring focal length multiple times

B. Placing the same lens in water instead of air and measuring its focal length

C. Changing the position of the object while using the same lens in air

D. Using monochromatic light of a fixed wavelength

85. A body starts from rest with uniform acceleration of 2m/s. The distance travelled in 5 s is :

A. 10 m
B. 20 m
C. 25 m
D. 50 m

86. An object is placed at the centre of curvature of a concave mirror. The image formed will be :

A. Virtual, erect and magnified
B. Real, inverted and same size
C. Real, erect and diminished
D. Virtual, inverted and same size

87. The slope of a velocity-time graph represents :

A. Velocity
B. Displacement
C. Acceleration
D. Distance

88. Two vectors of magnitudes 3 and 4 units are perpendicular to each other. Their resultant magnitude is :

A. 1 unit
B. 5 units
C. 7 units
D. 12 units

89. A projectile is fired at an angle θ with speed u. Its horizontal range is maximum when θ is :

A. 30°
B. 45°
C. 60°
D. 90°

90. In uniform circular motion, the quantity that remains constant is :

A. Velocity
B. Acceleration
C. Speed
D. Displacement

91. A force of 20 N acts on a body of mass 5 kg initially at rest. The acceleration produced is :

A. 2 m/s^2
B. 4 m/s^2
C. 5 m/s^2
D. 10 m/s^2

92. The work done by a force on a body is zero when the angle between force and displacement is :

A. 0° B. 45°

C. 90° D. 180°

93. According to Newton's third law of motion, action and reaction forces :

A. Act on the same body in same direction

B. Act on different bodies in opposite directions

C. Act on same body in opposite directions

D. Are equal only when bodies are at rest

94. A block of mass 2 kg is placed on a horizontal surface. If the coefficient of friction is 0.3, the limiting friction is approximately ($g = 10\ m/s^2$) :

A. 3 N B. 6 N

C. 9 N D. 12 N

95. Two bullets are fired simultaneously, horizontally and with different speeds from the same place. Which bullet will hit the ground first?

A. The faster one

B. The slower one

C. Depends on mass

D. Both will reach simultaneously

96. During a cricket match, a bowler delivers a ball that swings in the air before reaching the batsman. Which of the following best explains the reason for the swing of the cricket ball?

A. The ball curves due to gravitational force acting sideways

B. Unequal air pressure on the two sides of the ball due to differences in airflow causes it to swing

C. The spin of the ball alone causes it to move in a curved path. independent of air

D. The mass of the ball changes during motion, causing deviation

97. In an elastic collision, the quantity conserved is :

A. Only momentum

B. Only kinetic energy

C. Both momentum and kinetic energy

D. Neither momentum nor kinetic energy

98. An airplane is able to lift off the ground due to the shape of its wings. According to Bernoulli's principle, what is the main reason for the upward lift force on the wing?

A. Air moving over the top surface of the wing has higher pressure than the air below

B. Air moving over the top surface of the wing has lower pressure than the air below

C. The weight of the airplane decreases as its speed increases

D. Gravity becomes weaker at higher speeds

99. A block attached to a horizontal spring oscillates on a frictionless surface. It is pulled to one side and released. As it moves back and forth, how do the kinetic energy and potential energy of the system change?

A. Kinetic energy is maximum at the extreme positions, while potential energy is zero there

B. Potential energy is maximum at the equilibrium position, while kinetic energy is zero there

C. Kinetic energy is maximum at the equilibrium position, while potential energy is maximum at the extreme positions

D. Both kinetic and potential energy remain constant throughout the motion

100. A stone is released from an elevator moving upward with an acceleration a. The acceleration of the stone after the release is :

A. a upward

B. (g – a) upward

C. (g – a) downward

D. g downward

ROUGH WORK

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