Series - D

Question Booklet No.

522040

COMMON ENTRANCE TEST - 2013
QUESTION BOOKLET
PHYSICS (Code - 01)

Maximum Time Allowed : 1½ hours
Negative Marking : 0.2

No. of Questions : 75
Maximum Marks : 75

Roll No. | | | | | | |

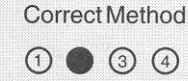
Answer Sheet No. | | | | | | |

INSTRUCTIONS

PLEASE READ THE FOLLOWING INSTRUCTIONS CAREFULLY

1. **Check the booklet thoroughly :** In case of any defect - Misprint, Missing Question(s) or duplication of question(s)/ Page(s) get the booklet changed with the booklet of the same series from the Room Invigilator. No complaint shall be entertained after the entrance test.
2. Write your Roll Number and Answer Sheet No. in the space provided on the Question Booklet and on the OMR Answer Sheet. Incomplete and/or incorrect particulars will result in the non-evaluation of your answer sheet.
3. Strictly follow the instructions given by Centre Supervisor / Room Invigilator and those given on the Question Booklet.
4. Candidates are not allowed to carry any papers, notes, books, calculators, mobile phones, scanning devices etc. in the Examination Hall. Any candidate found using or in possession of such unauthorized material or indulging in copying or impersonation or adopting unfair means / reporting late / without Admit Card will be debarred from the Written Test.
5. Use ONLY blue/black ball point pen for darkening the circles on the OMR Answer Sheet. Use of eraser, whitener (fluid) and cutting on the OMR Answer Sheet is not allowed.
6. The test is of objective type containing multiple choice questions (MCQs). Each objective question is followed by four responses. Choose the correct/best response and mark your response on the OMR Answer Sheet and not in the Question Booklet.
7. Completely darken the CIRCLE so that the number inside the CIRCLE is not visible as shown in the example below.

Correct Method



Wrong Methods

8. Darken ONLY ONE CIRCLE for each answer. If you darken more than one circle, it will be treated as a wrong answer.
9. Mark answer only in the space provided. DO NOT make any stray mark anywhere on the OMR Answer Sheet. DO NOT fold or wrinkle the OMR Answer Sheet. Rough work MUST NOT be done on the answer sheet. Use your question booklet for this purpose.
10. Candidates are provided carbonless OMR Answer Sheet (optical mark reader answer sheet) having original copy and candidate's copy. After completing the examination candidates are directed to fold at perforation at the top of sheet, tear it to separate original copy and candidate's copy and then hand over the original copy of OMR Answer Sheet to the Room Invigilator and take candidate's copy with them.

SEAL

DO NOT OPEN THE SEAL OF THIS BOOKLET UNTIL TOLD TO DO SO

1306/01

1. Unpolarized light falls on two polarizing sheets placed one on top of other. If the intensity of transmitted light is one fourth of the incident light, the angle between them is
   1. 35º 2. 40º
   3. 45º 4. 50º

2. The Brewster's law is given by the expression
   1. $\mu = \frac{\sin i}{\sin r}$ 2. $\mu = \tan\theta_p$
   3. $\mu = \cos\theta$ 4. $\mu = \sin\theta$

3. Einstein's photoelectic equation is
   1. $E_{max} = h\nu - \phi$
   2. $E = mc^2$
   3. $E^2 = p^2c^2 + m_0^2 c^4$
   4. $E = (\frac{1}{2})mv^2$

4. The Davisson-Germer experiment is the direct evidence of
   1. particle nature of electrons
   2. wave nature of electrons
   3. wave nature of light
   4. particle nature of light

5. The Rutherford scattering experiment proves that an atom consists of
   1. a sphere of positive charge in which electrons are embedded like seeds of water-melon
   2. a sphere of negative charge in which protons are embedded like seeds of water-melon
   3. a sphere of electron cloud in which the positive charge is placed at the centre of the sphere
   4. a sphere of neutral charge

6. According to Bohr model of hydrogen atom, only those orbits are permissible which satisfy the condition
   1. $mv = nh$
   2. $mv^2/r = n\,(h/2\pi)$
   3. $mvr = n\,(h/2\pi)$
   4. $mvr^2 = n\,(h/2\pi)$

7. The radioactive decay of thorium (A = 232, Z = 90) releases six alpha and four beta particles. The atomic number and mass number of the final product is
   1. Z = 80, A = 207
   2. Z = 82, A = 208
   3. Z = 92, A = 209
   4. Z = 90, A = 207

8. Polonium has a half-life of 140 days. If we take 20 g of polonium initially then the amount of it that remains after 280 days is
   1. 2.5 g 2. 5 g
   3. 10 g 4. 15 g

9. Based on the band theory of conductors, insulators and semi-conductors, the forbidden gap is smallest in
   1. conductors
   2. insulators
   3. semi-conductors
   4. all of these

10. Based on the I-V characterstics of the diode, we can classify diode as
    1. bi-directional device
    2. ohmic device
    3. non-ohmic device
    4. passive element

11. The Boolean expression for an XOR gate is
    1. Y = A+B 2. Y = A.B
    3. Y = AB–BA 4. Y = A⊕B

12. Which of the following logic gates are also known as the Universal gates ?
    1. AND, OR, NOT gate
    2. XOR, XNOR gate
    3. NAND, NOR gate
    4. All logic gates

13. The length of antenna (L) required to propagate a signal of wavelength λ is given as
    1. $L = \lambda/2$ 2. $L = 2\lambda$
    3. $L = \lambda/3$ 4. $L = \lambda/4$

14. The modulation is the process in which the
    1. modulating signal is sent by antenna in the air
    2. carrier signal is sent by the antenna in the air
    3. modulated signal formed by the mixing of modulating signal with the carrier signal is sent by the antenna
    4. modulated signal formed by the mixing of modulating signal with the carrier signal is received by a receiver antenna

15. The demodulator or detector circuit consists of a
    1. resistor 2. transistor
    3. diode 4. capacitor

16. Which of the following physical quantity unit is **not** a fundamental unit ?
    1. Length
    2. Mass
    3. Magnetic field
    4. Current

17. The dimensional formula of electric potential is
    1. $ML^2T^{-3}A^{-1}$
    2. $M^{-1}L^2T^{-2}A$
    3. $M^{-1}L^2T^{-2}A^{-1}$
    4. $ML^2T^{-2}A$

18. The motion of a particle in straight line is an example of
    1. constant velocity motion
    2. uniformly accelerated motion
    3. non-uniformly accelerated motion
    4. zero velocity motion

19. The velocity vector of the motion described by the position vector of a particle, $r = 2t\,i + t^2\,j$ is given by
    1. $V = 2i + 2t\,j$
    2. $V = 2t\,i + 2t\,j$
    3. $V = t\,i + t^2\,j$
    4. $V = 2\,i + t^2\,j$

20. The velocity-time graph of a particle comes out to be a non-linear curve. The motion is
    1. uniform velocity motion
    2. uniformly accelerated motion
    3. non-uniform accelerated motion
    4. nothing can be said about the motion

21. A projectile is thrown with initial velocity v_0 and angle 30º with the horizontal. If it remains in the air for 1 sec, what was its initial velocity ?
    1. 19.6 m/s
    2. 9.8 m/s
    3. 4.9 m/s
    4. 1 m/s

22. Newton's second law of motion is
    1. $F = dp/dt$
    2. $F = mv$
    3. $F = mv^2$
    4. $F = m^2v$

23. The centripetal force is given by the expression
    1. Mv^2/R
    2. M^2v/R
    3. Mv/R^2
    4. Mv/R

24. Uniform circular motion is an example of
    1. constant speed motion
    2. constant velocity motion
    3. non accelerated motion
    4. zero accelerated motion

25. The scalar product of two vectors $A = 2i + 2j - k$ and $B = -j + k$, is given by
    1. $A.B = 3$
    2. $A.B = 4$
    3. $A.B = -4$
    4. $A.B = -3$

26. The linear momentum is conserved in
    1. elastic collisions
    2. inelastic collisions
    3. both 1 and 2
    4. neither 1 nor 2

27. The power (P) of an engine lifting a mass of 100 kg upto a height of 10 m in 1min is
    1. P = 163.3 W
    2. P = 9800 W
    3. P = 10000 W
    4. P = 5000 W

28. The conservation of angular momentum demands that
    1. the external force on the system must be zero
    2. the external torque on the system must be zero
    3. both the external force as well as the external torque must be zero
    4. neither of them must be zero

29. The moment of inertia (I) and the angular momentum (L) are related by the expression
    1. $I = L\omega$
    2. $L = I\omega$
    3. $L = I^2\omega$
    4. $\omega = LI$

    where ω is the angular velocity

30. The moment of inertia (I) of a sphere of radius R and mass M is given by
    1. $I = MR^2$
    2. $I = (1/2)\,MR^2$
    3. $I = (4/3)\,MR^2$
    4. $I = (2/5)\,MR^2$

31. The universal law of gravitation is the force law known also as the
    1. triangular law
    2. square law
    3. inverse square law
    4. parallelogram law

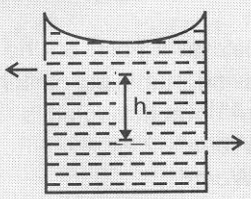
32. The value of acceleration due to gravity at the surface of earth
    1. is maximum at the poles
    2. is maximum at the equator
    3. remains constant everywhere on the surface of the earth
    4. is maximum at the international timeline

33. The escape velocity of a particle from the surface of the earth is given by
    1. $(gR)^{1/2}$
    2. $(2gR)^{1/2}$
    3. $(3gR)^{1/2}$
    4. $(gR/2)^2$

34. The young's modulus of a rope of 10 m length and having diameter of 2 cm is 20.0×10^{11} dyne/cm^2. If the elongation produced in the rope is 1 cm, the force applied on the rope is
1. 6.28×10^5 N
2. 6.28×10^4 N
3. 6.28×10^4 dyne
4. 6.28×10^5 dyne

35. "The pressure exerted at any point in an enclosed fluid is transmitted equally in all directions". This is known as
1. Archimedes' principle
2. Law of floatation
3. Pascal's law
4. Bernoulli's principle

36. There are two identical small holes on the opposite sides of a tank containing a liquid. The tank is open at the top. The difference in height between the two holes is h. As the liquid comes out of the two holes, the tank will experience a net horizontal force proportional to



1. $\sqrt{h}$
2. h
3. $h^{3/2}$
4. h^2

37. The zeroth law of thermodynamics for three systems A, B and C in contact demands that
1. A and B are in thermal equilibrium
2. B and C are in thermal equilibrium
3. A and C are in thermal equilibrium
4. A, B and C are in thermal equilibrium

38. The efficiency of a Carnot engine kept at the temperatures of 27º C and 127º C is
1. 20%
2. 25%
3. 30%
4. 40%

39. The average pressure of an ideal gas is
1. $P = (1/3)\, mnV_{av}^2$
2. $P = (1/2)\, mnV_{av}$
3. $P = (1/4)\, mnV_{av}^2$
4. $P = (1/3)\, mnV_{av}$

where symbols have their usual meanings

40. According to equipartition law of energy each particle in a system of particles have thermal energy E equal to
1. $E = K_B T$
2. $E = (1/2)\, K_B T$
3. $E = 3\, K_B T$
4. $E = (3/2)\, K_B T$

41. The velocity of sound in a gas is 1300 m/s at STP and specific heat at constant pressure is 6.84 cal $K^{-1}mol^{-1}$. The rms velocity at STP is ($R = 1.98$ cal K^{-} mol^{-1})
1. 1300 m/s
2. 2600 m/s
3. 1898 m/s
4. 650 m/s

42. The time period of a simple pendulum of length 9.8 m is
1. 0.159 sec
2. 3.14 sec
3. 6.5 sec
4. 6.28 sec

43. The displacement, velocity and acceleration in a simple harmonic motion are related as the
1. displacement, velocity and acceleration all act in the same direction
2. displacement and velocity act in the same direction, but acceleration in the opposite direction
3. velocity and acceleration are parallel and both are perpendicular to the displacement
4. displacement and acceleration are antiparallel and both perpendicular to the velocity

44. The beats are the examples of
1. simple harmonic motion
2. interference of two or more waves having same amplitude but slightly different frequencies in the same direction
3. interference of two or more waves having different amplitude but same frequencies in the same direction
4. interference of two or more waves having same amplitude but slightly different frequencies in the perpendicular direction

45. The fundamental frequency of an open pipe of length 1 m, if the speed of sound in air is 340 m/s is
1. 340 Hz
2. 170 Hz
3. 680 Hz
4. 85 Hz

46. A whistle with frequency 1020 Hz is blown at a station. A man travelling in a train moving towards the station at 30 m/s hears the sound of the whistle. If the speed of sound is 340 m/s, the apparent frequency heard by him is
1. 1020 Hz
2. 1110 Hz
3. 2040 Hz
4. 610 Hz

47. An electric charge **does not** have which of the following properties ?
1. Total charge conservation
2. Quantization of charge
3. Two type of charge
4. Circular line of force

48. The net electric force on a charge of +3μC at the mid-point on the line joining two charges of magnitude +2μC and -2μC separated by the distance of 6 mm, is
1. 6000 N
2. 500 N
3. 60 N
4. zero

49. A hollow sphere of radius 0.1 m has a charge of 5×10^{-8} C. The potential at a distance of 5 cm from the centre of the sphere is

$(\frac{1}{4\pi\varepsilon_0} = 9 \times 10^9 \text{ Nm}^2 \text{ C}^{-2})$

1. 4000 V
2. 4500 V
3. 5000 V
4. 6000 V

50. A parallel plate capacitor of capacitance 5 microfarad is charged to 120 V and then connected to another uncharged capacitor. If the potential falls to 40 V, the capacitance of the second capacitor is
1. 5 micro farad
2. 10 micro farad
3. 15 micro farad
4. 20 micro farad

51. Two identical capacitors are first connected in series and then in parallel. The ratio of equivalent capacitance is
1. 1 : 1
2. 1 : 2
3. 1 : 3
4. 1 : 4

52. An electron revolves in a circle at the rate of 10^{19} rounds per second. The equivalent current is ($e = 1.6 \times 10^{-19}$ C)
1. 1.0 A
2. 1.6 A
3. 2.0 A
4. 2.6 A

53. A silver wire of radius 0.1 cm carries a current of 2A. If the charge density in silver is 5.86×10^{28} m^{-3}, the drift velocity is
1. 0.2×10^{-3} m/s
2. 0.4×10^{-4} m/s
3. 0.68×10^{-4} m/s
4. 7×10^{-4} m/s

54. A 1 m long wire of diameter of 0.31 mm has a resistance of 4.2 ohms. If it is replaced by another wire of same material of length 1.5 m and diameter 0.155 mm, the resistance of wire is
1. 25.2 ohms
2. 0.6 ohms
3. 26.7 ohms
4. 0.8 ohms

55. 24 cells of emf 1.5 V each having internal resistance of 1 ohm are connected to an external resistance of 1.5 ohms. To get maximum current
1. all cells are connected in series combination
2. all cells are connected in parallel combination
3. 4 cells in each row are connected in series and 6 such rows are connected in parallel
4. 6 cells in each row are connected in series and 4 such are rows are connected in parallel

56. The temperature coefficient of the resistance of a wire is 0.00125 per ºC. At 300 K its resistance is 1 ohm. The resistance of wire will be 2 ohms at
1. 1154 K
2. 1100 K
3. 1400 K
4. 1127 K

57. A long straight wire is carrying a current of 12 A. The magnetic field at a distance of 8 cm is
($\mu_0 = 4\pi \times 10^{-7}$ N/A^2)
1. 2×10^{-4} Wb/m^2
2. 3×10^{-5} Wb/m^2
3. 4×10^{-4} Wb/m^2
4. 4×10^{-5} Wb/m^2

58. The magnetic field at a point on the axis of a long solenoid having 5 turns per cm length when a current of 0.8 A flows through it is
1. 5.024×10^{-8} Wb/m^2
2. 6.024×10^{-8} Wb/m^2
3. 7.024×10^{-8} Wb/m^2
4. 8.024×10^{-8} Wb/m^2

59. Two straight wires each 10 cm long are parallel to one another and separated by 2 cm. When the current flowing in them is 30 A and 40 A respectively, the force experienced by either of the wires is
1. 1.2×10^{-3} N
2. 12×10^{-3} N
3. 11.2×10^{-3} N
4. 10.2×10^{-3} N

60. The horizontal and vertical components of earth's magnetic field at a place are 0.3 G and 0.52 G. The earth's magnetic field and the angle of dip are
1. 0.3 G and $\delta = 30^\circ$
2. 0.4 G and $\delta = 40^\circ$
3. 0.5 G and $\delta = 50^\circ$
4. 0.6 G and $\delta = 60^\circ$

61. A bar magnet of pole strength 10 Am is cut into two equal parts breadthwise. The pole strength of each magnet is
1. 5 Am 2. 10 Am
3. 15 Am 4. 20 Am

62. A conductor of length 5 cm is moved parallel to itself with a speed of 2 m/s, perpendicular to a uniform magnetic field of 10^{-3} Wb/m^2. The induced e.m.f. generated is
1. 2×10^{-3} V 2. 1×10^{-3} V
3. 1×10^{-4} V 4. 2×10^{-4} V

63. The induced e.m.f. in a coil of 10 henery inductance in which current varies from 9 A to 4 A in 0.2 second is
1. 200 V 2. 250 V
3. 300 V 4. 350 V

64. The alternating current in a circuit is given by I = 50 sin 314t. The peak value and frequency of the current are
1. $I_0 = 25A$ and f = 100 Hz
2. $I_0 = 50A$ and f = 50 Hz
3. $I_0 = 50A$ and f = 100 Hz
4. $I_0 = 25A$ and f = 50 Hz

65. A 50 Hz a.c. signal is applied in a circuit of inductance of $(1/\pi)$ H and resistance 2100 ohm. The impedance offered by the circuit is
1. 1500 ohm 2. 1700 ohm
3. 2102 ohm 4. 2500 ohm

66. If the alternating current $I = I_1 \cos \omega t + I_2 \sin \omega t$ then the rms current is given by
1. $\frac{I_1 + I_2}{\sqrt{2}}$ 2. $\frac{|I_1 + I_2}{\sqrt{2}}$
3. $\sqrt{\left(\frac{I_1^2 + I_2^2}{2}\right)}$ 4. $\sqrt{\frac{I_1^2 + I_2^2}{\sqrt{2}}}$

67. The transverse nature of electromagnetic waves is proved by which of the following ?
1. Interference phenomena
2. Diffraction phenomena
3. Dispersion phenomena
4. Polarization phenomena

68. Which component of electromagnetic spectrum have maximum wavelength ?
1. Radio waves
2. Visible spectrum
3. Gamma rays
4. X-rays

69. An object is 8 cm high. It is desired to form a real image 4 cm high at 60 cm from the mirror. The type of mirror needed with the focal length is
1. convex mirror with focal length f = 40 cm
2. convex mirror with focal length f = 20 cm
3. concave mirror with focal length f = -40 cm
4. concave mirror with focal length f = -20 cm

70. When an object is placed 40 cm from a diverging lens, its virtual image is formed 20 cm from the lens. The focal length and power of lens are
1. F = - 20 cm P = - 5 D
2. F = - 40 cm P = - 5 D
3. F = - 40 cm P = - 2.5 D
4. F = - 20 cm P = - 2.5 D

71. A magnifying glass of focal length 5 cm is used to view an object by a person whose smallest distance of distinct vision is 25 cm. If he holds the glass close to eye, the magnification is
1. 5 2. 6
3. 2.5 4. 3

72. A person has a minimum distance of distinct vision as 50 cm. The power of lenses required to read a book at a distance of 25 cm is
1. 3D 2. 1D
3. 2D 4. 4D

73. If two slits in Young's experiment are 0.4 mm apart and fringe width on a screen 200 cm away is 2 mm the wavelength of light illuminating the slits is
1. 500 nm 2. 600 nm
3. 400 nm 4. 300 nm

74. A parallel beam of monochromatic light of wavelength 400 nm passes through a slit 0.4 mm wide and forms a diffraction pattern on a screen 1m away from the slit and parallel to it. The width of central bright band is
1. 0.24 cm 2. 0.20 cm
3. 0.30 cm 4. 0.40 cm

75. The distance of moon from the earth is 3.8×10^5 km. Supposing that the eye is most sensitive to the light of wavelength 550 nm, the separation of two points on the moon that can be resolved by a 500 cm telescope is
1. 50 m 2. 55 m
3. 51 m 4. 60 m