

**SECTION – I****(SINGLE CORRECT ANSWER TYPE)**

This section contains 20 multiple choice questions. Each question has 4 options (A), (B), (C) and (D) for its answer, out of which **ONLY ONE** option can be correct.

Marking scheme: +4 for correct answer, 0 if not attempted and -1 if not correct.

MATHEMATICS**Syllabus: Maths – A : Trigonometric Ratios, Maths – B : 2D – Coordinate system**

- $\log \sin 1^\circ \cdot \log \sin 2^\circ \cdot \log \sin 3^\circ \dots \dots \log \sin 179^\circ =$
 a) -1 b) 0 c) 1 d) 2
- $\frac{\cot \theta + \operatorname{cosec} \theta - 1}{\cot \theta - \operatorname{cosec} \theta + 1} =$
 a) $\frac{1 - \cos \theta}{\sin \theta}$ b) $\frac{\sin \theta}{1 + \cos \theta}$ c) $\frac{1 + \cos \theta}{\sin \theta}$ d) $\frac{1 - \sin \theta}{\cos \theta}$
- $\tan^2 \theta - \sin^2 \theta - \tan^2 \theta \sin^2 \theta =$
 a) -1 b) 0 c) 1 d) 2
- $\sqrt{1 - \sin^2 100^\circ} \cdot \sec 100^\circ =$
 a) -1 b) 0 c) 1 d) 2
- If $\cos \theta = \frac{3}{5}$ and θ is not in the first quadrant then $\frac{5 \tan(\pi + \theta) + 4 \cos(\pi + \theta)}{5 \sec(2\pi - \theta) - 4 \cot(2\pi + \theta)} =$
 a) $\frac{4}{5}$ b) $-\frac{4}{5}$ c) $\frac{5}{4}$ d) $-\frac{5}{4}$
- $3[\sin x - \cos x]^4 + 6[\sin x + \cos x]^2 + 4[\sin^6 x + \cos^6 x] =$
 a) 3 b) 6 c) 4 d) 13
- $\frac{\cos^3 A + \sin^3 A}{\cos A + \sin A} + \frac{\cos^3 A - \sin^3 A}{\cos A - \sin A} = K \Rightarrow K =$
 a) 0 b) 1 c) 2 d) -1
- If $\sqrt{\sin x + \cos x} = 0$ then $\sin x =$
 a) $\frac{\sqrt{5} + 1}{2}$ b) $\frac{\sqrt{5} - 1}{8}$ c) $\frac{\sqrt{5} - 1}{8}$ d) $\frac{\sqrt{5} - 1}{2}$
- If $x = r \cos \theta \cos \phi$, $y = r \cos \theta \sin \phi$, $z = r \sin \theta$ then $x^2 + y^2 + z^2 =$
 a) x^2 b) y^2 c) z^2 d) r^2
- If $\tan 20^\circ = K$ then $\frac{\tan 250^\circ + \tan 340^\circ}{\tan 200^\circ - \tan 110^\circ} =$
 a) $\frac{1 + K}{1 - K}$ b) $\frac{1 - K}{1 + K}$ c) $\frac{1 + K^2}{1 - K^2}$ d) $\frac{1 - K^2}{1 + K^2}$
- If $\frac{\pi}{2} < \alpha < \pi$, then the distance between the points $(\tan \alpha, 2)$, $(0, 1)$ is
 a) $\operatorname{cosec} \alpha$ b) $-\operatorname{cosec} \alpha$ c) $\sec \alpha$ d) $-\sec \alpha$
- If the centroid of the triangle formed by the points $(a, 1)$, (b, c^2) , $(-1, 4)$ lies on y – axis, then
 a) $a + b = 3$ b) $a + b = 1$ c) $a - b = 1$ d) $c^2 - 4 = 0$

13. The orthocenter of the triangle having vertices as (2, 3), (2, 5), (4, 3) is
 a) (0, 0) b) (4, 3) c) (2, 5) d) (2, 3)
14. The harmonic conjugate of (4, -2) with respect to (2, -4) and (7, 1) is
 a) (-8, -14) b) (2, 3) c) (-2, -3) d) (13, -5)
15. If Δ_1 is the area of the triangle formed by the centroid of two vertices of a triangle; Δ_2 is the area of the triangle formed by the middle points of the sides of the given triangle, then $\Delta_1 : \Delta_2 =$
 a) 3 : 4 b) 4 : 1 c) 4 : 3 d) 2 : 1
16. The in-centre of the triangle with vertices (0, 0), (1, 0), (0, 1) is
 a) $\left(\frac{2-\sqrt{2}}{2}, \frac{2-\sqrt{2}}{2}\right)$ b) $\left(\frac{2+\sqrt{2}}{2}, \frac{2+\sqrt{2}}{2}\right)$ c) $\left(\frac{\sqrt{2}-1}{2}, \frac{\sqrt{2}-1}{2}\right)$ d) $\left(\frac{1}{3}, \frac{1}{3}\right)$
17. If centroid and orthocenter of a triangle are (1, 2) and (9, -6), then circumcentre is
 a) (3, -6) b) (2, 4) c) (-3, 6) d) (2, -6)
18. If A = (6,3), B = (-3, 5), C = (4, -2) and P = (α, β) then the ratio of the areas of the triangles PBC, ABC is
 a) $|(\alpha + \beta)| : 7$ b) $|\alpha - \beta| : 7$ c) $|\alpha + \beta + 2| : 7$ d) $|\alpha + \beta - 2| : 7$
19. The circumcentre of the triangle formed by (2, -5), (2, 7), (4, 7) is
 a) (3, 1) b) (2, -9) c) (4, -1) d) (3/2, 5/2)
20. P and Q are two points on the line joining A(-2, 5), B(3, 1) such that $AP = PQ = QB$ then PQ is
 a) $\frac{\sqrt{13}}{2}$ b) $\frac{\sqrt{41}}{2}$ c) $\frac{\sqrt{41}}{3}$ d) $\frac{\sqrt{13}}{4}$

SECTION-II
(Numerical Value Answer Type)

This section contains 5 questions. The answer to each question is a Numerical values comprising of positive or negative decimal numbers.

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21. $\frac{\sin^2 \alpha}{1 + \cot^2 \alpha} + \frac{\tan^2 \alpha}{(1 + \tan^2 \alpha)^2} + \cos^2 \alpha = \dots\dots$
22. If $\sin(\alpha + \beta) = 1$, $\sin(\alpha - \beta) = \frac{1}{2}$ and α, β are acute then $\tan(\alpha + 2\beta)\tan(2\alpha + \beta) = \dots\dots$
23. If $A = (t^2, 2t)$ and $B = \left(\frac{1}{t^2}, \frac{-2}{t}\right)$ and S = (1,0). Then $\frac{1}{SA} + \frac{1}{SB} = \dots\dots\dots$
24. If (a, b) is equidistant from (6, -1) and (2, 3). Then the value of a - b is.....
25. The distance between the points (1, 1) and $\left(\frac{2t^2}{1+t^2}, \frac{(1-t)^2}{1+t^2}\right)$ is.....

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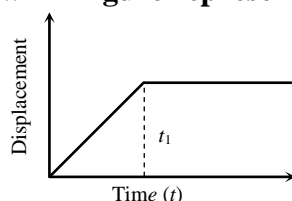
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PHYSICS**Syllabus: Motion in a straight line upto free falling bodies.**

26. A Body moves 6 m north. 8 m east and 10m vertically upwards, what is its resultant displacement from initial position

a) $10\sqrt{2}m$ (b) $10m$ c) $\frac{10}{\sqrt{2}}m$ d) $10 \times 2m$

27. The $x-t$ graph shown in figure represents



- a) Constant velocity
 b) Velocity of the body is continuously changing
 c) Instantaneous velocity
 d) The body travels with constant speed upto time t_1 and then stops
28. An athlete completes one round of a circular track of radius R in 40 sec. What will be his displacement at the end of 2 min. 20 sec
- a) Zero b) $2R$ c) $2\pi R$ d) $7\pi R$
29. A wheel of radius 1 meter rolls forward half a revolution on a horizontal ground. The magnitude of the displacement of the point of the wheel initially in contact with the ground is
- a) 2π b) $\sqrt{2}\pi$ c) $\sqrt{\pi^2 + 4}$ d) π
30. A person travels along a straight road for half the distance with velocity v_1 and the remaining half distance with velocity v_2 . The average velocity is given by
- a) $v_1 v_2$ b) $\frac{v_2^2}{v_1^2}$ c) $\frac{v_1 + v_2}{2}$ d) $\frac{2v_1 v_2}{v_1 + v_2}$
31. The displacement-time graph for two particles A and B are straight lines inclined at angles of 30° and 60° with the time axis. The ratio of velocities of $V_A : V_B$ is
- a) 1:2 b) $1:\sqrt{3}$ c) $\sqrt{3}:1$ d) 1:3
32. A car moves for half of its time at 80 km/h and for rest half of time at 40 km/h. Total distance covered is 60 km. What is the average speed of the car
- a) 60 km/h b) 80 km/h c) 120 km/h d) 180 km/h
33. Which of the following is a one dimensional motion
- a) Landing of an aircraft
 b) Earth revolving a round the sun
 c) Motion of wheels of a moving trains
 d) Train running on a straight track

34. A particle is constrained to move on a straight line path. It returns to the starting point after 10 sec. The total distance covered by the particle during this time is 30 m. Which of the following statements about the motion of the particle is false
- Displacement of the particle is zero
 - Average speed of the particle is 3 m/s
 - Displacement of the particle is 30 m
 - Both (a) and (b)

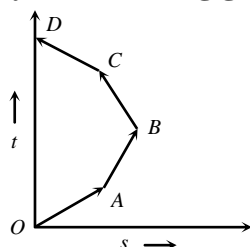
35. A particle moves along a semicircle of radius 10m in 5 seconds. The average velocity of the particle is

- $2\pi \text{ ms}^{-1}$
- $4\pi \text{ ms}^{-1}$
- 2 ms^{-1}
- 4 ms^{-1}

36. The ratio of the numerical values of the average velocity and average speed of a body is always

- Unity
- Unity or less
- Unity or more
- Less than unity

37. Which of the following options is correct for the object having a straight line motion represented by the following graph



- The object moves with constantly increasing velocity from O to A and then it moves with constant velocity.
- Velocity of the object increases uniformly
- Average velocity is zero
- The graph shown is impossible

38. The correct statement from the following is

- A body having zero velocity will not necessarily have zero acceleration
- A body having zero velocity will necessarily have zero acceleration
- A body having uniform speed can have only uniform acceleration
- A body having non-uniform velocity will have zero acceleration

39. The initial velocity of a body moving along a straight line is 7 m/s . It has a uniform acceleration of 4 m/s^2 . The distance covered by the body in the 5th second of its motion is

- 25 m
- 35 m
- 50 m
- 85 m

40. The velocity of a body depends on time according to the equation $v = 20 + 0.1t^2$. The body is undergoing

- Uniform acceleration
- Uniform retardation
- Non-uniform acceleration
- Zero acceleration

41. A particle moving with a uniform acceleration travels 24 m and 64 m in the first two consecutive intervals of 4 sec each. Its initial velocity is

- 1 m/sec
- 10 m/sec
- 5 m/sec
- 2 m/sec

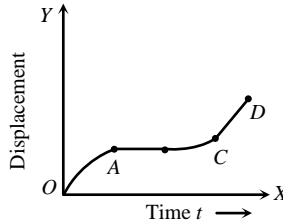
42. A body of mass 10 kg is moving with a constant velocity of 10 m/s. When a constant force acts for 4 seconds on it, it moves with a velocity 2 m/sec in the opposite direction. The acceleration produced in it is

- 3 m/sec^2
- -3 m/sec^2
- 0.3 m/sec^2
- -0.3 m/sec^2

43. A stone falls from a balloon that is descending at a uniform rate of 12 m/s . The displacement of the stone from the point of release after 10 sec is
 a) 490 m b) 510 m c) 610 m d) 725 m
44. Two bodies of different masses m_a and m_b are dropped from two different heights a and b . The ratio of the time taken by the two to cover these distances are
 a) $a:b$ b) $b:a$ c) $\sqrt{a}:\sqrt{b}$ d) $a^2:b^2$
45. The graph between the displacement x and time t for a particle moving in a straight line is shown in figure. During the interval OA, AB, BC and CD , the acceleration of the particle is

OA, AB, BC, CD

- a) + 0 + +
 b) - 0 + 0
 c) + 0 - +
 d) - 0 - 0



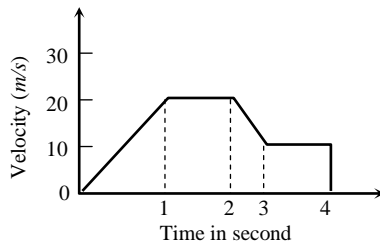
SECTION- II

(Numerical Value Answer Type)

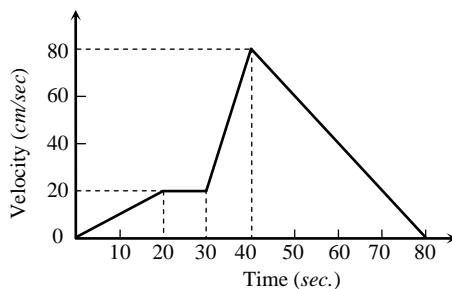
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46. The variation of velocity of a particle with time moving along a straight line is illustrated in the following figure. The distance travelled by the particle in four seconds is ----- in m



47. The velocity of a body moving with a uniform acceleration of 2 m./sec^2 is 10 m/sec . Its velocity after an interval of 4 sec is----- in m/s
48. A particle travels 10m in first 5 sec and 10m in next 3 sec . Assuming constant acceleration what is the distance travelled in next 2 sec ----- in m
49. The $v-t$ graph of a moving object is given in figure. The maximum acceleration is ----- in cm/s^2



50. An aeroplane flies 400 m north and 300 m south and then flies 1200 m upwards then net displacement is-----in m

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CHEMISTRY

Syllabus: Introduction, Specific charge, electromagnetic radiation, planks quantum theory, black body radiation upto photoelectric effect.

51. Moseley's equation is
 a) $E = hv$ b) $mvr = n \frac{h}{2\pi}$ c) $\Delta x \cdot \Delta p \geq \frac{h}{4\pi}$ d) $\sqrt{v} = a(z - b)$
52. The ratio of $\frac{e}{m}$ of proton and α -particle is
 a) 2 : 1 b) 1 : 2 c) 1 : 1 d) 1 : 3
53. An increasing order for values $\frac{e}{m}$ for electron (e), proton (p), neutron (n) and α -particle is
 a) e, p, n, α b) n, p, e, α c) n, p, α, e d) n, α, p, e
54. The metal best used in photoelectric cell's is
 a) Na b) Mg c) Al d) Cs
55. A certain particle carries $4.8 \times 10^{-19} C$ of static charge. The number of electrons present in it is
 a) 4 b) 1 c) 2 d) 3
56. The species which are isoelectronic with 'CO' is
 a) Cl^- b) OH^- c) CH_3^+ d) N_2
57. To provide 1.0 joule energy of light associated with wavelength 6000Å , the number of photons required are
 a) 3.0×10^{20} b) 3.0×10^{18} c) 2×10^{23} d) 3.0×10^{10}
58. The work function of metal is $4.2 eV$. To emit electron with kinetic energy of $3.2 \times 10^{-19} J$. The wavelength of radiation that should fall on metal surface is
 a) 6000Å b) 3000Å c) 2000Å d) 1500Å
59. Electro magnetic radiation of wavelength 242nm is just sufficient to ionize sodium atom. The ionization energy of sodium in KJ/Mole is
 a) 8.21×10^{-16} b) 4.94×10^2 c) 8.21×10^{-19} d) 4.94×10^{-2}
60. A photon has an energy of $5 \times 10^{-11} \text{erg}$. Its wavelength is
 a) 4Å b) 40Å c) 400Å d) 4000Å
61. Ionisation energy of gaseous Na atoms is 495.5KJ/mole . The lowest possible frequency of light that ionizes a sodium atom is ($h = 6.626 \times 10^{-34} \text{JS}$ $N_A = 6.022 \times 10^{23} \text{mol}^{-1}$)
 a) $7.50 \times 10^4 \text{s}^{-1}$ b) $4.76 \times 10^{14} \text{s}^{-1}$ c) $3.15 \times 10^{15} \text{sec}^{-1}$ d) $1.24 \times 10^{15} \text{s}^{-1}$
62. Calculate the number of protons, neutrons and electrons respectively in $({}_7N^{14})^{-3}$
 a) 7, 10, 7 b) 7, 7, 10 c) 10, 7, 7 d) 7, 7, 7
63. The electronic configuration of dispositive metal ion M^{+2} is 2, 8, 14. Its atomic weight is '56'. The number of neutrons in the nucleus is
 a) 30 b) 32 c) 34 d) 40
64. The value of $\frac{e}{M}$ for an electron is
 a) $1.78 \times 10^8 \text{c/g}$ b) $1.672 \times 10^{-24} \text{c/g}$ c) 0.00548c/g d) 1.00866c/g

65. The charge of one mole of an electrons is
 a) 1F b) 2F c) 3F d) 4F
66. Energy levels of A,B,C of a certain atom corresponds to increasing values of energy i.e. $E_A < E_B < E_C$. $\lambda_1, \lambda_2, \lambda_3$ are the wavelengths C to B, B to A, C to A respectively. Which of the following statement is correct
 a) $\lambda_3 = \lambda_1 + \lambda_2$ b) $\lambda_3 = \frac{\lambda_1 \lambda_2}{\lambda_1 + \lambda_2}$ c) $\lambda_1 = \lambda_2 + \lambda_3 = 0$ d) $\lambda_3^2 = \lambda_1^2 + \lambda_2^2$
67. A radiation of wavelength $3000A^0$ is required to remove an electron from a metal atom. If a radiation of wavelength $2000A^0$ is allowed to impinge on the metal surface, the kinetic energy of the emitted electron is KJ/Mole is
 a) 1.98×10^2 b) 3.3×10^{-19} c) 3.3×10^{-20} d) 19.8
68. The work function of a photo electric material is 3.3ev. It's threshold frequency will be
 a) $8 \times 10^{14} Hz$ b) $8 \times 10^{10} Hz$ c) $5 \times 10^{33} Hz$ d) $4 \times 10^{11} Hz$
69. The mass-charge ratio for A^+ ion is $1.97 \times 10^{-7} kg / c$. Calculate the mass of 'A' atom
 a) $3.16 \times 10^{26} kg$ b) $3.16 \times 10^{-26} g$ c) $3.16 \times 10^{-26} kg$ d) $3.16 \times 10^{-26} mg$
70. An element has 2 electrons in its k-shell , s-electrons in L-shell, 13-electrons in M-shell and one electron in N-shell. The element is
 a) Cr b) Fe c) Mn d) Ti

SECTION-II

(Numerical Value Answer Type)

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71. An oxide of nitrogen has molecular weight of 30. Total no.of electrons in one molecule of the compound is
72. In Cr^{+3} ($Z = 24$) the number of unpaired electrons is.....
73. The wavelength of light having wavenumber $4000cm^{-1}$ is
74. The number of neutrons in the dipositive zinc ion (mass no = 65)
75. The wavelength (in A^0) of a photon having energy '3eV' is approximately.....
 ($1ev = 1.602 \times 10^{-12} erg$)($h = 6.625 \times 10^{-27} erg.sec$).

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