SRIGAYATRI EDUCATIONAL INSTITUTIONS

INDIA

INCOMING JR MPC | **JEE MAINS MODEL WT-01** | **Date: 19-07-2020**

Time: 3 Hours | **Max. Marks: 300 M**

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

1. $\log\sin 1^0.\log\sin 2^0.\log\sin 3^0.....\log\sin 179^0 =$

a) -1 **b) 0** **c) 1** **d) 2**

2. $\dfrac{\cot\theta+\operatorname{cosec}\theta-1}{\cot\theta-\operatorname{cosec}\theta+1}=$

a) $\dfrac{1-\cos\theta}{\sin\theta}$ **b)** $\dfrac{\sin\theta}{1+\cos\theta}$ **c)** $\dfrac{1+\cos\theta}{\sin\theta}$ **d)** $\dfrac{1-\sin\theta}{\cos\theta}$

3. $\tan^2\theta-\sin^2\theta-\tan^2\theta\sin^2\theta=$

a) -1 **b) 0** **c) 1** **d) 2**

4. $\sqrt{1-\sin^2 100^0}.\sec 100^0 =$

a) -1 **b) 0** **c) 1** **d) 2**

5. **If** $\cos\theta=\dfrac{3}{5}$ *and* θ **is not in the first quadrant then** $\dfrac{5\tan(\pi+\theta)+4\cos(\pi+\theta)}{5\sec(2\pi-\theta)-4\cot(2\pi+\theta)}=$

a) $\dfrac{4}{5}$ **b)** $-\dfrac{4}{5}$ **c)** $\dfrac{5}{4}$ **d)** $-\dfrac{5}{4}$

6. $3\left[\sin x-\cos x\right]^4+6\left[\sin x+\cos x\right]^2+4\left[\sin^6 x+\cos^6 x\right]=$

a) 3 **b) 6** **c) 4** **d) 13**

7. $\dfrac{\cos^3 A+\sin^3 A}{\cos A+\sin A}+\dfrac{\cos^3 A-\sin^3 A}{\cos A-\sin A}=K\Rightarrow K=$

a) 0 **b) 1** **c) 2** **d) -1**

8. **If** $\sqrt{\sin x}+\cos x=0$ **then sinx =**

a) $\dfrac{\sqrt{5}+1}{2}$ **b)** $\dfrac{\sqrt{5}+1}{8}$ **c)** $\dfrac{\sqrt{5}-1}{8}$ **d)** $\dfrac{\sqrt{5}-1}{2}$

9. **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

10. **If** $Tan20^0=K$ **then** $\dfrac{tan250^0+\tan 340^0}{\tan 200^0-\tan 110^0}=$

a) $\dfrac{1+K}{1-K}$ **b)** $\dfrac{1-K}{1+K}$ **c)** $\dfrac{1+K^2}{1-K^2}$ **d)** $\dfrac{1-K^2}{1+K^2}$

11. **If** $\dfrac{\pi}{2}<\alpha<\pi$**, then the distance between the points** $(\tan\alpha,2)$**,** $(0,1)$ **is**

a) $\operatorname{cosec}\alpha$ **b)** $-\operatorname{cosec}\alpha$ **c)** $\sec\alpha$ **d)** $-\sec\alpha$

12. **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.

Marking scheme: +4 for correct answer, 0 in all other cases.

---

21. $\frac{\sin^2\alpha}{1+\cot^2\alpha}+\frac{\tan^2\alpha}{\left(1+\tan^2\alpha\right)^2}+\cos^2\alpha = ...$

22. **If** $\sin(\alpha+\beta)=1$, $\sin(\alpha-\beta)=\frac{1}{2}$ **and** α,β **are acute then** $\tan(\alpha+2\beta)\tan(2\alpha+\beta) = ...$

23. **If** $A=(t^2,2t)$ **and** $B=\left(\frac{1}{t^2},\frac{-2}{t}\right)$ **and S = (1,0). Then** $\frac{1}{SA}+\frac{1}{SB}=$ **…….**

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……..**

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.

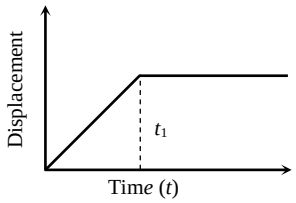
PHYSICS

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

26. **A Body moves 6 *m* north. 8 *m* east and 10*m* 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) 2*R*** **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_1v_2 **b)** $\frac{v_2^2}{v_1^2}$ **c)** $\frac{v_1+v_2}{2}$ **d)** $\frac{2v_1v_2}{v_1+v_2}$

31. **The displacement-time graph for two particles *A* and *B* are straight lines inclined at angles of 30^o and 60^o 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**

a) Displacement of the particle is zero

b) Average speed of the particle is 3 *m/s*

c) Displacement of the particle is 30 *m*

d) Both (a) and (b)

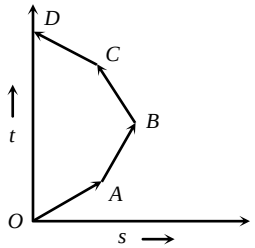
35. **A particle moves along a semicircle of radius 10*m* in 5 seconds. The average velocity of the particle is**

a) $2\pi\ ms^{-1}$ **b)** $4\pi\ ms^{-1}$ **c)** $2\ ms^{-1}$ **d)** $4\ ms^{-1}$

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

a) Unity **b) Unity or less** **c) Unity or more** **d) Less than unity**

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



a) The object moves with constantly increasing velocity from *O* to A and then it moves with constant velocity.

b) Velocity of the object increases uniformly

c) Average velocity is zero

d) The graph shown is impossible

38. **The correct statement from the following is**

a) A body having zero velocity will not necessarily have zero acceleration

b) A body having zero velocity will necessarily have zero acceleration

c) A body having uniform speed can have only uniform acceleration

d) 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 5^{th} second of its motion is**

a) 25 *m* **b) 35 *m*** **c) 50 *m*** **d) 85 *m***

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

a) Uniform acceleration **b) Uniform retardation**

c) Non-uniform acceleration **d) 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**

a) 1 *m/sec* **b)** $10\,m/\sec$ **c) 5 *m/sec*** **d) 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**

a) $3m/\sec^2$ **b)** $-3m/\sec^2$ **c)** $0.3m/\sec^2$ **d)** $-0.3m/\sec^2$

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**

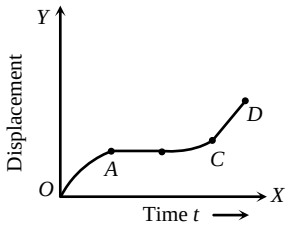
a) $490\ m$ **b)** $510\ m$ **c)** $610\ m$ **d)** $725\ m$

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

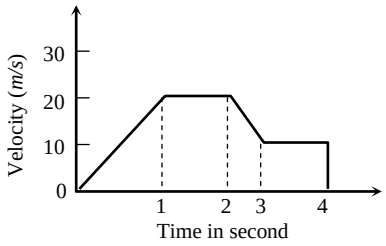


SECTION- II
(Numerical Value Answer Type)

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

Marking scheme: +4 for correct answer, 0 in all other cases.

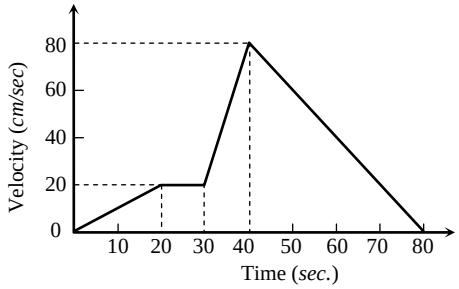
46. **The variation of velocity of a particle with time moving along a straight line is illustrated in the following figure. The distance travelled by the particle in four seconds is ----- in m**



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 10*m* in first 5 *sec* and 10*m* 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/s2**



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

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.

CHEMISTRY

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

51. Moseley's equation is

a) $E = h\nu$ **b)** $mvr = n\frac{h}{2\pi}$ **c)** $\Delta x.\Delta p \geq \frac{h}{4\pi}$ **d)** $\sqrt{\nu} = a(z-b)$

52. The ratio of $\frac{e}{m}$ of proton and $\alpha-$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 $4.8\times10^{-19}C$ 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 $6000A^0$, 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 $4.2eV$. To emit electron with kinetic energy of $3.2\times10^{-19}J$. The wavelength of radiation that should fall on metal surface is

a) $6000A^0$ **b)** $3000A^0$ **c)** $2000A^0$ **d)** $1500A^0$

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 $5\times10^{-11}erg$. Its wavelength is

a) $4A^0$ **b)** $40A^0$ **c)** $400A^0$ **d)** $4000A^0$

61. Ionisation energy of gaseous Na atoms is $495.5KJ/mole$. The lowest possible frequency of light that ionizes a sodium atom is ($h = 6.626\times10^{-34}JS$ $N_A = 6.022\times10^{23}mol^{-1}$)

a) $7.50\times10^{4}s^{-1}$ **b)** $4.76\times10^{14}s^{-1}$ **c)** $3.15\times10^{15}\sec^{-1}$ **d)** $1.24\times10^{15}\,s^{-1}$

62. Calculate the number of protons, neutrons and electrons respectively in $\left({}_7N^{14}\right)^{-3}$

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) $1.78\times10^{8}c/g$ **b)** $1.672\times10^{-24}c/g$ **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) $8\times10^{14}\,Hz$ **b)** $8\times10^{10}\,Hz$ **c)** $5\times10^{33}\,Hz$ **d)** $4\times10^{11}\,Hz$

69. The mass-charge ratio for A^+ ion is $1.97\times10^{-7}\,kg/c$. Calculate the mass of 'A' atom
a) $3.16\times10^{26}\,kg$ **b)** $3.16\times10^{-26}\,g$ **c)** $3.16\times10^{-26}\,kg$ **d)** $3.16\times10^{-26}\,mg$

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)

This section contains 5 questions. The answer to each question is a Numerical values comprising of positive or negative decimal numbers.
Marking scheme: +4 for correct answer, 0 in all other cases.

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 $4000\,cm^{-1}$ 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……..
$(1ev = 1.602\times10^{-12}\,erg)(h = 6.625\times10^{-27}\,erg.\sec)$.

SRIGAYATRI EDUCATIONAL INSTITUTIONS

INDIA

INCOMING JR MPC | **JEE MAINS MODEL WT-01** | **Date: 19-07-2020**

Time: 3 Hours | **Max. Marks: 300 M**

KEY SHEET

MATHEMATICS

1) **B**	2) **C**	3) **B**	4) **A**	5) **B**	6) **D**	7) **C**	8) **D**	9) **D**	10) **D**
11) **D**	12) **B**	13) **D**	14) **A**	15) **C**	16) **A**	17) **C**	18) **D**	19) **A**	20) **C**
21) **1**	22) **1**	23) **1**	24) **3**	25) **1**					

PHYSICS

26) **A**	27) **D**	28) **B**	29) **C**	30) **D**	31) **D**	32) **A**	33) **D**	34) **C**	35) **D**
36) **B**	37) **C**	38) **A**	39) **A**	40) **C**	41) **A**	42) **B**	43) **C**	44) **C**	45) **B**
46) **55**	47) **18**	48) **28.3**	49) **6**	50) **1200**					

CHEMISTRY

51) **D**	52) **A**	53) **D**	54) **D**	55) **D**	56) **D**	57) **B**	58) **C**	59) **B**	60) **C**
61) **D**	62) **B**	63) **A**	64) **A**	65) **A**	66) **B**	67) **A**	68) **A**	69) **C**	70) **A**
71) **15**	72) **03**	73) **2.5**	74) **35**	75) **4141**					

HINTS & SOLUTIONS

MATHEMATICS

1. in the middle of the series
$\log\sin 90^0 = \log 1 = 0$
$\therefore$ total product = 0

2. $\dfrac{\cot\theta + \operatorname{cosec}\theta - (\operatorname{cosec}^2\theta - \cot^2\theta)}{\cot\theta - \operatorname{cosec}\theta + 1}$
$= \dfrac{(\cot\theta + \operatorname{cosec}\theta) - (\operatorname{cosec}\theta + \cot\theta)(\operatorname{cosec}\theta - \cot\theta)}{\cot\theta - \operatorname{cosec}\theta + 1}$
$= \dfrac{(\cot\theta + \operatorname{cosec}\theta)\{1 - (\operatorname{cosec}\theta - \cot\theta)\}}{\cot\theta - \operatorname{cosec}\theta + 1}$
$= \operatorname{cosec}\theta + \cot\theta$
$= \dfrac{1+\cos\theta}{\sin\theta}$

3. put $\theta = 0^0$ (or)
$\tan^2\theta - \sin^2\theta = \dfrac{\sin^2\theta}{\cos^2\theta} - \sin^2\theta$
$= \sin^2\theta\left[\dfrac{1}{\cos^2\theta} - 1\right]$
$= \sin^2\theta\left(\sec^2\theta - 1\right)$

4. $\sqrt{1-\sin^2 100^0}.\sec 100^0$
$= \sqrt{\operatorname{cosec}^2 100^0}.\sec 100^0$
$= -\cos 100^0.\sec 100^0$
$\because 100^0 \in Q_2$
= -1

5. $\cos\theta = \dfrac{3}{5}(+ve)$, but $\theta \notin Q_1$
$\theta \in Q_4$
$\therefore \dfrac{5\tan\theta - 4\cos\theta}{5\sec\theta - 4\cot\theta} = \dfrac{5\left(\dfrac{-4}{3}\right) - 4\left(\dfrac{3}{5}\right)}{5\left(\dfrac{5}{3}\right) - 4\left(-\dfrac{3}{4}\right)} = -\dfrac{4}{5}$

6. put x = 0^0
$3[0-1]^4 + 6[0+1]^2 + 4[0+1] = 3+6+4 = 13$

7. put A = 0^0
$\dfrac{1+0}{1+0} + \dfrac{1-0}{1-0} = K$
$\Rightarrow 1+1 = K$
$\Rightarrow K = 2$

8. $\sqrt{\sin x} = -\cos x$
$\Rightarrow \sin x = \cos^2 x$
$\Rightarrow \sin^2 x + \sin x - 1 = 0$
$\Rightarrow \sin x = \dfrac{-1+\sqrt{1+4}}{2} = \dfrac{-1+\sqrt{5}}{2}$

$\because \sin x \neq \dfrac{-1-\sqrt{5}}{2}$

9. $x^2+y^2+z^2 = r^2\cos^2\theta\left(\cos^2\phi+\sin^2\phi\right)+r^2\sin^2\theta$

$= r^2\left(\cos^2\theta+\sin^2\theta\right) = r^2$

10. $\dfrac{\tan\left(270^0-20^0\right)+\tan\left(360^0-20^0\right)}{\tan\left(180^0+20^0\right)-\tan\left(90^0+20^0\right)}$

$= \dfrac{\cot 20^0-\tan 20^0}{\tan 20^0+\cot 20^0} = \dfrac{\frac{1}{K}-K}{K+\frac{1}{K}} = \dfrac{1-K^2}{1+K^2}$

11. $\sqrt{\tan^2\alpha+1} = |\sec\alpha|$

$\dfrac{\pi}{2} < \alpha < \pi \Rightarrow \alpha \in Q_2$

$Dis = -\sec\alpha$

12. $\left(\dfrac{a+b-1}{3}, \dfrac{1+c^2+4}{3}\right)$ when Y-axis

x = 0

$\dfrac{a+b-1}{3} = 0 \Rightarrow a+b = 1$

13. triangle is right angled triangle
14. ratio 2 : 3

Take 2 : -3

Harmonic conjugate $\left(\dfrac{14-6}{2-3}, \dfrac{2+12}{2-3}\right)$

$(-8,-14)$

15. Conceptual
16. Apply incentre formula
17. 2S + H = 3G
18. Use distance formula
19. triangle is right angled triangle
20. $PQ = \dfrac{1}{3}AB$
21. $put\ \alpha = 45^0$

$\dfrac{1}{2}+\dfrac{1}{4}+\dfrac{1}{2} = \dfrac{1}{4}+\dfrac{1}{4}+\dfrac{1}{2} = 1$

22. $\alpha+\beta = 90^0$
$\alpha-\beta = 30$
$\Rightarrow \alpha = 60^0,\ \beta = 30^0$

$\therefore \tan\left(\alpha+2\beta\right)\tan\left(2\alpha+\beta\right)$

$= \tan 120\tan\left(150\right)$

$= \left(-\sqrt{3}\right)\left(-\dfrac{1}{\sqrt{3}}\right) = 1$

23. Use distance formula
24. P(a, b) A(6, -1) B(2, 3)

PA = PB

$PA^2 = PB^2$

$(a-6)^2+(b+1)^2=(a-2)^2+(b-3)^3$

$8a-8b=24$

$a-b=3$

25. put t = 0

PHYSICS

26. $\vec{r}=x\hat{i}+y\hat{j}+z\hat{k} \quad \therefore r=\sqrt{x^2+y^2+z^2}$

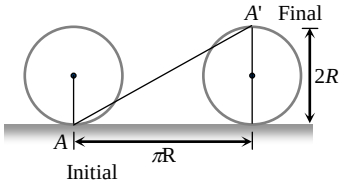
$r=\sqrt{6^2+8^2+10^2}=10\sqrt{2}\ m$

27.(d) Up to time t_1 slope of the graph is constant and after t_1 slope is zero *i.e.* the body travel with constant speed up to time t_1 and then stops.

28. Total time of motion is 2 *min* 20 *sec* = 140 *sec*.

As time period of circular motion is 40 *sec* so in 140 *sec*. athlete will complete 3.5 revolution *i.e.*, He will be at diametrically opposite point *i.e.*, Displacement = 2*R*.

29. Horizontal distance covered by the wheel in half revolution = πR.



So the displacement of the point which was initially in contact with ground = AA' =

$\sqrt{(\pi R)^2+(2R)^2}$

$=R\sqrt{\pi^2+4}=\sqrt{\pi^2+4} \qquad (As\ R=1m)$

30. As the total distance is divided into two equal parts therefore distance averaged speed $=\frac{2v_1v_2}{v_1+v_2}$

31. $\frac{v_A}{v_B}=\frac{\tan\theta_A}{\tan\theta_B}=\frac{\tan 30^\circ}{\tan 60^\circ}=\frac{1/\sqrt{3}}{\sqrt{3}}=\frac{1}{3}$

32. Time average speed = $\frac{v_1+v_2}{2}=\frac{80+40}{2}=60km/hr$.

33. d

34. Displacement of the particle will be zero because it comes back to its starting point

$$\text{Average speed}=\frac{\text{Total distance}}{\text{Total time}}=\frac{30m}{10\sec}=3\,m/s$$

35. $\text{Velocity of particle}=\frac{\text{Total diplacement}}{\text{Total time}}$

$=\frac{\text{Diameter of circle}}{5}=\frac{2\times 10}{5}=4\,m/s$

36. $\frac{|\text{Average velocity}|}{|\text{Average speed}|}=\frac{|\text{displacement}|}{|\text{distance}|}\le 1$

because displacement will either be equal or less than distance. It can never be greater than distance.

37. From given figure, it is clear that the net displacement is zero. So average velocity will be zero.

38. When the body is projected vertically upward then at the highest point its velocity is zero but acceleration is not equal to zero $(g = 9.8 m/s^2)$

39. $S_n = u + \frac{a}{2}[2n-1]$

$S_{5^{th}} = 7 + \frac{4}{2}[2\times 5 - 1] = 7 + 18 = 25m$.

40. Acceleration $a = \frac{dv}{dt} = 0.1 \times 2t = 0.2t$

Which is time dependent *i.e.* non-uniform acceleration.

41. Distance travelled in 4 *sec*

$24 = 4u + \frac{1}{2}a \times 16 \quad \ldots(\text{i})$

Distance travelled in total 8 *sec*

$88 = 8u + \frac{1}{2}a \times 64 \quad \ldots(\text{ii})$

After solving (i) and (ii), we get $u = 1$ *m/s.*

42. $v = u + at \Rightarrow -2 = 10 + a \times 4 \Rightarrow a = -3 m/\sec^2$

43. $u = 12\, m/s,\ g = 9.8\, m/\sec^2,\ t = 10 \sec$

Displacement $= ut + \frac{1}{2}gt^2$

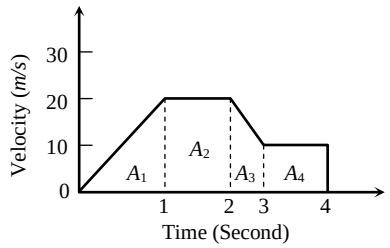
$= 12 \times 10 + \frac{1}{2} \times 9.8 \times 100 = 610m$

44. $h = \frac{1}{2}gt^2 \Rightarrow t = \sqrt{2h/g}$

$t_a = \sqrt{\frac{2a}{g}}$ and $t_b = \sqrt{\frac{2b}{g}} \Rightarrow \frac{t_a}{t_b} = \sqrt{\frac{a}{b}}$

45. Region *OA* shows that graph bending toward time axis *i.e.* acceleration is negative.
Region *AB* shows that graph is parallel to time axis *i.e.* velocity is zero. Hence acceleration is zero.
Region *BC* shows that graph is bending towards displacement axis *i.e.* acceleration is positive.
Region *CD* shows that graph having constant slope *i.e.* velocity is constant. Hence acceleration is zero.

46. Distance = Area under $v - t$ graph $= A_1 + A_2 + A_3 + A_4$



$= \frac{1}{2} \times 1 \times 20 + (20 \times 1) + \frac{1}{2}(20 + 10) \times 1 + (10 \times 1)$

$= 10 + 20 + 15 + 10 = 55\, m$

47. $v = u + at = 10 + 2 \times 4 = 18\, m/\sec$

48. Let initial $(t = 0)$ velocity of particle $= u$

For first 5 *sec* motion $s_5 = 10$ *metre*

$s = ut + \frac{1}{2}at^2 \Rightarrow 10 = 5u + \frac{1}{2}a(5)^2$

$2u + 5a = 4 \quad \ldots(\text{i})$

For first 8 *sec* of motion $s_8 = 20\ metre$

$$20 = 8u + \frac{1}{2}a(8)^2 \Rightarrow 2u + 8a = 5 \qquad \ldots(ii)$$

By solving $u = \frac{7}{6} m/s$ and $a = \frac{1}{3} m/s^2$

Now distance travelled by particle in Total 10 *sec.*

$$s_{10} = u \times 10 + \frac{1}{2}a(10)^2$$

By substituting the value of *u* and *a* we will get $s_{10} = 28.3\ m$

so the distance in last $2\ \text{sec} = s_{10} - s_8$

49. Maximum acceleration means maximum change in velocity in minimum time interval.
In time interval $t = 30$ to $t = 40\ \text{sec}$

$$a = \frac{\Delta v}{\Delta t} = \frac{80-20}{40-30} = \frac{60}{10} = 6\ cm/\text{sec}^2$$

50. An aeroplane flies 400 *m* north and 300 *m* south so the net displacement is 100 *m* towards north.

Then it flies 1200 *m* upward so $r = \sqrt{(100)^2 + (1200)^2}$

$$= 1204\,m \simeq 1200\,m$$

The option should be 1204 *m*, because this value mislead one into thinking that net displacement is in upward direction only.

CHEMISTRY

51. Moseley's equation is $\sqrt{\nu} = a(Z-b)$

52. $\frac{e}{M}$ *of* $\frac{{}_1H^1}{{}_2He^4} = \frac{\frac{1}{1}}{\frac{2}{4}} = \frac{4}{2} = 2:1$

53.

Particle	α	E	p	n
e/M	0.5	1.76×10^8	10^5	0

54. '*Cs*' is used as metal in photoelectric cell's

55. one electron = $1.602\times10^{-19} c$

? = $4.8\times10^{-19} c$ = 3

56. Isoelectronic species are having same no.of electrons.

57. $E = nh\nu$

$$E = nh\frac{c}{\lambda}$$

$$1 = \frac{n \times 6.625\times10^{-34} \times 3\times10^8}{6000\times10^{-10}}$$

$$n = 3\times10^{18}$$

58. $h\nu = h\nu^0 + K.E \quad h\nu^0 = 4.2\times1.602\times10^{-19}\ J$

$$\frac{6.625\times10^{-34}\times3\times10^8}{\lambda} = \left(6.72\times10^{-19} + 3.2\times10^{-19}\right)$$

59. $E = \frac{hc}{\lambda}$

$$E=\frac{6.625\times10^{-34}\times3\times10^{8}}{242\times10^{-9}}\,J/atom$$

$$E=\frac{6.625\times10^{-34}\times3\times10^{8}}{242\times10^{-9}}\times10^{-3}\,kJ/atom$$

$$E=\frac{6.625\times10^{-34}\times3\times10^{8}\times6\times10^{23}\times10^{-3}}{242\times10^{--9}}\,kJ/mole$$

$$E=4.9\times10^{2}\ \ kJ/mole$$

60. $E=\frac{hc}{\lambda}$

$$5\times10^{11}=\frac{6.625\times10^{-27}\times3\times10^{10}}{\lambda}$$

$$\lambda=\frac{20\times10^{-6}}{5}CM$$

$$\lambda=4\times10^{-6}CM$$

$$\lambda=400\times10^{-8}CM$$

$$\lambda=400A^{0}$$

61. $E=h\nu$

$495.5\times10^{-3}\,J$ _____ 6.023×10^{23} *atoms*

…….? _____1 atom

$$=\frac{495.5\times10^{3}}{6.023\times10^{23}}\,J$$

$$\therefore\frac{495.5\times10^{3}}{6.023\times10^{23}}=6.625\times10^{-34}\times\nu$$

$$=1\nu=1.24\times10^{15}s^{-1}$$

62. ${}_{7}N^{14}$

$e=7+3=10e^{-}$

$p=7p$

$n=A-Z=14-7=7n$

63. In 'M' state, electronic configuration is 2,8,16

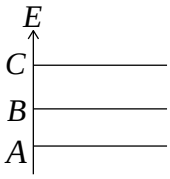
$\therefore$ atomic number = 26

$\Rightarrow{}_{26}Fe^{45}$, $neutrons=A-Z=56-26=30$

64. $\frac{e}{M}$ value of an electron is $1.78\times10^{8}c/g$

65. Charge of one mole of an electron is one Faraday.

66.



$$E_C-E_A=(E_C-E_B)+(E_B-E_A)$$

$$\frac{1}{\lambda_3}=\frac{1}{\lambda_1}+\frac{1}{\lambda_2},\qquad \frac{1}{\lambda_3}=\frac{\lambda_2+\lambda_1}{\lambda_1\lambda_2}$$

67. $E_{(ev)}=\frac{12,400}{\lambda(A^{0})}h\nu=h\nu_{0}+K.E$

$$\Rightarrow\frac{12400}{2000}=\frac{12400}{3000}+K.E$$

$\Rightarrow K.E = 6.2 - 4.2 = 2ev/atom$

$K.E = 6\times10^{23}\times2\times1.602\times10^{-19}\times10^{-3}$

$= 1.92\times10^{2}\,kJ/mole$

68. Work function $(h\nu_0) = 3.3eV$

Threshold frequency $(\nu_0) = \dfrac{3.3\times1.602\times10^{-19}}{6.625\times10^{-34}}$

$\nu_0 = 8\times10^{14}\,Hz$

69. charge – mass ratio = $\dfrac{1}{1.97\times10^{-7}\,\dfrac{c}{kg}}$

Mass of 'A' $= \dfrac{\text{charge}}{specific\ charge}$

$= \dfrac{1.602\times10^{-19}C}{\dfrac{1}{1.97}\times10^{-7}\,\dfrac{c}{kg}}$

$= 1.602\times10^{-19}\times1.97\times10^{-7}kg = 3.16\times10^{-26}kg$

70. $Cr_{24} = \dfrac{1s^2}{K^2}\dfrac{2s^2 2p^6}{L^8}\dfrac{3s^2 3p^6 3d^5}{M^{13}}\dfrac{4s^1}{N^1}$

71. given oxide of nitrogen is No. and no.of electrons are 15.

72. $Cr_{24}^{+3} = (Ar)4s^0 3d^3$

$\therefore$ No.of unpaired electrons are 3.

73. wave number $\therefore (\bar{\nu}) = \dfrac{1}{\lambda}$

$\lambda = \dfrac{1}{4000CM^{-1}}$

$\lambda = 2.5\times10^{-4}CM$

$\lambda = 2.5\times10^{-6}M$

$\lambda = 2.5\mu m$

74. Zn_{30}^{65}, *no. of neutrons* $(n) = A - Z = 65 - 30 = 35$

75. $E = h\dfrac{c}{\lambda}$

$\lambda = \dfrac{6.625\times10^{-27}\times3\times10^{10}}{4.8\times10^{-12}}$

$\lambda = \dfrac{19.875\times10^{-5}}{4.8}$

$\lambda = 4141A^0$

Paper Setters:

Subject	Name of the Paper Setter	Phone No	Branch
MATHS-IIA	CH SUBBA RAO	8520038425	HYDBPRB2
MATHS-IIB	J L N MURTHY	8919059210	HYDBPRB2
PHYSICS	BHASKARA REDDY	9032166125	HYDBPRB2
CHEMISTRY	SRINIVAS	9849878889	HYDBPRB2