SRIGAYATRI EDUCATIONAL INSTITUTIONS

INDIA

SR EAMCET
TIME: 3 hrs.

DPP-3

DATE: 08-04-2020

MATHEMATICS-IA

SYLLABUS: Trigonometric Equations.

1. **If** $\cos p\theta+\cos q\theta=0,$ **then the different values of** θ **are in A.P, where the common difference is:**

A) $\frac{\pi}{p+q}$ B) $\frac{\pi}{p-q}$ C) $\frac{2\pi}{p\pm q}$ D) $\frac{3\pi}{p\pm q}$

2. **If** $3\tan^2\theta-2\sin\theta=0,$ **then** θ **is equal to**

A) $\frac{n\pi}{4}, n\pi$ B) $n\pi+(-1)^n\frac{\pi}{6}, n\pi$

C) $n\pi+(-1)^n\frac{\pi}{3}, n\pi$ D) $n\pi+\frac{\pi}{3}, n\pi$

3. **If** $0\le x\le 2\pi,$ **then the number of solutions of equation** $3(\sin x+\cos x)-2(\sin^3 x+\cos^3 x)=8$ **is:**

A) 0 B) 1 C) 2 D) 4

4. **If** $\frac{1}{6}\sin\theta, \cos\theta, \tan\theta$ **are in G.P, then** θ **is equal to** $(n\in I)$

A) $2n\pi\pm\frac{\pi}{3}$ B) $2n\pi\pm\frac{\pi}{6}$ C) $n\pi+(-1)^n\frac{\pi}{3}$ D) $n\pi+\frac{\pi}{3}$

5. **If** $\sin x+\cos+=\sqrt{\left(y+\frac{1}{y}\right)}, x\in[0,\pi]$ **then**

A) $x=\frac{\pi}{4}, y=1$ B) $y=0$ C) $y=2$ D) $x=\frac{3\pi}{4}$

6. **Let** $\theta\in[0,4\pi]$ **satisfying the equation** $(\sin\theta+2)(\sin\theta+3)(\sin\theta+4)=6.$ **If the sum of all the values of** θ **is of the term** $k\pi$ **then value of** k **is:**

A) 6 B) 5 C) 4 D) 2

7. **For** $n\in I,$ **the general solution of the equation** $(\sqrt{3}-1)\sin\theta+(\sqrt{3}+1)\cos\theta=2$ **is:**

A) $\theta=2n\pi\pm\frac{\pi}{4}+\frac{\pi}{12}$ B) $\theta=n\pi+(-1)^n\frac{\pi}{4}+\frac{\pi}{12}$

C) $\theta=2n\pi\pm\frac{\pi}{4}$ D) $\theta=n\pi+(-1)^n\frac{\pi}{4}-\frac{\pi}{12}$

8. **If** $\tan\left(\frac{p\pi}{4}\right)=\cot\left(\frac{q\pi}{4}\right)$ **and** $n\in I,$ **then**

A) $p+q=0$ B) $p+q=2n+1$ C) $p+q=2n$ D) $p+q=2(2n+1)$

9. **The number of solutions of the equation** $\sin x+\sin 2x+\sin 3x=\cos x+\cos 2x+\cos 3x,$ $0\le x\le 2\pi$ **is:**

A) 7 B) 5 C) 4 D) 6

10. **The general solution of the equation** $\sin 3\alpha=4\sin\alpha\sin(x+\alpha)\sin(x-\alpha)$ **is** $(\alpha\ne n\pi)$

A) $n\pi\pm\frac{\pi}{4}\ \forall\ n\in I$ B) $n\pi\pm\frac{\pi}{3}\ \forall\ n\in I$ C) $n\pi\pm\frac{\pi}{9}\ \forall\ n\in I$ D) $n\pi\pm\frac{\pi}{12}\ \forall\ n\in I$

11. **The general solution of** $\sin^2 x+\frac{1}{4}\sin^2 3x=\sin x\sin^2 3x$ **is**

A) $n\pi$ or $n\pi+(-1)^n\frac{\pi}{6}$ B) $n\pi$ or $n\pi+(-1)^n\frac{\pi}{3}$

C) $n\pi$ or $n\pi+(-1)^n\frac{\pi}{4}$ D) $n\pi$ or $n\pi+(-1)^n\frac{\pi}{2}$

12. **The general solution of** $\tan\left(\frac{\pi}{2}\cos\theta\right)=\cot\left(\frac{\pi}{2}\sin\theta\right)$ **is:**

A) $2n\pi,\ (2n+1)\pi,\ \left(2n\pm\frac{1}{2}\right)\pi$ B) $2n\pi,\ (2n+1)\pi,\ \left(2n\pm\frac{1}{2}\right)\frac{\pi}{2}$

C) $2n\pi,\ (2n+1)\pi,\ \left(2n\pm\frac{1}{2}\right)\frac{\pi}{3}$ D) $2n\pi,\ (2n+1)\pi,\ \left(2n\pm\frac{1}{2}\right)\frac{\pi}{4}$

13. **For** $a\in\left(\frac{3\sqrt{3}-\pi}{3},\infty\right)$, **the equation** $2\sin x=|x|+a$ **has**

A) No solution B) One solution C) Two solutions D) Three solutions

14. **The smallest positive root of the equation** $\sqrt{\sin(1-x)}=\sqrt{\cos x}$ **is:**

A) $x=\frac{7\pi}{4}+\frac{1}{2}$ B) $x=\frac{7\pi}{4}+\frac{1}{3}$ C) $x=\frac{7\pi}{4}+\frac{1}{4}$ D) $x=\frac{7\pi}{4}$

15. **For which values of** x **and** y **the equation** $\tan^4 x+\tan^4 y+2\cot^2 x\cot^2 y=3+\sin^2(x+y)$ **satisfies**

A) $x=y=n\pi\pm\frac{\pi}{4}$ B) $x=y=n\pi\pm\frac{\pi}{3}$ C) $x=y=n\pi\pm\frac{\pi}{6}$ D) $x=y=n\pi\pm\frac{\pi}{2}$

16. **Solutions of** $\sin x+\sin y=\sin(x+y)$ **and** $|x|+|y|=1$ **is:**

A) $(0,\pm1),(\pm1,0),\left(\frac{1}{2},-\frac{1}{2}\right)$ and $\left(-\frac{1}{2},\frac{1}{2}\right)$ B) $(0,1),(1,0),\left(\frac{1}{2},-\frac{1}{2}\right)$ and $\left(-\frac{1}{2},\frac{1}{2}\right)$

C) $(0,-1),(-1,0),\left(\frac{1}{2},-\frac{1}{2}\right)$ and $\left(-\frac{1}{2},\frac{1}{2}\right)$ D) $(0,1),(1,0),\left(\frac{1}{2},\frac{1}{2}\right)$ and $\left(-\frac{1}{2},-\frac{1}{2}\right)$

17. **Solution of the inequality** $\sin^4\left(\frac{x}{3}\right)+\cos^4\left(\frac{x}{3}\right)>\frac{1}{2}$ **is:**

A) $R\sim\left\{x:x=\frac{3n\pi}{2}\pm\frac{3\pi}{4},\ n\in I\right\}$ B) $\frac{3n\pi}{2}\pm\frac{3\pi}{4},\ n\in I$

C) $R\sim\left\{x:x=\frac{3n\pi}{2}+\frac{3\pi}{4},\ n\in I\right\}$ D) $\frac{3n\pi}{12}-\frac{3\pi}{4},\ n\in I$

18. **Solution of** $3\tan 2x-4\tan 3x=\tan^2 3x\tan 2x$ **is:**

A) $n\pi,\ n\pi\pm\tan^{-1}\sqrt{\frac{3}{5}},\ n\in I$ B) $n\pi,\ n\pi\pm\tan^{-1}\sqrt{\frac{2}{5}},\ n\in I$

C) $n\pi,\ n\pi\pm\tan^{-1}\sqrt{\frac{1}{3}},\ n\in I$ D) $n\pi,\ n\pi\pm\tan^{-1}\sqrt{\frac{1}{5}},\ n\in I$

19. **The general solution of the equation** $\sin^{100} x-\cos^{100} x=1$ **is:**

A) $n\pi\pm\frac{\pi}{2},\ n\in I$ B) $n\pi\pm\frac{\pi}{3},\ n\in I$ C) $n\pi\pm\frac{\pi}{4},\ n\in I$ D) $n\pi\pm\frac{\pi}{6},\ n\in I$

20. **The values of** x **in** $(-\pi,\pi)$ **satisfying inequality** $|4\sin x-1|<\sqrt{5}$ **are:**

A) $x\in\left(-\frac{\pi}{10},\frac{3\pi}{10}\right)$ B) $x\in\left(-\frac{\pi}{5},\frac{3\pi}{5}\right)$ C) $x\in\left(-\frac{\pi}{3},\frac{\pi}{3}\right)$ D) $x\in\left(-\frac{\pi}{2},\frac{\pi}{2}\right)$

MATHEMATICS-IB

SYLLABUS: Straight lines upto Perpendicular distance.

21. If $x+4y-5=0$ and $4x+ky+7=0$ are two perpendicular lines then $k=$
A) 3 B) 4 C) -1 D) -4

22. If the straight lines $3x+4y+5-k(x+y+3)=0$ is parallel to y-axis, then $k=$
A) 1 B) 2 C) 3 D) 4

23. The equation of a straight line which cuts an intercept of 3 units on negative y-axis and inclined at an angle $\tan^{-1}\left(\frac{3}{5}\right)$ to x-axis is:
A) $5y-3x+15=0$ B) $5y-3x=15$ C) $3y-5x+15=0$ D) $3y-5x-15=0$

24. A line is perpendicular to $3x+y-3=0$ and passes through $(2, 2)$. It's y-intercept is:
A) $\frac{2}{3}$ B) $\frac{1}{3}$ C) 1 D) $\frac{4}{3}$

25. The equation of line passing through the points $(-1, 3)$ and $(4, -2)$ is:
A) $x-y+2=0$ B) $x-y-2=0$ C) $x+y+2=0$ D) $x+y-2=0$

26. The intercept made by a line on y-axis is double to the intercept made by it on x-axis and if it passes through $(1, 2)$ then its equation is:
A) $2x+y=4$ B) $2x+y+4=0$ C) $2x-y=4$ D) $2x-y+4=0$

27. The equation of a line passing through $(2, 3)$ so that the segment of the line intercepted between the axes is bisected at this point is:
A) $3x-2y=12$ B) $3x-2y+12=0$ C) $3x+2y=12$ D) $3x+2y+12=0$

28. The equation of a line which is at a distance of 3 units from origin and the perpendicular from origin to the line makes an angle of 30^0 anticlockwise with the positive direction of x-axis is:
A) $\sqrt{3}x+y+6=0$ B) $\sqrt{3}x+y=6$ C) $\sqrt{3}x-y=6$ D) $\sqrt{3}x-y+6=0$

29. The angle between the lines $2x-y+5=0$ and $3x+y+4=0$ is:
A) 30^0 B) 45^0 C) 60^0 D) 90^0

30. The area (in square units) of the triangle formed by the lines $x=0,\ y=0$ and $3x+4y=12$ is:
A) 3 B) 4 C) 6 D) 12

31. The length of the segment of the straight lines passing through $(3, 3)$ and $(7, 6)$ cut off by the coordinate axes is:
A) $\frac{4}{5}$ B) $\frac{5}{4}$ C) $\frac{7}{4}$ D) $\frac{4}{7}$

32. The angle which the straight line $y=\sqrt{3}x-4$ makes with y-axis is:
A) 30^0 B) 45^0 C) 60^0 D) 90^0

33. If the portion of a line intercepted between the coordinate axes is divided by the point $(2, -1)$ in the ratio 3:2 then the equation of the line is:
A) $5x-2y-20=0$ B) $2x-y-5=0$ C) $3x-y-7=0$ D) $x-3y-5=0$

34. A straight line L is perpendicular to $5x-y=1$ and the area of the triangle formed by line L and the coordinate axes is 5 square units. Then the equation of L can be:
A) $x+5y=\pm 2\sqrt{2}$ B) $x+5y=\pm 5\sqrt{2}$ C) $x-5y=5\sqrt{2}$ D) $-x+5y=\pm 3\sqrt{2}$

35. The number of points $p(x, y)$ with natural numbers as coordinates that lie inside the quadrilateral formed by the lines $2x+y=2,\ x=0,\ y=0,\ x+y=5$ is:
A) 12 B) 10 C) 6 D) 4

36. $A(-1, 1)$ $B(5, 3)$ **are opposite vertices of a square. The equation of the other diagonal (not passing through A, B) of the square is:**
A) $2x-3y+4=0$ B) $2x-y+3=0$ C) $y+3x-8=0$ D) $x+2y-1=0$

37. **If the perpendicular distance between the point** $(1, 1)$ **to the line** $3x+4y+c=0$ **is 7, then the possible values of** c **are:**
A) $-35, 42$ B) $35, 28$ C) $42, -28$ D) $28, -42$

38. **The equation of the median of the triangle with vertices** $(4, 3)$ $(-2, 3)$ $(1, -2)$ **passing through** $(-2, 3)$ **is:**
A) $5x+9y+17=0$ B) $9x-5y-11=0$ C) $5x+9y-17=0$ D) $5x-9y+13=0$

39. **If the straight lines** $y=4-3x,\ ay=x+10,\ 2y+bx+9=0$ **represent the three consecutive sides of rectangle, then** $ab=$
A) 18 B) -3 C) $-\frac{1}{2}$ D) $-\frac{1}{3}$

40. **The line** $2x+3y+12=0$ **cuts the axes at A and B. The equation of the perpendicular bisector of AB is:**
A) $3x-2y+5=0$ B) $3x+2y+5=0$ C) $2x+3y+2=0$ D) $2x-3y+3=0$

PHYSICS

SYLLABUS: Oblique Projectile and Horizontal Projectile.

41. **A particle is projected with a velocity** v**, so that its range on a horizontal plane is twice the greatest height attained. If** g **is acceleration due to gravity, then its range is:**
A) $\frac{4v^2}{5g}$ B) $\frac{4g}{5v^2}$ C) $\frac{4v^3}{5g^2}$ D) $\frac{4v}{5g^2}$

42. **A projectile is fired with velocity** u **making an angle** θ **with the horizontal. What is the angular momentum of the projectile at the highest point about the starting point? (Given the mass of the projectile is** m**)**
A) $\frac{m\cos\theta}{2g}$ B) $\frac{mu^2\sin^2\theta\cos\theta}{2g}$ C) $\frac{mu^3\cos^2\theta}{2g}$ D) $\frac{mu^3\sin^2\theta\cos\theta}{2g}$

43. **The maximum height attained by a projectile is increased by 10% keeping the angle of projection constant, what is the percentage increase in the time of flight?**
A) 5% B) 10% C) 20% D) 40%

44. **A body of mass 2kg has an initial velocity of 3 m/s along x-axis and it is subjected to a force of 4N in y-direction. The distance of the body from origin after 4 seconds will be: (The body was subjected to force at the origin at** $t=0$**)**
A) 12 m B) 28 m C) 20 m D) 48 m

45. **The horizontal range of a projectile is** $4\sqrt{3}$ **times its maximum height. Its angle of projection will be:**
A) 45^0 B) 60^0 C) 90^0 D) 30^0

46. **The path of one projectile as seen by an observer on another projectile is a / an:**
A) Straight line B) Parabola C) Ellipse D) Circle

47. **The range of a projectile when fired at** 75^0 **with the horizontal is 0.5 km. What will be its range when it is fired at an angle of** 45^0 **?**
A) 0.5 km B) 1.0 km C) 1.5 km D) 2.0 km

48. **The equation of motion of a projectile is** $y=12x-\frac{3}{4}x^2$**. The horizontal component of velocity is** $3ms^{-1}$**. Given that** $g=10ms^{-2}$**, what is the range of the projectile?**
A) 12.4 m B) 21.6 m C) 30.6 m D) 36.0 m

49. A particle of mass m is projected with a velocity u making an angle of 45^0 with the horizontal. The magnitude of the angular momentum of the projectile about the point of projection when the particle is at its maximum height h is:

A) Zero B) $mu^3/4\sqrt{2}g$ C) $mu^3/\sqrt{2}g$ D) $m\sqrt{2gh^3}$

50. A projectile has a maximum range of 16 km. At the highest point of its motion, it explodes into two equal masses. One mass drops vertically downwards. The horizontal distance covered by the other mass from the time of explosion is:

A) 8 km B) 16 km C) 24 km D) 32 km

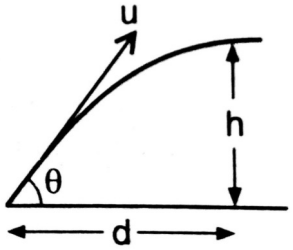
51. A ball rolls off the top of a staircase with a horizontal velocity $u\ m/s$. If the steps are h metre high and b metre wide, the ball will hit the edge of the n^{th} step, if:

A) $n=\dfrac{2hu}{gb^2}$ B) $n=\dfrac{2hu^2}{gb}$ C) $n=\dfrac{2hu^2}{gb^2}$ D) $\dfrac{hu^2}{gb^2}$

52. A projectile is fired from level ground at angle θ above the horizontal. The elevation angle ϕ of the highest point as seen from the launch point is related to θ by the relation:

A) $\tan\phi=\dfrac{1}{4}\tan\theta$ B) $\tan\phi=\tan\theta$ C) $\tan\phi=\dfrac{1}{2}\tan\theta$ D) $\tan\phi=2\tan\theta$

53. If a stone is to hit at a point which is at a distance d away and at a height h above the point from where the stone starts, then what is the value of initial speed u if the stone is launched at an angle θ?



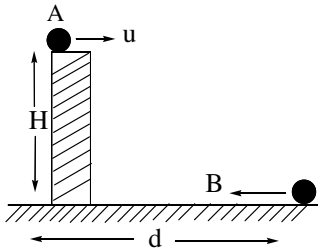
A) $\dfrac{g}{\cos\theta}\sqrt{\dfrac{d}{2(d\tan\theta-h)}}$ B) $\dfrac{d}{\cos\theta}\sqrt{\dfrac{g}{2(d\tan\theta-h)}}$

C) $\sqrt{\dfrac{gd^2}{h\cos^2\theta}}$ D) $\sqrt{\dfrac{gd^2}{(d-h)}}$

54. A cart is moving horizontally along a straight line with constant speed 30 m/s. A projectile is to be fired from the moving cart in such a way that it will return to the cart after the cart has moved 80 m. At what speed (relative to the cart) must the projectile be fired? (Take $g=10ms^{-2}$)

A) $10\sqrt{8}$ m/s B) $8\sqrt{10}$ m/s C) $\dfrac{40}{3}$ m/s D) None of these

55. Two particles A and B are placed as shown in the figure. The particle A on the top of tower is projected horizontally with a velocity u and the particle B is projected along the surface towards the tower simultaneously. If particles meet each other, then the speed of projection of particle B is: [Ignore friction]



A) $d\sqrt{\dfrac{g}{2H}}-u$ B) $d\sqrt{\dfrac{g}{2H}}$ C) $d\sqrt{\dfrac{g}{2H}}+u$ D) u

56. The potential energy of a projectile at its maximum height is equal to its kinetic energy there. If the velocity of projection is $20ms^{-1}$, its time of flight is $\left(g=10ms^{-2}\right)$

A) 2s B) $2\sqrt{2}$ s C) $\frac{1}{2}$ s D) $\frac{1}{\sqrt{2}}$ s

57. Two cliff of heights 120 m and 100.4 m are separated by a horizontal distance of 16m. If a car has to reach from the first cliff to the second, the horizontal velocity of the car should be

A) $16\,ms^{-1}$ B) $4\,ms^{-1}$ C) $2\,ms^{-1}$ D) $8\,ms^{-1}$

58. A ball is projected horizontally from top of a building 19.6m high. If the line joining the point of projection to the point where it hits the ground makes an angle of 45^0 to the horizontal, the initial velocity of the ball is:

A) $4.9\,ms^{-1}$ B) $9.8\,ms^{-1}$ C) $19.6\,ms^{-1}$ D) $14.7\,ms^{-1}$

59. A stone is projected horizontally with a velocity $9.8\,ms^{-1}$ from a tower of height 100m. Its velocity one second after projection is:

A) $9.8\,ms^{-1}$ B) $4.9\,ms^{-1}$ C) $9.8\sqrt{2}\,ms^{-1}$ D) $4.9\sqrt{2}\,ms^{-1}$

60. Two thin wood screens A and B are separated by 200m. A bullet travelling horizontally at a speed of 600 ms^{-1} hits the screen A, penetrates through it and finally emerges out from B making holes in A and B. If the resistance of air and wood are negligible, the difference of heights of the holes in A and B is:

A) 5 m B) $\frac{49}{90}$ m C) $\frac{7}{\sqrt{90}}$ m D) zero

CHEMISTRY

SYLLABUS: Wave equation, Uncertainty principle, Shapes of orbitals, Aufbau's principle, Hunds rule, Pauli's and electronic configurations.

61. The pair of ions having same electronic configuration is:

A) Cr^{+3}, Fe^{3+} B) Fe^{3+}, Mn^{+2} C) Fe^{+3}, CO^{3+} D) Se^{+3}, Cr^{3+}

62. Which of the following is responsible to rule out the existence of definite paths or trajectories of electrons?

A) Pauli's exclusion principle B) Heisenberg's uncertainty principle
C) Hund's rule of maximum multiplicity D) Aufbau principle

63. Which of the following options does not present ground state electronic configuration of an atom?

A) $1s^2 2s^2 2p^6 3s^2 3p^6 3d^8 4s^2$ B) $1s^2 2s^2 2p^6 3s^2 3p^6 3d^9 4s^2$
C) $1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 4s^1$ D) $1s^2 2s^2 2p^6 3s^2 3p^6 3d^5 4s^1$

64. The uncertainty in the velocity of particle of mass $6.626\times10^{-28}\,kg$ is 10^{-6} m/sec. What is the uncertainty in its position in nm?

A) $\frac{1}{2\pi}$ B) $\frac{2.5}{\pi}$ C) $\frac{4}{\pi}$ D) $\frac{1}{4\pi}$

65. In an atom, an electron is moving with a speed of 600 m/s with an accuracy upto 0.005%. What is the uncertainty in position?

A) 1.52×10^{-4} m B) 5.10×10^{-3} m C) 1.92×10^{-3} m D) 3.84×10^{-3} m

66. The uncertainty in the position of an electron moving with a velocity of 3×10^4 cm/sec accurate upto 0.011% will be:

A) 1.92 cm B) 7.66 cm C) 0.175 cm D) 3.84 cm

67. If uncertainty in position and velocity are equal, then Δp will be:

A) $\frac{1}{2}\sqrt{\frac{mh}{\pi}}$ B) $\frac{1}{2}\sqrt{\frac{h}{\pi m}}$ C) $\frac{h}{4\pi m}$ D) $\frac{mh}{4\pi}$

68. Wave nature of electron was demonstrated by:

A) Schrodinger B) De-Broglie

C) Davisson & Germer D) Heisenberg

69. For an electron, if the uncertainty in velocity is Δv, the uncertainty in position Δx is given by:

A) $\frac{hm}{4\pi\Delta v}$ B) $\frac{4\pi}{hm\Delta v}$ C) $\frac{h}{4\pi m\Delta v}$ D) $\frac{4\pi m}{h\Delta v}$

70. Which have the same number of s-electrons as the d-electrons in Fe^{+2} ?

A) Li B) Na C) N D) P

71. Which of the following element is represented by electronic configuration $1s^2\,2s^2\,2p_x^1\,2p_y^1\,2p_z^1$?

A) N B) O C) P D) S

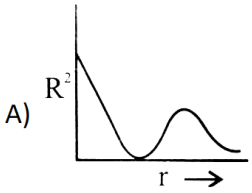
72. The atomic number of element is 17. The no. of orbital containing electron pair in its valency shell is:

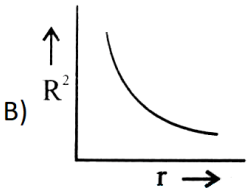
A) 3 B) 4 C) 6 D) 8

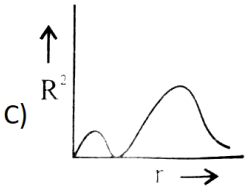
73. The total no. of electrons present in all the p-orbital of bromine are:

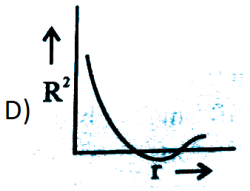
A) 5 B) 15 C) 17 D) 35

74. The probability density curve for 2s electron appears like:

A) 

B) 

C) 

D) 

75. Non-directional orbital is:

A) 3s B) 4f C) 4d D) 4p

76. The maximum probability of finding electron in the d_{xy} orbital is:

A) along the x-axis B) along the y-axis

C) at an angle of 45^0 from the x- and y-axis D) at an angle of 90^0 from the x- and y-axis

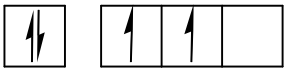
77. Which d-orbital does not have four lobes?

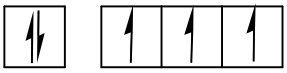
A) dx^2y^2 B) dxy C) dz^2 D) dxz

78. Which orbital has two angular nodal plans?

A) s B) p C) d D) f

79. The orbital diagram in which aufbau principle is violated is:

A)  B) 

C)  D) 

80. The filling of 4p-subshell starts in the element of atomic number:

A) 29 B) 31 C) 35 D) 19

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SRIGAYATRI EDUCATIONAL INSTITUTIONS

INDIA

SR EAMCET
TIME: 3 hrs.

DPP-3

DATE: 08-04-2020

KEY SHEET

MATHEMATICS-IA

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

MATHEMATICS-IB

21) **C**	22) **D**	23) **A**	24) **D**	25) **D**	26) **A**	27) **C**	28) **B**	29) **B**	30) **C**
31) **B**	32) **A**	33) **D**	34) **B**	35) **C**	36) **C**	37) **D**	38) **C**	39) **A**	40) **A**

PHYSICS

41) **A**	42) **D**	43) **A**	44) **C**	45) **D**	46) **A**	47) **B**	48) **B**	49) **B**	50) **B**
51) **C**	52) **C**	53) **B**	54) **C**	55) **A**	56) **B**	57) **D**	58) **B**	59) **C**	60) **B**

CHEMISTRY

61) **B**	62) **B**	63) **B**	64) **D**	65) **C**	66) **C**	67) **A**	68) **C**	69) **C**	70) **D**
71) **A**	72) **A**	73) **C**	74) **A**	75) **A**	76) **C**	77) **C**	78) **C**	79) **B**	80) **B**

SRIGAYATRI EDUCATIONAL INSTITUTIONS

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HINTS & SOLUTIONS
MATHEMATICS-IA

1. $\cos p\theta = -\cos q\theta = \cos(\pi - q\theta)$

$p\theta = 2n\pi \pm (\pi - q\theta),\ (p \pm q)\theta = (2n \pm 1)\pi$

$\theta = \dfrac{(2n \pm 1)\pi}{(p \pm q)} = \dfrac{r\pi}{(p \pm q)},$ where $r = -3, -1, 1, 3, ...$

$\Rightarrow \theta = ..., \dfrac{-3\pi}{(p \pm q)}, \dfrac{-\pi}{(p \pm q)}, \dfrac{\pi}{(p \pm q)}, \dfrac{3\pi}{(p \pm q)}, ...$

So common difference $= \dfrac{2\pi}{(p \pm q)}$

2. $\dfrac{3\sin^2\theta}{\cos^2\theta} - 2\sin\theta = 0,\ \cos\theta \neq 0$

$\Rightarrow 3\sin^2\theta - 2\sin\theta(\cos^2\theta) = 0,\ 3\sin^2\theta - 2\sin\theta(1 - \sin^2\theta) = 0$

$\Rightarrow \sin\theta(2\sin^2\theta + 3\sin\theta - 2) = 0$

$\Rightarrow \sin\theta(2\sin\theta - 1)(2\sin\theta + 2) \Rightarrow \sin\theta = 0,\ \dfrac{1}{2},\ -2(\text{rejected})$

$\Rightarrow \theta = n\pi,\ n\pi + (-1)^n \dfrac{\pi}{6}$

3. $3(\sin x + \cos x) - 2(\sin x + \cos x)(\sin^2 x + \cos^2 x - \sin x\cos x) = 8$

$\Rightarrow (\sin x + \cos x)[3 - 2 + 2\sin x\cos x] = 8$

$\Rightarrow (\sin x + \cos x)[1 + 2\sin x\cos x] = 8$

$\Rightarrow (\sin x + \cos x)^3 = 8, \quad \sin x + \cos x = 2$

No Solution

4. $\cos^2\theta = \dfrac{1}{6}\sin\theta\tan\theta \quad \Rightarrow \quad 6\cos^3\theta = 1 - \cos^2\theta$

$\Rightarrow 6\cos^3\theta + \cos^2\theta - 1 = 0 \quad \Rightarrow \quad (2\cos\theta - 1)(3\cos^2\theta + 2\cos\theta + 1) = 0$

$\Rightarrow \cos\theta = \dfrac{1}{2} \quad \Rightarrow \quad \theta = 2n\pi \pm \dfrac{\pi}{3},\ n \in I$

5. $\sqrt{y + \dfrac{1}{y}} \geq \sqrt{2}$ assuming $y > 0$

But $|\sin x + \cos x| \leq \sqrt{2}$ so $y = 1$ & $x = \dfrac{\pi}{4}$

6. Since, L.H.S. ≥ 6 and R.H.S. = 6, So equality holds

Only if $\sin\theta = -1 \quad \Rightarrow \quad \theta = \dfrac{3\pi}{2}, \dfrac{7\pi}{2}$

$\therefore$ sum $= 5\pi \quad \Rightarrow \quad k = 5$

7. $\dfrac{(\sqrt{3} - 1)}{2\sqrt{2}}\sin\theta + \dfrac{(\sqrt{3} + 1)}{2\sqrt{2}}\cos\theta = \dfrac{1}{\sqrt{2}}$

$\Rightarrow \sin\frac{\pi}{12}\sin\theta+\cos\frac{\pi}{12}\cos\theta=\cos\frac{\pi}{4}$

$\cos\left(\theta-\frac{\pi}{12}\right)=\cos\frac{\pi}{4}, \qquad \theta-\frac{\pi}{12}=2n\pi\pm\frac{\pi}{4}$

$\theta=2n\pi\pm\frac{\pi}{4}+\frac{\pi}{12}$

8. $\tan\left(\frac{p\pi}{4}\right)=\tan\left(\frac{\pi}{2}-\frac{q\pi}{4}\right)$

$\Rightarrow \frac{p\pi}{4}=n\pi+\frac{\pi}{2}-\frac{q\pi}{4}\Rightarrow\frac{(p+q)}{4}=n+\frac{1}{2}$

$\Rightarrow (p+q)=2(2n+1)$

9. $(\sin x+\sin 3x)+\sin 2x=(\cos x+\cos 3x)+\cos 2x$

$\Rightarrow 2\sin 2x\cos x+\sin 2x=2\cos 2x\cos x+\cos 2x$

$\Rightarrow \sin 2x(2\cos x+1)=\cos 2x(2\cos x+1)$

$\Rightarrow \cos x=-\frac{1}{2}, \qquad \tan 2x=1$

$x=2n\pi\pm\frac{2\pi}{3},\ 2x=n\pi+\frac{\pi}{4}$

$\Rightarrow x=2n\pi\pm\frac{2\pi}{3},\ \frac{n\pi}{2}+\frac{\pi}{8}$

$0\le x\le 2\pi$

$x=\frac{\pi}{8},\frac{5\pi}{8},\frac{2\pi}{3},\frac{9\pi}{8},\frac{4\pi}{3},\frac{13\pi}{8}$

10. $\sin 3\alpha=4\sin\alpha(\sin^2 x-\sin^2\alpha)$

$\Rightarrow 3\sin\alpha-4\sin^3\alpha=4\sin\alpha\sin^2 x-4\sin^3\alpha$

$\Rightarrow 3\sin\alpha=4\sin\alpha\sin^2 x$

If $\sin\alpha\neq 0 \qquad \sin^2 x=\frac{3}{4}, \qquad \sin x=\pm\frac{\sqrt{3}}{2}$

$x=n\pi\pm\frac{\pi}{3}\ \forall n\in I$

If $\sin\alpha=0$; i.e. $\alpha=n\pi$, then equation becomes an identity.

11. $\sin^2 x-\sin x\sin^2 3x+\frac{1}{4}\sin^2 3x=0$

$\left(\sin x+\frac{1}{2}\sin^2 3x\right)^2+\frac{1}{4}\sin^2 3x(1-\sin^2 3x)=0$

$\left(\sin x-\frac{1}{2}\sin^2 3x\right)^2+\frac{1}{4}\sin^2 3x\cos^2 3x=0$

$\left(\sin x-\frac{1}{2}\sin^2 3x\right)^2+\frac{1}{16}\sin^2 6x=0$

$\sin x-\frac{1}{2}\sin^2 3x=0 \quad \text{and} \quad \sin 6x=0$

$\Rightarrow 2\sin x=\sin^2 3x \quad \text{and} \quad \sin 6x=0\Rightarrow x=\frac{k\pi}{6}=k\in I.$

$\sin^2\left(3\left(\frac{k\pi}{6}\right)\right)=\sin^2\left(\frac{k\pi}{2}\right)=\begin{cases}1, & \text{if } k \text{ is odd}\\ 0, & \text{if } k \text{ is even}\end{cases}$

$\Rightarrow \sin x = 0 \quad \text{or} \quad \frac{1}{2}$

$\Rightarrow x = n\pi \quad \text{or} \quad x = n\pi + (-1)^n \frac{\pi}{6}, \quad n \in I$

12. $\tan\left(\frac{\pi}{2}\cos\theta\right) = \tan\left(\frac{\pi}{2} - \frac{\pi}{2}\sin\theta\right)$

$\Rightarrow \frac{\pi}{2}\cos\theta = n\pi + \frac{\pi}{2} - \frac{\pi}{2}\sin\theta \Rightarrow \sin\theta + \cos\theta = (2n+1)$

$\Rightarrow \sqrt{2}\cos\left(\theta - \frac{\pi}{4}\right) = (2n+1) \Rightarrow n = 0, -1$ are the only possibility

$\Rightarrow \cos\left(\theta - \frac{\pi}{4}\right) = \pm\frac{1}{\sqrt{2}}, \quad \text{when} \quad \cos\left(\theta - \frac{\pi}{4}\right) = \frac{1}{\sqrt{2}} = \cos\frac{\pi}{4}$

$\Rightarrow \theta - \frac{\pi}{4} = 2n\pi \pm \frac{\pi}{4}, \quad \theta = 2n\pi \quad \text{or} \quad 2n\pi + \frac{\pi}{2}$

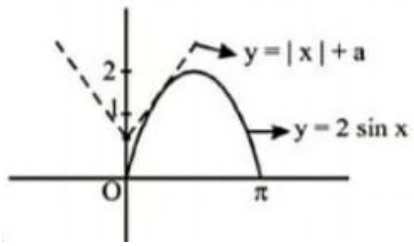
When $\cos\left(\theta - \frac{\pi}{4}\right) = -\frac{1}{\sqrt{2}} = \cos\left(\frac{3\pi}{4}\right), \ \theta - \frac{\pi}{4} = 2n\pi \pm \frac{3\pi}{4}$

$\theta = (2n+1)\pi \quad \text{or} \quad 2n\pi - \frac{\pi}{2}$

So $\theta = 2n\pi, (2n+1)\pi, \left(2n \pm \frac{1}{2}\right)\pi$

$\theta = m\pi, \left(2n \pm \frac{1}{2}\right)\pi$

13. The equation $2\sin x = |x| + a$ will have a solution so long as the line $y = |x| + a$ intersects or atleast touches the curve, $y = 2\sin x$. So $\frac{dy}{dx} = 2\cos x = 1$.



$\Rightarrow \cos x = \frac{1}{2} \quad \Rightarrow \quad x = \frac{\pi}{3}$

Hence, solution will not be possible if $x + a > 2\sin x$ at $x = \frac{\pi}{3}$

$\frac{\pi}{3} + a > 2\frac{\sqrt{3}}{2} \Rightarrow a > \frac{3\sqrt{3} - \pi}{3}$

14. $\sin(1-x) \geq 0$ and $\cos x \geq 0$

$\sin(1-x) = \cos x, \quad \cos\left(\frac{\pi}{2} - (1-x)\right) = \cos x$

$\Rightarrow \frac{\pi}{2} - 1 + x = 2n\pi \pm x \Rightarrow x = \frac{2n\pi - \frac{\pi}{2} + 1}{2}$

For $n = 2, \quad x = \frac{7\pi}{4} + \frac{1}{2}$ which is the smallest positive root of the given equation.

15. $\tan^4 x + \tan^4 y + 2\cot^2 x \cot^2 y - 2 = 1 + \sin^2(x+y)$

$\left(\tan^2 x-\tan^2 y\right)+2\left(\tan x\tan y-\cot x\cot y\right)^2=-1+\sin^2\left(x+y\right)$

$L.H.S.\geq 0$ and $R.H.S.\leq 0 \Rightarrow L.H.S.=R.H.S.=0$

$\Rightarrow \tan^2 x=\tan^2 y$ and $\tan x\tan y=\cot x\cot y$

$\Rightarrow \tan^2 x\tan^2 y=1$ and $\sin^2\left(x+y\right)=1$

$\Rightarrow \tan^2 x=\tan^2 y=1$

$x=n\pi\pm\frac{\pi}{4},\ y=n\pi\pm\frac{\pi}{4},\ x+y=2n\pi\pm\frac{\pi}{2}$

So, $x=y=n\pi\pm\frac{\pi}{4}$

16. $2\sin\left(\frac{x+y}{2}\right)\left[\cos\left(\frac{(x-y)}{2}\right)-\cos\left(\frac{(x+y)}{2}\right)\right]=0$

$\Rightarrow 4\sin\left(\frac{x+y}{2}\right)\sin\frac{x}{2}.\sin\frac{y}{2}=0$

a. $\sin\left(\frac{x+y}{2}\right)=0\Rightarrow x+y=2n\pi\Rightarrow x+y=0,\ n\in I$

b. $\sin\frac{x}{2}=0 \quad \Rightarrow x=2m\pi, m\in I \quad \Rightarrow \quad x=0$

c. $\sin\frac{y}{2}=0 \quad \Rightarrow y=2p\pi, p\in I \quad \Rightarrow \quad y=0$

Now, In $|x|+|y|=1$, if $x=0$, then $|y|=1\Rightarrow y=\pm 1$

If $y=0$, then $|x|=1\Rightarrow x=\pm 1$

If $y=-x$, then $|x|+|-x|=1\Rightarrow x=\pm\frac{1}{2}$ and $y=\pm\frac{1}{2}$

Solutions are: $(0,1),(0,-1),(1,0),(-1,0),\left(\frac{1}{2},-\frac{1}{2}\right)$ and $\left(-\frac{1}{2},\frac{1}{2}\right)$.

17. $1-2\sin^2\left(\frac{x}{3}\right)\cos^2\left(\frac{x}{3}\right)>\frac{1}{2}$

$\Rightarrow 1-\frac{1}{2}\sin^2\left(\frac{2x}{3}\right)>\frac{1}{2}$

$\Rightarrow \sin^2\left(\frac{2x}{3}\right)<1$

Which is always true except when $\sin^2\left(\frac{2x}{3}\right)=1$

$\frac{2x}{3}=n\pi\pm\frac{\pi}{2}$ or $x=\frac{3n\pi}{2}\pm\frac{3\pi}{4}$

So, solution of x is $R\sim\left\{x: x=\frac{3n\pi}{2}\pm\frac{3\pi}{4},\ n\in I\right\}$.

18. $3\left(\tan 2x-\tan 3x\right)=\tan 3x\left(1+\tan 3x\tan 2x\right)$

$\Rightarrow 3\left(\frac{\tan 2x-\tan 3x}{1+\tan 3x\tan 2x}\right)=\tan 3x\Rightarrow -3\tan\left(3x-2x\right)=\tan 3x$

$\Rightarrow -3\tan x=\frac{3\tan x-\tan^3 x}{1-3\tan^2 x}\Rightarrow -3=\frac{3-\tan^2 x}{1-3\tan^2 x}$

Or $\tan x=0$ so $x=n\pi,\ \tan^2 x=\frac{3}{5}$

$x = n\pi \pm \tan^{-1}\sqrt{\frac{3}{5}},\ n \in I$

$x = n\pi,\ n \in I$

19. $\sin^{100} x = 1 + \cos^{100} x \quad L.H.S \le 1,\ R.H.S. \ge 1$

So, L.H.S. = R.H.S. = 1

$\cos^{100} x = 0,\ \sin^{100} x = 1; x = n\pi \pm \frac{\pi}{2}.$

20. $-\sqrt{5} < 4\sin x - 1 < \sqrt{5},\ \frac{-\left(\sqrt{5}-1\right)}{4} < \sin x < \frac{\left(\sqrt{5}-1\right)}{4}$

$\Rightarrow -\sin\left(\frac{\pi}{10}\right) < \sin x < \cos\left(\frac{2\pi}{10}\right) \Rightarrow \sin\left(\frac{-\pi}{10}\right) < \sin x < \sin\left(\frac{3\pi}{10}\right)$

$x \in \left(\frac{-\pi}{10}, \frac{3\pi}{10}\right)$

MATHEMATICS-IB

21. $m_1 = -\frac{1}{4},\ m_2 = -\frac{4}{k}$

$m_1 m_2 = -1$

$\Rightarrow k = -1$

22. $y - \text{coeff.} = 0$

$\Rightarrow 4 - k = 0$

$\Rightarrow k = 4$

23. Verify $y = -3$

$\tan\theta = \frac{3}{5}$

24. Perpendicular line is $x - 3y = k$

Sub. $(2, 2) \Rightarrow 2 - 6 = k$

$\Rightarrow k = -4$

$x - 3y + 4 = 0$

$x = 0 \Rightarrow y = \frac{4}{3}$

25. $y - 3 = \frac{-2-3}{4+1}(x+1)$

$\Rightarrow y - 3 = -x - 1$

$x + y - 2 = 0$

26. $\frac{x}{a} + \frac{y}{2a} = 1$

$(1, 2) \Rightarrow 2 + 2 = 2a$

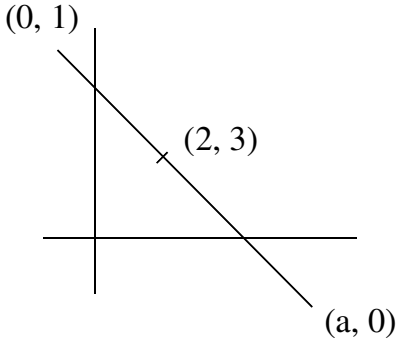
$a = 2$

$\therefore 2x + y = 4$

27. $\frac{x}{a} + \frac{y}{b} = 1$

$\frac{a}{2} = 2,\ \frac{b}{2} = 3$

$a = 4,\ b = 6$



$\frac{x}{4}+\frac{y}{6}=1$

$\Rightarrow 3x+2y=12$

28. $x\cos 30+y\sin 30=3$

$\sqrt{3}x+y=6$

29. $\tan\theta=\left|\frac{m_1-m_2}{1+m_1m_2}\right|$

$\tan\theta=1\Rightarrow\theta=45^0$

30. $\Delta=\frac{1}{2}|ab|$

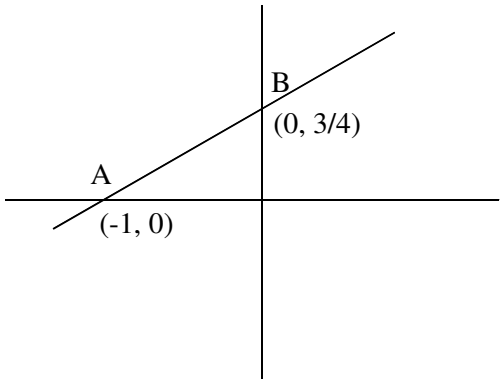
$=\frac{1}{2}|3\times 4|=6$

31. $y-3=\frac{3}{4}(x-3)$

$4y-12=3x-9$

$3x-4y=-3$

$\frac{x}{-1}+\frac{y}{3/4}=1$

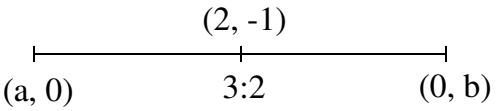


$AB=\sqrt{1+\frac{9}{16}}=\frac{5}{4}$

32. Angle made with x-axis = 60^0

Angle made with y-axis = $90^0-60^0=30^0$

33.



Internal division formula

$\Rightarrow\frac{2a}{5}=2\Rightarrow a=5$

And $\Rightarrow \frac{3b}{5} = -1 \Rightarrow b = -\frac{5}{3}$

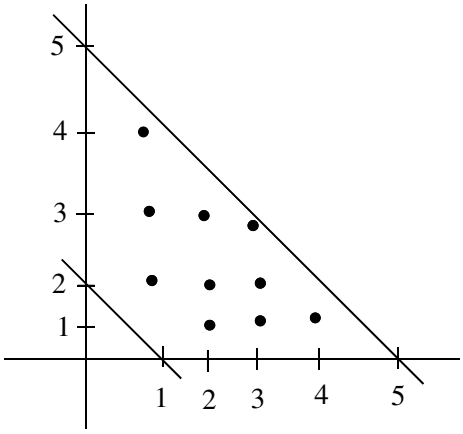
$\therefore x - 3y - 5 = 0$

34. Perpendicular line is $x + 5y = k$

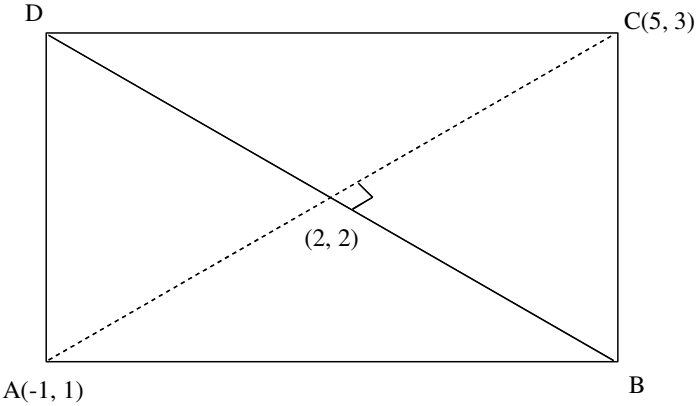
$\Delta = \frac{c^2}{2|ab|} = \frac{k^2}{10} = 5$

$k = \pm 5\sqrt{2}$

35.



36.



$m_{AC} = -\frac{1}{\left[\frac{3-1}{5+1}\right]} = -\frac{1}{\left(\frac{1}{3}\right)} = -3$

$y - 2 = -3(x - 2)$

$3x + y = 8$

37. $\frac{|3+4+c|}{\sqrt{3^2+4^2}} = 7$

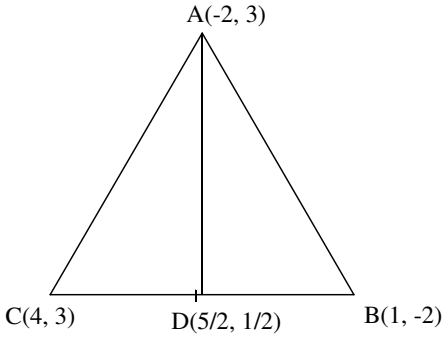
$|c + 7| = 35$

$c + 7 = \pm 35$

$c = 35 - 7, \quad c = -35 - 7$

$c = 28, \quad c = -42$

38.

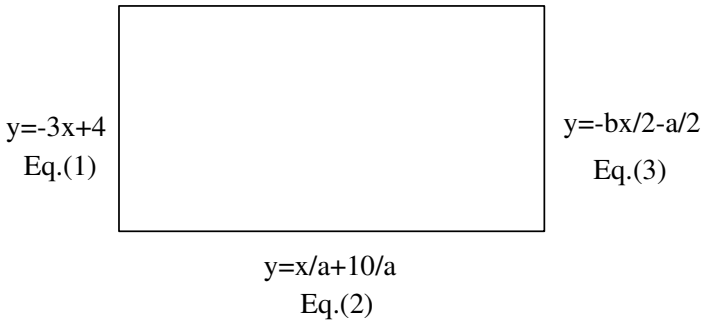


$$m_{AD}=\frac{3-\frac{1}{2}}{-2-\frac{5}{2}}=\frac{5}{9}$$

$$y-3=-\frac{5}{9}(x+2)$$

$$5x+9y-17=0$$

39.



Equation (1), (3) are parallel implies

$$-\frac{b}{2}=-3$$

$$b=6$$

Equation (1), (2) are perpendicular implies

$$(-3)\frac{1}{a}=-1$$

$$a=3$$

$$\therefore ab=18$$

40. $A=(-6,\ 0)$

$B=(0,\ -4)$

$3x-2y=k$

Midpoint $=(-3,\ -2)$

$-9+4=k$

$k=-5$

$3x-2y+5=0$

PHYSICS

41. $H=\frac{v^2}{2g}\sin^2\theta \qquad R=\frac{v^2}{g}\sin 2\theta$

But $R=2H$

$\tan\theta=2$

$$R=\frac{v^2}{g}\times 2\sin\theta\cos\theta$$

$$R = \frac{4v^2}{5g}$$

42. Linear momentum = $mu\cos\theta$

Angular momentum at highest point = Linear momentum × perpendicular distance

$$= mu\cos\theta \times \frac{u^2}{2g}\sin^2\theta$$

$$= \frac{mu^3\sin^2\theta\cos\theta}{2g}$$

43. $h = \frac{u^2}{2g}\sin\theta; \quad T = \frac{2u}{g}\sin\theta$

$$\frac{h}{T^2} = \frac{g}{8}$$

$$h \propto T^2$$

$$\frac{\Delta h}{h} = 2\frac{\Delta T}{T}$$

$$\frac{\Delta T}{T} = \frac{1}{2}\frac{\Delta h}{h}$$

$$= \frac{1}{2}\times 10\% = 5\%$$

44. $S_x = u_x t + \frac{1}{2}a_x t^2$

$$= 3\times 4 + \frac{1}{2}\times 0\times 4^2 = 12\,\text{m}$$

$$S_y = u_y t + \frac{1}{2}a_y t^2$$

$$= 0\times 4 + \frac{1}{2}\times 2\times 4^2 = 16\,\text{m}$$

$$S = \sqrt{S_x^2 + S_y^2}$$

$$= \sqrt{12^2 + 16^2} = 20\,\text{m}$$

45. $R = 4\sqrt{3}H$

$$\frac{u^2}{g}\sin 2\theta = 4\sqrt{3}\,\frac{u^2}{2g}\sin^2\theta$$

$$\tan\theta = \frac{1}{\sqrt{3}}$$

$$\theta = 30^0$$

46. Conceptual

47. $R_1 = \frac{u^2}{g}\sin 2\theta$

$$= \frac{u^2}{g}\sin 2\times 75$$

$$= \frac{u^2}{g}\sin 150 = \frac{u^2}{2g}$$

$$R_2 = \frac{u^2}{g}\sin 90 = \frac{u^2}{g}$$

$$R_2 = 2R_1$$

$= 2 \times 0.5 = 1.0\,\text{km}$

48. $y = 12x - \frac{3}{4}x^2$

$\frac{dy}{dx} = 12\frac{dx}{dt} - \frac{3}{2}\frac{dx}{dt}$

At $x = 0$ $\frac{dy}{dt} = 12\frac{dx}{dt}$

If θ be the angle of projection

$\frac{dy/dt}{dx/dt} = 12 = \tan\theta$

$u\cos\theta = 3$

$\tan\theta \times u\cos\theta = 36$

$u\sin\theta = 36$

$R = \frac{u^2}{g} \times 2\sin\theta\cos\theta$

$R = \frac{2 \times 36 \times 3}{10} = 21.6\,\text{m}$

49. $u_x = u\cos 45 = \frac{u}{\sqrt{2}}$

Linear momentum $= \frac{mu}{\sqrt{2}}$

$H = \frac{u^2}{4g}$

Angular momentum $= \frac{mu}{\sqrt{2}} \times \frac{u^2}{4g}$

$= \frac{mu^3}{4\sqrt{2}g}$

50. Maximum range $R_m = \frac{u^2}{g} = 16$ km where $\theta = 45^0$

Linear momentum at the highest point $= mu\cos 45 = \frac{mu}{\sqrt{2}}$

After explosion, the projectile breaks into two equal masses. As one mass drops vertically downwards, hence its velocity and momentum is zero

According to LCLM, $mu\cos 45^0 = \frac{m}{2}v$

$v = 2u\cos 45^0$

Horizontal distance covered from the time of explosion $= v \times \frac{T}{2}$

$= 2u\cos 45^0 \times \frac{1}{2} \times \frac{2u\sin 45}{g}$

$= \frac{u^2}{g} = 16$ km

51. If the ball hits the n^{th} step then horizontal distance = nb

Vertical distance = nh

$nb = ut$

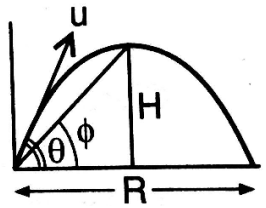
$nh = \frac{1}{2}gt^2$

$$t=\frac{nb}{u}$$

$$nh=\frac{1}{2}g\left(\frac{nb}{u}\right)^2 \Rightarrow n=\frac{2hu^2}{gb^2}$$

52. $\tan\phi=\dfrac{H}{R/2}$

$$\tan\phi=\frac{1}{2}\tan\theta$$



53. $h=u\sin\theta t-\dfrac{1}{2}gt^2$

$$d=u\cos\theta t$$

$$t=\frac{d}{u\cos\theta}$$

$$h=u\sin\theta\times\frac{d}{u\cos\theta}-\frac{1}{2}g\left(\frac{d}{u\cos\theta}\right)^2$$

$$u=\frac{d}{\cos\theta}\sqrt{\frac{g}{2\left(d\tan\theta-h\right)}}$$

54. Time taken by the cart to cover 80 m $t=\dfrac{s}{v}=\dfrac{80}{30}=\dfrac{8}{3}\sec$

$$v=u+at$$

$$t=\frac{8/3}{2}=\frac{4}{3}$$

(Since time of flight to reach the max height is half of its time of flight)

$$0=u-10\times\frac{4}{3}$$

$$u=\frac{40}{3}$$

55. In horizontal distance relative velocity $=u+v$

$$\left(u+v\right)t=d$$

$$t=\frac{d}{u+v}$$

$$H=\frac{1}{2}gt^2$$

$$t=\sqrt{\frac{2H}{g}}$$

$$\frac{d}{u+v}=\sqrt{\frac{2H}{g}}$$

$$u+v=d\sqrt{\frac{g}{2H}}$$

$v = d\sqrt{\frac{g}{2H}} - u$

56. $PE = KE$

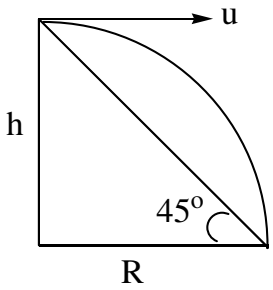
$mg \times \frac{u^2}{2g}\sin^2\theta = \frac{1}{2}mu^2\cos^2\theta$

Find θ then $T_f = \frac{2u}{g}\sin\theta$

57. Difference in heights = 19.6

$R = u\sqrt{\frac{2h}{g}}$ where $h = 19.6$, $R = 16\,\text{m}$, $u = 8\,\text{m/s}$

58. $h = R$



$\frac{1}{2}gt^2 = u\sqrt{\frac{2h}{g}}$

$t = 2\,\text{sec}$

$u = 9.8\,\text{m/s}$

59. $v = \sqrt{v_x^2 + v_y^2}$

$v_x = u \quad v_y = gt$

60. $R = u\sqrt{\frac{2h}{g}}$

$200 = 600\sqrt{\frac{2h}{g}}$

$g = 9.8\,\text{m/s}^2$

$h = \frac{49}{90}\text{m.}$

CHEMISTRY

61. $Cr^{3+} = [Ar]3d^3 \qquad Fe^{3+} = [Ar]3d^5 \qquad Mn^{+2} = [Ar]3d^5$

$CO^{3+} = [Ar]3d^6 \qquad Se^{+3} = [Ar]3d^0$

Thus, Fe^{3+} and Mn^{+2} have the same electronic configuration.

62. The important implications of the Heisenberg uncertainty principle is that it rules out existence of definite paths or trajectories of electrons and other similar particles.

63. Due to extra stability of fully filled orbital of d-subshell as electronic configuration should be $1s^2 2s^2 2p^6 3s^2 3p^6 4s^1 3d^{10}$

64. According to Heisenberg's uncertainty principle

$m\Delta v \times \Delta x > \frac{h}{4\pi} \qquad m = 6.626\times10^{-28}\,\text{kg}, \qquad \Delta v = 10^{-6}\,\text{m/sec} \qquad h = 6.626\times10^{-34}\,\text{Js}$

$6.626\times10^{-28}\times10^{-6}\times\Delta x = \frac{6.626\times10^{-34}}{4\pi}$

$$\Delta x = \frac{6.626\times10^{-34}}{4\pi\times6.626\times10^{-34}} = \frac{1}{4\pi}$$

65. $\Delta x.\Delta p = \frac{h}{4\pi} \Rightarrow \Delta x.m\Delta v = \frac{h}{4\pi}$

$$\Delta v = \frac{0.005}{1000}\times600 = 3\times10^{-2}\,\text{ms}^{-1}$$

$$\therefore \Delta x = \frac{6.626\times10^{-34}}{4\times3.14\times9.1\times10^{-31}\times3\times10^{-2}}$$

$$\Delta x = 1.92\times10^{-3}\,\text{m}$$

66. According to Heisenberg principle $\Delta x = \frac{h}{4\pi m\Delta v}$

$$= \frac{6.6\times10^{-27}\times100}{4\times3.14\times9.1\times10^{-24}\times3\times10^{4}\times0.011}$$

$$\therefore \Delta x = 0.175\,\text{cm}$$

67. Here, $\Delta x = \Delta v$ $\qquad \Delta x\times\Delta p > \frac{h}{4\pi} \Rightarrow (\Delta v)^2 = \frac{h}{4\pi m}$

$$\Delta v = \sqrt{\frac{h}{4\pi m}} \qquad \Delta p = n_1\Delta v$$

$$\Delta p = m\sqrt{\frac{h}{4\pi m}} = \sqrt{\frac{mh}{4\pi}}$$

$$\therefore \Delta p = \frac{1}{2}\sqrt{\frac{mh}{2\pi}}$$

68. Wave nature of electron was first demonstrated by Davisson and Germer.

69. $\Delta x.\Delta p \geq \frac{h}{4\pi}$

$$\Delta p = m\Delta v$$

$$\Delta v.m\Delta v \geq \frac{h}{4\pi}$$

$$\therefore \Delta x = \frac{h}{4\pi m\Delta v}$$

70. $p\left(1s^2,\ 2s^2 2p^6,\ 3s^2 3p^3\right)$ has 6 electrons in s-subshells as in d-shell of Fe^{+2}

71. There are 7 electrons so "N"

72. Atomic no. 17

$1s^2 2s^2 2p^6 3s^2 3p^5$

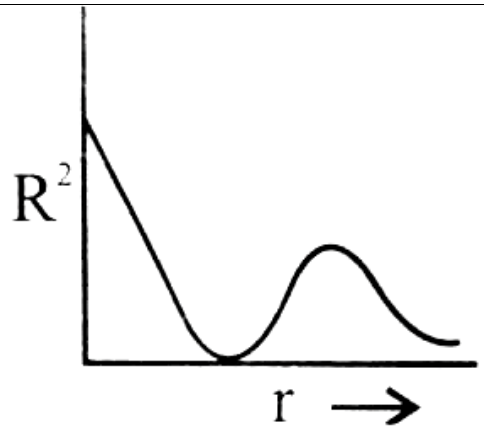
Here valency shell is $3s^2 3p^5$

Valence shell has 3 orbitals with paired electrons

73. $Br - 1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^5$

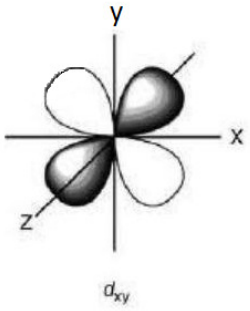
Total no. of p-electrons in bromine is 17.

74.



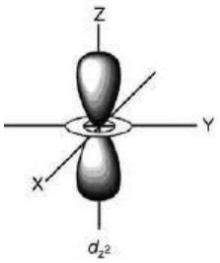
75. s-orbital spherical shape, non-directional.

76.



d_{xy}

77.



d_{z^2}

Do not have four lobes

78. Angular nodal planes = l value for d – l = 2.

79. Filling of electrons follows energy increasing order
$\therefore$ after filling s-orbital enters into p-orbital.

80. $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^1$
Total no. of electrons 31, so atomic no = 31.

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