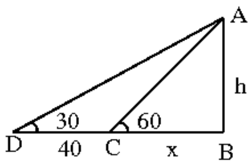
HINTS & SOLUTIONS

1. (1)



$$\tan 30 = \frac{h}{40+x} \qquad \tan 60 = \frac{h}{x}$$

$$\frac{40+x}{\sqrt{3}} = h \qquad \sqrt{3}x = h$$

$$3x = 40 + x \Rightarrow x = 20$$

2. (2). Normal equation $= \frac{ax}{\sec\theta} + \frac{by}{\tan\theta} = a^2 + b^2$

transvers axies y = 0

$$\Rightarrow x = \frac{(a^2+b^2)\sec\theta}{a} = ae^2\sec\theta$$

$$G = (ae^2\sec\theta, 0)$$

A = (a, 0)

A^1 = (–a, 0)

$$\Rightarrow AG.A^1G = (ae^2\sec\theta - a)(ae^2\sec\theta + a)$$

$$= a^2(e^2\sec^2\theta - 1)$$

3. (4). $l + m + n = 0$ ....(1)

$2lm - mn + 2nl = 0$........(2)

$l + m = -n$

substute (2) we have $\Rightarrow$ $m = l$ or $m = -2l$

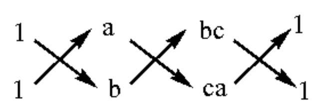
$$\ell : m : n = \frac{-k}{2} : \frac{-k}{2} : k \quad \text{or} \quad \ell : m : n = k : -k : k$$

= (–1, –1, 2) = (1, 1, –2)

$$\cos\theta = \frac{|a_1a_2 + b_1b_2 + c_1c_2|}{\sqrt{a_1^2+b_1^2+c_1^2}\sqrt{a_2^2+b_2^2+c_2^2}} = \frac{-1}{2}$$

$$\theta = 120$$

4. (3). $x^2 + ax + bc = 0$, $x^2 + bx + ca = 0$



common root is $\frac{bc - ac}{b - a} = c$

c is a common root, then $c^2 + ac + bc = 0$

$\Rightarrow a + b + c = 0.$

The other roots are b and a.

quadratic equation whose roots are a and b,

then $x^2 - (a+b)x + ab = 0$

$x^2 + cz + ab = 0$

5. (4). $\log(1 + x + x^2) = \log(1-x^3) - \log(1-x)$

$$= -x^3 + \frac{x^6}{2} .... + x + \frac{x^2}{2} + \frac{x^3}{3} + ... \quad \text{coeff. of } x^3 = -1 + \frac{1}{3} = -\frac{2}{3}$$

6. (3). $\phi < x < 3$

$\phi < x^3 < 27$

$0 < x^3 - 1 < 26$

$\therefore$ number of discontinuous points are 25

7. (4). ginven equation 5x – y = 1

perpendicular equation is x + 5y – k = 0

are $\frac{c^2}{2|ab|} \Rightarrow \frac{k^2}{2|5|} = 5$

$k = \pm 2\sqrt{5} \Rightarrow x + 5y \pm 2\sqrt{5} = 0$

8. (1). $C = \left(\frac{-(-4+6\lambda)}{2}, \frac{-(-2+8\lambda)}{2}\right)$

$C = (2 - 3\lambda,\ 1 - 4\lambda)$

radious = 0 $\Rightarrow \lambda = \frac{4 \pm \sqrt{17}}{5}$

$C_1 = \left(\frac{-2-3\sqrt{7}}{5}, \frac{-11-4\sqrt{7}}{5}\right)$, $C_2 = \left(\frac{-2+3\sqrt{7}}{5}, \frac{-11+4\sqrt{7}}{5}\right)$

$C_1C_2 = \frac{10}{5}\sqrt{7} = 2\sqrt{7}$

9. (3). $ax^2 + by^2 = 1$

diff. w. r. to x

$2ax + 2byy_1 = 0$

$ax + b\, yy_1 = 0$ ....(1)

again diff. w. r. to x

$a + b\left[y_1^2 + yy_2\right] = 0$....................(2)

$x \times (2) \Rightarrow ax + b\left[y_1^2 + yy_2\right]x = 0$.....................(3)

$(1) - (3) \Rightarrow xyy_2 + xy_1^2 - yy_1 = 0$

10. (4) . $S = 4\pi r^2 \Rightarrow \log S = \log 4\pi + 2\log r$

$\Rightarrow \frac{\Delta S}{S} \times 100 = 0 + 2\frac{\Delta r}{r} \times 100 = 2.\frac{0.03 \times 100}{3} = 2$

11. (1) . $\sqrt{14} = \frac{\left|\frac{k}{2} - 1\right|}{\sqrt{4+9+1}} \Rightarrow \left|\frac{k}{2} - 1\right| = 14 \Rightarrow k - 1 = \pm 28 \Rightarrow k = -26, 30$

12. (1). $ho(gof)\left(\frac{\sqrt{\pi}}{2}\right) = h\left(g\left(\frac{\pi}{4}\right)\right) = h(1) = 0$

13. (2). $16 - 9x^2 > 0 \Rightarrow x^2 - \frac{16}{9} < 0 \Rightarrow x \in \left(-\frac{4}{3}, \frac{4}{3}\right)$

$|3x - 2| < 1 \Rightarrow -1 < 3x - 2 < 1 \Rightarrow 1 < 3x < 3 \Rightarrow \frac{1}{3} < x < 1$

Rq.so. $\Rightarrow x \in \left(\frac{1}{3}, 1\right)$

14. (4). Range $\left[-\sqrt{a^2+b^2},+\sqrt{a^2+b^2}\right]$

Max : $\sqrt{2^2+3^2}=13$

Min exist at x = 0 $\Rightarrow$ 0^-

15. (2). Let $y=\dfrac{x^2+2x+9}{x^2+4x+3a}$

$(y-1)x^2+(4y-2)x+(3ay-a)=0$

$x \in R$: $(4-3a)y^2-4(1-a)y+(1-a)>0$

$y \in R$: $16(1-a)^2-4(4-3a)(1-a)<0$

$\Rightarrow a^2-a<0$

$(a-0)\ (a-1)<0$

$0<a<1$

16. (4). $(A-B)(A+B)=A.A+A.B-B.A-B.B$

$A^2-B^2=A^2+AB-BA-B^2$

$\Rightarrow A.B=B.A$

17. (1). $\cot v=\dfrac{x^{2/3}+y^{2/3}}{x+y}$

$n=\dfrac{2}{3}-1=\dfrac{-1}{3}$

By Euler's theorem

$x.(-\operatorname{cosec}^2 v)vx+y(-\operatorname{cosec}^2 v)vy=\dfrac{-1}{3}.\cot v$

$x\,vx+y\,vy=\dfrac{1}{3}\dfrac{\cos v}{\sin v}.\sin^2 v \quad =\dfrac{1}{3}\sin v.\cos v$

$=\dfrac{1}{6}2\sin v\cos v \quad =\dfrac{\sin 2v}{6}$

18. (2). $\begin{bmatrix}1&1&1\\1&2&\lambda\\1&2&3\end{bmatrix}\begin{bmatrix}x\\y\\z\end{bmatrix}=\begin{bmatrix}6\\0\\10\end{bmatrix}$

If the system has no. solution ....

$\begin{vmatrix}1&1&1\\1&2&\lambda\\1&2&3\end{vmatrix}=0$

$1(6-2\lambda)-1(3-\lambda)+0=0$

$\lambda=3$

19. (4). $\alpha+\beta+\gamma=0$

$\alpha\beta+\beta\gamma+\gamma\alpha=-3$

$\alpha\beta\gamma=-1$

Let $\alpha_1=\dfrac{-2}{\beta\gamma},\alpha_2=\dfrac{-2}{\alpha\gamma},\alpha_3=\dfrac{-2}{\alpha\beta}$

$$\alpha_1+\alpha_2+\alpha_3=-2\left[\frac{\alpha+\beta+\gamma}{\alpha\beta\gamma}\right]=0$$

$$\alpha_1\alpha_2\alpha_3=\frac{-8}{(\alpha\beta\gamma)^2}=\frac{-8}{(-1)^2}=-8$$

$$\alpha_1\alpha_2+\alpha_2\alpha_3+\alpha_3\alpha_1=-4\left[\frac{1}{\alpha}+\frac{1}{\beta}+\frac{1}{\gamma}\right]$$

$$=-\left[\frac{\alpha\beta+\beta\gamma+\gamma\alpha}{\alpha\beta\gamma}\right]$$

$$=-\left[\frac{-3}{-1}\right]=-12$$

Required equation

$$x^3-(\alpha_1+\alpha_2+\alpha_3)x^2+(\alpha_1\alpha_2+\alpha_2\alpha_3+\alpha_3\alpha_1)x-\alpha_1\alpha_2\alpha_3=0$$

$$x^3-0-12x+8=0$$

$$x^3-12x+8=0$$

20. (3). $f^{n-r+1}=f^{4-2+1}=f^3$

$$x^4+4x^3+2x^2-4x-2=0$$

$$4x^3+12x^2+4x-4=0$$

$$12x^2+24x+4=0$$

$24x + 24 = 0$

$x = -1$

-1	1	4	2	-4	-2	
	0	-1	-3	1	3	
-1	1	3	-1	-3	1	
	0	-1	-2	3		
-1	1	2	-3	0		
	0	-1	-1			
-1	1	2	-4			
	0	-1				
	1	0				

Required equation is $y^4-4y^2+1=0$

21. (3). $\dfrac{2\tan x/2}{1+\tan^2 x/2}+\dfrac{\tan^2 x/2}{1+\tan^2 x/2}=\dfrac{1}{5}$

$$\Rightarrow 2\tan xh+1-\tan^2 xh=\frac{1}{5}(1+\tan^2 xh)\Rightarrow -5\tan^2 xh+10\tan xh+5=1+\tan xh$$

$$6\tan^2 xh-10\tan xh-4=0\Rightarrow 3\tan^2 xh-5\tan xh-1=0\Rightarrow \tan xh=2,-1/3$$

$$\therefore \tan x=\frac{2\tan xh}{1-\tan^2 xh}=\frac{-4}{5}\ \text{ or }\ \frac{-3}{4}$$

22. (2). tanA + tanB + tanC = 6, tanA tanB = 2

$$A+B+C=180 \Rightarrow \sum \tan A = \Pi \tan B \Rightarrow \tan C = 3 \Rightarrow -\tan A + \tan B = 3$$

$\therefore \tan A = 1, \tan B = 2, \tan C = 3$

tanA + tanB = tanC

$\therefore$ It is accute angle

23. (4). $\sin^6\theta + \cos^6\theta + k\cos^2\theta = 1 \Rightarrow \left((\sin\theta)^2\right)^3 + (\cos^2\theta)^3 + k\cos^2\theta = 1$

$$1 - 3\sin^2\theta\cos^2\theta + k\cos^2\theta = 1 \Rightarrow 3\sin^2\theta\cos^2\theta = k\cos^2\theta \Rightarrow k = 3\sin^2\theta$$

24. (3) I) $\dfrac{\sin 65 + \sin 25}{\cos 65 + \cos 25} = \dfrac{2\sin 75 \cos 20}{2\cos 45 \cos 20} = 1$

II) $\dfrac{\sin 70 + \cos 40}{\cos 70 + \cos 40} = \dfrac{\sin 70 + \sin 50}{\cos 70 + \cos 50} = \dfrac{2\sin 60 . \cos 10}{2\cos 60 . \cos 20} = \sqrt{3}$

III)

$$\frac{\cos^3 33 + \cos^3 27}{\cos 33 + \cos 27} = \cos^2 33 - \cos 33 \cos 27 + \cos^2 27 = 1 + \cos^2 33 - \sin 27 - \frac{1}{2}(2\cos 33 \cos 27)$$

$$= 1 + \cos 60 . \cos 6 - \frac{1}{2}\left[\cos 60 + \cos 63 = 1 - \frac{1}{2}.\frac{1}{2} = \frac{3}{4}\right]$$

25. (3). ASSISTANT

A – 2
S – 3
I – 1
T – 2
N – 1

STATISTICS

S – 3
T – 3
A – 1
I – 2
C – 1

$$\frac{{}^2C_1.{}^1C_1 + {}^3C_1.{}^3C_1 + {}^1C_1.{}^2C_1 + {}^2C_1{}^3C_1}{{}^9C_1.{}^{10}C_1} = \frac{2+9+2+6}{9.10} = \frac{19}{90}$$

26. (4). $\tan^{-1}\sqrt{x(x+1)} + \sin^{-1}\sqrt{x^2+x+1} = \dfrac{\pi}{2}$

$$\cos^{-1}\left(\frac{1}{\sqrt{(x^2+x)^2+1}}\right) + \sin^{-1}\sqrt{x^2+x+1} = \frac{\pi}{2}$$

$$\frac{1}{(x^2+x)^2+1} = x^2+x+1$$

put $x^2 + x = a$

$(a+1)(a^2+1) = 1$

$a^3 + a^2 + a + 1 = 0$

$a(a^2 + a + 1) = 0$

$a = 0$ $\qquad a = \dfrac{-1 \pm \sqrt{3}}{2}$

$x^2 + x = 0$

$x = 0, -1$

$\therefore$ Two real solutions

27. (4). $\sin x \sinh y = \cos\theta, \quad \cos x \cosh y = \sin\theta$

$$\cos^2\theta + \sin^2\theta = \sin^2 x \sin^2 hy + \cos^2 x \cos^2 hy$$

$$1 = \sin^2 x \sin^2 hy + \cos^2 hy - \sin^2 x \cos^2 hy$$

$1 = -\sin^2 x + \cos^2 hy$

$1 = -1 + \cos^2 x + \cos^2 hy$

$\therefore \cos^2 x + \cos^2 hy = 2$

28. (1). A, B, C are A.P. $\to B = 20$, $A + C = 120$

$22^2 = 24^2 + k^2 - 2.\ 24.\ k \cos 68$

$484 = 576 + k^2 - 24k$

$k^2 - 24k + 92 = 0$

$k = \dfrac{24 \pm \sqrt{576 - 368}}{2}$

$= 12 \pm 2\sqrt{3}$

29. (4). $a = 30$, $b = 24$, $c = 18$, $s = 36$, $s - a = 6$, $s - b = 12$, $s - c = 18$

$$\frac{1}{r_1} : \frac{1}{r_2} : \frac{1}{r_3} = \frac{s-a}{\Delta} : \frac{s-b}{\Delta} : \frac{s-c}{\Delta} = 6 : 12 : 18 := 1 : 2 : 3$$

30. (2). $\cos A + \cos B + \cos C = 1 + 4\sin\frac{A}{2}\sin\frac{B}{2}\sin\frac{C}{2}$

$$= 1 + \frac{4R}{R}\sin\frac{A}{2}\sin\frac{B}{2}\sin\frac{C}{2} = 1 + \frac{r}{R}$$

31. (1). $3S = \dfrac{3.5}{2!}\left(\dfrac{1}{9}\right)^2 + \dfrac{3.5.8}{3!}\left(\dfrac{1}{9}\right)^3 + \ldots\ldots\ldots\ldots\ldots\ldots$

$$1 + 3.\frac{1}{9} + 3S = \left(1 - \frac{2}{9}\right)^{-3/2}$$

$$1 + \frac{1}{3} + 3S = \left(\frac{7}{9}\right)^{-3/2} = \left(\frac{9}{7}\right)^{3/2}$$

$$\frac{4}{3} + 3S = \frac{9}{7}.\sqrt{\frac{9}{7}}$$

32. (2). $S = 1 + 2\alpha + 3\alpha^2 + \ldots\ldots\ldots n\alpha^{n-1}$

$\alpha S = 0 + \alpha + 2\alpha^2 + \ldots\ldots\ldots\ldots\ldots\ldots\ldots n\alpha^n$

$\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots$

$\alpha^n = 1$

$(1-\alpha)S = 1 + \alpha + \alpha^2 \ldots\ldots\ldots \alpha^{n-1} - n\alpha^n$

$(1-\alpha)S = \dfrac{\alpha^n - 1}{\alpha - 1} - n\alpha^n$

$S = \dfrac{(\alpha^n - 1)}{(1-\alpha)^2} - \dfrac{n.\alpha^n}{1-\alpha}$

α is n^{th} roots of unity as

$S = 0 - \dfrac{n}{1-\alpha} = \dfrac{-n}{1-\alpha}$

33. (4). $z^2 + pz + q = 0$

It is equilateral triangle

$z_1 + z_2 = -p, z_1 z_2 = q$

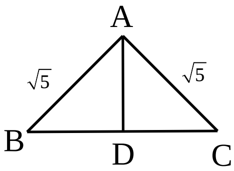
$\therefore z_1^2 + z_2^2 = z_1 z_2 \Rightarrow p^2 = 3q$

$(z_1 + z_2)^2 = 3z_1 z_2$

34. (2). $a = \cos\dfrac{4\pi}{3} + i\sin\dfrac{4\pi}{3} = -\cos 60 - i\sin 60 = -\dfrac{1}{2} - \dfrac{\sqrt{3}}{2}i$

$$1 + a = \frac{1}{2} - \frac{\sqrt{3}}{2}i \Rightarrow \left(\frac{1+a}{2}\right)^{3n} = \frac{1}{2^{3n}}\left(1 + a^n\right) = \frac{1}{2^{3n}}(\cos\pi x - i\sin\pi x) = \frac{1}{2^{3n}}(\cos\pi - i\sin\pi)^n = \frac{(-1)^n}{2^{3n}}$$

35. (2).



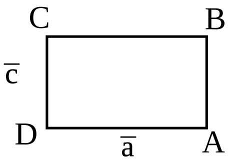
$D = \left(\frac{3}{2}, \frac{1}{2}, 2\right)$

$\frac{BD}{DC} = \frac{AB}{AC} = \frac{1}{1=}$

$\therefore$ D is the mid point of DC

$\therefore AD = \sqrt{\frac{1}{4} + \frac{1}{4} + 1} = \sqrt{\frac{6}{4}} = \sqrt{\frac{3}{2}}$

36. (3).



Equation of line pasing through a point and parallel to vertices $\bar{a} = at + b$

$\therefore$ Equation of BC = $r = c + ta$

$F = 2i - 3j + 4k$, A = (3, 4, 5), B = (1, 2, 3)

$\bar{a} = AB = (-2 \ \ -2 \ \ -2)$

work done = F.a = (–2 –2 –2).(2 –3 2)

= – 4 + 6 – 4 = –2

37. (4)

38. (3). Let he required vector be $\bar{c} = x\bar{i} + y\bar{j} + z\bar{k}$ then

$\left[\bar{A} \ \ \bar{B} \ \ \bar{C}\right] = 0$ and $\left(\bar{i} + \bar{j} + \bar{k}\right).\left[x\bar{i} + y\bar{j} + z\bar{k}\right] = 0$

After simplification we can get

x = 0, y = 1, t = –1; Required vector = $\frac{\bar{j} - \bar{k}}{\sqrt{2}}$

39. (2). $(a \times b) \times c = \frac{1}{3}|b||c|\bar{a}$

$(a.c).b - (b.c)a = \frac{1}{3}|b||c|\bar{a}$

$\therefore |b||c|\cos\theta = \frac{1}{3}|b|c \Rightarrow \cos\theta = \frac{1}{3}$

$\sin\theta = \sqrt{1 - \frac{1}{9}} = \sqrt{\frac{8}{9}} = \frac{2\sqrt{2}}{3}$

40. (2). $n(S) = 6^6$

$n(E) = {}^6C_2.{}^6C_1.5^4$

$\therefore$ probability of exactly two shows same number $= \frac{{}^6C_2.{}^6C_1.5^4}{6^6} = \frac{5^5}{2 \times 6^4}$

41. (4). required $\frac{{}^2C_1}{{}^5C_4} = \frac{2}{52} = \frac{1}{26}$

42. (4). $\tan x + \sec x = 2\cos x \Rightarrow 1 + \sin x = 2\cos^2 x \Rightarrow 1 + \sin x = 2 - 2\sin^2 x \Rightarrow 2\sin^2 x + \sin x - 1 = 0$

$\Rightarrow \sin x = \frac{1}{2}, \sin x = -1$

Therefore, solutions in $[0 \ 2\pi]$ are

$\frac{\pi}{6}, \pi - \frac{\pi}{6}, \frac{3\pi}{2}$

Hence, there are three solutions.

43. (2). $p(x = k) = \frac{(k+1)a}{3^k}$

$$a\left[1 + \frac{2}{3} + \frac{3}{3^2} + \ldots\ldots\right] = 1$$

$$a\left[1 - \frac{1}{5}\right]^{-2} = 1$$

$$a\left(\frac{2}{3}\right)^{-2} = 1$$

$$a\left(\frac{3}{2}\right)^{2} = 1 \Rightarrow a\left(\frac{9}{4}\right) = 1 \Rightarrow a = \frac{4}{9}$$

44. (3). $P = \frac{250}{500} = \frac{1}{2}$

$$\lambda = 2 \times \frac{1}{2} = 1$$

$$P(x = 0) = \frac{e^{-\lambda}.\lambda^0}{0!} = \frac{e^{-1}.1^0}{0!} = e^{-1}$$

45. (2). $\underset{x \to 0}{\mathrm{Lt}} \frac{\tan^{10} x - \sin^{10} x}{x^{10+k}} = 5$

$$\underset{x \to 0}{\mathrm{Lt}} \frac{\sin^{10} x}{x^{10}} . \frac{1 - \cos^{10} x}{x^k} = 5$$

$$\underset{x - 10}{\mathrm{Lt}} 1. \frac{1 - \cos^{10} x}{x^k} = 5$$

If k = 2: $\underset{x \to 0}{\mathrm{Lt}} \frac{1 - \cos^{10} x}{x^2} = 5 \Rightarrow \frac{10\cos^9 x \sin x}{20} = 5 \Rightarrow 5(1).1 = 5 \Rightarrow 5 = 5$

46. (1). $\underset{x \to \frac{\pi}{2}}{\mathrm{Lt}} \frac{1 - (\sin x)^{\sin x}}{\cos^2 x}$

$$\underset{x \to \frac{\pi}{2}}{\mathrm{Lt}} \frac{-(\sin x)^{\sin x} \cos x\left[1 + \log(\sin x)\right]}{-2\cos x . \sin x}$$

$$\underset{x \to \frac{\pi}{2}}{\mathrm{Lt}} \frac{(\sin x)^{\sin x - 1}}{2}\left[1 + \log(\sin x)\right] = \frac{1}{2}$$

47. (3). $A = \frac{1}{10.11} = \frac{1}{110}$, $B = \frac{1}{15.17}$, $C = \frac{1}{19.22}$, $D = \frac{1}{21.25}$

D < C < B < A

48. (2). $\frac{dy}{dx} = \frac{1}{4}\left(\frac{1-x}{1+x}\right)\frac{1 - x + 1 + x}{(1-x)^2} - \frac{1}{2(1+x^2)} \quad = \frac{1}{2(1-x^2)} - \frac{1}{2(1+x^2)}$

$$= \frac{1 + x^2 - 1 + x^2}{2(1-x^4)} = \frac{x^2}{1-x^4}$$

49. (4). $y = f\left(e^{2x}\right)e^x$

$$\frac{dy}{dx} = f\left(e^{2x}\right)e^{x} + e^{x}.f^{1}(e^{2x}).e^{2x}.2$$

$$\left(\frac{dy}{dx}\right)_{x=0} = f\left(1\right).1 + 1.f^{1}(1).2$$

$$= 0 + \frac{3}{5}.2 = \frac{6}{5}$$

50. (2). $(\sin x - \cos x)^2 \left(\frac{\cot x + 1}{\cot x - 1}\right)$

$$\Rightarrow (\cos x - \sin x)^2 \frac{(\cos x + \sin x)}{(\cos x - \sin x)}$$

$$\Rightarrow \cos^2 x - \sin^2 x \Rightarrow \cos 2x$$

required solution $-2^{50} \cos 2x$

51. (1). Ch.equation of $A = \begin{bmatrix} 2 & 3 \\ 5 & 6 \end{bmatrix}$ is

$$|A - \lambda I| = 0$$

$$(2 - \lambda)(6 - \lambda) - 15 = 0$$

$$\lambda^2 - 8\lambda - 3 = 0$$

By cayley - Hamolton Theorem every square matrix satiesfies its Ch. Equation.

$$\therefore A^2 - 8A - 3I = 0$$

where k =8

52. (3). $\left(\frac{dy}{dx}\right)_{(1,1)} = 1$

$2(1)\ \ b = 1 \Rightarrow b = -1$

$1 = 1 + b + c \Rightarrow c = 1$

$$\frac{dy}{dx} < 0$$

$2x + b < 0$

$$x < \frac{-b}{2} \Rightarrow x < \frac{1}{2}$$

$$\Rightarrow x \in \left(-\infty, \frac{1}{2}\right)$$

53. (3). $\frac{x^2}{25} + \frac{y^2}{9} = 1$

$a = 5$

$b = 3$

Area $= 4ab.\sin\theta.\cos\theta \ = 2ab\sin 2\theta$

Area is maximum only. when $2\theta = \frac{\pi}{2} \Rightarrow \theta = \frac{\pi}{4}$

side lengths: $2a\cos\theta,\ 2b\sin\theta$

$$2(5).\frac{1}{\sqrt{2}}, \quad 2(3).\frac{1}{\sqrt{2}}$$

$$5\sqrt{2}, \quad 3\sqrt{2}$$

54. (4). $\alpha+\beta=a$

$\alpha\beta = 2a-3$

$f=\alpha^3+\beta^3=(\alpha+\beta)^3-3\alpha\beta(\alpha+\beta)$

$=a^3-3a(2a-3)$

$f=a^3-6a^2+9a$

$\frac{df}{da}=3a^2-12a+9$

$3a^2-12a+9=0$

$9^2-4a+3=0$

a = 1, 3

$a\neq 1$ and a = 3

55. (2). $\frac{\alpha+0}{2}=x_1 \Rightarrow \alpha=2x_1$, $\frac{\beta+0}{2}=y_1 \Rightarrow \beta=2y_1$

(α,β) lie on $x^2+y^2-2y=0$

$\alpha^2+\beta^2-2\beta=0$

$4x_1^2+4y_1^2-4y_1=0$

$x^2+y^2-y=0$

56. (3). $\int\frac{1+\sin^2 2x}{1+\cos^2 2x-1}d(4x)$

$\int\frac{1+\sin^2 2x}{2\cos^2 2x}d(4x)$

$\int\sec^2 2x\,d(4x)-\int\frac{1}{2}...d(4x)$

4x = t

4 dx = dt

$dx=\frac{1}{4}dt$

by simplification

2tan2x – 2x + C

57. (2). $x+1=t^2$

dx = 2t dt

$2\int\frac{(t^2+1)t\,dt}{(t^2-1)^2+3(t^2-1)+3t}$

$2\int\frac{(t^2+1)dt}{t^4+t^2+1}$

$\int\frac{1}{t^2+t+1}dt+\int\frac{1}{t^2-t+1}dt$

$\int\frac{dt}{\left(t+\frac{1}{2}\right)^2+\left(\frac{\sqrt{3}}{2}\right)^2}+\int\frac{dt}{\left(t-\frac{1}{2}\right)^2+\left(\frac{\sqrt{3}}{2}\right)^2}$

$\frac{2}{\sqrt{3}}\left(\tan^{-1}\left(\frac{2t+1}{\sqrt{3}}\right)+\tan^{-1}\left(\frac{2t-1}{\sqrt{3}}\right)\right)+c$

by simplification $\frac{2}{\sqrt{3}}\tan^{-1}\left(\frac{x}{\sqrt{3}(x+1)}\right)+c$

58. (1). $\int \tan^{-1} x \; x^{-4} dx$

$$\tan^{-1} x \frac{x^{-4+1}}{-4+1} - \int \frac{1}{1+x^2}\frac{x^{-3}}{-3}dx$$

$$\frac{-1}{3x^3}\tan^{-1} x + \frac{1}{3}\int \frac{1}{(1+x^2)x^3}dx$$

$$\frac{-1}{3x^3}\tan^{-1} x + \frac{1}{3}\int\left(\frac{A}{x}+\frac{B}{x^2}+\frac{C}{x^3}+\frac{dx+e}{x^2+1}\right)dx$$

A = –1, B = 0, C = 1, D = 1, e = 0

$$\frac{-1}{3x^3}\tan^{-1} x + \frac{1}{6x^2} - \frac{1}{3}\log\left(\frac{x}{\sqrt{1+x^2}}\right)+c$$

59. (3). $\int_0^{\frac{\pi}{2}} \frac{(\cos 3x+1)\sin x}{(2\cos x-1)\sin x}dx$

$$\int_0^{\frac{\pi}{2}} \frac{\cos^2 \frac{3x}{2}\sin x}{\sin 2x - \sin x}dx$$

$$\int_0^{\frac{\pi}{2}} \frac{2\cos^2 \frac{3x}{2}\sin x}{2\cos\frac{3x}{2}\sin\frac{x}{2}}dx$$

$$\int_0^{\frac{\pi}{2}} (\cos 2x + \cos 2x)dx \Rightarrow \left(\frac{\sin 2x}{2}\right)_0^{\frac{\pi}{2}} + (\sin x)_0^{\frac{\pi}{2}} \Rightarrow 1$$

60. (2). $I = \int_0^{\pi} \frac{x\sin x}{1+\cos^2 x}dx$

$$2I = \int_0^{\pi} \frac{\sin x}{1+\cos^2 x}dx$$

cosx = t

$$2I = \int_{-1}^{1} \frac{dt}{1+t^2}$$

$$2I = \left(\tan^{-1} t\right)_{-1}^{1}$$

$$2I = \frac{\pi}{2} \Rightarrow I = \frac{\pi^2}{4}$$

61. (4). $\int_{-1}^{2}\left(\frac{x+2}{4}-\frac{x^2}{4}\right)dx$

$$\frac{1}{4}\int_{-1}^{2}(x+2-x^2)dx$$

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

$$\frac{1}{4}\left(2+4-\frac{8}{3}\right)-\left(\frac{1}{2}-2+\frac{1}{3}\right)\Rightarrow\frac{1}{4}\left(\frac{10}{3}\right)+\frac{7}{6} = \frac{1}{4}\left(\frac{27}{6}\right)=\frac{9}{8}$$

62. (2). $\underset{x\to a}{\mathrm{Lt}}\ \frac{1}{n}\sum_{r=1}^{n}\frac{\left(\frac{r}{n}\right)^2}{1+\left[\frac{r}{n}\right]^3}$

$$\int_0^1\frac{x^2}{1+x^3}dx$$

$$\frac{1}{3}\int_0^1\frac{3x^2}{1+x^3}dx$$

$$\frac{1}{3}\log(1+x^3)_0^1=\frac{1}{3}(\log 2-\log 1)\Rightarrow\frac{1}{3}\log 2$$

63. (3). I) coefficient of x^2 = coefficient of x^2

$${}^9C_2k^2.3^7={}^9C_3k^33^6$$

$${}^9C_2.3={}^9C_3.k\Rightarrow\frac{3}{k}=\frac{{}^9C_3}{{}^9C_2}=\frac{9-3+1}{3}=\frac{7}{3}$$

k=9/7

II) $3^{-1}\left(1-\frac{2}{3}x\right)^{-1}=\frac{1}{3}\left[1+\frac{2x}{3}+\left(\frac{2x}{3}\right)^2+\left(\frac{2x}{3}\right)^3\right]$

coefficient x^2 $=\frac{1}{3}.\frac{8}{27}=\frac{8}{81}$

64. (2). $\frac{dy}{dx}=e^y\left[e^x+x^2e^{x^3}\right]$

$$\int\frac{dy}{dx}=\int\left(e^x+x^2e^{x^3}\right)dx$$

$$e^x+e^{-y}+\frac{1}{3}e^{x^3}=c$$

65. (4). $\frac{dy}{dx}-\frac{y}{1+x}=e^{2x}(1+x)$

$$\frac{dy}{dx}+py=Q$$

I.F = $e^{\int pdx}=e^{\int-\frac{1}{1+x}dx}=e^{-\log_e(1+x)}=\frac{1}{1+x}$

66. (2). P(x_1, y_1) be point of locus

$$\frac{\cos\alpha+\sin\alpha+1}{3}=x_1,\frac{\sin\alpha-\cos\alpha+2}{3}=y_1$$

$(3x_1-1)=\cos\alpha+\sin\alpha$.................(1)

$(3y_1-2)=\sin\alpha-\cos\alpha$.................(2)

$$\Rightarrow 3(x^2+y^2)-2x_1-4y_1+12=0$$

67. (3). $1=2\cos\theta-0(\sin\theta)$...............(1)

$\sqrt{3}=2\sin\theta+0(\cos\theta)$...............(2)

$$\frac{(2)}{(1)} = \tan\theta = \sqrt{3} \Rightarrow \theta = \frac{\pi}{3}$$

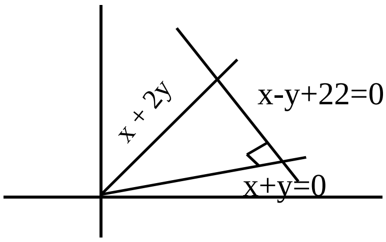
68. (4). consonens $\Rightarrow$R, N, T, L
ovels $\Rightarrow$O, I, E, A
Rq. no. of ways 4!.4!.2!:

69. (2). $PQ = r = \dfrac{-(ax_1 + by_1 + c)}{a\cos\theta + b\sin\theta}$

$(x_1, y_1) = (-3, 5) \Rightarrow \tan\theta = 1 \Rightarrow \theta = 45$

$$PQ = -\left(\frac{-3+5-6}{\frac{1}{\sqrt{2}} + \frac{1}{\sqrt{2}}}\right) = \frac{4}{\sqrt{2}} = 2\sqrt{2}$$

70. (1). $x^2 + 3xy + 2y^2 = (x+y)........(1)(x+2y)..........(2)$
given x – y + 2 = 0.............(3)



(1) & (2) are perpendicular

For a right angle triangle, orthocentre is right vertex (1) & (3) PI is (–1, 1)
Both A & R are true, R is the correct explanation of A.

71. (3). $d = 2\sqrt{\dfrac{g^2 - ac}{|a(a+b)|}}$ $\left[\begin{array}{l} g = 2\sqrt{2} \\ a = 1 \quad c = -42 \end{array}\right.$

$$d = 2\sqrt{\frac{8+42}{1(1+49)}} = 2$$

72. (2). $AB^2 + AC^2 = BC^2$
O = ortho centre is (1, 2, 3)

S = circum centre is $\left(\dfrac{7}{2}, \dfrac{-1}{2}, 1\right)$

distance between O & S $= \sqrt{\left(1 - \dfrac{7}{2}\right)^2 + \left(2 + \dfrac{1}{2}\right)^2 + (3-1)^2}$

$$= \sqrt{\frac{25}{4} + \frac{25}{4} + 4} = \frac{\sqrt{66}}{2}$$

73. (4). $e^{2x} + e^{-2x}$
odd power terms are cancelled
coefficient of x^n = 0

74. (3). $r < d$

$$\Rightarrow \left|\frac{6 - 16 - \lambda}{\sqrt{9+16}}\right| < 5$$

$\pm(10 - \lambda) < 5$

$\Rightarrow \lambda < 15, \qquad \lambda > -35$

$\lambda \in (-35, 15)$

75. (2). $2y\dfrac{dy}{dx} = 18\dfrac{dw}{dt}$ and $\dfrac{dy}{dx} = 2\dfrac{dn}{dt}$

$(2y)2\dfrac{dx}{dt} = 18\dfrac{dx}{dt}$

2y = 9

$y = \dfrac{9}{2}, x = \dfrac{9}{8}, \qquad (x, y) = \left(\dfrac{9}{8}, \dfrac{9}{2}\right)$

76. (2). Number of onto functions: $n = 2^3 - 2 = 6$

$A = \left\{\dfrac{1}{2}, \dfrac{1}{3.1}, \dfrac{1}{4.1}, \dfrac{1}{5}, \dfrac{2}{3}, \dfrac{2}{5}, \dfrac{3}{4}, \dfrac{3}{5}, \dfrac{4}{5}\right\}$

m = n(A) = 9

m – n = 3

77. (2). Tangent at P is $\dfrac{x}{a}\cos\theta + \dfrac{y}{b}\sin\theta = 1$

Tangent at D is $-\dfrac{x}{a}\sin\theta + \dfrac{y}{b}\cos\theta = 1$

Squaring and adding, $\dfrac{x^2}{a^2} + \dfrac{y^2}{b^2} = 2$

78. (3). Slope of 2x + y = k = –2 = –t $\Rightarrow$ t = 2

If t = 2, point is (8, 8) lies on 2x + y = K

$\Rightarrow$K = 24

79. (2). $\dfrac{x^4 + 2}{(x-1)^2(x+1)^2} = x + 1 + \dfrac{2x^2 + 1}{(x-1)^2(x+1)}$

A=1; D= 3/2; E = 3/4

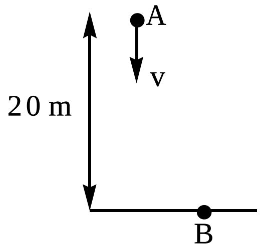
$A + D - 2E = 1 + \dfrac{3}{2} - 2\left(\dfrac{3}{4}\right) = 1 + \dfrac{3}{2} - \dfrac{3}{2} = 1$

80. (3). $4 + 3\cos\theta = \dfrac{8}{r}$

$1 + \dfrac{3}{4}cox\theta = \dfrac{2}{r}$

$\therefore \ e = \dfrac{3}{4}$

81. (1). Initial energy at $A = mgh + \dfrac{1}{2}mv^2$



final energy (at A) = mgh

$\therefore$ loss in energy $= \dfrac{1}{2}mv^2$

$= \dfrac{50}{100}\left(mgh + \dfrac{1}{2}mv^2\right)$

$\therefore \dfrac{1}{2}mv^2 = mgh \qquad v = \sqrt{2gh} = \sqrt{2 \times 10 \times 20} = 20\ m/s$

82. (1). $i = \frac{2}{10+1+R}$

P.D across wire $iR = \left(\frac{2}{10+1+R}\right)10 = 1\times10^{-3}$

$\Rightarrow R = 19989\Omega$

83. (1).. Let us say at temperature T both will have same surface area

$\therefore$ for brass $A^1 = A\left(1+2\alpha_B\left(T-10\right)\right)$

steel $A^1 = A\left(1+2\alpha_S\left(T-20\right)\right)$

$A\left(1+2\alpha_B\left(T-10\right)\right) = A\left(1+2\alpha_S\left(T-20\right)\right)$

$\alpha_B\left(T-10\right) = \alpha_S\left(T-20\right)$

On substituting $\alpha_B \,\&\, \alpha_S$ we get T = –3.75 ^{0}C

84. (3). According to Boyles law (at constant temperature)

$P_1V_1 = P_2V_2$

$\left(P_{atm}+P_w\right)\frac{4}{3}\pi r^3 = \left(P_{atm}\right)\frac{4}{3}\pi\left(2r\right)^3$

$P_{atm}+P_w = 8P_{atm}$

$P_w = 7P_{atm}$

$h = 70\,m$.

85. (2). Energy supplied by machine in 5 min = (5) (60) (10 × 10^3) J
50% of energy used to raise in T or metal

$\therefore \Delta T = \left(\frac{50}{100}\right)\left(\frac{5\left(60\right)\left(10^4\right)}{M\times S}\right)$

$= \frac{1}{2}\left(\frac{300\times10^4}{10\times10^3}\right) = 150^0C$

$\therefore \Delta T = 150^0C$

86. (2). $v_1 = \left(\frac{m_1-m_2}{m_1+m_2}\right)u_1 + \left(\frac{2m_2}{m_1+m_2}\right)u_2$

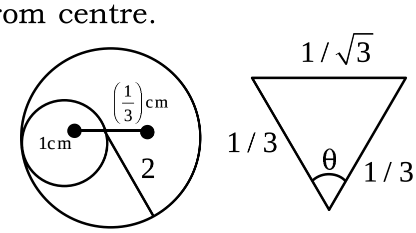
$m_2 >> m_1$

$v = \left(-\frac{m_2}{m_2}\right)u_1 + \left(\frac{2m_2}{m_2}\right)u_2$

$-u_1 + 2u_2 = -12 + 20 = 8\,m/s$

87. (4). New position of COM = 1/3 cm from centre.
Given disc rotated by angle θ

$\therefore \cos\theta = \frac{\left(1/3\right)^2+\left(1/3\right)^2-\left(1/\sqrt{3}\right)^2}{2\left(1/3\right)\left(1/3\right)} = -\frac{1}{2}$

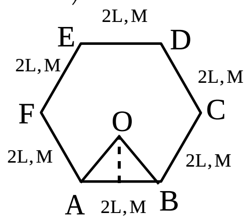


$\therefore \theta = 120^0$

88. (4). Power = Force × velocity

$$\text{velocity} = \frac{\text{power}}{\text{force}} = \frac{P}{\mu_3 mg}$$

89. (1). M.I of hexagon about $O = (\text{M.I of AB about O}) \times 6$



$$= \left(\frac{M(21)^2}{12}\right) + M\left(\sqrt{31}\right)^2 \times 6$$

$$\left(\frac{ML^2}{3} + 3ML^2\right) \times 6 = 20\,ML^2$$

90. (1).

91. (3). $T^2 \propto R^3$

$$\left(\frac{T_2}{T_1}\right)^2 = \left(\frac{r_2}{r_1}\right)^3$$

$$\frac{T_2^2}{25} = 64$$

$$T^2 = 40$$

92. (a) PE is maximum at extreme position (f)

(b) PE is $\frac{1}{2}$ total energy

$$\frac{1}{2}m\omega^2x^2 = \frac{1}{4}m\omega^2A^2 \quad \text{(e)}$$

$$x^2 = \frac{A^2}{2} \qquad x = \frac{A}{\sqrt{2}}$$

KE is $\frac{1}{4}$ of total energy

(c) $\frac{1}{2}m\omega^2(A^2 - x^2) = \frac{1}{8}m\omega^2A^2$

$4A^2 - x^2 = A^2$

$3A^2 = 4x^2$

$$x^2 = \frac{3A^2}{4}$$

$$x = \frac{\sqrt{3}A}{2}$$

(d) Velocity is maximum at mean position.

93 (2). By hooks law

$e \propto F_{ext}$

When lift at rest $F_{ext} = mg$

when lift accelerates upwards with g/2 $F_{ext} = 3mg/2$

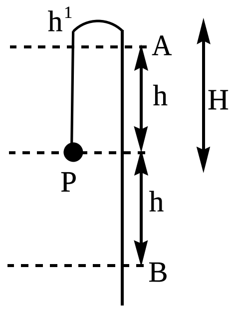
$$\therefore \frac{e_2}{e} = \frac{\frac{3mg}{2}}{mg}\, e_2 = \frac{3}{2}e$$

94. (2). Pressure = F/A = $\frac{MLT^{-2}}{L^2} = ML^{-1}T^{-2}$

distance = L
time = T
on solving a/b = MT^{-2}

95. (4). 1 = 0.25 + .64 + c^2
1 – .89 = c^2
$c = \sqrt{.11}$

96. (2). Let velocity at A = V
then velocity at B = 2V



$\therefore 2Mgh = \frac{1}{2}M\left(4v^2 - v^2\right) \Rightarrow v = 2\sqrt{\frac{gh}{3}}$

$\therefore$ further ht it goes above A is

$$h = \frac{\frac{1}{2}mv^2}{Mg} = \frac{\frac{1}{2}\left(\frac{4gh}{3}\right)}{g} = 2h/3$$

$\therefore$ Total ht above $\rho = h + \frac{2h}{3} = \frac{5h}{3}$

97. (1). $R = \frac{u^2 \sin 2\theta}{g}$

$= \frac{100 \times 1}{10} = 10$

$10 = \frac{4^2 \sin 60^0}{g} \Rightarrow u = \sqrt{\frac{200}{3}} m/s$

98. (1). $P_0 + hdg + \frac{2T}{R}$

99. (4). $C_P = C_V + R$

$Q = nC_V dT$ at constant volume

$60 = (3)(C_V)(5)$

$\therefore C_V = 4$

$C_P = 4 + R = 4 + 2 = 6\ cal/mol/k$

$Q = nC_P dt = 5 \times 6 \times 10 = 300\ cal$ (at constant pressure)

100. (4). $Q = \frac{KA\delta\theta t}{2}$

on simphfication
we will get the answer.

101. (3). $n = \frac{v}{2L}$

$L = \frac{340}{2 \times 425} = 1\,m$

102. (2) $\frac{\sin 45}{\sin r_1}=\sqrt{2}$; $\sin r_1=\frac{1}{2}$ $\frac{\sin r_2}{\sin i_2}=\frac{1}{\sqrt{2}}$

A = 60°, r_1 + r_2 = 60° $\sin i_2=\frac{1}{\sqrt{2}}$

r_2 = 30° C_2 = 45

d = (i_1 + i_2) – A = (45 + 45) –60 = 30°

103. (1). $B=\frac{\mu_0}{2}\frac{nir^2}{\left(r^2+x^2\right)^{3/2}}$

104. (1). $e^-+e^+\rightarrow\gamma_{ray}$

rest man energy e^- or e^+ = 0.51 Mev

Let K.E of $e^-\,\&\,e^+$ is E

$\therefore 2E+2(0.51)=2.1\text{Mev}$

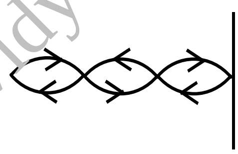
$\therefore E=0.54\text{Mev}$

105. (4). $\alpha=\frac{\beta}{1+\beta}=\frac{50}{1+50}=\frac{50}{51}=0.98$

106. (4). $a=\frac{4i_1i_2}{(i_1+i_2)^2}$

$=\frac{4i_1i_2}{(i_1+i_2)^2}=\frac{3}{4}$

$\frac{4(i_1/i_2)}{\left(\frac{i_1}{i_2}+1\right)}=\frac{3}{4}\Rightarrow\frac{4x}{(x+1)^2}=\frac{3}{4}\Rightarrow x=3$



$\therefore\frac{i_{max}}{i_{min}}=3$

107. (2).

108. (3). $\frac{A^1}{A}=-\frac{(\mu-1)}{\mu^1-1}$

$\frac{A^1}{4}=\frac{.72}{.54}$

$A^1=5.33$

109. (2) $d\sin\theta=n\lambda$

$\sin\theta=1$

$d=n\lambda$

$n=\frac{d}{\lambda}=\frac{9000\overset{0}{A}}{3000\overset{0}{A}}=3$

on both sides 3 + 3 + 1 = 7

110. (4) A) susceptibility of paramagnetic material depends upon temperature $X=\frac{C}{T}$

B) Ferromagnetism is explained by domain theory.

111. (1).

112. (3) Mass of Titanium > mass of duetron > mass of proton > mass of electron.

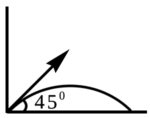
$$K.E. = \frac{P^2}{2m} \quad P \text{ is constant.}$$

$$K.E. \propto \frac{1}{m}$$

113. (3). Range $= \left(\frac{v}{\sqrt{2}}\right)t = 10$

$$t = \frac{10\sqrt{2}}{v} = \frac{10\sqrt{2}}{20} = \frac{1}{\sqrt{2}}$$

$$t = \frac{2u\sin\theta}{g} = \frac{2(20)1/\sqrt{2}}{10 + \frac{Eq}{m}} = \frac{1}{\sqrt{2}}$$



$$\Rightarrow 10 + \frac{Eq}{m} = 40$$

$$E = (30)\frac{m}{q} = 30\,N/C$$

114. (1).

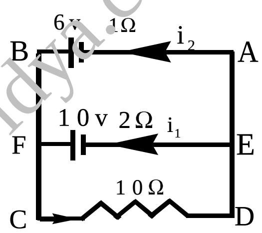
115. (1). For loop ABCD

$6 - i_2 - 10(i_1 + i_2) = 0 - (1)$ .... (1)

for loop EFGA

$10 - 2i_1 - 10(i_1 + i_2) = 0$ .... (2)

on solving (1) & (2) we get $i_1 = 1.56\,A$



116. (1). $e = at + bt^2$

$$\frac{8}{15} = \frac{a(50) + b(50)^2}{a(100) + b(100)^2} = \frac{a + 5b}{2a + 200b} = \frac{8}{15}$$

by solving $\frac{a}{b} = -850$

Nuutral temperature $= -\frac{a}{2b} = \frac{850}{2} = 425^0C$

117. (2). Time constant $= \frac{L}{R} = 5 \times 10^{-3}$

when 90Ω resistance is added

$$\frac{L}{R + 90} = 0.5 \times 10^{-3}$$

$$\frac{R + 90}{R} = 10 \Rightarrow R = 10\Omega$$

$$\therefore L = 5 \times 10^{-2}\,H = 50\,mH.$$

118. (2) According to Lenz's law the emf will be induced in a direction.
In a direction opposite to change of the magnetic flux

119. (4). Work function $\phi = \frac{hc}{\lambda} = \frac{hc}{\lambda_0}$

when $\frac{\lambda_0}{2}$ incident

$$K.E_{max} = \frac{hc}{\lambda} - \frac{hc}{\lambda_0} \qquad = \frac{\lambda c}{\lambda_0 / 2} - \frac{hc}{\lambda_0} = \frac{hc}{\lambda_0}$$

$$\therefore \frac{1}{2}(me)v_e^2 = \frac{hc}{\lambda_0} \qquad \Rightarrow v_e^2 = \frac{2hc}{\lambda_0 me}$$

when $\left(\frac{\lambda_0}{5}\right)$ incident

$$K.E_{max} = \frac{5hc}{\lambda_0} - \frac{hc}{\lambda_0} = \frac{4hc}{\lambda_0} = \frac{1}{2}mev_e^2 \qquad \therefore \left(v_e^1\right)^2 = v_e^2 \times 4$$

$$\therefore v_e^1 = 2v_e = 2 \times 10^6 \text{ m / s}$$

120. debroglie suggested that the dual nature is exhibited by
(1) elementary particle like electrons, protons, neutrons.

121. (1). One step oxidation of C_2H_4 gives CH_3CHO in the presence of a catalyst

122. (2). Ozonolysis of C_2H_4 gives formaldehyde and C_2H_2 gives glyoxal. Only acetylene is acidic, but not ethylene.

123. (4). $C_6H_5CH_2^+$ ion is more stable.

124. (2). Ozonolysis of ethylene gives formaldehyde. Partial oxidation of methane in the presence of MoO_3 also gives formaldehyde.

125. (4). Strength of acids : $CH_4 < H_2O < CH_3COOH < HClO_4$.

126. (4). Superoxide ion has unparied electron

127. (4). Unltimate shell of Cr^+ has one 3s, three 3p and five 3d, a total of nine orbitals.

128. (2). $Na_2S_2O_3 + Cl_2 + H_2O \rightarrow Na_2SO_4 + S + HCl$

129. (2). I_2 is molecular and h as van der Walls forces. SiO_2 has all covalent bonds 3D – network structure.

130. (1). Forward reaction is neutralisation. Backward reaction is salt hydrolysis.

131. (2) B = C_2H_5OH , C = CHI_3 , D = C_2H_2

Hydration of acetylene gives vinyl alcohol, which tautomerises finally to give acetaldehyde.

132. (1). $B(OH)_3 = H_3BO_3$ (orthoboric acid)

133. (1). $S + \frac{3}{2}O_2 \Rightarrow SO_3 ; \Delta H = -2x K.Cal \rightarrow (i)$

$$SO_2 + \frac{1}{2}O_2 \rightarrow SO_3 ; \Delta H = -y.K.Cal \rightarrow (ii)$$

(i) – (ii) gives ; $S + O_2 \rightarrow SO_2 ; \Delta H = -2x - (-y)$

134. (2). $[Co(NH_3)_5Cl]Cl_2$ has two free chloride ions in solution.

135. (3). ΔH is –ve and ΔS is +ve denotes spontaneous reaction at all temperatures.

136. (4). P – O – P likases in P_4O_6 and P_4O_{10} are the same in number (each 6)

137. (2). XeO_3 has trigonal pyramidal structure.

138. (2). X = $C_2H_5OH_5$, A = CH_3CHO, B = CH_3COOH and D = CH_3COCH_3.

139. (1). $P_4 + 3H_2O + 3NaOH \rightarrow PH_3 + 3NaH_2PO_2$

140. (2). Excited carbon has $2s^1 2p_x^1 2p_y^1 2p_z^1$ configuration. As per VBT, one s – s overlap and three s – p overlaps in CH_4 molecule

141. (2). Both statements are true. They are independent statements.

142. (1). Presence of Cl on benzene cause –I effect. Hence, ring electron denisty in C_6H_5Cl is less than that in C_6H_6.

143. (4). Sucrose is non reducing sugar, because anomeric carbon atoms are in acetal formation. Cellulose has 1,4 – β linkages.

144. (4). Molecular weight of Ne is 20. N_2 is 28, O_2 is 32 and F_2 is 38

145. (3). MCl_3 with 3 BP and no LP is symmetrical. Hence M should have only 3 valence electrons.

146. (2). 60 grams of 70% pure magnesite has 42g of $MgCO_3$. 0.5 mol of $MgCO_3$ decomposes to give 0.5 mol of CO_2.

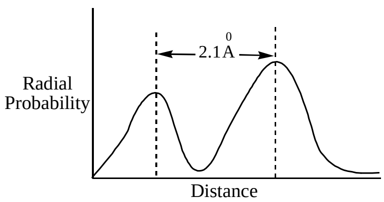
147. (3). Catalyst does not alter heat of reaction and also equilibrium.

148. (2). Due to +I effect, basic nature increases. Basic nature is less due to steric factor and also due to decreases in hydrogen bonding ability.

149. (1) As the temperature increases at constant pressure, extent of adsorption decreases. This graph denotes physical adrosption.

150. (3). $BeCO_3$ decomposes at room temperature. Thermal stability increases down the group to $BaCO_3$.

151. (3).



152. (2). Weakest monobasic acid provide least concentration of porton.

153. (2). Compared to He, Li^+ has more nuclear charge and small size.

154. (2). 2 – Butanol $CH_3 - CHOH - CH_2 - CH_3$ has chiral carbon.

155. (2). $1000 = \dfrac{\text{mg of } MgCl_2}{95} \times 100$

156. (3). Osmatic pressure is a direct colligative property.

157. (1). Asprin also posses antiblood clotting property.

158. (4). SiO_2 forms $CaSiO_3$ with hot $CaCO_3$ .SiO_2 is dissolved in hot NaOH to give Na_2SiO_3 and in HF to give H_2SiF_6

159. (2). Calamine is carbonate mineral of zinc metal. It's composition is $ZnCO_3$.

160. (2). X = $C_6H_5NH_2$ (aniline). Y = $C_6H_5N_2Cl$ (benzene diazonium chloride)
'Y' on reduction gives benzene. The reduclant may be H_3PO_2 or C_2H_5OH

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