

AIEEE TEST SERIES

SOLUTIONS FULL SYLLABUS TEST

(1) (3). Since $\frac{PV}{RT} = n = \frac{\text{weight}}{\text{mol. wt}}$

Hence, $\frac{PV}{RT}$ depends on the amount of the gas.

अतः $\frac{PV}{RT}$ गैस की मात्रा पर निर्भर करता है।

(2) (4). $\frac{U_A}{U_B} = \sqrt{\frac{T_B M_A}{T_A M_B}}$

Since, $T_A M_B = T_B M_A$
 $\therefore U_A = U_B$

(3) (1). $\lambda \propto \frac{1}{m}$. Mass of electron is minimum among the given particles.

$\lambda \propto \frac{1}{m}$ दिये गये कणों में इलेक्ट्रॉन का द्रव्यमान न्यूनतम है।

(4) (4). M^{+2} ion contains 2 electrons less than M but contains same number of neutrons and protons.

No. of electrons in $M^{+2} = Z - 2 = 25 - 2 = 23$

No. of protons = $Z = 25$

No. of neutrons = $A - Z = 52 - 25 = 27$

M^{+2} आयन में M की तुलना में 2 इलेक्ट्रॉन कम होते हैं परन्तु न्यूट्रॉनों तथा प्रोटॉनों की संख्या समान होती है।

M^{+2} में इलेक्ट्रॉनों की संख्या = $Z - 2 = 25 - 2 = 23$

प्रोटॉनों की संख्या = $Z = 25$

न्यूट्रॉनों की संख्या = $A - Z = 52 - 25 = 27$

(5) (3). $K_a \times K_b = K_w$

$$\therefore K_a \text{ for HX} = \frac{K_w}{K_b} = \frac{10^{-14}}{10^{-5}} = 10^{-9}$$

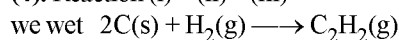
$$\text{pH} = \text{p}K_a + \log \frac{[X^-]}{[HX]}$$

$$\text{pH} = 9 + \log \frac{0.1}{0.3} = 9 - \log 3$$

(6) (3). 0.001M NaOH contain $[\text{OH}^-] = 0.001$ mole/litre

$$[\text{H}^+] = \frac{10^{-14}}{0.001} = 1000 \times 10^{-14} = 10^{-11} \text{ mole/litre}$$

(7) (4). Reaction (i) + (ii) - (iii)



$$\Delta H = -787 + (-286) - (-1301) = +228 \text{ kJ}$$

(8) (1). Since, $q = \Delta E - W$

$$W = -P\Delta V = -0.5 \times (6 - 2) = -0.5 \times 4 = -2 \text{ atm litre}$$

$$= -2 \times 101 \text{ J} = -202 \text{ J}$$

and $q = 200 \text{ J}$

$$\therefore 200 = \Delta E - (-202) = \Delta E + 202$$

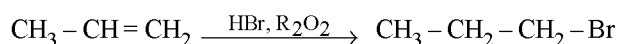
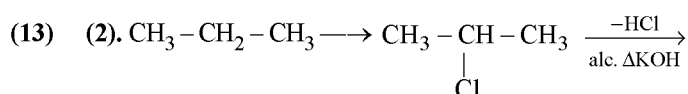
$$\Delta E = 200 - 202 = -2.0 \text{ J}$$

(9) (3). Order of IE_1 : $\text{Al} < \text{Mg} < \text{Si} < \text{S} < \text{P}$

(10) (3). The bridging Al - Cl bonds are lower than the terminal Al - Cl bonds.

(11) (1). Na imparts a golden yellow colour to the flame.

(12) (1). Solubility of sulphate decrease down group 2 with decrease in hydration energy.



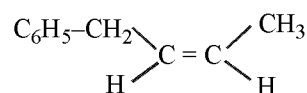
(14) (1). S_N1 reaction proceeds with carbocation so reactivity order is $\text{I} > \text{III} > \text{II} > \text{IV}$.

अभिक्रिया कार्बन धनायन के साथ अग्रसर होती है अतः क्रियाशीलता का क्रम है : $\text{I} > \text{III} > \text{II} > \text{IV}$.

(15) (4). (i) Polluted water causes the out break of jaundice.

(ii) The basic component of the smog includes O_3 & PAN

(16) (1).



Both sp^2 -c atom attached with different atoms or groups. दोनों sp^2 -c परमाणु विभिन्न परमाणुओं या समूहों से जुड़े हुए हैं।

(17) (2). Nearest atom in bcc are at corner and body centre = half of body diagonal

bcc में निकटतम परमाणु कोने एवं धन केन्द्र पर होते हैं

$$= \text{काय विकर्ण} \times \frac{1}{2}$$

$$\therefore \frac{\sqrt{3}a}{2} = \text{nearest distance}$$

$$a = \frac{2 \times 433}{\sqrt{3}} = 500 \text{ pm}$$

(18) (4). $\text{Al}(\text{OH})_3$ sol is a positively charged sol $[\text{Fe}(\text{CN})_6]^{4-}$ has maximum charge and hence has maximum coagulating power and minimum coagulation value.

$\text{Al}(\text{OH})_3$ सॉल धनावेशित सॉल है, $[\text{Fe}(\text{CN})_6]^{4-}$ सर्वाधिक आवेशित है अतः सर्वाधिक स्कन्दन क्षमता तथा न्यूनतम स्कन्दन मान।

(19) (2). According to Frnedlich adsorption equation फ्रेण्डलिच अधिशोषण समीकरण के अनुसार

$$\frac{x}{m} = k.p^{1/n}$$

$$\text{or } \log \frac{x}{m} = \log k + \frac{1}{n} \log P$$

It is a straight line equation therefore $\log(x/m)$ vs $\log P$ gives a straight line with positive slope.

यह सरल रेखीय समीकरण है इसलिए $\log(x/m)$ vs $\log P$ घनात्मक ढाल के साथ सरल रेखा देता है।

(20) (4). $K = \frac{0.693}{T_{1/2}} = \frac{0.693}{69.3}$

$\therefore t = \frac{2.303}{K} \log \frac{100}{(100-99.9)} = 691 \text{ minutes.}$

(21) (1). Due to absence of vacant d-orbitals.

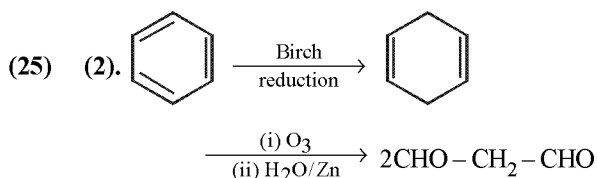
रिक्त d-कक्षकों की अनुपस्थिति के कारण

(22) (3). Due to inert pair effect.

(23) (1). Weak Vander Waals's bond.

(24) (1). F_2 is powerful oxidizing agent.

F_2 शक्तिशाली ऑक्सीकारक है।



(26) (2). Chloral give DDT on reaction with chlorobenzene.

(27) (4). Four rings at one carbon are highly unstable.

(28) (2). ERG nature of groups $CH_3O^- > CH_3^- > H^- > NO_2^-$
ERG stabilises the carbocation formed.

(29) (3). It is a polyamide.

यह पोलिएमिड है।

(30) (3). $[Fe(H_2O)_5NO]SO_4$

In the test of nitrate brown ring is obtained.

(31) (3). $v = u + at$ so graph will be straight line.

$v = u + at$ अतः वक्र सरल रेखीय होगा।

(32) (1). $x^2 = at^2 + b$

$$2x \frac{dx}{dt} = 2at + 0$$

$$xv = at$$

$$x \frac{dv}{dt} + v \frac{dx}{dt} = a ; x \frac{dv}{dt} = a - v^2$$

$$\frac{dv}{dt} = \frac{a - v^2}{x} = \frac{a - \frac{a^2 t^2}{x^2}}{x} = \frac{ab}{x^3} ; \frac{dv}{dt} \propto \frac{1}{x^3}$$

(33) (3). $S_1 = \frac{1}{2} gn^2$, $S_2 = \frac{1}{2} g(n-N)^2$

$$S_1 - S_2 = \frac{1}{2} g [n^2 - (n-N)^2]$$

$$l = \frac{g}{2} (2n - N) N ; n = \frac{l}{gN} + \frac{N}{2}$$

(34) (4). $h = \frac{1}{2} gt^2$

$$\frac{h_1}{h_2} = \frac{t^2}{4t^2}$$

(35) (4). $dU = -dW$

Here dU = change in potential energy

यहाँ dU = स्थितिज ऊर्जा में परिवर्तन तथा

and dW = work done by conservation forces.

dW = संरक्षी बलों द्वारा किया गया कार्य

Hence, work done by the conservation forces on a system is equal to the negative of the change in potential energy.

अतः एक निकाय पर संरक्षी बलों द्वारा किया गया कार्य स्थितिज ऊर्जा में परिवर्तन के ऋणात्मक के बराबर होता है।

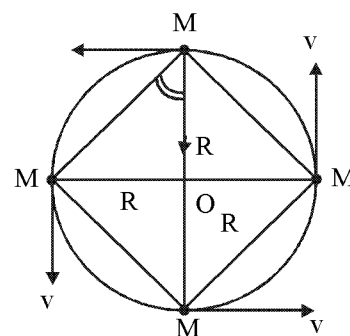
(36) (2). $K_R = \frac{1}{2} I \omega^2 = \frac{1}{2} I (\alpha t)^2 = \frac{1}{2} I \alpha^2 t^2$

$$1500 = \frac{1}{2} \times 1.2 \times (25)^2 t^2$$

$$\text{or } t^2 = 4 \text{ or } t = 2s$$

(37) (4). Gravitational force on each due to other three particles provides the necessary centripetal force.

अन्य तीन कणों के कारण प्रत्येक पर गुरुत्वाकर्षण बल आवश्यक अभिकेन्द्रीय बल उपलब्ध कराता है।



$$\therefore \sqrt{2} \frac{GM^2}{(\sqrt{2}R)^2} \cos 45^\circ + \frac{GM^2}{(2R)^2} = \frac{Mv^2}{R}$$

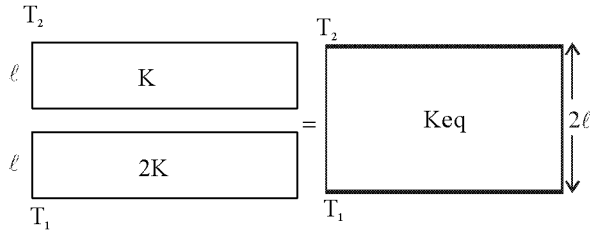
Simplifying it, we get

$$v = \sqrt{\left[\frac{GM}{R} \left(\frac{2\sqrt{2}+1}{4} \right) \right]}$$

(38) (3). K.E. = $\frac{1}{2} mv_e^2$ $\therefore v_e = \sqrt{2gR}$

$$= \frac{1}{2} m (2gR) = mgR$$

(39) (4).



$$\frac{2\ell}{K_{eq}(A)} = \frac{\ell}{2KA} + \frac{\ell}{KA} \quad (\text{Series connection } R = R_1 + R_2)$$

$$\Rightarrow K_{eq} = \frac{4}{3} K$$

(40) (3). $Q \propto AT^4 \propto \gamma^2 T^4 \Rightarrow \frac{Q_{star}}{Q_{sun}} = \frac{\gamma_{star}^2}{\gamma_{sun}^2} \times \frac{T_{star}^4}{T_{sun}^4}$

$$\Rightarrow \frac{10000}{1} = \frac{\gamma_{star}^2}{\gamma_{sun}^2} \times \left(\frac{2000}{6000}\right)^4$$

$$\frac{\gamma_{star}}{\gamma_{sun}} = \frac{900}{1}$$

(41) (4). $\frac{(\text{Area})_T}{(\text{Area})_{2000}} = \frac{T^4}{(2000)^4}$

$$\Rightarrow \frac{16}{1} = \left(\frac{T}{2000}\right)^4 \Rightarrow T = 4000 \text{ K}$$

(42) (1). $C_p - C_v = 2 \frac{\text{cal}}{\text{mol k}}$

$$\frac{C_p}{C_v} = \gamma [1 < \gamma < 2]$$

(43) (3). The weight which is kept on the system will separate from the piston when max. force will just exceeds the weight of the body.

भार जो निकाय पर रखा है पिस्टन से पृथक होगा जब अधिकतम बल पिण्ड के भार से ठीक ज्यादा होगा।

$$m\omega^2 y = mg$$

$$\text{or } y = \frac{g}{\omega^2} = \frac{9.8}{(2\pi)^2} = 0.25 \text{ m}$$

(44) (1). $\Delta\phi = \frac{2\pi}{\lambda} \Delta x = \frac{2\pi}{v} n \Delta x = \frac{2\pi}{20} \times 50 \times \frac{10}{100} = \frac{\pi}{2}$

(45) (1). Both statements are correct and reason is also correct.

(46) (1). Statement 2 is correct explanation.

कथन 2 सही व्याख्या है।

(47) (2). Current in circuit will be $I = \frac{\text{net emf}}{\text{net Resistance}}$

$$I = \frac{E_1 + E_2 + E_3 + \dots + E_n}{r_1 + r_2 + r_3 + \dots + r_n}$$

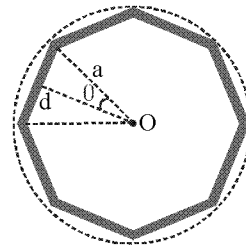
$$\text{but } \frac{E_1}{r_1} = \frac{E_2}{r_2} = \frac{E_3}{r_3} = \dots = \frac{E_n}{r_n} = K$$

Hence $E_1 = Kr_1; E_2 = Kr_2; \dots; E_n = Kr_n$

$$I = \frac{K[r_1 + r_2 + r_3 + \dots + r_n]}{[r_1 + r_2 + \dots + r_n]}$$

$$I = K$$

(48) (2). Magnetic field at the centre due to one side



$$B_1 = \frac{\mu_0 i (2 \sin \theta)}{4\pi d} \quad \text{where } d = a \cos \theta$$

$$\text{So } B_1 = \frac{\mu_0}{4\pi} \cdot \frac{2i \sin \theta}{a \cos \theta} = \frac{\mu_0 i}{2\pi a} \tan \theta$$

Hence net magnetic field

$$B_{net} = n \times \frac{\mu_0 i}{2\pi a} \tan \frac{\pi}{n}$$

(49) (3). First capacity increases and then decreases. So for constant supply voltage charge will flow first from A to B then from B to A.

(50) (3). Potential on $4\mu\text{F}$ capacitor = $\frac{6}{10} \times 10 = 6\text{V}$

Hence charge $q = (4\mu\text{F}) \times (6\text{V}) = 24 \mu\text{C}$

(51) (2). At $V=0$, i is maximum so current leads by 90° .

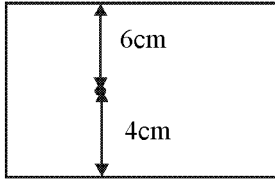
(52) (1). $\Delta\phi = M\Delta I \Rightarrow M = \frac{\Delta\phi}{\Delta I} = \frac{2 \times 10^{-2}}{0.01} = 2 \text{ H}$

(53) (3). $\cos \phi = \frac{R}{Z} = \frac{10}{20} = \frac{1}{2} \Rightarrow \phi = 60^\circ$

(54) (1). $f = \frac{1}{2\pi} \frac{1}{\sqrt{LC}}$

$$= \frac{1}{2\pi} \frac{1}{\sqrt{10 \times 10^{-3} \times 100 \times 10^{-6}}} = \frac{10^3}{2\pi} \text{ Hz}$$

(55) (3).



$$h_{app} = 6 + 4 = 10\text{cm.}$$

$$\mu = \frac{h_{ac}}{h_{app}} \Rightarrow 1.5 = \frac{h_{ac}}{10} \Rightarrow h_{ac} = 15\text{cm.}$$

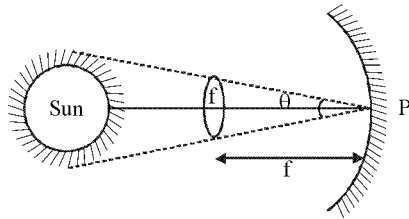
(56) (3). Focal length of a spherical mirror depends only on radius of curvature $f = R/2$. It is independent of the medium.

एक गोलीय दर्पण की फोकस दूरी केवल वक्रता त्रिज्या $f = R/2$ पर निर्भर करती है। यह माध्यम पर निर्भर नहीं करती है।

(57) (1). Spherical aberration is due to spherical nature of lens or mirror. Hence for spherical mirror chromatic aberration is not there.

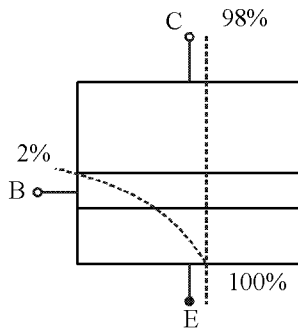
गोलीय विपथन लेंस या दर्पण की गोलीय प्रकृति के कारण होता है। गोलीय दर्पण के लिए वर्णीर्य विपथन उपस्थित नहीं होता है।

(58) (1).



$$\text{Diameter} = f\theta$$

(59) (4). Current gain is maximum in CC mode and it is γ , so अधिकतम धारा लाभ उभयनिष्ठ संग्राहक मोड़ में होता है तथा यह γ है, इसलिए



$$\gamma = \frac{I_E}{I_B} = \frac{100}{2} = 50$$

(60) (3). The amplifier in which input and output has phase difference of π is CE amplifier, therefore the voltage gain in this amplifier is

वह प्रवर्धक जिसमें निर्गत व निवेशी के मध्य कालान्तर π होता है। वह उभयनिष्ठ उत्सर्जक प्रवर्धक होता है अतएव इस प्रवर्धक में वोल्टता लाभ है।

$$|A_v| = \beta \frac{R_L}{R_{in}} = 49 \times \frac{500 \times 10^3}{500} = 49000$$

(61) (3). $\because iz^2 = \bar{z}$
Taking modulus of both sides

$$|iz^2| = |\bar{z}|$$

$$\Rightarrow |i||z^2| = |z|$$

$$\Rightarrow |z^2| = |z| \Rightarrow |z| = 0 \text{ or } 1$$

(62) (1). $\because \left(\frac{1-i}{2}\right)^x = 1 ; \left(\frac{\sqrt{2}\text{cis}(-\pi/4)}{2}\right)^x = 1$

$$\text{cis}\left(-\frac{\pi x}{4}\right) = (\sqrt{2})^x$$

Clearly equation is satisfied by $x = 0$ only.

(63) (3). Let $O(0)$, $A(z_1)$, $B(z_2)$, $C(z_3)$
Then $|z_1| = |z_2| = |z_3| \Rightarrow OA = OB = OC$
 $\therefore A, B, C$ lie on a circle centered at O (origin)

$$\text{Also centroid of } \Delta ABC = \frac{z_1 + z_2 + z_3}{3} = 0$$

\therefore Centroid coincides with circumcentre.
Hence it is an equilateral triangle.

(64) (4). $\because \alpha - \beta = \sqrt{S^2 - 4P}$

where S : sum and P : product of roots

$$6 = \sqrt{k^2 - 28}$$

$$\Rightarrow k^2 = 64$$

$$\therefore k = \pm 8$$

(65) (4). The general term

$$T_{r+1} = {}^{10}C_r \left(\sqrt{\frac{x}{3}}\right)^{10-r} \left(\sqrt{\frac{3}{2x^2}}\right)^r$$

$$= {}^{10}C_r \left(\frac{1}{3}\right)^{5-\frac{r}{2}} \left(\frac{3}{2}\right)^{\frac{r}{2}} x^{5-\frac{3r}{2}}$$

For independent term of x ,

$$5 - \frac{3r}{2} = 0 \Rightarrow r = \frac{10}{3}$$

which is not a positive integer. So there is no term independent of x .

(66) (1). The $(p+2)^{\text{th}}$ term from the end = The $(2n-p+1)^{\text{th}}$ term from beginning

$$= {}^{2n+1}C_{2n-p} x^{(2n+1)-(2n-p)} \cdot \left(-\frac{1}{x}\right)^{2n-p}$$

$$(-1)^p \frac{(2n+1)!}{(2n-p)!(p+1)!} x^{2p-2n+1}$$

(67) (4). $x_1 x_2 x_3 x_4 x_5 = 2 \times 3 \times 5^2 \times 7$ we can assign 2, 3 or 7 to any of variables.

We can assign entire 5^2 to just one variable in 5 ways or can assign

$5^2 = 5 \times 5$ to two variable in 5C_2 ways

${}^5C_1 + {}^5C_2 = 5 + 10 = 15$ ways

Required number of solutions = $5 \times 5 \times 5 \times 15 = 1875$

(68) (1). The number of ways of choosing first couple is $({}^{15}C_1)({}^{15}C_1) = 15^2$

The number of ways of choosing second couple is $({}^{14}C_1)({}^{14}C_1) = 14^2$ and so on.

Thus the number of ways of choosing the couples is $15^2 + 14^2 + 13^2 + \dots + 2^2 + 1^2$

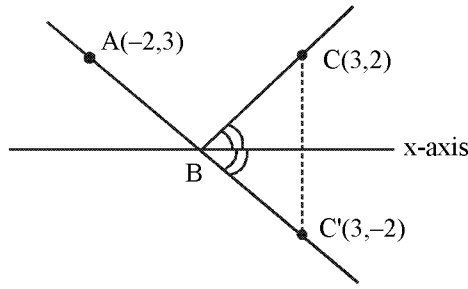
$$= \frac{15 \times (15+1) (2(15)+1)}{6} = 1240$$

(69) (2). $AB^2 + BC^2 = AC^2$

$$\Rightarrow (y-x)^2 + (z-y)^2 + (z-y)^2 + (x-z)^2 = (z-x)^2 + (x-y)^2$$

$$\Rightarrow 2(z-y)^2 = 0 \Rightarrow z=y$$

(70) (2).



Equation of line AB is same as line AC'

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

$$y-3 = -x-2$$

$$\Rightarrow x+y=1$$

(71) (1). Point must be point of intersection of given line and perpendicular line passing through (1, 2).

i.e. $3x+y=5 \Rightarrow (2, -1)$

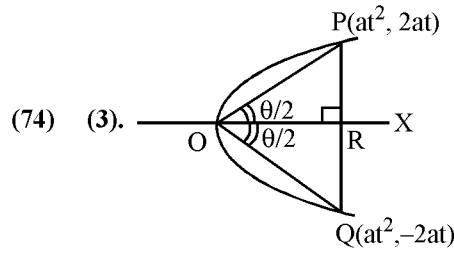
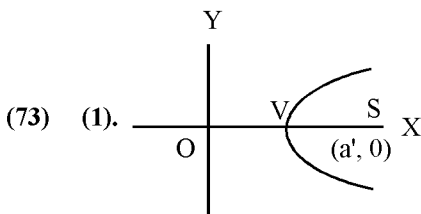
(72) (3). $c_1(0, 0)$, $r_1=3$ and $c_2(-\alpha, -1)$, $r_2=|\alpha|$
Circles touches each other if $c_1c_2 = r_1 \pm r_2$

$$\sqrt{\alpha^2+1} = 3 \pm |\alpha|$$

$$\alpha^2+1 = 9 + \alpha^2 \pm 6|\alpha|$$

$$6|\alpha| = \pm 8$$

$$\alpha = \pm 4/3$$



$$PQ = 8a \Rightarrow 4at = 8a \Rightarrow t = 2$$

$$\tan(\theta/2) = \frac{PR}{OR} = \frac{2at}{at^2} = \frac{2}{t} = \frac{2}{2} = 1$$

$$\frac{\theta}{2} = \frac{\pi}{4} \Rightarrow \theta = \frac{\pi}{2}$$

(75) (4). Hyperbola is $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$, $a^2 = 5$, $b^2 = 9$

$$c^2 = a^2 + b^2 \Rightarrow \lambda^2 = 5 + 9 = 14$$

$$\lambda = \pm \sqrt{14}$$

(76) (3). Here $r : (q \leftrightarrow p)$

$\therefore (q \leftrightarrow p)$ and $(\sim p \leftrightarrow \sim q)$ both are true when p and q have same truth values and both are false when p and q have different truth values.

so, $q \leftrightarrow p \equiv \sim p \leftrightarrow \sim q$

but $(\sim p \rightarrow \sim q)$ is true whenever p is true and q is false.

(77) (1). Given determinant is equal to zero and

$$3a^2b^2c^2 - [(ab)^3 + (bc)^3 + (ca)^3] = 0$$

$$(ab+bc+ca)(a^2b^2+b^2c^2+c^2a^2-ab^2c-bc^2a-ca^2b) = 0$$

$$\text{So, } (ab+bc+ca) = 0$$

$$\frac{1}{a} + \frac{1}{b} + \frac{1}{c} = 0$$

(78) (3). Since $\tan^{-1} \tan 4 = 4 - \pi$

$$\text{Hence, } \cos \tan^{-1} \tan 4 = \cos(4 - \pi) = -\cos 4$$

(79) (3). $\frac{3\pi}{2} \leq x \leq \frac{5\pi}{2}$ nearest π is 2π .

Then solution is $x - 2\pi$

(80) (2). $\cos^{-1} \cos \frac{8\pi}{7} = \cos^{-1} \cos \left(-\frac{\pi}{7} \right)$

$$= \cos^{-1} \cos \left(\pi - \frac{\pi}{7} \right) = \cos^{-1} \cos \left(\frac{6\pi}{7} \right) = \frac{6\pi}{7}$$

$$\tan^{-1} \left(\tan \frac{8\pi}{7} \right) = \tan^{-1} \left(\tan \frac{\pi}{7} \right) = \frac{\pi}{7}$$

(81) (3). $\lim_{x \rightarrow k^-} f(x) = 3 + n f(k) = 3$

$$f(k^-) > f(k) \text{ and } f(k^+) > f(k)$$

$$a^2 - 2 + 1 > 3$$

$$|a| > 2$$

(82) (3). $[\sin x]$ will be discontinuous at those points, where $\sin x$ becomes 0 and 1 and is continuous when $\sin x = -1$ or elsewhere.

$[\sin x]$ उन बिन्दुओं पर असतत होगा जहाँ $\sin x, 0$ तथा 1 होता है तथा सतत होगा जब $\sin x = -1$ हो या अन्य

Now $\sin x = 0$ and 1 .

If $x = n\pi$ or $x = (4n + 1)\pi/2$

i.e., $x = \frac{\pi}{2}, \pi, 2\pi, \frac{5\pi}{2}, 3\pi$ and $\sin 2x = 0$ or 1

If $2x = n\pi$ or $2x = (4n + 1)\frac{\pi}{2}$

$2x = \frac{\pi}{2}, \pi, 2\pi, \frac{5\pi}{2}, 3\pi, 4\pi, \frac{9\pi}{2}, 5\pi, 6\pi$

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

$\Rightarrow [\sin x] + [\sin 2x]$ is discontinuous at 9 points.

(83) (3). $f(x) = (k-1) \tan \pi x$; $x < k$

$f'(x) = (k-1) \pi \sec^2 \pi x$; $x < k$

$f(k^-) = (k-1) (-1)^{2k} \pi$; $x < k$

(84) (4). Continuity $f(2^+) = 2 + 2 \sin(0) = 2$

$f(2^-) = 3 + 2 \sin(0) = 3$ discontinuous at $x = 2$

At $x = 0$, $f(0^+) = 2(0) - 0 - 0 \times \sin(0) = 0$

$f(0^-) = 2(0) - (-1) + 0 \times \sin(0 - (-1))$

Discontinuous at $x = 0$.

(85) (2). $\frac{dy}{dx} + 3xy = x$

$\Rightarrow dy = x(1-3y) dx$

$\Rightarrow \frac{-3 dy}{(1-3y)} = -3x dx$

Integrating we get,

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

or $(1-3y) = e^{-3x^2/2} + C_1$

which passes through $(0, 4)$

$$C_1 = -11$$

\therefore Required curve is $3y = 1 + 11e^{-3x^2/2}$

(86) (2). For $x > 0$

$$\therefore \sin x < x \Rightarrow \frac{\sin x}{x} < 1$$

$$\Rightarrow \int_0^{\pi/2} \frac{\sin x}{x} dx < \int_0^{\pi/2} 1 dx$$

$$\Rightarrow \int_0^{\pi/2} \frac{\sin x}{x} dx < \frac{\pi}{2} \text{ and } \lim_{x \rightarrow 0} \frac{\sin x}{x} = 1$$

Both S-1 and S-2 are individually true but S-2 is not the correct explanation of S-1.

(87) (4). $\cot^{-1} x = \frac{\pi}{2} - \tan^{-1} x$

$$\therefore d(\cot^{-1} x) = -d(\tan^{-1} x)$$

Thus, $\int 2^{\tan^{-1} x} d(\cot^{-1} x)$

$$= -\int 2^{\tan^{-1} x} d(\tan^{-1} x) = -\frac{2^{\tan^{-1} x}}{\ln 2} + C$$

\therefore S-1 is false

S-2 is true

(88) (2). Area = $\int_1^3 -(x^2 - 4x + 3) dx$

$$= -\left(\frac{x^3}{3} - \frac{4x^2}{2} + 3x\right)\Bigg|_1^3 = \frac{4}{3}$$

\therefore S-1 is true

S-2 is true but does not explain S-1.

(89) (1). Let $P(C) = x$, then $P(B) = 3x$, $P(A) = 6x$

Since A, B, C are mutually exclusive and exhaustive events.

$$P(A \cup B \cup C) = P(A) + P(B) + P(C)$$

$$1 = 6x + 3x + x \Rightarrow x = 1/10$$

$$P(B) = \frac{3}{10} \left(\frac{m}{n}\right)$$

$$\text{Odds in favour of B} = \frac{m}{n-m} = \frac{3}{10-3} = \frac{3}{7}$$

(90) (1). Total coupons = 12

$1 \leq$ selected coupon no. ≤ 8

$$\text{Probability of one selected coupon} = \frac{8}{12} = \frac{2}{3}$$

Hence the required probability

$$= \frac{2}{3} \times \frac{2}{3} \times \dots \times 6 \text{ times} = \left(\frac{2}{3}\right)^6$$