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DIVISION: JEE (MAIN+ADVANCED)
ACADEMIC SESSION: 2023-24

PERIODIC ASSESSMENT TEST (PAT)

STUDENT SUPPORT BOOKLET (SSB)

Answer Key (AK) | Standard Hints (SH) | Text Solutions (TS) | Weightage Sheet (WS)

CLASS	XI	COURSE NAME	VIKAAS	COURSE CODE	JA
PHASE CODE(S)	01JA,02JA, 03JA,JAZA,IA	TOTAL PAGES	1	BATCH CODE(S)	01JA,02JA, 03JA,JAZA,IA

Target Examination & Year:

JEE (MAIN + ADVANCED) 2025

TEST PATTERN	TEST TYPE	TEST CODE & SEQUENCE
JEE (MAIN)	CUMULATIVE TEST (CT)	MCT 02

DATE & DAY:
03rd September 2023 | Sunday

Duration & Time:
3 Hrs | 11:30 AM to 02:30 PM

Contents:

- Weightage Sheet (WS) ✓
- Answer Key (AK) ✓
- Standard Hints (SH) ☐
- Text Solutions (TS) ✓
- Resonance Student's Critical Analysis of Learning for Excellence (ResoSCALE) ☐
- Student Self Assessment Sheet (SAS) ☐
- Video Solutions (VS) ✓

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ANSWER KEY (AK)

PAPER											
PART-A: PHYSICS	Q.No.	1	2	3	4	5	6	7	8	9	10
	Ans.	3	4	4	1	2	4	1	3	2	3
	Q.No.	11	12	13	14	15	16	17	18	19	20
	Ans.	1	2	4	1	1	1	2	2	4	1
	Q.No.	21	22	23	24	25	26	27	28	29	30
	Ans.	0327	0006	0024	0006	0002	0008	0008	0024	0000	0001
PART-B: CHEMISTRY	Q.No.	31	32	33	34	35	36	37	38	39	40
	Ans.	4	3	1	3	2	4	2	2	2	4
	Q.No.	41	42	43	44	45	46	47	48	49	50
	Ans.	1	3	3	3	2	2	3	2	3	2
	Q.No.	51	52	53	54	55	56	57	58	59	60
	Ans.	0022	0004	0008	0003	0006	0040	0004	0006	0005	0047
PART-C: MATHS	Q.No.	61	62	63	64	65	66	67	68	69	70
	Ans.	2	4	2	1	2	2	2	3	2	2
	Q.No.	71	72	73	74	75	76	77	78	79	80
	Ans.	3	4	3	3	4	3	3	2	1	1
	Q.No.	81	82	83	84	85	86	87	88	89	90
	Ans.	0025	0045	0003	0006	0002	0020	0001	0040	0025	0009

STUDENT'S SPACE

PAPER

PART-A: PHYSICS

1. $mg - f_v = ma$ ...(i)

$f_v - m'g = m'f$ ...(ii)

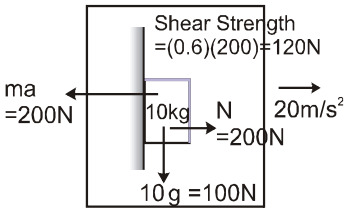
(i) & (ii)

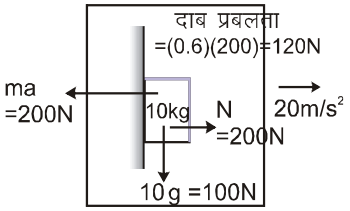
$$m' = \frac{m(g-f)}{(g+f)}$$

$$(m - m')g = \frac{2wf}{g+f}$$

2. The breaking force is insufficient, so the block will not slide.

भंजन बल अपर्याप्त है, अतः गुटका फिसलन नहीं करेगा।





So friction force अतः घर्षण बल = 100 N

and acceleration will be 20 m/sec² only

और त्वरण मात्र 20 m/sec² होगा।

Net contact force on the block गुटके पर कुल संपर्क बल = $\sqrt{(200)^2 + (100)^2}$

= $100\sqrt{5}$ N

All mechanical interactions are electromagnetic at microscopic level.

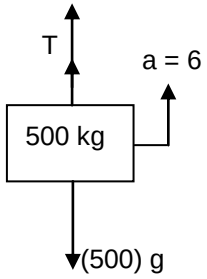
सभी यांत्रिक अन्तरक्रियायें सूक्ष्म स्तर पर विद्युत चुम्बकीय प्रवृत्ति की है।

3. $a = \frac{dv}{dt}$ slope of v – t graph

From t = 0 to t = 10

a = slope of v – t graph = + 6 m/sec²

T – (500) g = (500) (6) $\Rightarrow$ T = 8000 N



4. (i) For uniformly accelerated/deaccelerated motion

$v^2 = u^2 \pm 2gh$

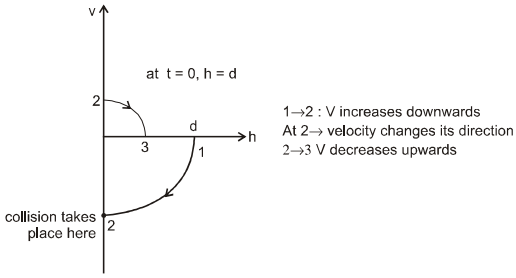
i.e. v-h graph will be a parabola (because equation is quadratic).

(ii) Initially velocity is downwards (-ve) and then after collision it reverses its direction with lesser magnitude. i.e. velocity is upwards (+ve). Graph (A) satisfies both these conditions.

Therefore, correct answer is (A)

Note that time t = 0 corresponds to the point on the graph where h = d

Next time collision takes place at 3.



(i) एक समान त्वरित/मंदित गति के लिये

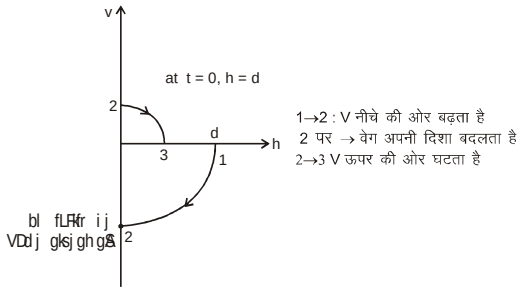
$v2 = u^2 \pm 2gh$

अर्थात v - h ग्राफ परवलय होगा (क्योंकि समीकरण द्विघात समीकरण है।)

(ii) प्रारम्भ में वेग नीचे की ओर (-ve) है और टक्कर के बाद यह अपनी दिशा बदल रहा है, जिसका परिमाण पहले से कम है। अतः वेग ऊपर की ओर (+ve) होगा। (A) ग्राफ इन दोनों शर्तों को पूरा करता है।

अतः (A) विकल्प सही है।

यहाँ t = 0 वह समय है जहाँ ग्राफ में h = d है।



अगली बार टक्कर, स्थिति 3 पर होगी।

5. From constrained motion,

$a_B = \frac{a_A}{2} = a$

$a_B = a$

$a_A = 2a$

$mg - T = m(2a)$ ...(i)

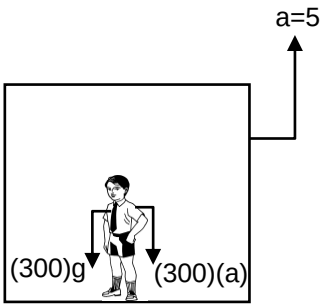
$2T - mg = m(a)$ ...(ii)

from (i) and (ii)

$a = \frac{g}{5}$

so $a_B = \frac{g}{5} \Rightarrow a_A = \frac{2g}{5}$

6.



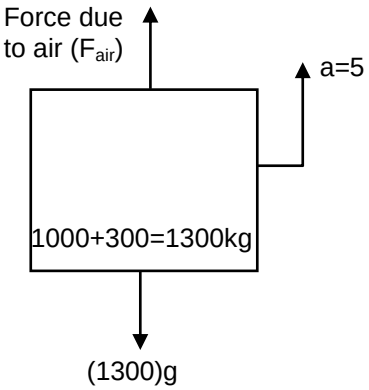
If we see with respect to the helicopter

$N = (300)g + (300)(1)$

$N = (300)(g + a) = (300)(10 + 5)$

$N = 4500$ N

7.



If we draw the free body diagram of (helicopter + passenger) system

$F_{air} - (1300)\,g = (1300)(5)$

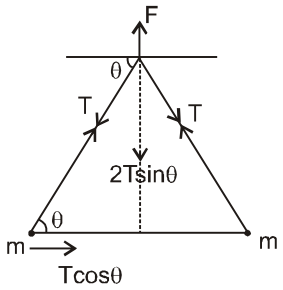
$F_{air} - (1300)(g + 5) = 19500$N

8. A is true but R is false

A सत्य है किंतु R असत्य हैं।

9. $F = 2T\sin\theta$

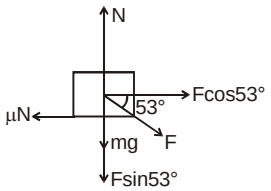
$a = \frac{T\cos\theta}{m}$



$a = \frac{F\cos\theta}{2m\sin\theta} = \frac{F}{2m}\frac{x}{\sqrt{a^2 - x^2}}$

10. Max. frictional force

अधिकतम घर्षण बल



$f_{max} = \mu N$

$= \mu(mg + F\sin53°)$

$= 0.2\left(20 \times 10 + 30 \times \frac{4}{5}\right)$

$= 44.8$ N

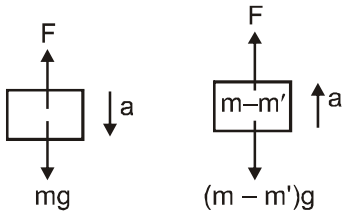
As applied horizontal force is Fcos53°

$= 18N < f_{max}$, friction force will also be 18 N.

चूंकि लगाया गया क्षैतिज बल Fcos 53° है = 18N

$< f_{max}$, घर्षण बल भी 18 N होगा।

11. $mg - F = ma$ .....(1)



$F - (m - m')g = (m - m')a$

from (1)

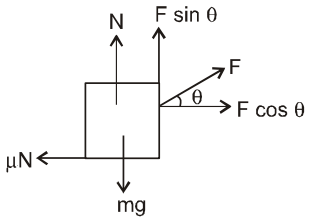
$F - mg + m'g = ma - m'a$

$mg - ma - mg + m'g = ma - m'a$

$m'(g + a) = 2ma$

$m' = \frac{2ma}{g + a}$

12.



$N = mg - F\sin\theta$

$F\cos\theta = \mu N = \mu\,[mg - F\sin\theta]$

$F = \dfrac{\mu\ mg}{\cos\theta + \mu\sin\theta}$

F is minimum when $\cos\theta + \mu\sin\theta$ is max

F न्यूनतम है, जब $\cos\theta + \mu\sin\theta$ अधिकतम है।

$\Rightarrow \quad \dfrac{d}{d\theta}(\cos\theta + \mu\sin\theta) = 0$

$\Rightarrow \quad -\sin\theta + \mu\cos\theta = 0$

$\Rightarrow \quad \mu = \tan\theta$

or या $\quad \theta = \tan^{-1}\mu$

also अतः $\cos\theta + \mu\sin\theta$

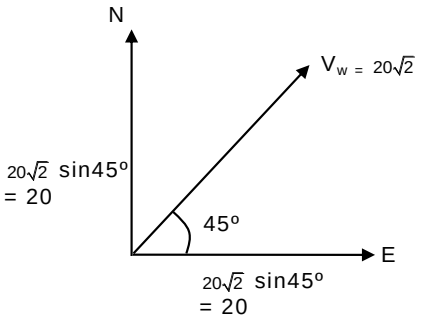
$= \sqrt{1+\mu^2}$ for $\theta = \tan^{-1}\mu$ के लिए

thus अतः F_{min} $F_{\text{न्यूनतम}} = \dfrac{\mu\ mg}{\sqrt{1+\mu^2}}$

13. $\tan^{-1}(3\mu)$

14. When the boat is standing on the port, the flag flutters towards N – E. So, the actual velocity of wind should be in N – E direction, and its magnitude will be

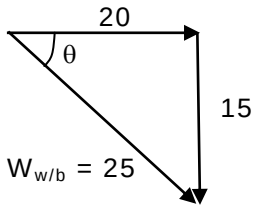
$72\sqrt{2}\,\text{Km/hr} = 72\sqrt{2}\times\dfrac{5}{18} = 20\sqrt{2}\ \text{m/sec}$



Now the boat moves with a velocity 126 Km/hr $= 126\times\dfrac{5}{18} = 35\ \text{m/sec}$ towards north.

So, $\vec{V}_{w/b} = \vec{V}_w - \vec{V}_b = (20\hat{i} + 20\hat{j}) - (35\hat{j})$

$\vec{V}_{w/b} = 20\hat{i} - 15\hat{j}$



$\tan\theta = \dfrac{15}{20} = \dfrac{3}{4}$

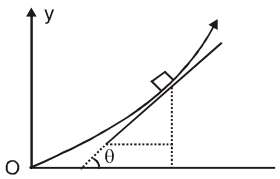
$\theta = 37^\circ$

Since the flag always adjusts in the direction of $\vec{V}_{w/b}$. So, the flag will settle at an angle 37° south of east.

15. $\dfrac{dy}{dx} = \tan\theta = \mu$ in limiting case

सीमान्त स्थिति में

$\dfrac{dy}{dx} = \dfrac{3x^2}{6} = \dfrac{1}{2}$



$\Rightarrow x = \pm 1$

So अतः $y = \dfrac{1}{6}$

16. Given, acceleration a = bt

दिया गया है कि त्वरण a = bt

$\Rightarrow \quad \dfrac{dv}{dt} = bt \Rightarrow v = \dfrac{bt^2}{2} + c$

At t = 0 पर, $v = v_0 \ \Rightarrow \ c = v_0$

So, $v = \dfrac{bt^2}{2} + v_0$

$\Rightarrow \quad \dfrac{ds}{dt} = \dfrac{bt^2}{2} + v_0$

$\Rightarrow \quad s = \dfrac{bt^3}{6} + v_0 t$

17. Acceleration of the block

$= \dfrac{mg\sin\theta - \mu_k mg\cos\theta}{m}$

$a = g\sin\theta - \mu_k g\cos\theta = 4$

Length of the incline = 30 cosec 37 = 50 m.

$s = ut + \dfrac{1}{2}at^2 \Rightarrow 50 = 0 + \dfrac{1}{2}(4)t^2$

$t = 5$ sec.

18. $y = x\tan\theta - \dfrac{gx^2}{2u^2\cos^2\theta}$ ……... (i)

For maxima उच्चिष्ठ के लिए, $\dfrac{dy}{d\theta} = 0$ gives

देता है $\tan\theta = \dfrac{u^2}{gx}$ ……... (ii)

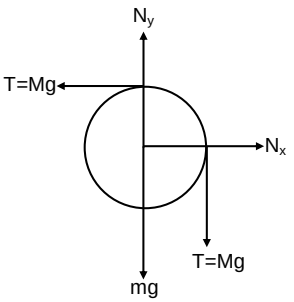
Put (ii) in (i)

(ii) को (i) में रखने पर

$y_{max} = \dfrac{u^4 - g^2x^2}{2gu^2}$

19. FBD of pulley

घिरनी का FBD

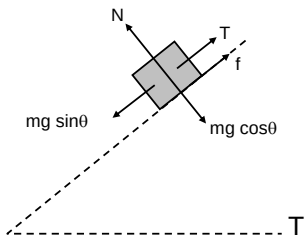


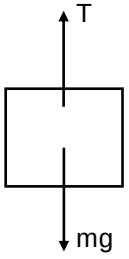
$N_x = Mg$

$N_y = (M + m)g$

$F = \sqrt{N_x^2 + N_y^2}$

20.





$F = Mg\sin\theta - T$

$T = Mg$

$\Rightarrow f = Mg\sin\theta - mg$

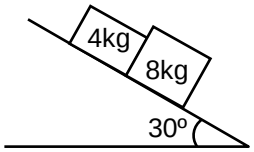
$f_{static} < \mu_s N$

$Mg\sin\theta - mg < \mu_s (mg\cos\theta)$

$m > 6$

$m_{min} = 6$ kg

21.



$a = \dfrac{8g\sin30^\circ + 4g\sin30^\circ - 2\times8g\cos30^\circ - 0.15\times4g\cos30^\circ}{12}$

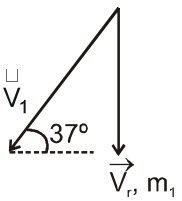
$a = \dfrac{60 - 8\sqrt{3} - 4\sqrt{3}}{12} = \left(5 - \sqrt{3}\right)m/s^2 = 03.27$

22. 0006

23. 0024

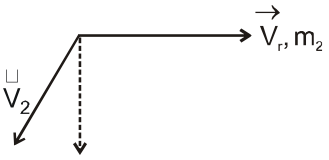
24. $V_{r_x} = V_1\cos37^\circ = (g\sin37^\circ t_1)\cos37^\circ$

$V_{r_y} = V_2\sin37^\circ = g\sin^2 37^\circ t_2$



$V_r = \sqrt{V_{r_x}^2 + V_{r_y}^2}$

$= \dfrac{10\times3}{25}\sqrt{16t_1^2 + 9t_2^2}$



$= \dfrac{6}{5}\sqrt{4 + 21} = 6m/s$

25. $\mu = \dfrac{m_B}{m_A} \Rightarrow 0.2 = \dfrac{m_B}{10} \Rightarrow m_B = 2kg$

26. $v\frac{dv}{dx} = 8 - 2x$

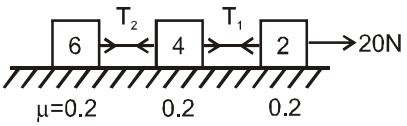
$\Rightarrow \int_0^v v dv = \int_0^x (8-2x)dx \quad \Rightarrow \frac{v^2}{2} = 8x - x^2$

$\Rightarrow v^2 = 16x - 2x^2$

At B, पर $v = 0$ so, $x = 8$

Hence, अतः $AB = 8$

27.



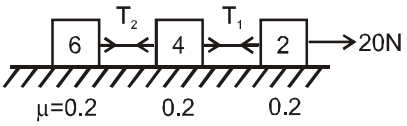
(i) Let the blocks do not move

then $T_1 = 20 - 4$

$T_2 = T_1 - 8 = 20 - 4 - 8 = 8$ N

Since T_2 < max possible friction force for 6 kg block

hence it will be at rest and this assumption is right. Therefore tension in the string connecting 4kg and 6 kg block = 8N



माना गुटके गति नहीं करते हैं

तो $T_1 = 20 - 4$

$T_2 = T_1 - 8 = 20 - 4 - 8 = 8$ N

चूंकि T_2 < 6 kg के गुटके के लिये अधिकतम संभव घर्षण बल

अतः ये विराम में होगा तथा परिकल्पना सही है।

अतः 4kg व 6 kg गुटके के मध्य रस्सी में तनाव = 8N

28. Block will move when. Fext becomes more than $F_{smax} = 0.6 \times 20 \times 10 = 120$ N. This happens at time > 3s.

ब्लॉक तब गति करेगा जब F_{ext} , $F_{smax} = 0.6 \times 20 \times 10 = 120$ N से अधिक होग। यह समय > 3s पर होता है।

$\frac{F-120}{20} = \frac{dv}{dt}$

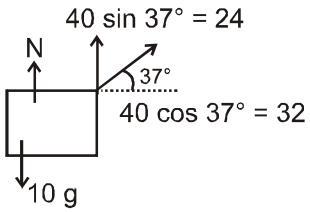
$\int_0^v dv = \int_3^{10} \frac{F-120}{20} dt$

$= \int_3^5 \frac{40\ t-120}{20} dt + \int_5^{10} \left(\frac{200-120}{20}\right) dt$

= 28.8 m/sec

Ans. 24 m/sec

29.



$N + 24 - 100 = 0$ for vertical direction

$N + 24 - 100 = 0$ लम्बवत् दिशा में

$\therefore$ $N = 76$ N

Now $0 \le f_s \le \mu_s N$

$0 \le f_s \le 76 \times 0.5$

$0 \le f_s \le 38$ N

$\therefore$ $32 < 38$ Hence $f = 32$

$\therefore$ acceleration of block is zero.

$\therefore$ ब्लॉक का त्वरण शून्य है।

30. $a = \left(\frac{4-1}{4+1}\right) g = 6\ m/s^2$

$s_r = u_r t + \frac{1}{2} a_r t^2$

$6 = 0 + \frac{1}{2} (6 - (-6)] t^2$

$t = 1$ sec

PART-B: CHEMISTRY

32. $SO_2Cl_2 + 4NaOH \longrightarrow$

moles (मोल) $= \frac{27000}{135} = 200$

Na_2SO_4 + 2NaCl + $2H_2O$

200 moles (मोल) 400 moles (मोल)

m = 200 × 142 g = 28.40 Kg m = 400 × 58.5 g = 23.4 Kg

$\Rightarrow$ x = 28.4 – 23.4 = 5 Kg.

33. $2\pi r = n\lambda$

Here (यहाँ), n = 2.

$\therefore 2\pi r = 2x \quad \therefore r =$ **29.**

37. Radial nodes = n – l –1

Angular node = *l*

हल: त्रिज्यीय नोड = n – l –1

कोणीय नोड = l

38. Mn - $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 3d^5\ 4s^2$

(1) $n + \ell = 4$ for 3p & 4s electrons. Hence, total = 6 + 2 = 8

(2) m = 0 for all s-electron and two-p electron and one d-electron. Hence, total = 13.

(3) No. of unpaired electrons = 5. So, μ = 5.92 BM

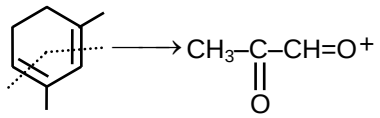
हल: Mn - $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 3d^5\ 4s^2$

(1) $n + \ell = 4$ for 3p & 4s इलेक्ट्रॉन। अतः कुल इलेक्ट्रॉन = 6 + 2 = 8

(2) सभी s-इलेक्ट्रॉन और दो p-इलेक्ट्रॉन और एक d-इलेक्ट्रॉन के लिये m = 0 है इसलिए इनकी कुल संख्या 13 है।

(3) अयुग्मित इलेक्ट्रॉनों की संख्या = 5 अतः, μ = 5.92 BM

41.



$CH_3–\underset{\underset{O}{\|}}{C}–CH_2–CH_2–CH=O$

42. After removal of one electron :

C^+ : $1s^2\ 2s^2\ 2p^1$;

N^+ : $1s^2\ 2s^2\ 2p^2$

O^+ : $1s^2\ 2s^2\ 2p^3$;

F^+ : $1s^2\ 2s^2\ 2p^4$

Removal of second electron will require maximum energy in case of O because of its half filled electronic configuration after removal of one electron.

$\therefore$ increasing order of 2nd ionisation enthalpy : C < N < F < O

हल. एक इलेक्ट्रॉन हटाने के पश्चात्

C^+ : $1s^2\ 2s^2\ 2p^1$;

N^+ : $1s^2\ 2s^2\ 2p^2$

O^+ : $1s^2\ 2s^2\ 2p^3$;

F^+ : $1s^2\ 2s^2\ 2p^4$

स्पष्ट है, कि O में से दूसरा इलेक्ट्रॉन हटाने के लिए अधिकतम ऊर्जा की आवश्यकता होगी, क्योंकि एक इलेक्ट्रॉन के निकल जाने के बाद यह अर्द्ध पूरित विन्यास धारण कर लेता है।

$\therefore$ द्वितीय आयनन एन्थैल्पी का बढ़ता हुआ क्रम : C < N < F < O

43. Refer periodic table.

आवर्त सारणी देखें।

44. Due to inert pair effect.

अक्रिय युग्म प्रभाव के कारण।

45. Second electron gain enthalpy is always endothermic.

द्वितीय इलेक्ट्रॉन ग्रहण एन्थैल्पी सदैव ऊष्माशोषी होती है।

46. $Cl–CH_2–CH=CH_2$; $CH_3–\underset{\underset{Cl}{|}}{C}=CH_2$; $CH_3–CH=CH_2–Cl$

47. (3) 10

48. **(Screening constant (σ))**

(परिरक्षण नियतांक (σ))

Be	2 , 2 = 0.35 + 2×0.85	=	2.05
B	2,3 = 2 × 0.35 + 2 × 0.85	=	2.40
C	2,4 = 3 × 0.35 + 2 × 0.85	=	2.75
N	2,5 = 2 × 0.85 + 4 × 0.35	=	3.10

49. C–C–C–C–NH–C, C–C(C)–C–NH–C,

C–C–C(C)–NH–C, C–C(C)(C)–NH–C, C–C–C–NH–

C–C, C–C(C)–NH–C–C

50. (2) $Na(g) \rightarrow Na^+(g) + e^-$

51.

$_{24}Cr$	$1s^2$	$2s^2$	$2p^6$	$3s^2$
n	1	2	2	3
l	0	0	1	0
m	0	0	(–1,0,+1)	0
n+l+m	1	2	(2,3,4)	3

$3p^6$	$3d^5$	$4s^1$
3	3	4
1	2	0

53. $[SO_4^{2-}] = \dfrac{n_{SO_4^{2-}}}{V_{sol}(L)} = \dfrac{1.2\times10^{-4}\, N_A / N_A}{10^{-3}}$

$= 1.2 \times 10^{-1}$ M

$\therefore$ Molarity of $Fe_2(SO_4)_3 = \dfrac{1.2\times10^{-1}}{3}$

$= 0.04$ M

$\therefore$ $Fe_2(SO_4)_3$ की मोलरता $= \dfrac{1.2\times10^{-1}}{3}$

$= 0.04$ M

$\therefore$ $n_{Fe_2(SO_4)_3} = M \times V_L = 0.04 \times 0.5 = 0.02$

$\therefore$ $m_{Fe_2(SO_4)_3} = 0.02 \times 400 = 8\ g = x$

54. (B), (C) & (E) are correct. सही है।

56. $= \dfrac{80}{188} \times \dfrac{\text{wt. of AgBr}}{\text{wt. of organic compound}}$

$= \dfrac{80}{188} \times \dfrac{0.188}{0.2} \times 100 = 40\%$

57. As there is sudden Jump between $I.E_4$ & $I.E_5$, so this element will have 4 electrons in outermost shell Hence, It has four valence electron.

यह $I.E_4$ व $I.E_5$ के मध्य अचानक कूदता है इसलिए यह तत्व बाह्यतम कोश में 4 इलेक्ट्रॉन रखेगा। अतः यह चार संयोजी इलेक्ट्रॉन रखता है।

59. Expected electron configuration should be [Kr] $4d^{10}\ 5s^0$. The principal quantum number (n) of valence shell is thus equal to 5. So the period of the element to which it belongs is 5.

सम्भावित इलेक्ट्रॉनिक अभिविन्यास [Kr] $4d^{10}\ 5s^0$ होना चाहिए। अतः संयोजी कोश की मुख्य क्वाण्टम संख्या (n) का मान 5 के बराबर है। इसलिए इस तत्व का आवर्त 5 होगा।

60. Electronic configuration of an ion $[M^+]$ is [Ar] $3d^{10}$, so electronic configuration of M is [Ar] $3d^{10}, 4s^1$. Atomic number of M is 29 so atomic number of element which is just below M in the periodic table is 47.

एक आयन $[M^+]$ का इलेक्ट्रॉनिक अभिविन्यास [Ar] $3d^{10}$ है। अतः M का [Ar] अभिविन्यास $3d^{10}, 4s^1$ है। M का परमाणु क्रमांक 29 है इसलिए M के नीचे वाले तत्व का परमाणु क्रमांक 47 हैं।

PART-C: MATHEMATICS

61. $D > 0$

$(a+b)^2 - (a-b+8)^2 > 0 \ \ \forall\ a \in R$

$a^2 + a(2b-1) + b^2 + b - 8 > 0$

so $D < 0$

$(2b-1)^2 - 4(b^2+b-8) < 0 \quad -8b + 33 < 0$

$b > \dfrac{33}{8} \qquad b_{min} = 5$

(as b is integer b के पूर्णांक है)

62. **1.** $\tan\alpha\tan2\alpha\tan3\alpha = \tan3\alpha - \tan2\alpha - \tan\alpha$

always holds good. सदैव सत्य है

2. R.H.S. $= \dfrac{\sin 4\alpha + \sin 2\alpha}{\sin 2\alpha \sin 4\alpha}$

$= \dfrac{2\sin 3\alpha \cos \alpha}{\sin 2\alpha \sin 4\alpha}$

$= \dfrac{1}{\sin \alpha} = \text{cosec}\,\alpha (\text{using } \pi/7 = \alpha)$

Hence, (B) is correct. अतः (B) सही है

3. $\cos\alpha + \cos 3\alpha + \cos 5\alpha$

$= \dfrac{\sin 3\alpha}{\sin \alpha} \cos 3\alpha$

$= \dfrac{\sin 6\alpha}{2\sin \alpha} = \dfrac{\sin \frac{6\pi}{7}}{2\sin \frac{\pi}{7}} = \dfrac{\sin\left(\pi + \frac{\pi}{7}\right)}{2\sin \frac{\pi}{7}} = \dfrac{1}{2}$

Also तथा $\cos 2\alpha = \cos \dfrac{2\pi}{7}$

$= -\cos\left(\pi - \dfrac{\pi}{7}\right)$

$= -\cos\left(\dfrac{5\pi}{7}\right) = -\cos 5\alpha$

4. $8\cos\alpha \cos 2\alpha \cos 4\alpha$

$= \dfrac{\sin 8\alpha}{\sin \alpha} = \dfrac{\sin \frac{8\pi}{7}}{\sin \frac{\pi}{7}} = -\dfrac{\sin \frac{\pi}{7}}{\sin \frac{\pi}{7}} = -1$

63. $\sin \dfrac{\pi}{14} \sin \dfrac{3\pi}{14} \sin \dfrac{5\pi}{14}$

$= \cos\left(\dfrac{3\pi}{7}\right) \cos\left(\dfrac{4\pi}{14}\right) \cos\left(\dfrac{2\pi}{14}\right)$

$\dfrac{3\pi}{7} = \pi - \dfrac{4\pi}{7}$

$= -\cos \dfrac{\pi}{7} \cos \dfrac{2\pi}{7} \cos \dfrac{4\pi}{7}$

so इसलिए

$\cos \dfrac{\pi}{7} \cos \dfrac{2\pi}{7} \cos\left(2\pi - \dfrac{4\pi}{7}\right) + \cos \dfrac{\pi}{7} \cos \dfrac{2\pi}{7} \cos \dfrac{4\pi}{7}$

$\Rightarrow 2 \cos \dfrac{\pi}{7} \cos \dfrac{2\pi}{7} \cos \dfrac{4\pi}{7}$

$\Rightarrow \dfrac{2\sin 2^3\left(\frac{\pi}{7}\right)}{2^3 \sin \frac{\pi}{7}} = -\dfrac{1}{2^2} \dfrac{\sin \frac{\pi}{7}}{\sin \frac{\pi}{7}}$

$= -\dfrac{1}{4}$

64. $q^2 = AR^{2p-1}$ and $p^2 = QR^{2q-1}$

$T_{p+q} = AR^{p+q-1} = (AR^{2p-1}.\ AR^{2q-1})^{1/2}$

$= (p^2q^2)^{1/2} = pq$

65. $T_n = 1^2 + 2^2 + 3^2 + \ldots\ldots + n^2$

$T_n = \dfrac{n(n+1)(2n+1)}{6} = \dfrac{2n^3 + 3n^2 + n}{6}$

$S_n = \sum T_n = \dfrac{1}{6}\left[2\sum n^3 + 3\sum n^2 + \sum n\right]$

$= \dfrac{1}{6}\left\{2\left[\dfrac{n(n+1)}{2}\right]^2 + \dfrac{3n(n+1)(2n+1)}{6} + \dfrac{n(n+1)}{2}\right\}$

$S_n = \dfrac{n(n+1)^2(n+2)}{12}$

66. $S = 1^2 - \dfrac{2^2}{5} + \dfrac{3^2}{5^2} - \dfrac{4^2}{5^3} + \dfrac{5^2}{5^4} -$

$\dfrac{6^2}{5^5} + \ldots\ldots\ldots\ldots\infty \ldots (i)$

$-\dfrac{1}{5} S = -\dfrac{1}{5} + \dfrac{2^2}{5^2} - \dfrac{3^2}{5^3} + \dfrac{4^2}{5^4} -$

$\dfrac{5^2}{5^5} + \ldots\ldots\infty \ldots (ii)$

(i) – (ii) we get से

$\dfrac{6}{5} S = 1 - \dfrac{3}{5} + \dfrac{5}{5^2} - \dfrac{7}{5^3} + \dfrac{9}{5^4} - \dfrac{11}{5^5} + \ldots\ldots\infty \ldots (iii)$

$-\dfrac{6}{25} S = -\dfrac{1}{5} + \dfrac{3}{5^2} - \dfrac{5}{5^3} + \dfrac{7}{5^4} -$

$\dfrac{9}{5^5} + \ldots\ldots\infty \ldots (iv)$

(iii) – (iv) we get से

$\dfrac{6s}{5}\left(\dfrac{6}{5}\right) = 1 - \dfrac{2}{5} + \dfrac{2}{5^2} - \dfrac{2}{5^3} + \dfrac{2}{5^4} - \ldots\ldots\ldots\infty$

$\dfrac{36}{25} S = 1 - \dfrac{2}{5}\left[\dfrac{1}{1 + \frac{1}{5}}\right]$;

$\dfrac{36}{25} S = 1 - \dfrac{2}{5}\left(\dfrac{5}{6}\right) = \dfrac{2}{3}$;

$S = \dfrac{25}{36} \times \dfrac{2}{3} = \dfrac{25}{54}$ **Ans**

67. $\log_6 abc = 6$

$abc = 6^6$

$b^3 = 6^6$

$\left(\because b^2 = ac\right)$

$\Rightarrow\ b = 36$

Since (b – a) is a square

चूंकि (b – a) एक पूर्ण वर्ग है।

$\therefore$ Possible values of a

= 35, 32, 27, 20, 11

$\therefore$ a के संभावित मान

a = 35, 32, 27, 20, 11

Now $c = \frac{b^2}{a} = \frac{36^2}{a}$

is an integer for a = 27

अब $c = \frac{b^2}{a} = \frac{36^2}{a}$ पूर्णांक है, a = 27

$\therefore$ a = 27, b = 36, c = 48

$\therefore$ a + b – c = 15

68.

$\frac{1}{a}, \frac{1}{H_1}, \frac{1}{H_2}, ... \frac{1}{H_n}, \frac{1}{b}$

are in AP समान्तर श्रेणी में है।

$\frac{1}{H_1} = \frac{1}{a} + d \qquad \frac{1}{H_n} = \frac{1}{b} - d$

$H_1 = \frac{a}{1+ad} \qquad H_n = \frac{b}{1-bd}$

$\frac{H_1 + a}{H_1 - a} + \frac{H_n + b}{H_n - b}$

$= \frac{\frac{a}{1+ad} + a}{\frac{a}{1+ad} - a} + \frac{\frac{b}{1-bd} + b}{\frac{b}{1-bd} - b}$

$= \frac{2+ad}{-ad} + \frac{2-bd}{bd}$

$= -2 + \frac{2}{d}\left(\frac{1}{b} - \frac{1}{a}\right) = -2 + (n+1)2$ = 2n

69. $\frac{T_4}{T_2} = \frac{ar^3}{ar} = \frac{1}{16}$

$r = \pm \frac{1}{4}$

$\therefore\ r = + \frac{1}{4}$

{decreasing G.P. ह्रासमान गुणोत्तर श्रेणी }

$\frac{T_3}{T_2^2} = \frac{ar^2}{a^2r^2} = \frac{1}{a} = \frac{1}{9} \Rightarrow a = 9$

$S_\infty = \frac{a}{1-r} = \frac{9}{1-\frac{1}{4}} = 12$

70. 1050 = 1 + 1 + 1 + ... + 1 1050 times

$$\frac{1+\left(1-\frac{1}{2}\right)+\left(1-\frac{2}{3}\right)+\left(1-\frac{3}{4}\right)+.....+\left(1-\frac{1049}{1050}\right)}{1+\frac{1}{2}+\frac{1}{3}+.....+\frac{1}{1050}}$$

$= \frac{x+1}{2024}$

$\frac{1+\frac{1}{2}+\frac{1}{3}+.....+\frac{1}{1050}}{1+\frac{1}{2}+\frac{1}{3}+.....+\frac{1}{1050}} = \frac{x+1}{2024} = 1$

x = 2023

71. 2b = a + c

a,p,b,q,c are in A.P Hence,

$p = \frac{a+b}{2}$ and $q = \frac{b+c}{2}$

Again, a,p′,b,q′ and c are in G.P.

Hence, $p' = \sqrt{ab}$ and $q' = \sqrt{bc}$

$\Rightarrow\ p^2 - q^2 = \frac{(a-c)(a+c+2b)}{4}$

$= (a - c)b = ab - bc = p'^2 - q'^2$

हल. 2b = a + c

a, p, b, q, c समान्तर श्रेणी में है अतः

$p = \frac{a+b}{2}$ और $q = \frac{b+c}{2}$

पुनः a,p′,b,q′ और c गुणोत्तर श्रेणी में है।

अतः, $p' = \sqrt{ab}$ और $q' = \sqrt{bc}$

$\Rightarrow\ p^2 - q^2 = \frac{(a-c)(a+c+2b)}{4} = (a - c)b$

$= ab - bc$

$= p'^2 - q'^2$

72. As चूकि $a_1, a_2, a_3 ... a_{n-1}, a_n$ are in A.P., hence

चूकि $a_1, a_2, a_3 ... a_{n-1}, a_n$ समान्तर श्रेणी में है।

$d = a_2 - a_1 = a_3 - a_2 = .. a_n - a_{n-1}$

$\sin d\,[\sec a_1 \sec a_2 + \sec a_2 \sec a_3 + ... + \sec a_{n-1} \sec a_n]$

$= \frac{\sin(a_2 - a_1)}{\cos a_1 \cos a_2} + \frac{\sin(a_3 - a_2)}{\cos a_2 \cos a_3} + ... + \frac{\sin(a_n - a_{n-1})}{\cos a_{n-1} \cos a_n}$

$= (\tan a_2 - \tan a_1) + (\tan a_3 - \tan a_2) + ... + (\tan a_n - \tan a_{n-1})$

$= \tan a_n - \tan a_1$

73. a,b,c are in H.P.

Hence, H.M. of a and c is b.

$\therefore \sqrt{ac} > b \qquad (\because \text{G.M.} > \text{H.M.})$

Since A.M. > G.M., so

$\frac{a^{101} + c^{101}}{2} > ((\sqrt{ac})^{101} > b^{101} \quad (\because \sqrt{ac} > b)$

or $\qquad 2b^{101} - a^{101} - c^{101} < 0$

Let $f(x) = x^2 - kx + 2b^{101} - a^{101} - c^{101}$

$\therefore \quad f(0) = 2b^{101} - a^{101} - c^{101} < 0$

Hence, equation f(x) = 0 has one root in $(-\infty, 0)$ and other in $(0, \infty)$.

हल. a,b,c हरात्मक श्रेढी में है तथा a और c का हरात्मक माध्य b है।

$\therefore \sqrt{ac} > b \qquad (\because \text{G.M.} > \text{H.M.})$

चूकि A.M. > G.M., इसलिए

$\frac{a^{101} + c^{101}}{2} > ((\sqrt{ac})^{101} > b^{101} \quad (\because \sqrt{ac} > b)$

या $\qquad 2b^{101} - a^{101} - c^{101} < 0$

माना $f(x) = x^2 - kx + 2b^{101} - a^{101} - c^{101}$

$\therefore \quad f(0) = 2b^{101} - a^{101} - c^{101} < 0$

अतः समीकरण f(x) = 0 का एक मूल $(-\infty, 0)$ में है तथा $(0, \infty)$ में है।

74. $\cos^4 \frac{\pi}{16} + \cos^4 \frac{3\pi}{16} + \cos^4 \frac{5\pi}{16} + \cos^4 \frac{7\pi}{16}$

$= \left(\frac{1+\cos\pi/8}{2}\right)^2 + \left(\frac{1+\cos 3\pi/8}{2}\right)^2 + \left(\frac{1+\cos 5\pi/8}{2}\right)^2 + \left(\frac{1+\cos 7\pi/8}{2}\right)^2$

$= \frac{1}{4}\left[(1+\cos\pi/8)^2 + (1+\cos 3\pi/8)^2 + (1-\cos 3\pi/8)^2 + (1-\cos\pi/8)^2\right]$

$= \frac{1}{4}\left[4 + 2\cos^2 \pi/8 + 2\cos^2 3\pi/8\right] =$

$\frac{1}{4}\left[4 + 1 + \cos\pi/4 + 1 + \cos 3\pi/4\right]$

$= \frac{1}{4}\left[6 + \frac{1}{\sqrt{2}} - \frac{1}{\sqrt{2}}\right] = \frac{3}{2}$

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

$f(x) = 1 - \frac{3}{4}(\sin^2 2x)$

76. $A \equiv 2\cos^2\theta + \sin\theta \le 2$

$2 - 2\sin^2\theta + \sin\theta \le 2$

$2\sin\theta\left(\sin\theta - \frac{1}{2}\right) \ge 0$

$\sin\theta\left(\sin\theta - \frac{1}{2}\right) \ge 0$

$\sin\theta \in \left(-\infty, 0\right] \cup \left[\frac{1}{2}, \infty\right)$

But परन्तु $\sin\theta \in [-1, 1]$

$\sin\theta \in [-1, 0] \cup \left[\frac{1}{2}, 1\right]$

$\theta \in \left[\frac{\pi}{6}, \frac{5\pi}{6}\right] \cup [\pi, 2\pi)$

$B = \theta \in \left[\frac{\pi}{2}, \frac{3\pi}{2}\right]$

$A \cap B = \theta \in \left[\frac{\pi}{2}, \frac{5\pi}{6}\right] \cup \left[\pi, \frac{3\pi}{2}\right]$

77. $2\cos(a + bx) = x - \frac{x^2 + 5}{2} = -2 - \frac{1}{2}$

$(x - 1)^2 \le -2$

$\Rightarrow \cos(a + bx) = -1$

$\Rightarrow a + bx = 2n\pi - \pi$ and $x = 1$

$\therefore a + b = \pi, 3\pi, \ldots\ldots$but less than 10

$\therefore a + b = \pi, 3\pi, \ldots\ldots$परन्तु 10 से कम

78. $x^2 - \sqrt{3}x + \sqrt{6} = 0 \begin{cases} \alpha \\ \beta \end{cases}$

Equation having roots $1 + \frac{1}{\alpha^2}, 1 + \frac{1}{\beta^2}$

$$\frac{1}{x-1}-\frac{\sqrt{3}}{\sqrt{x-1}}+\sqrt{6}=0$$

$$\left(\frac{1}{x-1}+\sqrt{6}\right)=\sqrt{\frac{3}{x-1}}$$

$$\frac{1}{(x-1)^2}+6+\frac{2\sqrt{6}}{x-1}=\frac{3}{x-1}$$

$1 + 6 (x–1)^2 + 2\sqrt{6} (x–1) = 3 (x–1)$

$$\Rightarrow 6x^2+\left(2\sqrt{6}-15\right)x+\left(10-2\sqrt{6}\right)=0$$

$$\Rightarrow x^2+\left(\frac{2\sqrt{6}-15}{6}\right)x+\left(\frac{10-2\sqrt{6}}{6}\right)=0$$

So, $a=\frac{2\sqrt{6}-15}{6}, b=\frac{10-2\sqrt{6}}{6}$

$$\Rightarrow a+b=-\frac{5}{6}$$

Now quadratic equation

$x^2 – (a + b– 2) x + (a + b + 2) = 0$ is

also $6x^2 + 17x + 7 = 0$

Since, $D = (17)^2 –4 (6) (7) > 0$, sum of roots

$= -\frac{17}{6}$ and product of roots = $\frac{7}{6}$

Hence both roots are real negative

79. $x_1 (x – x_2)^2 + x_2 (x – x_1)^2 = 0$

$\Rightarrow x^2(x_1 + x_2) – 4x x_1x_2 + x_1x_2 (x_1 + x_2) = 0$

$D = 16(x_1x_2)^2 – 4x_1x_2(x_1 + x_2)^2 > 0$ as $x_1x_2 < 0$

Product of roots = $x_1x_2 < 0$

Thus root are real and of opposite signs

हल. $x_1 (x – x_2)^2 + x_2 (x – x_1)^2 = 0$

$\Rightarrow x^2(x_1 + x_2) – 4x x_1x_2 + x_1x_2 (x_1 + x_2) = 0$

$D = 16(x_1x_2)^2 – 4x_1x_2(x_1 + x_2)^2 > 0$ as $x_1x_2 < 0$

मूलों का गुणन = $x_1x_2 < 0$

अतः मूल वास्तविक और विपरीत चिन्ह के है।

80. Put $2^x = t$, then (1) can be written as

$2^x = t$ रखने पर (1) से

$$1+\log_2 t-2\log_2(t+3)+\frac{2}{2}\log_2\left(10-\frac{1}{t}\right)=0$$

$$\Rightarrow 1+\log_2 t-\log_2(t+3)^2+\log_2(10t-1)-\log_2 t=0$$

$$\Rightarrow \log_2(10t-1)/(t+3)^2=-1$$

$$\Rightarrow 10t-1=\frac{1}{2}(t+3)^2$$

$$\Rightarrow t^2-14t+11=0$$

If $t_1 = 2^{x_1}, t_2 – 2^{x_2}$ are roots of (2),

यदि $t_1 = 2^{x_1}, t_2 – 2^{x_2}$ (2) के मूल है।

then तब , $t_1t_2 = 2^{x_1} \cdot 2^{x_2} = 11$

$\Rightarrow x_1 + x_2 = \log_2 11$

81. $S=\left\{\alpha:\log_2\left(9^{2\alpha-4}+13\right)-\log_2\left(\frac{5}{2}.3^{2\alpha-4}+1\right)=2\right\}$

$$\log_2\left(9^{2\alpha-4}+13\right)-\log_2\left(\frac{5}{2}.3^{2\alpha-4}+1\right)=2$$

$$\Rightarrow \quad \log_2\left(\frac{9^{2\alpha-4}+13}{\frac{5}{2}9^{\alpha-2}+4}\right)=2$$

$$\Rightarrow \quad 9^{2\alpha-4}+13=4\left(\frac{5}{2}9^{\alpha-2}+1\right)$$

$$\Rightarrow \quad 9^{2(\alpha-2)}+13=109^{\alpha-2}+4$$

$\Rightarrow$ $9^2 – 10y + 9 = 0$ [where $y = 9^{\alpha-2}$

$\Rightarrow$ $(y – 9) (y – 1) = 0$

$y = 9$ or $y = 1$

$9^{\alpha-2} = 9$ or $9^{\alpha-2} = 1$

so $\alpha = 2, 3$

$\Rightarrow$ $s = \{2, 3\}$

Now $x^2 – 2\left(\sum_{\alpha\in S}\alpha\right)^2 x + \sum_{\alpha\in S}(\alpha+1)^2\ \beta = 0$

$x^2 – 50x + 25\ \beta = 0$

for real roots

$D \geq 0$

$50^2 – 100\ \beta \geq 0$ [$D = b^2 – 4ac$]

$2500 – 100\ \beta \geq 0$

$25 – \beta \geq 0$

$\beta \leq 25$

$\beta_{max} = 25$

82. $e^{2x} – 11e^x – 45e^{-x} + \frac{1}{2} = 0$

Let $e^x = t$

$$t^2-11t-\frac{45}{t}+\frac{81}{2}=0$$

$2t^3 - 22t^2 - 90 + 81t = 0$

$2t^3 - 22t^2 + 81t + - 90 = 0 \Leftarrow \begin{matrix}\alpha\\ \beta\\ \gamma\end{matrix}$

Hence $e^x = \alpha,\beta,\gamma$

$x = \log_e(\alpha), \log(\beta), \log_e(\gamma)$

sum of solution = $\log_e(\alpha) + \log_e(\beta) + \log_e(\gamma)$s

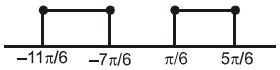
$= \log_e(\alpha\beta\gamma) = \log_e(45) \Rightarrow p = 45$

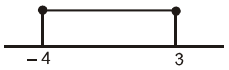
83. $2\sin^2 x - 3\sin x + 1 \le 0$

$\Rightarrow (2\sin x - 1)(\sin x - 1) \le 0$

$\frac{1}{2} \le \sin x \le 1$

$\Rightarrow 2n\pi + \frac{\pi}{6} \le x \le 2n\pi + \frac{5\pi}{6}$, $n \in I$ ....(1)





$x^2 + x - 12 \le 0$

$\Rightarrow (x + 4)(x - 3) \le 0$

$\Rightarrow x \in [-4, 3]$ .....(2)

(1) and और (2)

$\Rightarrow x \in \left[-4, \frac{-7\pi}{6}\right] \cup \left[\frac{\pi}{6}, \frac{5\pi}{6}\right]$

$\therefore$ Integers are पूर्णांक $-4, 1, 2$ है।

84. $3 + 3\cos\theta = 2 - 2\cos^2\theta$

$\Rightarrow 2\cos^2\theta + 3\cos\theta + 1 = 0$

$\Rightarrow (2\cos\theta + 1)(\cos\theta + 1) = 0$

$\therefore \cos\theta = -1$ or या $\cos\theta = -\frac{1}{2}$

if यदि $\cos\theta = -1$ then

तब $\theta = \pi, 3\pi, 5\pi, 7\pi, 9\pi$, ...

if यदि $\cos\theta = -1/2$ then

तब $\theta = \frac{2\pi}{3}, \frac{4\pi}{3}, \frac{8\pi}{3}, \frac{10\pi}{3}, \frac{14\pi}{3}$, ...

solution in increasing order

हल बढते क्रम में है।

$0 < \underbrace{\frac{2\pi}{3}}_{\theta_1} < \underbrace{\pi}_{\theta_2} < \underbrace{\frac{4\pi}{3}}_{\theta_3} < \frac{8\pi}{3}$

$< 3\pi < \frac{10\pi}{3} < \underbrace{\frac{14\pi}{3}}_{\theta_7} < 5\pi$, ...

$\theta_3 + \theta_7 = \frac{4\pi}{3} + \frac{14\pi}{3} = 6\pi = a\pi \Rightarrow a = 6$

85. $\frac{3 + (\cos 80^\circ \cos 20^\circ / \sin 80^\circ \sin 20^\circ)}{(\cos 80^\circ / \sin 80^\circ) + (\cos 20^\circ / \sin 20^\circ)}$

$= \frac{2\sin 80^\circ \sin 20^\circ + \cos 80^\circ \cos 20^\circ + \sin 80^\circ \sin 20^\circ}{\sin 20^\circ \cos 80^\circ + \cos 20^\circ \sin 80^\circ}$

$= \frac{\cos 60^\circ - \cos 100^\circ + \cos 60^\circ}{\sin 100^\circ} = \frac{1 - \cos 100^\circ}{\sin 100}$

$= \tan 50^\circ$

86. Let the m^{th} term of final A.P. = n^{th} term of second A.P.

माना mवां पद समान्तर श्रेढी है = nवां पद

समान्तर श्रेढी में दूसरा है।

$2 + (m - 1) \times 3 = 3 + (n - 1) \times 2$

$3m - 1 = 2n + 1$

$3m = 2n + 2$

$\frac{m}{2} = \frac{n+1}{3} = k$ (sayमाना)

$m = 2k$, $n = 3k - 1$

$2k \le 50$, $3k - 1 \le 60$

$k \le 25$, $k \le 20\frac{1}{3}$

$K \le 20$

87. $x^2 - x = t$; $\tan\alpha = \frac{t}{t+1}$; $\tan\beta = \frac{1}{2t+1}$

$\therefore \tan(\alpha + \beta) = \frac{\tan\alpha + \tan\beta}{1 - \tan\alpha \tan\beta}$

$= \frac{\frac{t}{t+1} + \frac{1}{2t+1}}{1 - \frac{t}{t+1}.\frac{1}{2t+1}} = \frac{t(2t+1)+t+1}{(2t+1)(t+1)-t}$

$= \frac{2t^2+2t+1}{2t^2+2t+1} = 1 \Rightarrow \tan(\alpha + \beta) = 1$

88. $= \sum_{r=1}^{10}\left(\frac{2r-1+2r+1}{r(2r-1)(2r+1)}\right) =$

$= 4\sum_{r=1}^{10}\frac{1}{(2r-1)(2r+1)}$

$$= \frac{4}{2}\sum_{r=1}^{10}\left(\frac{1}{2r-1}-\frac{1}{2r+1}\right)$$

$$= 2\left[\left(1-\frac{1}{3}\right)+\left(\frac{1}{3}-\frac{1}{5}\right)+.....+\left(\frac{1}{19}-\frac{1}{21}\right)\right]$$

$$= 2\left(1-\frac{1}{21}\right)$$

$$= \frac{40}{21}$$

89. $\because \frac{1}{1-\sin x} = 2 \Rightarrow \sin x = \frac{1}{2} \Rightarrow x = \frac{\pi}{6}$

90. $(a^2+\frac{1}{a^2}+3)\ (b^2+\frac{1}{b^2}+5)\ \ (c^2+\frac{1}{c^2}+7)$

$$= \left(\left(a-\frac{1}{a}\right)^2+5\right)\left(\left(b-\frac{1}{b}\right)^2+7\right)\left(\left(c-\frac{1}{c}\right)^2+9\right)$$

$\therefore$ Minimum is at a = b = c = 1

Minimum value = 5.7.9 = 315 = p. q. r

p + q + r = 3 + 1 + 5 = 9

हल. $(a^2+\frac{1}{a^2}+3)\ (b^2+\frac{1}{b^2}+5)\ \ (c^2+\frac{1}{c^2}+7)$

$$= \left(\left(a-\frac{1}{a}\right)^2+5\right)\left(\left(b-\frac{1}{b}\right)^2+7\right)\left(\left(c-\frac{1}{c}\right)^2+9\right)$$

$\therefore$ a = b = c = 1 पर न्यूनतम है।

न्यूनतम मान = 5.7.9 = 315 = p. q. r

p + q + r = 3 + 1 + 5 = 9

---- TEXT SOLUTIONS (TS) END ----

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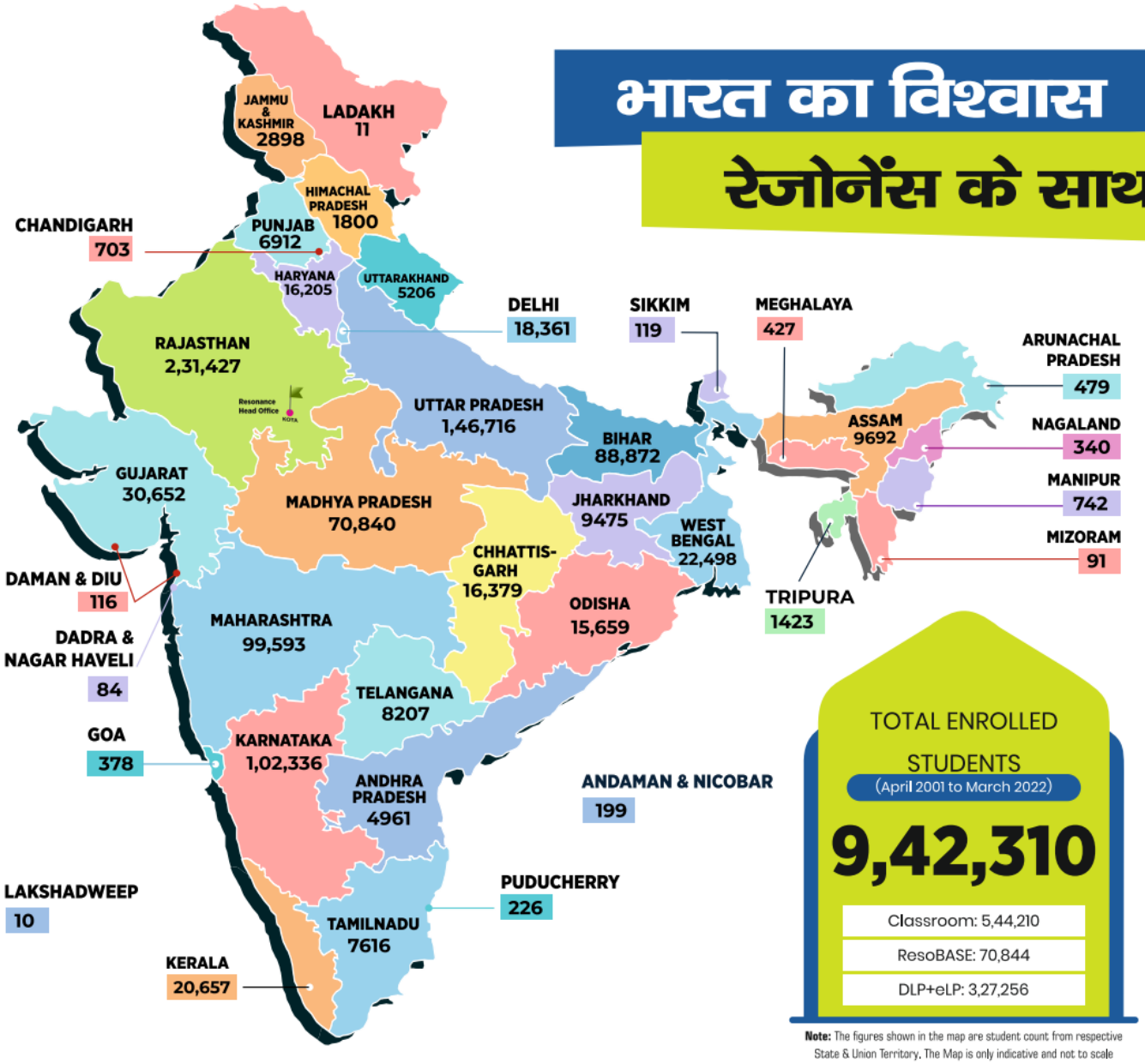

TOTAL ENROLLED STUDENTS
(April 2001 to March 2022)

9,42,310

- Classroom: 5,44,210
- ResoBASE: 70,844
- DLP+eLP: 3,27,256

Note: The figures shown in the map are student count from respective State & Union Territory. The Map is only indicative and not to scale

Resonance : The Legacy of 21 Years (2001-2022) of Academic Excellence

- **JEE (Adv.) / IIT-JEE** ▸ **50 हजार +** SELECTIONS SINCE 2002
  229 AIRs in TOP-100 (Classroom + DLP)
- **JEE (Main) / AIEEE** ▸ **2.40 लाख+** SELECTIONS SINCE 2009
  136 AIRs in TOP-100 (Classroom + DLP)
- **NEET (UG) / AIPMT** ▸ **19 हजार+** SELECTIONS SINCE 2012
  19 AIRs in TOP-100 (Classroom + DLP)

- **NTSE** SINCE 2006 ▸ **2440** Scholars
- **KVPY** SINCE 2006 ▸ **2859** Fellowship Winners
- **OLYMPIADS** SINCE 2006 ▸ **52** Medalists (Gold/Silver/ Bronze) in International Olympiads
- **CA & CS** SINCE 2013 ▸ **4179** Selections — 5 Times AIR-1 in CA & CS Exams
- **CLAT, SET & GPTU** SINCE 2014 ▸ **77** Selections — AIR-1 in GPTU