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DIVISION: PRE-MEDICAL
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	SAKSHAM, SAMRATH, WINNER	COURSE CODE	MA & MT
PHASE CODE(S)	MA, MB, MT, MTCHT (ALL PHASES)	TOTAL PAGES	16	BATCH CODE(S)	MA, MB, MT, MTCHT (ALL BATCHES)

Target Examination & Year:

NEET 2025

TEST PATTERN	TEST TYPE	TEST CODE & SEQUENCE
NEET	ALL INDIA RESONANCE TEST (AIRT)	AIRT 01

DATE & DAY:
29st October 2023 | Sunday

Duration & Time:
200 Minutes | 02:30 PM to 5:50 PM

Contents:

Scan QR Code for Video Solutions

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Academic Session: 2023-24

PAT : TOPIC-WISE WEIGHTAGE SHEET

	PAPER	Total		PAPER	Total
Total Qs	200	200	Subject wise Qs.	50	200
Max. Marks	720	720	Subject wise Marks	240	720

Chemistry

S.No.	Topic Name	Question Type & Sequencing						Total Qs. (Topic-wise)	Total Marks (Topic-wise)	% Weightage (Topic-wise)
		MCQ		MTCQ		ARQ				
		No. of Qs.	Qs. Sequencing	No. of Qs.	Qs. Sequencing	No. of Qs.	Qs. Sequencing			
Physical Chemistry										
	Class-11	**23**		**1**		**1**		**25**	**100**	**50.00%**
1	Mole Concept	4	1,2,3,12	–	–	–	–	4	16	8.00%
2	Redox Reaction	3	4,6,8	–	–	1	10	4	16	8.00%
3	Chemical Equilibrium	8	5,14,15,16, 17,18,39, 40	1	7	–	–	9	36	18.00%
4	Ionic Equilibrium	8	9,11,13,19, 20,36,37, 38	–	–	–	–	8	32	16.00%
Inorganic Chemistry										
	Class-11	**12**						**12**	**48**	**24.00%**
5	Periodic Table	6	28,29,30, 31,32,33	–	–	–	–	6	24	12.00%
6	Chemical Bonding	6	34,35,41, 42,43,44	–	–	–	–	6	24	12.00%
Organic Chemistry										
	Class-11	**13**						**13**	**52**	**26.00%**
7	IUPAC nomenclature	13	21,22,23,2 4,25,26,27, 45,46,47, 48,49,50	–	–	–	–	13	52	26.00%
	Total	**48**		**1**		**1**		**50**	**200**	**100%**

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Physics								
S.No.	Topic Name	Question Type & Sequencing				Total Qs. (Topic-wise)	Total Marks (Topic-wise)	% Weightage (Topic-wise)
		MCQ		ARQ				
		No. of Qs.	Qs. Sequencing	No. of Qs.	Qs. Sequencing			
	Class-11	**49**		**1**		**50**	**200**	**100.00%**
1	Circular motion	3	51,56,86	_	_	3	12	6.00%
2	Measurement Error	4	52,57,62,72	1	67	5	20	10.00%
3	Mathematical Tools	5	53,77,82,90,95	_	_	5	20	10.00%
4	Projectile motion	4	54,59,64,69	_	_	4	16	8.00%
5	Newton's laws of motion	7	55,60,65,71,76, 80,81	_	_	7	28	14.00%
6	Rectilinear motion	8	58,63,68,70,73,74, 78,83	_	_	8	32	16.00%
7	Friction	6	61,66,85,88, 89,92	_	_	6	24	12.00%
8	Relative motion	2	75,79	_	_	2	8	4.00%
9	Unit and Dimension	4	84,87,91,96	_	_	4	16	8.00%
10	Work, Power, Energy	6	93,94,97,98, 99,100	_	_	6	24	12.00%
Total		**49**		**1**		**50**	**200**	**100%**

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Botany										
S.No.	Topic Name	Question Type & Sequencing						Total Qs. (Topic-wise)	Total Marks (Topic-wise)	% Weightage (Topic-wise)
		MCQ		MTCQ		ARQ				
		No. of Qs.	Qs. Sequencing	No. of Qs.	Qs. Sequencing	No. of Qs.	Qs. Sequencing			
	Class-11	**45**		**1**		**4**		**50**	**200**	**100.00%**
1	Cell Biology	21	101,102,103, 104,105,106, 107,108,109, 111,112,113, 114,115,116, 117,118,119, 138,140,142	1	110	2	120,141	24	96	48.00%
2	Biological Classification	8	121,122,123, 124,136,137, 139,147	_	_	_	_	8	32	16.00%
3	Plant Kingdom	7	125,126,127, 128,143,145, 146	_	_	1	144	8	32	16.00%
4	Plant Physiology-II-Photosynthesis In Higher Plants	9	129,130,131, 132,133,134, 135,149,150	_	_	1	148	10	40	20.00%
	Total	**45**		**1**		**4**		**50**	**200**	**100%**

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PAT : TOPIC-WISE WEIGHTAGE SHEET

Zoology										
S.No.	Topic Name	Question Type & Sequencing						Total Qs. (Topic-wise)	Total Marks (Topic-wise)	% Weightage (Topic-wise)
		MTCQ		MCQ		ARQ				
		No. of Qs.	Qs. Sequencing	No. of Qs.	Qs. Sequencing	No. of Qs.	Qs. Sequencing			
	Class-11	**1**		**45**		**4**		**50**	**200**	**100.00%**
1	Structural Organisation in Animal	1	151	3	152,153,154	1	186	5	20	10.00%
2	Structural organisation in animals	_	_	3	155,157,188	1	156	4	16	8.00%
3	Biomolecule-I	_	_	9	158,160,161, 162,163,167, 189,190,191	_	_	9	36	18.00%
4	Biomolecule-II	_	_	2	159,164	_	_	2	8	4.00%
5	Body fluids and circulation	_	_	14	165,170,172, 173,174,175, 176,178,179, 183,187,195, 196,197	2	177,199	16	64	32.00%
6	Breathing and Exchange of Gases	_	_	7	166,168,169, 171,192,193, 194	_	_	7	28	14.00%
7	Locomotion and Movement	_	_	7	180,181,182, 184,185,198, 200	_	_	7	28	14.00%
	Total	**1**		**45**		**4**		**50**	**200**	**100%**

ANSWER KEY (AK)

PAPER											
PART-A : CHEMISTRY	Q.No.	1	2	3	4	5	6	7	8	9	10
	Ans.	2	3	2	2	4	3	2	2	4	2
	Q.No.	11	12	13	14	15	16	17	18	19	20
	Ans.	4	4	2	3	2	2	1	1	3	2
	Q.No.	21	22	23	24	25	26	27	28	29	30
	Ans.	1	4	3	1	3	4	3	4	2	2
	Q.No.	31	32	33	34	35	36	37	38	39	40
	Ans.	4	2	4	2	1	3	3	1	4	3
	Q.No.	41	42	43	44	45	46	47	48	49	50
	Ans.	4	1	4	4	2	1	1	1	2	2
PART-B : PHYSICS	Q.No.	51	52	53	54	55	56	57	58	59	60
	Ans.	2	2	3	4	2	2	3	2	2	3
	Q.No.	61	62	63	64	65	66	67	68	69	70
	Ans.	4	3	3	1	2	2	3	3	3	2
	Q.No.	71	72	73	74	75	76	77	78	79	80
	Ans.	1	4	3	1	3	3	4	4	3	3
	Q.No.	81	82	83	84	85	86	87	88	89	90
	Ans.	2	1	2	1	2	1	1	1	2	3
	Q.No.	91	92	93	94	95	96	97	98	99	100
	Ans.	3	3	4	4	2	1	2	2	2	4
PART-C : BIOLOGY	Q.No.	101	102	103	104	105	106	107	108	109	110
	Ans.	2	1	2	3	1	2	2	1	3	1
	Q.No.	111	112	113	114	115	116	117	118	119	120
	Ans.	2	4	4	3	1	2	2	2	2	2
	Q.No.	121	122	123	124	125	126	127	128	129	130
	Ans.	3	1	3	2	1	1	2	2	2	1
	Q.No.	131	132	133	134	135	136	137	138	139	140
	Ans.	1	4	4	3	4	**1**	3	4	3	4
	Q.No.	141	142	143	144	145	146	147	148	149	150
	Ans.	2	2	3	**4**	3	4	1	2	4	1
	Q.No.	151	152	153	154	155	156	157	158	159	160
	Ans.	3	3	3	3	3	2	2	**3**	3	2
	Q.No.	161	162	163	164	165	166	167	168	169	170
	Ans.	1	4	4	4	3	3	3	1	3	2
	Q.No.	171	172	173	174	175	176	177	178	179	180
	Ans.	2	4	4	1	4	4	1	4	4	4
	Q.No.	181	182	183	184	185	186	187	188	189	190
	Ans.	3	3	1	3	1	2	1	2	3	3
	Q.No.	191	192	193	194	195	196	197	198	199	200
	Ans.	3	3	3	4	1	1	1	3	3	3

STUDENT'S SPACE

TEXT SOLUTIONS (TS)

PAPER

PART-A: CHEMISTRY

1. 8 moles of O-atom are contained by 1 mole $Mg_3(PO_4)_2$.
Hence, 0.25 moles of O-atom
$= \frac{1}{8} \times 0.25 = 3.125 \times 10^{-2}$ mole $Mg_3(PO_4)_2$.
8 मोल O परमाणु उपस्थित है
= 1 मोल $Mg_3(PO_4)_2$ में
अतः , 0.25 मोल O परमाणु है
$= \frac{1}{8} \times 0.25$
$= 3.125 \times 10^{-2}$ मोल $Mg_3(PO_4)_2$ में।

2. NH_2OH
$x + 3(+1) + 1(-2) = 0$
$x = -1$

3. For I[st] reaction $\frac{\text{Mole of } S_8}{1} = \frac{\text{Mole of } SO_2}{8}$
Mole of $SO_2 = \frac{1\times 8}{1} = 8$
For II[nd] reaction $\frac{\text{Mole of } SO_2}{2}$
$= \frac{\text{Mole of } SO_3}{2} = 8$
wt of $SO_3 = 8 \times 80 = 640$ g.
I[st] अभिक्रिया के लिए $\frac{S_8 \text{ के मोल}}{1}$
$= \frac{SO_2 \text{ के मोल}}{8}$
SO_2 के मोल $= \frac{1\times 8}{1} = 8$
II[nd] अभिक्रिया के लिए $\frac{SO_2 \text{ के मोल}}{2}$
$= \frac{SO_3 \text{ के मोल}}{2} = 8$
SO_3 का भार $= 8 \times 80 = 640$ ग्राम.

4. In H_2O_2 oxidation state of oxygen is –1.
It can undergo both oxidation as well as reduction
$O^- - e^- \rightarrow O$ (Oxidation)
$O^- + e^- \rightarrow O^{2-}$ (reduction)
Hence it can act both as oxidizing as well as reducing agent.
H_2O_2 में, ऑक्सीजन का ऑक्सीकरण अंक –1 है।
इसका ऑक्सीकरण के साथ–साथ अपचयन दोनों होता है।
$O^- - e^- \rightarrow O$ (ऑक्सीकरण)
$O^- + e^- \rightarrow O^{2-}$ (अपचयन)
अतः यह ऑक्सीकरण व अपचयन दोनों की तरह व्यवहार करता है।

5. $K_p = K_c (RT)^{\Delta n}$; $\Delta n = 1 - \left(1 + \frac{1}{2}\right)$
$= 1 - \frac{3}{2} = -\frac{1}{2}$.
$\therefore \quad \frac{K_c}{K_p} = (RT)^{1/2}$.

6. In acidic medium $KMnO_4$ shows following reaction –
$\overset{+7}{Mn}O_4^- + 8H^+ + e^- \rightarrow Mn^{2+} + 4H_2O$
V.f. = +5
Equivalent weight $= \frac{\text{molecular wt.}}{\text{v.f.}} = \frac{M}{5}$

7. 5.82×10^{-2} atm

8. 49

9. $HClO_4 + H_2O \longrightarrow H_3O^+ + ClO_4^-$ ($HClO_4$ has donated H^+ & formed ClO_4^-)

10. When O. No. decreases i.e. reduced or oxidizing agent.
जब ऑक्सीकरण अंक घटता है तो अणु का अपचयन होता है तथा वह ऑक्सीकरण की तरह कार्य करता है।

11. Buffer solutions
बफर (Buffer) विलयन

12.

Eleme	Percen	r.a.	No. of atoms	atomic ratio
C	74	12	74/12 = 6.16	6.16/1.23 = 5
H	8.7	1	8.7/1 = 8.7	8.7/1.123 = 7
N	17.3	14	17.3/14 = 1.23	1.23/1.23 = 1

The ratio of atoms = C : H : N = 5 : 7 : 1
Empirical formula = C_5H_7N
Empirical formula mass = 5 C + 7H + N = 5 × 12 + 7 × 1 + 14 = 81
Molecular mass = 162 (given)
No. of empirical units per molecule = n

$$= \frac{\text{Molecular mass}}{\text{Empirical formula mass}} = \frac{162}{81} = 2$$

Molecular formula = (Empirical formula) × 2
= $(C_5 H_7N) \times 2 = C_{10}H_{14}N_2$

तत्व	प्रतिशत	सा. प. भार	परमाणु की संख्या	परमाण्विक अनुपात
C	74	12	74/12 = 6.16	6.16/1.23= 5
H	8.7	1	8.7/1 = 8.7	8.7/1.123= 7
N	17.3	14	17.3/14= 1.23	1.23/1.23= 1

परमाणुओं का अनुपात = C : H : N = 5 : 7 : 1

मूलानुपाती सूत्र = C_5H_7N

मूलानुपाती सूत्रभार = 5 C + 7H + N = 5 × 12 + 7 × 1 + 14 = 81

अणुभार = 162 (दिया गया)

प्रत्येक अणु में मूलानुपाती इकाई = n

$$= \frac{\text{अणुभार}}{\text{मूलानुपाती सूत्रभार}} = \frac{162}{81} = 2$$

अणुसूत्र = (मूलानुपाती सूत्र) × 2

= $(C_5 H_7N) \times 2 = C_{10}H_{14}N_2$.

13. Solubility of $Al_2(SO_4)_3$

$$Al_2(SO_4)_3 \rightleftharpoons 2Al^{+++} + 3SO_4^{--}$$

$$K_{sp} = [Al^{3+}]^2 [SO_4^{2-}]^3$$

14.
$$K_p = \frac{P_{PCl_3} \times P_{PCl_2}}{P_{PCl_5}} =$$

$$\frac{\frac{b}{(a+b+c)}.P \times \frac{c}{(a+b+c)} \times P}{\frac{a}{(a+b+c)}P}$$

$$K_p = \frac{bc.P}{a\ (a+b+c)}$$

15. $2SO_2(g) + O_2(g) \rightleftharpoons 2SO_3(g)$

$$K_C = \frac{[SO_3]^2}{[SO_2]^2[O_2]}$$

Concentration in gram mole/litre, therefore

$$[SO_3] = \frac{48}{80 \times 1}$$

(Where 80 is molecular weight of SO_3)

$$[SO_2] = \frac{128}{64 \times 1}$$

(Where 64 is molecular weight of SO_2)

$$[O_2] = \frac{9.6}{32 \times 1}$$

(Where 32 is molecular weight of O_2)

$$\text{Thus, } K_C = \frac{\left(\frac{48}{80}\right)^2}{\left(\frac{12.8}{64}\right)^2\left(\frac{9.6}{32}\right)} = 0.30$$

$2SO_2(g) + O_2(g) \rightleftharpoons 2SO_3(g)$

$K_C = \frac{[SO_3]^2}{[SO_2]^2[O_2]}$ ग्राम मोल/लीटर में सान्द्रता,

अतः

$$[SO_3] = \frac{48}{80 \times 1}$$

(जहाँ SO_3 का अणु भार 80 हो)

$$[SO_2] = \frac{128}{64 \times 1}$$

(जहाँ SO_2 का अणु भार 64 हो)

$$[O_2] = \frac{9.6}{32 \times 1}$$

(जहाँ O_2 का अणु भार 32 हो)

$$\text{अतः, } K_C = \frac{\left(\frac{48}{80}\right)^2}{\left(\frac{12.8}{64}\right)^2\left(\frac{9.6}{32}\right)} = 0.30$$

16. $2A_{(g)} + B_{(g)} \rightleftharpoons 3C_{(g)} + D_{(g)}$

Initial moles : 1 1 0 0

Moles at eq : $1 - 2x$ $1 - x$ $3x$ x

Moles of eq. : $1 - (2 \times 0.25)$ $1 - 0.25$ 3×0.25 0.25

$= 0.5$ $= 0.75$ $= 0.75$ $= 0.75$

Equilibrium constant,

$K = \Rightarrow K =$

$2A_{(g)} + B_{(g)} \rightleftharpoons 3C_{(g)} + D_{(g)}$

प्रारम्भिक मोल : 1 1 0 0

साम्य पर मोल : $1 - 2x$ $1 - x$ $3x$ x

साम्य पर मोल : $1 - (2 \times 0.25)$ $1 - 0.25$ 3×0.25 0.25

$= 0.5$ $= 0.75$ $= 0.75$ $= 0.75$

साम्यावस्था नियतांक,

$$K = \frac{[C]^3[D]}{[A]^2[B]} \Rightarrow K = \frac{(0.75)^3(0.25)}{(0.5)^2(0.75)}$$

FTP (14)

Sol. $2\ A\ (g) + B\ (g) \rightleftharpoons 3\ C\ (g) + D\ (g)$

At t=0 1 1 0 0

At $t=t_{eq}$ $1-0.50$ $1-0.25$ 0.75 0.25

$$K_C = \frac{[D][C]^3}{[A]^2[B]} = \frac{0.25 \times (0.75)^3}{0.75 \times (0.50)^2}$$

17. $\alpha = \frac{D-d}{d} = \frac{46-30}{30} = 0.533 = 53.3\%$

18. Gibbs equation (गिब्स समीकरण) ΔG

$= \Delta G^o - RT \ln K$

at equilibrium (साम्य पर) $\Delta G = 0$

$\Delta G^o = -RT \ln K$

19. For CH3COOH :

$[H^+] = C.\alpha$

$[H^+] = 10^{-2} \times \frac{1}{100} = 10^{-4}$ M

$pH = -\log[H^+]$

$pH = -\log 10^{-4}$

$pH = 4$

20. $BaSO_4 \rightleftharpoons Ba^{+2} + SO^{2-}_4$

$K_{sp} = [Ba^{+2}]\ [SO^{2-}_4]$

$= 1.5 \times 10^{-9} = S^2$

$S = \sqrt{1.5 \times 10^{-9}} = 3.87 \times 10^{-5}$

$Ba(NO_3)_2 \rightarrow Ba^{+2}\ (aq) + 2NO^-_3\ (aq)$

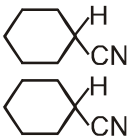
[Due to common ion] $\rightarrow (0.1 + S')\ (S') = K_{sp}$

$(0.1) \times S' = 1.5 \times 10^{-9}$ ( )

21. π bond electrons = no. of double bond × 2

$= 4 \times 2 = 8\ \pi$ electrons

22. $HC{\equiv}C{-}CH_2{-}CH_2{-}CH_3$, $HC{\equiv}C{-}CH(CH_3)_2$, $HC_3{-}C{\equiv}C{-}CH_2{-}CH_3$.

23.  is a homocyclic compound.

समचक्रीय यौगिक है।

24. 2-Bromo methyl-3-oxo hexanamide

2-ब्रोमो मेथिल-3-ऑक्सोहेक्सेनैमाइड

25. Ethyl 2-methyl butanoate

ऐथिल 2-मेथिल ब्यूटेनोऐट

26. Functional group isomers

क्रियात्मक समूह समावयवी

27. 5

28. Cl & F

29. B < Al < Ga < In

30. $N^{3-} > O^{2-} > F^- > Na^+ > Mg^{2+}$

31. First Ionization energy of Be is higher than Boron but lower than Carbon

Be की प्रथम आयनन ऊर्जा बोरॉन से अधिक किन्तु कार्बन से कम होती है।

32. Down the group the effective nuclear charge remains almost constant. But down the group with increasing atomic number, the number of shells increase and thereby atomic size increases. As a result, the distance of valence shell electron from nucleus increases, attraction between them decreases and therefore ionization energy decreases.

वर्ग में नीचे जाने पर प्रभावी नाभिकीय आवेश लगभग स्थिर रहता है, परन्तु वर्ग में नीचे जाने पर परमाणु क्रमांक बढ़ने पर कोशों की संख्या में वृद्धि होती है और परमाणु का आकार बढ़ता है। इस कारण, नाभिक से संयोजी कोश इलेक्ट्रॉन की दूरी बढ़ती है और उनके बीच आकर्षण घटता है, जिसके परिणामस्वरूप आयनन ऊर्जा घटती है।

33. Lanthanoid contraction is due to ineffective shielding produced by larger f-subshell.
लैन्थेनॉइड संकुचन, $4f$ इलेक्ट्रॉनों द्वारा बाह्य इलेक्ट्रॉनों पर नाभिकीय आवेश से अपर्याप्त परिरक्षण के कारण होता है।

34. Steric number = 0 + 3 = 3; so sp^2 hybridisation
त्रिविम संख्या = 0 + 3 = 3; अतः sp^2 संकरण

35. 1s & $2p_y$

36. $[OH] = 10^{-2}$
$pOH = -\log(OH^-)$
$pOH = -\log(10^{-2})$
$pOH = 2$
$pH = 14 - pOH$
$= 14 - 2 = 12$

37. Buffer of H_2CO_3 / HCO_3^- helps maintain the pH of blood
H_2CO_3 /HCO_3^- का बफर विलयन रक्त की pH को बनाऐ रखता है।

38. Millimoles of acetic acid = 50 × 2 = 100
Millimoles of CH_3COONa = 10 × 1 = 10

$$pH = \frac{[Salt]}{[Acid]} - \log K_a + \log \text{ or}$$

$$pH = -\log 10^{-5} + \log \frac{10}{100} = 4$$

एसीटिक अम्ल के मिली मोल = 50 × 2 = 100
CH_3COONa के मिली मोल = 10 × 1 = 10

$$pH = -\log K_a + \log \frac{[\text{लवण}]}{[\text{अम्ल}]} \text{ या}$$

$$pH = -\log 10^{-5} + \log \frac{10}{100} = 4$$

39. Eq. (i) + Eq. (ii) + Eq. (iii)
$= K_1 \times K_2 \times K_3$
$= 2 \times 4 \times 6 = 48$

40. K → Deepend on temperature

41. RbCl

42. sp^3d and trigonalbipyramidal

43. All contributing structures always have same stability.
सभी योगदान देने वाली संरचनाओं का स्थायित्व हमेशा समान होता है।

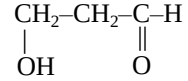
44. $NH_3 \rightarrow BF_3$

45. Pentane-2-one-4-ol
पेन्टेन-2-ओन-4-ऑल

46. Position isomers
स्थिति समावयवी

47. Position isomers
स्थिति समावयवी

48. Only an acid

49.


50. Chain isomerism

PART-B: PHYSICS

51. As the speed is constant throughout the circular motion therefore its average speed is equal to instantaneous speed.
चूँकि वृत्तीय गति के दौरान चाल नियत होती है अतः वस्तु की औसत चाल इसकी तात्क्षणिक चाल के बराबर होगी।

52. $H = I^2Rt$

$$\therefore \frac{\Delta H}{H} \times 100 = \left(\frac{2\Delta I}{I} + \frac{\Delta R}{R} + \frac{\Delta t}{t}\right) \times 100$$

$$= (2 \times 3 + 4 + 6)\% = 16\%$$

53. Given vectors can be rewritten as $\vec{A} = 2\hat{i} + 3\hat{j} + 8\hat{k}$ and $\vec{B} = -4\hat{i} + 4\hat{j} + \alpha\hat{k}$
Dot product of these vectors should be equal to zero because they are perpendicular.

$$\therefore \vec{A}.\vec{B} = -8 + 12 + 8\alpha = 0$$

$$\Rightarrow 8\alpha = -4 \Rightarrow \alpha = -1/2$$

माना दिये गये सदिश हैं $\vec{A} = 2\hat{i} + 3\hat{j} + 8\hat{k}$

तथा $\vec{B} = b\hat{j}$

चूँकि दोनों सदिश परस्पर लम्बवत् हैं, अतः इनका अदिश गुणन शून्य होगा।

$$\therefore \vec{A}.\vec{B} = -8 + 12 + 8\alpha = 0$$

$$\Rightarrow 8\alpha = -4 \Rightarrow \alpha = -1/2$$

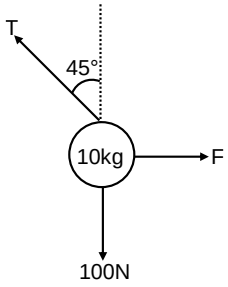
54. $R = 4H\cot\theta$ if $\theta = 45°$ then

$R = 4H\cot(45°) = 4H$

$R = 4H\cot\theta$ यदि $\theta = 45°$ तब

$R = 4H\cot(45°) = 4H$

55.



$\frac{T}{\sqrt{2}} = 100$

$\frac{T}{\sqrt{2}} = F$

F = 100 N

56. It is a vector quantity.
यह एक सदिश राशि है

57. Given, $L = 2.331\text{cm}$

$= 2.33$ (correct upto two decimal places)

and $B = 2.1\text{cm} = 2.10\text{cm}$

$\therefore L + B = 2.33 + 2.10 = 4.43\text{cm}. = 4.4\text{cm}$

Since minimum significant figure is 2.

दिया है, $L = 2.331\text{cm}$

$= 2.33$ (दशमलव के दो स्थानों तक शुद्ध मान)

तथा $B = 2.1\text{cm} = 2.10\text{cm}$

$\therefore L + B = 2.33 + 2.10 = 4.43\text{cm} = 4.4\text{cm}$

क्योंकि सार्थक अंकों की न्यूनतम संख्या दो है।

58. Time average velocity = $\frac{v_1 + v_2 + v_3}{3}$

$= \frac{3+4+5}{3} = 4\text{m/s}$

औसत वेग = $\frac{v_1 + v_2 + v_3}{3}$

$= \frac{3+4+5}{3} = 4$ **मी/सै**

59. $R_{15°} = \frac{u^2 \sin(2\times 15°)}{g} = \frac{u^2}{2g} = 1.5\text{km}$

$R_{45°} = \frac{u^2 \sin(2\times 45°)}{g}$

$= \frac{u^2}{g} = 1.5 \times 2 = 3\text{km}$

60. $F = \frac{dp}{dt} \Rightarrow Kt = \frac{dp}{dt}$

$\int_P^{3P} dP = \int_0^t Ktdt \Rightarrow 3P - P = \frac{Kt^2}{2}$

$\Rightarrow t = 2\sqrt{\frac{P}{K}}$

61. $v = u - at \Rightarrow t = \frac{u}{a}$ [As $v = 0$]

$t = \frac{u \times m}{F} = \frac{30 \times 1000}{5000} = 6\text{ sec}$

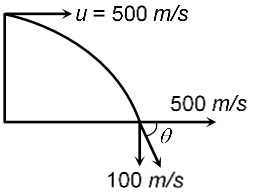
62. Percentage error in g = (%error in l) + 2(% error in T) = 1% + 2(3%) = 7%

g में प्रतिशत त्रुटि = (l में प्रतिशत त्रुटि)+ 2(T में प्रतिशत त्रुटि)

= 1% + 2(3%) = 7%

63. $v_{av} = \frac{2v_1v_2}{v_1 + v_2} = \frac{2\times 40\times 60}{100} = 48\text{kmph}$

64. Horizontal component of velocity v_x= 500 m/s



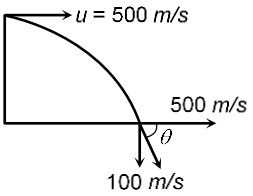
and vertical components of velocity while striking the ground.

$v_y = 0 + 10\times 10 = 100\text{m/s}$

$\therefore$ Angle with which it strikes the ground.

$\theta = \tan^{-1}\left(\frac{v_y}{v_x}\right) = \tan^{-1}\left(\frac{100}{500}\right) = \tan^{-1}\left(\frac{1}{5}\right)$

वेग का क्षैतिज घटक v_x= 500 m/s



तथा जमीन पर टकराते समय वेग का ऊर्ध्वाधर घटक

$v_y = 0 + 10\times 10 = 100\text{m/s}$

$\therefore$ वह कोण जिसके साथ यह जमीन से टकरायेगा

$\theta = \tan^{-1}\left(\frac{v_y}{v_x}\right) = \tan^{-1}\left(\frac{100}{500}\right) = \tan^{-1}\left(\frac{1}{5}\right)$

65. $k_1\ell_1 = k_2\ell_2 = k\ell$

$$\frac{k_1}{k_2} = \frac{\ell_2}{\ell_1} = \frac{\ell_2}{n\ell_2} = \frac{1}{n}$$

66. We know $s = \frac{u^2}{2\mu g}$

$$\therefore \ \mu = \frac{u^2}{2gs} = \frac{(6)^2}{2\times 10\times 9} = 0.2$$

हम जानते हैं कि $s = \frac{u^2}{2\mu g}$

$$\therefore \ \mu = \frac{u^2}{2gs} = \frac{(6)^2}{2\times 10\times 9} = 0.2$$

67. Since zeros placed to the left of the number are never significant, but zeros placed to right of the
number are significant.
क्योंकि संख्या के बायीं ओर स्थित शून्य सार्थक अंक नहीं होते किन्तु संख्या के दायीं ओर स्थित सभी शून्य सार्थक अंक होते हैं।

68. Acceleration $a = \tan\theta$, where θ is the angle of tangent drawn on the graph with the time axis.
त्वरण $a = \tan\theta$, जहाँ θ ग्राफ पर खींची गयी स्पर्श रेखा का समय अक्ष के साथ बनाया गया कोण है।

69. Because horizontal velocity is same for coin and the observer. So relative horizontal displacement will be zero.
क्योंकि सिक्के एवं प्रेक्षक दोनों के लिये क्षैतिज वेग समान है इसलिये सापेक्षिक क्षैतिज विस्थापन शून्य होगा।

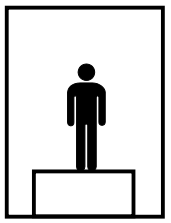
70. Time

$$= \frac{\text{Total length}}{\text{Relative velocity}} = \frac{50+50}{10+15} = \frac{100}{25} = 4\,sec$$

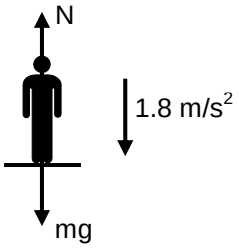
समय

$$= \frac{\text{कुल लंबाई}}{\text{आपेक्षिक बा}} = \frac{50+50}{10+15} = \frac{100}{25} = 4\,sec$$

71.



FBD of man



mg – N = 1.8 m

N = m (10 – 1.8)

N = 60 × 8.2

N = 492 N

Thus weight of the man will be 492 N

72. Pitch पिच = $\frac{3}{6}$ = 0.5 mm

L.C. = $\frac{0.5\,mm}{50}$

= $\frac{1}{100}$ mm = 0.01 mm = 0.001 cm

73. $y = a + bt + ct^2 - dt^4$

$$\therefore v = \frac{dy}{dt} = b + 2ct - 4dt^3$$

and $a = \frac{dv}{dt} = 2c - 12dt^2$

Hence, at t = 0, $v_{initial}$
= b and $a_{initial}$ = 2c.

$y = a + bt + ct^2 - dt^4$

$$\therefore v = \frac{dy}{dt} = b + 2ct - 4dt^3$$

अथवा $a = \frac{dv}{dt} = 2c - 12dt^2$

अतः t = 0, पर $v_{प्रारंभिक}$

= b अथवा $a_{प्रारंभिक}$ = 2c

74. When two particles moves towards each other then $v_1 + v_2 = 6$ ...(i)
When these particles moves in the same direction then $v_1 - v_2 = 4$ ...(ii)
By solving $v_1 = 5$ and $v_2 = 1 m/s$
जब दो कण एक दूसरे की ओर गति करें तब $v_1 + v_2 = 6$ ...(i)
जब दोनों कण एक ही दिशा में गति करें तब $v_1 - v_2 = 4$ ...(ii)
समीकरण (i) व (ii)को हल करने पर $v_1 = 5$, $v_2 = 1 m/s$

75. Relative velocity सापेक्षिक वेग
$= (3i + 4j) - (-3i - 4j) = 6i + 8j$

76. $F = 20\hat{i} + 10\hat{j}$

$a = \frac{F}{m} = \frac{20\hat{i} + 10\hat{j}}{2} = 10\hat{i} + 5\hat{j}$

$x = \frac{1}{2} \times a_x t^2$

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

x = 500 m

77. $A = 3N$, $B = 2N$ then

$R = \sqrt{A^2 + B^2 + 2AB\cos\theta}$

$R = \sqrt{9 + 4 + 12\cos\theta}$

...(i)

Now $A = 3N$, $B = 2N$ then

$2R = \sqrt{36 + 4 + 24\cos\theta}$

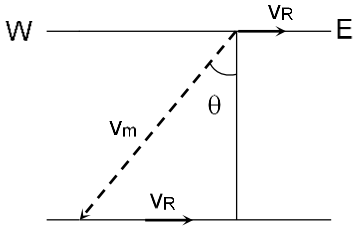
...(ii)

from (i) and (ii) we get

$\cos\theta = -\frac{1}{2} \therefore \theta = 120°$

78. v = u + at = 10 +2 × 4 = 18 m/sec

79. For shortest possible path man should swim with an angle (90+θ) with downstream.



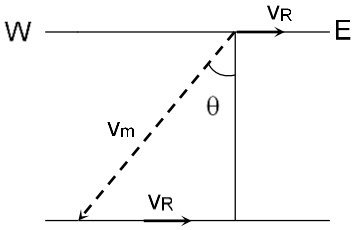
From the fig, $\sin\theta = \frac{v_r}{v_m} = \frac{5}{10} = \frac{1}{2}$

$\Rightarrow \therefore \theta = 30°$

So angle with downstream

$= 90° + 30° = 120°$

सबसे छोटे संभव मार्ग से नदी को पार करने के लिये व्यक्ति को धारा के प्रवाह की दिशा के साथ (90+θ) कोण पर तैरना होगा। चित्रनुसार



$\sin\theta = \frac{v_r}{v_m} = \frac{5}{10} = \frac{1}{2} \Rightarrow \therefore \theta = 30°$

अतः जल के प्रवाह की दिशा के साथ कोण

$= 90° + 30° = 120°$

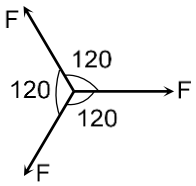
80. Total weight in right hand = 10 + 1 = 11 kg
दायें हाथ में कुल भार = 10 + 1 = 11 kg

81. $W_{app} = m.g_{eff}$

82. In N forces of equal magnitude works on a single point and their resultant is zero then angle between any two forces is given

$\theta = \frac{360}{N} = \frac{360}{3} = 120°$

If these three vectors are represented by three sides of triangle then they form equilateral triangle

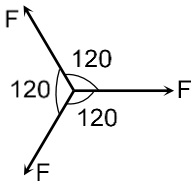


यदि समान परिमाण के N बल एक बिन्दु पर कार्यरत् हैं और उनका

परिणामी शून्य है तो किन्ही भी दो बलों के मध्य कोण

$\theta = \frac{360}{N} = \frac{360}{3} = 120°$

यदि यह तीन सदिश किसी त्रिभुज की भुजाओं द्वारा दर्शायें जायें तो यह समबाहु त्रिभुज बनाते हैं।



83. Speed of stone in a vertically upward direction is 20m/s. So for vertical downward motion we will consider $u = -20\ m/s$

ऊर्ध्वाधर ऊपर की ओर पत्थर की चाल 20m/s है इसलिये नीचे की ओर पत्थर की चाल $u = -20\ m/s$

$$v^2 = u^2 + 2gh$$

$$= (-20)^2 + 2\times 9.8\times 200 = 4320\ m/s$$

$$\therefore v \simeq 65 m/s.$$

84. Physical quantity (p) = Numerical value (n) $\times$ Unit (u)

If physical quantity remains constant then $n \propto 1/u \ \therefore n_1u_1 = n_2u_2$.

भौतिक राशि (p) = आंकिक मान (n) $\times$ मात्रक (u)

यदि भौतिक राशि नियत रहे तब $n \propto 1/u \Rightarrow n_1u_1 = n_2u_2$

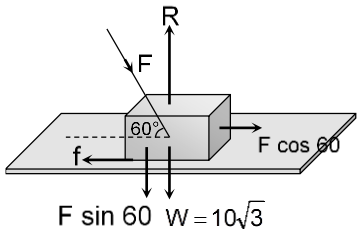
85. $g(\sin\theta - \mu\cos\theta)$

86. $$a = \frac{v^2}{r} = \frac{(400)^2}{160} = 10^3\ m/s^2 = 1 km/s^2$$

87. Frequency

आवृत्ति का

88.

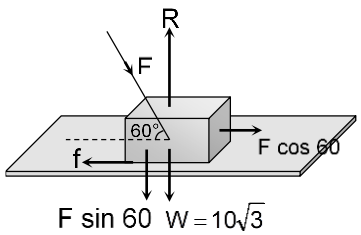


$f = \mu R$

$$F\cos 60° = \mu(W + F\sin 60°)$$

Substituting $\mu = \frac{1}{2\sqrt{3}}$ & $W = 10\sqrt{3}$ we get

$$F = 20N$$



$f = \mu R$

$\Rightarrow F\cos 60° = \mu(W + F\sin 60°)$

$\mu = \frac{1}{2\sqrt{3}}$ तथा $W = 10\sqrt{3}$ प्रतिस्थापित करने पर हमें प्राप्त होता है, $F = 20N$

89. $\mu = \tan(\text{Angle of repose}) = \tan 60° = 1.732$

$\mu = \tan$ (विराम कोण) $= \tan 60° = 1.732$

90. Resultant of two vectors $\vec{A}$ and $\vec{B}$ can be given by $\vec{R} = \vec{A} + \vec{B}$

$$|\vec{R}| = |\vec{A} + \vec{B}| = \sqrt{A^2 + B^2 + 2AB\cos\theta}$$

If $\theta = 0°$ then $|\vec{R}| = A + B = |\vec{A}| + |\vec{B}|$

दो सदिशों $\vec{A}$ तथा $\vec{B}$ का परिणामी होता है

$$\vec{R} = \vec{A} + \vec{B}$$

$$|\vec{R}| = |\vec{A} + \vec{B}| = \sqrt{A^2 + B^2 + 2AB\cos\theta}$$

यदि $\theta = 0°$ हो, तब $|\vec{R}| = A + B = |\vec{A}| + |\vec{B}|$

91. $1 fermi = 10^{-15} metre$

1 फर्मी $= 10^{-15}$ मीटर

92. For given condition we can apply direct formula

दी गई स्थिति के लिये निम्न सूत्र प्रयुक्त होता है।

$$I_1 = \left(\frac{\mu}{\mu + 1}\right) I$$

93. Friction is a non-conservative force.

घर्षण एक गैर–रूढ़िवादी बल है।

94. Condition for stable equilibrium

स्थिर संतुलन के लिए शर्त

$$F = -\frac{dU}{dx} = 0$$

$$\Rightarrow -\frac{d}{dx}\left[\frac{a}{x^{12}} - \frac{b}{x^6}\right] = 0$$

$$\Rightarrow -12ax^{-13} + 6bx^{-7} = 0$$

$$\Rightarrow \frac{12a}{x^{13}} = \frac{6b}{x^7} \Rightarrow \frac{2a}{b} = x^6$$

$$\Rightarrow x = \sqrt[6]{\frac{2a}{b}}$$

95. $\cos\theta = \dfrac{\vec{F_1}.\vec{F_2}}{|F_1||F_2|}$

$= \dfrac{(5\hat{i}+10\hat{j}-20\hat{k}).(10\hat{i}-5\hat{j}-15\hat{k})}{\sqrt{25+100+400}\sqrt{100+25+225}}$

$= \dfrac{50-50+300}{\sqrt{525}\sqrt{350}}$

$\Rightarrow \cos\theta = \dfrac{1}{\sqrt{2}} \therefore \ \theta = 45°$

96. Kinetic energy
गतिज ऊर्जा

$= \dfrac{1}{2}mv^2 = M[LT^{-1}]^2 = [ML^2T^{-2}]$

97. $W = \dfrac{1}{2}k(x_2^2 - x_1^2)$

$= \dfrac{1}{2}\times 800\times(15^2-5^2)\times 10^{-4} = 8\,J$

98. By applying law of conservation of energy
ऊर्जा संरक्षण के नियम से

$mgR = \dfrac{1}{2}mv^2 \Rightarrow v = \sqrt{2Rg}$

99. $\Delta U = mgh = 20\times 9.8\times 0.5 = 98J$

100. $W = \int_0^5 Fdx = \int_0^5 (7-2x+3x^2)\,dx$

$= [7x - x^2 + x^3]^5$

$= 35 - 25 + 125 = 135$ J

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

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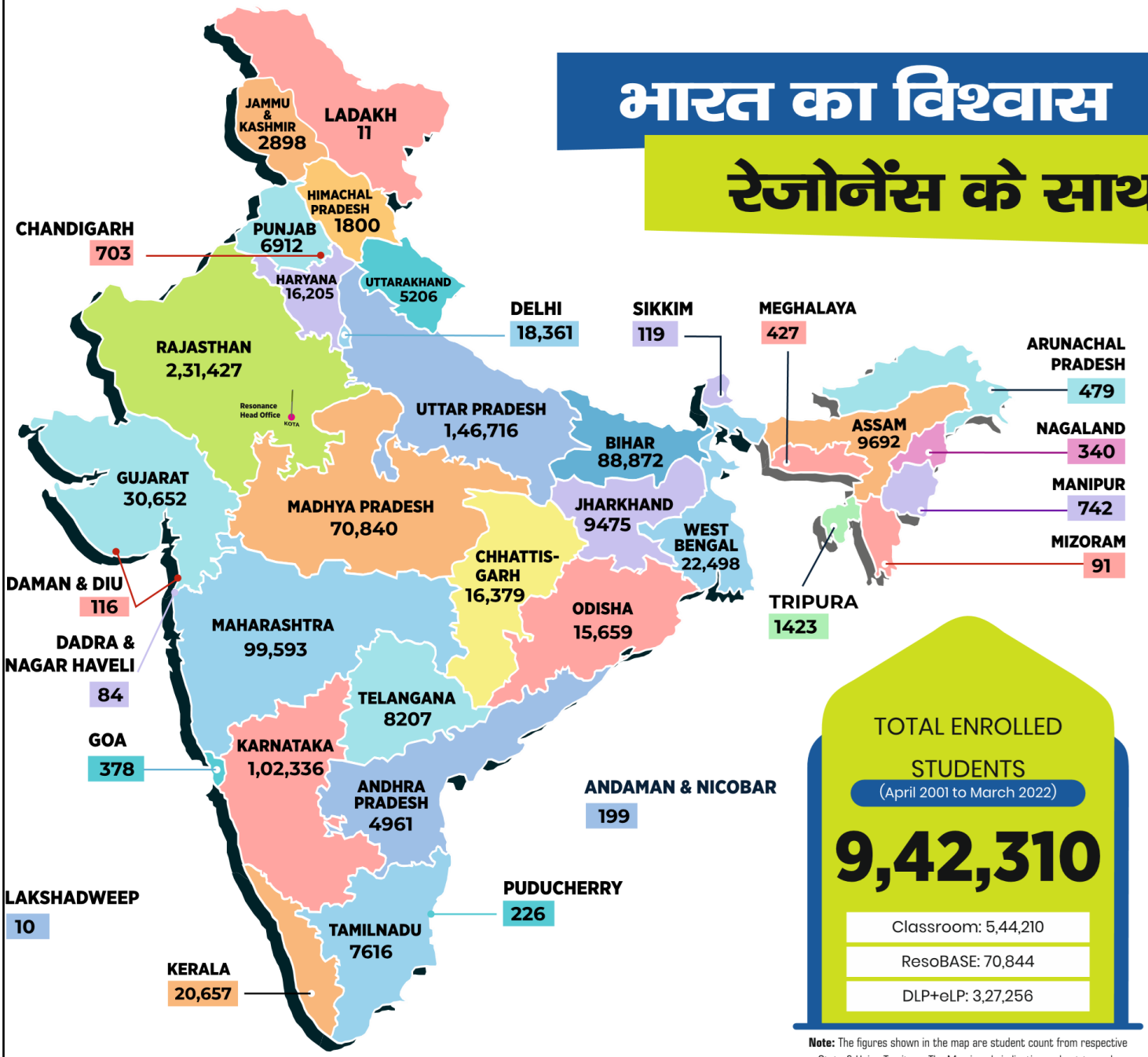

TOTAL ENROLLED STUDENTS
(April 2001 to March 2022)

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

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  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